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UDC 339.13:004.738.5:314.15(477:4-672EU)
JEL classification: : F15, F22, K33, L81, O15
DOI: https://doi.org/10.17721/1728-2667.2026/229-2/13

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UKRAINIAN E-COMMERCE BUSINESSES IN THE EU: A MIGRATION-DRIVEN PHENOMENON

Background. ***The full-scale Russian invasion of Ukraine has precipitated a massive wave of migration, fundamentally shifting the demographic and economic landscape within the European Union. This displacement has resulted in a unique phenomenon: a sharp decline in domestic consumer demand within Ukraine, coupled with a simultaneous surge in demand for familiar products and services among the diaspora in the EU. This context creates a critical need to analyze how this demographic shift influences the strategic expansion of Ukrainian e-commerce enterprises into European markets to mitigate domestic losses. The primary objective of this study is to evaluate the strategic impact of Ukrainian migration on the development and revenue of e-commerce businesses in the EU market. Furthermore, the research aims to assess the comparative advantages of Ukrainian marketplaces–specifically regarding pre-existing demand and legislative alignment–and to formulate recommendations for their successful integration into the EU economic space.***

Methods. ***The methodological framework employs a quantitative approach. Linear regression analysis was conducted using data from 2010 to 2023 to explore the relationship between internet sales volumes, the number of migrants, investment levels, and the share of enterprises across four key European markets: Germany, Poland, Czechia, and Spain. Additionally, a Holt-Winters Exponential Smoothing model was applied to historical refugee data from 31 European countries to generate a time-series forecast of Ukrainian migration trends up to 2026, accounting for both trend and seasonality components.***

Results. ***The analysis revealed a positive relationship between migration volume and internet sales in Germany and Spain, with marginal significance in Poland, while investment factors played a larger role in Czechia. The Holt-Winters forecast indicates a continued upward trend in forced migration, predicting that the total number of Ukrainian refugees in the EU will reach approximately 5 million by 2026. This correlates to a potential loss of roughly one-third of the active pre-war e-commerce customer base within Ukraine, signifying a major geographical shift in consumer purchasing power.***

Conclusions. ***The study confirms that the migration wave constitutes a significant competitive advantage for Ukrainian e-commerce expansion, driven by direct demand from the diaspora and reduced marketing barriers. The analysis suggests that Ukrainian marketplaces possess distinct strengths, including alignment with EU legislative frameworks and advanced digital payment systems. Consequently, shifting focus to the EU market is not merely an expansion strategy but a necessary measure to compensate for domestic market contraction. Targeting the refugee demographic provides a strategic entry point for broader market integration and revenue restoration.***

Keywords: e-commerce, *EU market, migration processes, economic integration, online marketplace.*

Background

The European Union (EU) is one of the largest and most dynamic markets in the world, with a population of over 448 million people and a GDP of over 15 trillion euros (European Union, 2023). The EU offers a wide range of opportunities for businesses that want to sell their products or services online, as e-commerce is a fast-growing and lucrative sector in the region. In 2022 alone, 76% of EU citizens aged 16-74 used the internet for online shopping, and the total value of e-commerce sales in the EU reached 893 billion euros (Eurostat, 2023a). However, entering and succeeding in the EU market is not a simple task. It requires careful planning, adaptation, and innovation. Businesses that want to operate in the EU market must comply with various rules and regulations that aim to ensure fair competition, consumer protection, and tax compliance. They also have to face fierce competition from well-established and powerful platforms that dominate the e-commerce landscape in the EU.

For Ukrainian businesses, especially those in the e-commerce sector, the EU market presents both challenges and opportunities. On the one hand, Ukraine has a close historical, cultural, and economic relationship with the EU, which is reflected in the Association Agreement signed in 2014 (Association Agreement…, 2014). This agreement aims to deepen political and economic ties between Ukraine and the EU, and to facilitate trade and cooperation in various sectors (Cabinet of Ministers of Ukraine, 2017). On the other hand, Ukraine has been suffering from a prolonged conflict that Russia began in 2014 that further escalated into a full-fledged war in February 2022, which has caused political instability, economic decline, and humanitarian crisis. This war has also triggered a massive wave of migration from Ukraine to other countries, especially to the EU. All this poses a question on whether Ukrainian e-commerce businesses should expand into EU, what are the opportunities, challenges, how can the two cooperate for the benefit of both? This article aims to answer these questions.

Literature review. First and foremost, it's important to understand what e-commerce really is. The EU Directive on electronic commerce defines e-commerce as any service provided at a distance by electronic means at the individual request of a recipient. This includes a wide array of online activities such as online information services, online selling of products and services, online advertising, professional services, entertainment services, and basic intermediary

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services. Essentially, it covers most digital services that are commonly used today. The EU Directive on electronic commerce sets the legal framework for online services within the EU. Digital payment systems are crucial for secure online transactions, while e-logistics manages the transportation and storage of goods, ensuring customer satisfaction through efficient delivery and order processing. Together, they form the backbone of e-commerce operations (Directive on electronic commerce…, 2000).

It is a key component of the digitalisation of society and its development, as it enables faster, cheaper, and more convenient transactions across borders and sectors. E-commerce also fosters innovation, competition, and consumer choice, as well as creating new opportunities for entrepreneurs, businesses, and workers. According to the United Nations Conference on Trade and Development (UNCTAD) report, global e-commerce sales grew by 4% in 2020 to reach $26.7 trillion, accounting for 19% of all retail sales (United Nations Conference On Trade And Development, 2021). In one study (Zatonatska et al., 2019) by building a model using International Telecommunication Union data authors concluded that in developing countries Internet technology and broadband Internet access spread very rapidly, a lot faster that in more developed countries, which in turn positively influences the development of e-commerce in such countries. As a result, this positively affected economy of Ukraine and even more developed countries such as Austria and Poland as authors have concluded. This shows that e-commerce becomes way more prevalent in our day to day lives. E-commerce has also been instrumental in mitigating the economic and social impacts of the COVID-19 pandemic, as it allowed many businesses and consumers to continue their activities online despite lockdowns and restrictions. However, e-commerce also faces some challenges and risks, such as cybercrime, data protection, digital divide, taxation, and regulation. Therefore, many countries have already developed a coherent and inclusive policies and frameworks that can support the growth and sustainability of e-commerce while ensuring its benefits are shared by all.

E-commerce is not only a convenient way of shopping, but also a powerful driver of human development and prosperity, especially for the EU. E-commerce can contribute to the achievement of the Sustainable Development Goals by enhancing access to goods and services, creating new income opportunities, reducing poverty and inequality, promoting innovation and entrepreneurship, and fostering environmental sustainability (United Nations Development Programme, n. d.). E-commerce can also support the EU's digital single market strategy, which aims to create a seamless online space where consumers and businesses can trade freely across borders, benefit from fair competition, and enjoy high levels of consumer and data protection. According to the EuroCommerce (2023), e-commerce rules in the EU have made it easier and safer for European consumers to shop online, as well as boosting the growth and competitiveness of the e-commerce sector. Cardona et al. (2015) in their article explain similar findings. Not just that but e-commerce can also help the EU recover from the COVID-19 crisis, as it has enabled many businesses and consumers to continue their activities online despite lockdowns and restrictions. That being said, authors also highlight the fact that the shift from offline to online retail induces considerable welfare redistribution from retailing to other sectors and to households, which obviously comes at a cost for certain economic sectors.

For a long time Ukraine had a prosperous e-commerce sector as well, especially after COVID-19, which isn't surprising. The coronavirus pandemic has had a significant impact on the e-commerce sector in Ukraine, and according to International Trade Administration (2023), Ukrainian e-commerce market grew immensely, reaching $4 billion, or approximately 2.6% of Ukraine's GDP. This represents a 41% annual growth rate compared to 2019. The main catalyst for such rapid growth was the Covid-19 pandemic, which prompted Ukrainians to shop online more frequently and for a wider range of products, such as food, household chemicals, and masks. The pandemic also accelerated the shift to online payments, which increased by 50% compared to 2019. Mazorenko (2021) confirms in her article that rates of growing of e-commerce turnover in Ukraine is one of the highest in the world, as is the rate of mastering advanced digital payment technologies. The 3 key factor that have contributed the most to such accelerated growth of Ukrainian e-commerce is shift towards online shopping from usual retail, increased Internet penetration as well as increased use of digital secure payments.

The conflict in Ukraine, which started in 2014 after Russia annexed Crimea and that turned into a full-fledged war in Ukraine on February 24, 2022, when Russia launched a surprise military attack on Ukraine's territory, violating its sovereignty and territorial integrity, is one of the most devastating in the world, which has caused immense suffering and displacement for millions of people. Voznyak et al. (2023) discuss the internal migration issues faced by Ukraine due to the ongoing war. Study focuses on the insecurity, chaotic extensive internal movement, and external migration, which have led to increased social vulnerability and decreased economic stability of internally displaced persons. The research is based on empirical data and provides insights into the recent challenges and problems caused by the large-scale Russian war against Ukraine. The authors conclude that lack of affordable housing, limited employment opportunities, high rents, and delays in social benefits payments seem to be the main challenges for Ukrainian refugees impeding their social integration into the host communities.

Mulska et al. (2021) evaluated the pull factors that create an attractive environment for migrants to explain the increasing migration of Ukrainians to EU countries prior to 2022. The research covers the period from 2005 to 2018 and uses a method that involves weighting indicators and sub-indices to calculate partial and integral indices of the pull environment of migration for selected EU countries and the EU-28. The findings indicate that during the period studied, the integral level of the pull environment of migration in the EU-28 was above average. The most attractive countries for external migrants were Germany, the Czech Republic, Spain, and Italy. In terms of the intensity of total migration from Ukraine in 2018, Poland, Hungary, Germany, and Italy were among the main destinations.

So there already were evidence of increased migration flows in Ukraine before the war. However, the Russian invasion triggered a massive displacement of non-EU citizens from the war-torn country, quickly escalating situation into a complete humanitarian crisis, as millions of Ukrainians were forced to flee their homes and seek refuge abroad. According to the data from Eurostat (2023b), the statistical office of the European Union, by 30 June 2023, there were 4.07 million beneficiaries of temporary protection from Ukraine residing in EU member states. This represents an increase of 1.1% (or 45 800 people) compared to prior

months, pointing out that number of refugees keeps growing to this day.

Many of the refugees were women and children, who faced multiple risks and challenges during their displacement, such as violence, exploitation, trafficking, and separation from their families. Some adult men stayed behind to work or fight in the war, while others joined the ranks of the refugees later. The distribution of beneficiaries of temporary protection from Ukraine across the EU was uneven, with some countries hosting much larger numbers than others. Germany was the main destination country, with 1 133 420 people (or 27.9% of the total), followed by Poland with 977 740 people (or 24.0%) and Czech Republic with 349 140 people (or 8.6%). These three countries accounted for more than half (60.5%) of all beneficiaries of temporary protection from Ukraine in the EU (Table 1).

The monthly change in the number of beneficiaries of temporary protection from Ukraine also varied across the EU. While most countries recorded an increase in June 2023, two countries experienced a decrease: Poland (–13 635 people or –1.4%) and Italy (–1 005 people or –0.6%). The largest increases were observed in Germany (+21 830 people or +2.0%), Czech Republic (+9 050 people or +2.7%) and Ireland (+3 100 people or +3.7%).

The ratio of beneficiaries of temporary protection to the total population varied significantly among the EU member states in June 2023. The EU average was 9.1 beneficiaries per thousand people, but some countries had much higher ratios. Czech Republic had the highest ratio of 32.2 beneficiaries per thousand people, followed by Poland (26.6), Estonia (25.8), Bulgaria (24.9) and Lithuania (24.7). These five countries had ratios that were more than double the EU average.

The majority of beneficiaries of temporary protection in the EU were citizens of Ukraine, who accounted for 98.1% of the total. The gender and age composition of the beneficiaries was also skewed, with adult women (46.6%) and children (34.4%) forming the bulk of the population, while adult men (19.0%) were a minority (Eurostat, 2023).

It is important to emphasize, that the war in Ukraine has had a significant impact on the e-commerce sector in both Ukraine and the EU. On the one hand, the war has disrupted the supply chains, logistics, and infrastructure of many online businesses, especially those operating in the eastern regions of Ukraine. On the other hand, the war has also created new opportunities and challenges for e-commerce expansion and cooperation between Ukraine and the EU. One of the main factors that creates favorable conditions for Ukrainian e-commerce businesses to expand into the EU is the large number of Ukrainian refugees and migrants who have settled in various European countries.

Table 1

Non-EU migrants from Ukraine

№	Top-10 Countries	Migrants
1	Germany	1 133 420
2	Poland	977 740
3	Czech Republic	349 140
4	Spain	180 235
5	Bulgaria	160 690
6	Italy	157 325
7	Romania	133 545
8	Netherlands	125 790
9	Slovakia	103 960
10	Ireland	86 945

Source: built by the authors on the basis of Eurostat (2023b).

Kozlovskyi et al. (2024) investigated the relationship between net migration and the economic development of individual European countries. The research used correlation-regression analysis based on statistical data from Eurostat and the State Statistics Service of Ukraine for the period 2014−2021 for selected European countries, including the EU-27 member states, Switzerland, and Ukraine. One of the key findings was that an increase in net migration to Poland by 1% can lead to an increase in gross domestic product by 1.43 million euros. The study also highlights the significant impact of net migration from Ukraine to Poland due to Russia's war against Ukraine, potentially increasing Poland's GDP in 2023 by 0.08% or 529.54 million euros, which further proves the point that Ukrainian migrants can be a significant advantage to Ukraine's e-commerce expansion into EU.

Wen, Kurniasari, and Lestari (2024) were analysing main drivers of repurchase intention in the e-marketplace through the lens of online trust-building mechanisms. Authors utilized a robust quantitative methodology, using survey data of 231 customers of Lazada Indonesia, employing partial least squares structural equation modeling to analyze the data. The research reveals pivotal role of trust between customers and online retailers in the e-commerce landscape, suggesting that online platforms must prioritize the development of trust-building features to sustain and enhance customer retention, loyalty and speed up business development.

Both these findings suggest that not only are Ukrainian migrants are very reliable paying audience, as their presence was shown to significantly impact Poland economy in a positive way, but also that this audience can be very loyal as it has a well-established trust with Ukrainian e-commerce providers. These people represent a very prosperous potential market for Ukrainian online retailers, who can offer them familiar products, services, and brands at competitive prices. Moreover, these refugees and migrants can also serve as ambassadors and influencers for Ukrainian e-commerce businesses, promoting them to their local networks and communities. This subject is vastly understudied, as forced migration isn't a common phenomenon as it is. Adding to it the location in Europe and the scale of migration makes it that much more of a rare study case. That being said, authors of one article (Zatonatska et al., 2022) have conducted a study, where they modeled the influence of migration on the e-commerce market and forecasted the potential future dynamic using the economic-mathematical model, constructed using R language as well as artificial neural network, using Deductor Studio software, with the help of the data about the e-commerce market that was collected by an EVO Group and Statista for a period from 2010 to 2021. Authors ultimately

came to a conclusion, that while Ukrainian e-commerce market has slightly plummeted, as a consequence of war and all that it entails, and there still is a possibility for further decrease in the future at rates of about 18-26% less prior to war, the vast majority of this demand has shifted towards EU. The biggest proof of that is a forecasted growth for Poland market at around 13%, which can be suggested as a direct influence of Ukrainian migrants which correlates with findings of article mention before. Authors highlight that their models prove the significant influence of migration on the level of the e-commerce market and on its future dynamic. The findings of this article in and of themselves prove that Ukrainian migrants have created a new significant wave of demand in EU market, which means it can be a very lucrative for Ukrainian businesses to expand into EU market space in order to target these migrants with aforementioned benefits, and use this opportunity as a stepping stone for further development along with the EU.

There are multitude of ways in which EU and Ukraine can both benefit from e-commerce expansion and cooperation. For instance, e-commerce can boost the trade volume and value between the EU and Ukraine, creating more jobs, income, and investment opportunities for both sides. E-commerce can also help diversify the economic sectors and markets of both regions, reducing their dependence on traditional industries and commodities. Additionally, such cooperation can foster innovation and digitalisation in the EU as well as Ukraine, enhancing their competitiveness and productivity in the global market. E-commerce can also facilitate the transfer of knowledge, skills, and technologies between the two regions, stimulating research and development, entrepreneurship, and education. Not only that, but this can promote social and cultural integration between the two, strengthening their mutual understanding, trust, and cooperation. Zatonatska and Volvach (2023) provide significant empirical evidence supporting the correlation between demographic shifts and the strategic need for Ukrainian business expansion into the European Union. In their analysis of the electronic payment systems (EPS) market, specifically the case of NovaPay, the authors identify the forced migration of the Ukrainian population as a primary driver for entering foreign markets, with a specific focus on countries with high refugee concentrations such as Poland, Germany, and the Czech Republic. Their findings corroborate the hypothesis that targeting the diaspora serves as an effective market entry strategy, as it leverages pre-existing consumer loyalty to mitigate the risks associated with the contraction of domestic demand caused by the war. Furthermore, the study highlights that the advanced digitalization of Ukrainian financial and logistical services constitutes a distinct competitive advantage in the EU, reinforcing the argument that Ukrainian enterprises possess the technological maturity required for successful cross-border integration. All this goes to show, that entry of Ukrainian e-commerce into the EU market can enhance the economic, social, and cultural ties between the two regions, especially with the help of migrants, that are already present in EU, which would also facilitate a smoother and more painless integration of Ukraine into the EU.

However, expanding into the EU market also entails some challenges and barriers for Ukrainian e-commerce businesses. Arguably, one of the most important barriers is regulatory compliance. Ukrainian online retailers need to abide by the EU laws and regulations regarding consumer protection, data protection, taxation, customs, and other aspects of e-commerce.

The General Data Protection Regulation (GDPR) is a set of rules that governs how personal data of EU residents is collected, processed, and protected and is the main standard of data protection that has to be met in order to have a functioning e-commerce business in EU from outside countries. It requires e-commerce businesses to obtain explicit consent from users before collecting their data, to inform them about how their data is used and stored, to respect their rights to access, correct, delete, or restrict their data, and to implement appropriate security measures to prevent data breaches. E-commerce businesses that fail to comply with GDPR can face hefty fines and legal actions. In order to understand how close Ukraine's ecommerce is to these policies Strzelecki and Rizun (2020) conducted a study where they compared Polish and Ukrainian e-commerce stores for standards of user data protection policies. This would help understand how close the two legislative systems are as Poland, being a part of EU, functions under GDPR policies, whilst Ukraine doesn't have to follow same strict conditions. Authors concluded, that although non-related, the differences between policies on e-commerce in two countries are quite insignificant and are rather similar. It should be noted though that privacy policy in Poland is more strict (due to the implementation of GDPR) and usage of price comparison engines in Polish electronic commerce is far more developed than in Ukrainian one. One of the ways that Ukrainian e-commerce businesses can overcome these challenges and leverage their competitive advantages is by using advanced digital payment technologies. Ukraine is one of the leading countries in the world in terms of mobile payments, as well as crypto-payments etc. These technologies offer several benefits for e-commerce transactions, such as speed, convenience, security, and low costs. In the study authors confirm that 100% of Ukrainian stores use credit card transactions as the major way of payment; most of them also allow paying in cash when receiving the goods, and other alternative options, which puts Ukraine at an advantage compared to vast majority of EU e-commerce stores. All of them provide information about payment options as a separate web page, which is very easy to find. Moreover, Ukraine's experience in developing and implementing these technologies could be very useful for the EU, which is also striving to foster innovation and digitalisation in its payment systems.

Tofan and Bostan (2022) in their work explain what intricacies must be taken into account for e-commerce businesses in EU, considering their strict regulations. Thus, Ukraine would have to create legislative policies to comply with the e-Commerce Directive mentioned before. It covers issues such as transparency and information requirements for online service providers, commercial communications, electronic contracts, and limitations of liability of intermediary service providers. It also enhances administrative cooperation between the member states and the role of self-regulation. The e-Commerce Directive is currently under review and should be replaced by the Digital Services Act (DSA), which aims to address new challenges and opportunities in the digital age. Abramova et al. (2021) also add the necessity of understanding that the value-added tax (VAT) rules for ecommerce in the EU also play a major role. The new rules aim to simplify and modernize the VAT system for cross-border online sales of goods and services. They include the introduction of a one-stop shop (OSS) portal that allows ecommerce businesses to register and declare their VAT obligations in one single member state, instead of having to register in each member state where they sell their products or services. They also include

the removal of the VAT exemption for low-value imports from outside the EU, which means that all imports will be subject to VAT at the point of sale.

One of prime examples of successful Ukrainian business that was able to integrate into EU market is Nova Poshta – a private Ukrainian postal and courier company that provides logistics and related services for individuals and businesses. It is the largest private postal service in Ukraine and has a network of almost 6,000 branches across the country. Nova Poshta has integrated into the EU market by opening branches in its countries and offering services such as express delivery, warehouse logistics, cargo transportation, and international delivery. According to their reports (Nova Poshta Poland Official Website, n. d.), in October 2022, the company entered the Polish market and opened Nova Post in Poland. Nova Poshta became the first Ukrainian company to enter the European market during the full-scale war. Currently, there are 32 branches in 19 Polish cities, as well as two sorting terminals in Warsaw and near Rzeszów. In addition, recently new post offices entered the Lithuanian, Czech Republic, Romanian and German markets. Malichenko (2022) explains that GDPR policies not only create a pretty strict environment for companies themselves that function within its influence, but also forces them to carefully cherry-pick counterparties for the processing of personal data from outside the territory of the EU. Quite obviously Nova Poshta being a logistics company was able to overcome such hardships and is now being used and supported by aforementioned Ukrainian refugees in EU, which is an exemplary case set for other Ukrainian companies to follow.

Methods

To evaluate the strategic impact of Ukrainian migration on e-commerce activity in the EU, this study employs Vector Error Correction Modelling (VECM). The analytical sample consists of four selected countries – Germany, Poland, Czechia, and Spain – that represent the primary destinations of Ukrainian temporary-protection beneficiaries in the EU and together account for over 60% of the total Ukrainian migrant population in Europe (Eurostat, 2023).

Four variables enter each country system: *InternetSales* – the share of an enterprise's total turnover generated through e-commerce (%); *Migrants* – the annual amount of migrants (in units of 100,000); *GFCF* – private gross fixed capital formation as a percentage of GDP, capturing investment activity in productive assets; and *Enterprises* – the share of enterprises reporting e-commerce sales (%). All series are sourced from Eurostat and observed the period 2000–2024.

Prior to estimation, all time series were tested for stationarity using the Augmented Dickey–Fuller (ADF) test, with the null hypothesis of a unit root (non-stationarity), complemented by the KPSS test as a confirmatory cross-check. Lag length was selected automatically by the Akaike Information Criterion. The results, presented in Table 2, indicate that the majority of series in levels are non-stationary, failing to reject the ADF null at conventional significance levels. First-differencing renders most series stationary, indicating that the variables are predominantly integrated of order one, I(1). Notable exceptions include Migrants for Germany and Czechia, where the differenced series yield borderline results, likely due to the structural breaks introduced by the 2015 migration crisis and the 2022 Ukrainian refugee wave.

Table 2

Stationarity Test Results (Augmented Dickey-Fuller)

Country	Variable	ADF (levels)	p-value	ADF (Δ)	p-value	Order
Germany	Internet Sales	–2.942**	0.041	–8.081***	0.000	I(1)
	Migrants	1.288	0.997	–1.950	0.309	I(1)*
	GFCF	–1.347	0.608	–5.192***	0.000	I(1)
	Enterprises with E-commerce	–1.642	0.461	–4.094***	0.001	I(1)
Poland	Internet Sales	–0.682	0.851	–7.336***	0.000	I(1)
	Migrants	–0.426	0.906	–2.527	0.109	I(1)
	GFCF	0.428	0.983	–11.686***	0.000	I(1)
	Enterprises with E-commerce	0.855	0.993	–5.030***	0.000	I(1)
Czechia	Internet Sales	–2.325	0.164	1.795	0.998	I(1)*
	Migrants	2.029	0.999	1.164	0.996	I(1)*
	GFCF	–2.093	0.248	–5.279***	0.000	I(1)
	Enterprises with E-commerce	–1.065	0.729	–1.087	0.720	I(1)*
Spain	Internet Sales	–0.826	0.811	–7.794***	0.000	I(1)
	Migrants	0.291	0.977	–4.633***	0.000	I(1)
	GFCF	–1.901	0.332	–2.575*	0.098	I(1)
	Enterprises with E-commerce	3.756	1.000	–5.572***	0.000	I(1)

Notes: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$. I(1)* denotes series where differencing does not fully resolve non-stationarity.
Source: compiled by the authors on the results of the modeling.

The predominance of I(1) variables rules out OLS estimation in levels, which would risk producing spurious results. This necessitates either modelling in first differences or, where a cointegrating long-run relationship can be established among the I(1) variables, the estimation of a Vector Error Correction Model (VECM), which simultaneously captures both the long-run equilibrium and short-run dynamics among the variables.

To determine whether such a cointegrating relationship exists, the Johansen trace test was applied to each country system separately. The procedure tests the null hypothesis that the number of cointegrating vectors r is at most i, against the alternative that $r > i$. The lag order was set to $k = 2$ in first differences, the maximum safely estimable given the sample size and a four-variable system. Results are reported in Table 3.

The trace test confirms one cointegrating vector (rank = 1) in all four country systems at the 95% confidence level: the trace statistic at $r = 0$ exceeds the 95% critical value of 47.85 for Germany (76.161), Poland (71.417), and Czechia (60.041), and exceeds the same threshold for Spain (52.967). The null of $r \leq 1$ cannot be rejected at the 95% level for any country. This establishes that a single stable long-run equilibrium relationship exists among Internet Sales, Migrants, GFCF, and Enterprises in each country, providing the statistical foundation for VECM estimation.

Table 3

Johansen trace test for cointegration (*k* = 2)

Country	H_0	Trace stat.	CV 90%	CV 95%	CV 99%	Sig.
Germany	*r* = 0	76.161	44.49	47.85	54.68	***
	r ≤ 1	27.79	27.07	29.8	35.46	*
	r ≤ 2	7.636	13.43	15.49	19.93	
	r ≤ 3	0.182	2.71	3.84	6.63	
Poland	*r* = 0	71.417	44.49	47.85	54.68	***
	r ≤ 1	28.593	27.07	29.8	35.46	*
	r ≤ 2	12.697	13.43	15.49	19.93	
	r ≤ 3	2.053	2.71	3.84	6.63	
Czechia	*r* = 0	60.041	44.49	47.85	54.68	***
	r ≤ 1	24.149	27.07	29.8	35.46	
	r ≤ 2	9.956	13.43	15.49	19.93	
	r ≤ 3	0.874	2.71	3.84	6.63	
Spain	*r* = 0	52.967	44.49	47.85	54.68	**
	r ≤ 1	20.444	27.07	29.8	35.46	
	r ≤ 2	7.07	13.43	15.49	19.93	
	r ≤ 3	0.327	2.71	3.84	6.63	

Notes: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$ relative to the 99%, 95%, and 90% critical values respectively. Cointegration rank selected at the 95% confidence level.

Source: compiled by the authors on the results of the modelling.

Given the confirmed presence of cointegration, a VECM with two lags in first differences (k = 2) is estimated for each country. The general specification takes the form in equation:

$$\Delta Y_t = \alpha \cdot \beta' Y_{t-1} + \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \varepsilon_t$$

where Y_t = [*InternetSalest*, *Migrantst*, *GFCFt*, *Enterprisest*]′ is the (4×1) vector of endogenous variables; β is the (4×1) cointegrating vector normalised on *InternetSales*, capturing the long-run equilibrium relationship; α is the (4×1) vector of loading coefficients (speed-of-adjustment parameters), measuring how rapidly each variable responds to deviations from long-run equilibrium; Γ_1 and Γ_2 are (4×4) matrices of short-run dynamic coefficients; and ε_t is a vector of error terms. The cointegrating relationship is interpreted as the long-run equilibrium between e-commerce penetration, migration inflows, capital investment, and enterprise digitalisation; the loading coefficient α is expected to be negative for *InternetSales*, signalling stable convergence back to that equilibrium following any short-run disturbance.

Results

The VECM results for the four countries are summarised in Table 4. Panel A reports the long-run cointegrating vector (β), normalised on Internet Sales; Panel B reports the error correction term loading coefficient (α) for the Internet Sales equation; and Panel C reports the short-run dynamic coefficients of the same equation. Standard errors are in parentheses below each coefficient.

Table 4

VECM results by country

Dependent variable: Internet Sales	Germany	Poland	Czechia	Spain
Panel A: Long-run cointegrating vector (normalised on Internet Sales)				
Migrants	+1.7***	+2.0***	−6.5***	−1.2***
	–0.2	–0.2	–1.4	–0.2
GFCF	+1.142***	−0.273***	−1.475***	−0.004
	–0.203	–0.097	–0.131	–0.047
Enterprises with E-commerce	+0.272***	+0.784***	+1.016***	+1.204***
	–0.061	–0.04	–0.112	–0.076
Panel B: Error correction term (speed of adjustment, α)				
ECT (α)	−0.110	0.182	−0.659***	−0.074
	–0.18	–0.253	–0.12	–0.159
Panel C: Short-run dynamics (ΔInternet Sales equation)				
ΔMigrants (t−1)	−0.3	+1.6**	+4.0***	0
	–0.3	–0.8	–1	–0.1
ΔMigrants (t−2)	0.1	−0.7	+3.8***	−0.2***
	–0.4	–0.8	–1.2	–0.1
ΔGFCF (t−1)	−0.250	0.13	+1.098***	−0.215***
	–0.423	–0.207	–0.169	–0.058
ΔEnterprises (t−1)	0.296	−0.110	−0.320*	−0.074
	–0.389	–0.214	–0.179	–0.15
ΔEnterprises (t−2)	0.05	−0.355	−0.289***	−0.276
	–a0.246	–0.224	–0.108	–0.172
Model fit				
Observations	25	25	25	25
Johansen trace (r=0)	76.161***	71.417***	60.041***	52.967**
Cointegration rank	1	1	1	1

Notes: standard errors in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$. Migrants expressed in units of 100,000 to match the scaling used in equation (1).

Source: compiled by the authors on the results of the modelling.

The share of Enterprises with e-commerce sales is positively and significantly associated with Internet Sales in the long-run equilibrium across all four countries ($p < 0.01$). This is the most robust finding of the analysis: structural adoption of digital sales channels at the firm level is a necessary precondition for translating demographic demand into sustained e-commerce revenue growth, regardless of country-specific institutional factors. The long-run elasticity ranges from +0.272 (Germany) to +1.204 (Spain), indicating that a one percentage point increase in the share of digitalised enterprises is associated with a 0.27 to 1.20 percentage point increase in the e-commerce share of turnover in the long run.

The Migrants variable enters the cointegrating vector with a positive long-run coefficient in Germany (+1.7, $p < 0.01$) and Poland (+2.0, $p < 0.01$), consistent with the central hypothesis that sustained migration inflows are positively associated with e-commerce revenue in the long run. For Czechia and Spain the long-run coefficient is negative, reflecting the composition of total immigration over the full 2000–2024 horizon: pre-2010 flows into both countries were dominated by labour migration with a different consumption profile from that of the post-2022 Ukrainian displacement wave. This compositional issue does not contradict the hypothesis; rather, it underscores that the migration–e-commerce relationship is most clearly visible in the short-run dynamics, where the Ukrainian refugee wave is temporally isolated, as confirmed in Panel C.

GFCF enters the long-run vector with mixed signs. The positive coefficient for Germany (+1.142, $p < 0.01$) reflects the complementarity between private capital accumulation and digital infrastructure investment over the 25-year horizon. The negative coefficients for Poland (−0.273, $p < 0.01$) and Czechia (−1.475, $p < 0.01$) are consistent with a crowding-out interpretation, where periods of elevated private fixed capital formation in these economies were concentrated in offline industrial capacity rather than digital infrastructure, temporarily depressing the e-commerce revenue share relative to trend. The Spanish coefficient is statistically insignificant.

The error correction coefficient α measures the speed at which Internet Sales adjusts back towards long-run equilibrium following a deviation. Czechia produces the strongest and most precisely estimated value: $\alpha = -0.659$ ($p < 0.01$), implying that approximately 66% of any deviation from long-run equilibrium is corrected within a single year. This is consistent with Czechia's status as the country with the highest per-capita concentration of Ukrainian refugees in the sample (32.2 beneficiaries per 1,000 inhabitants), where the short-run demand shock from migration is large enough to produce a statistically clear adjustment dynamic. For Germany and Spain, α is negative (−0.110 and −0.074 respectively) but not significant at conventional levels, indicating a directionally correct but weaker adjustment mechanism. For Poland the coefficient is positive (+0.182) and insignificant; this should be interpreted alongside the dominant short-run migration effect documented in Panel C.

The short-run coefficients capture the immediate response of *ΔInternetSales* to one- and two-period lagged changes in each regressor, and are the most directly relevant to the article's hypothesis as they capture the dynamic effect of year-on-year changes in migration on e-commerce revenue growth. In Poland, *ΔMigrants* at lag 1 is positive and significant ($\gamma = +1.6$, $p < 0.05$), confirming that an increase in migrant arrivals in year $t-1$ generates a measurable increase in the e-commerce revenue share in year t, consistent with the documented role of Ukrainian migrants as active e-shoppers in the Polish online retail market (Zatonatska et al., 2022). In Czechia, both lags of *ΔMigrants* are positive and highly significant (lag 1: $\gamma = +4.0$, $p < 0.01$; lag 2: $\gamma = +3.8$, $p < 0.01$), representing the strongest short-run migration effect in the sample. The significance at both lags indicates that the demand stimulus from new arrivals persists for at least two years, consistent with the settlement and consumption integration process of refugee populations who progressively increase their e-commerce engagement after relocating. *ΔGFCF* at lag 1 is also positive and highly significant in Czechia ($\gamma = +1.098$, $p < 0.01$), suggesting contemporaneous complementarity between investment activity and e-commerce growth in the short run.

In Germany and Spain, *ΔMigrants* is not significant at either lag in the Internet Sales equation. This reflects the heterogeneous composition of immigration flows across the full 25-year sample. For Germany in particular, pre-2022 migration was predominantly composed of labour migrants from EU accession countries and asylum seekers whose behaviour in e-commerce differs structurally from that of Ukrainian temporary-protection beneficiaries. An auxiliary specification incorporating a post-2022 level-shift dummy yields a positive and marginally significant structural break in Internet Sales following the 2022 Ukrainian refugee wave (coefficient = +4.520, $p < 0.10$), consistent with the hypothesis for the relevant subperiod.

Across the four VECM systems, three principal conclusions emerge. First, a genuine long-run cointegrating relationship exists between internet sales, migration inflows, private investment, and enterprise digitalisation in all four countries, validating the econometric framework and ruling out spurious correlation. Second, the share of enterprises with e-commerce sales is universally significant in the long run, confirming that structural digitalisation at the firm level is the dominant driver of e-commerce revenue penetration across all markets. Third – and most directly relevant to the article's hypothesis – short-run migration shocks generate significant positive e-commerce demand effects in Poland and Czechia, the two markets with the highest per-capita Ukrainian refugee concentrations, with directionally consistent results in Germany and Spain partly masked by compositional heterogeneity over the longer sample period. Collectively, these findings provide robust multi-country time-series evidence that the migration wave constitutes a measurable, quantifiable competitive advantage for Ukrainian enterprises in e-commerce sector expanding into EU markets.

The results of the Holt–Winters forecast are shown in Fig. 1. The validity of the forecast was assessed through an out-of-sample evaluation, where the resulting mean absolute percentage error (MAPE) fell within the 5–15% range typically regarded as a good and acceptable level of deviation for time-series forecasting, indicating that the model reproduced short-term dynamics with sufficient accuracy.

According to the forecast, the number of Ukrainian refugees is expected to maintain a generally upward trajectory throughout 2026, reaching approximately 4.6–4.8 million people by the end of the year. This indicates that even under stable conditions, displacement levels remain persistently high, reflecting ongoing structural pressures influencing migration flows. According to European E-commerce Report as of 2022 in Ukraine 90% of population are active internet users, which is the average indicator in EU.

Nevertheless, out of that population only 57% are active online retail shoppers or e-shoppers or around 18 million people, which is on a lower end. As it has been mentioned before, Ukrainian refugees have created a significant demand in e-commerce sector, increasing e-commerce revenue for

recipient countries, as these refugees mainly consist of working and paying people. Taking that into account, as well as the forecasted increase in migration for the foreseeable future, it is possible that by 2026, Ukraine could lose close to 5 million paying customers in their e-commerce sector, compared to the times before the war, which would account for a third of total e-commerce sector in Ukraine, which is huge. (European E-commerce Report, 2023)

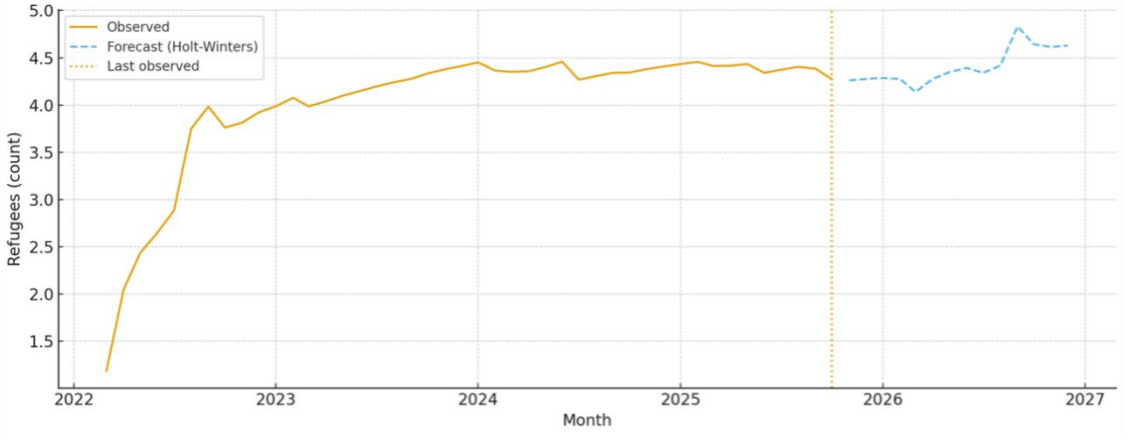


Fig. 1. EU Ukrainian refugees forecast
Source: compiled by the authors on the results of the modeling.

Discussion and conclusions

The war that Russia started against Ukraine has caused a massive wave of migration from the affected regions to the EU. Using statistical analysis it was confirmed that while Ukrainian refugees as of today are scattered all over the world, the vast majority of them are located in EU, especially closer to Ukraine in the eastern EU regions. Additionally, results of current literature analysis showed that this has created a huge demand for Ukrainian products and services in the EU market, as the demand in e-commerce sector has decreased in Ukraine and increased in regions of EU that were the main migration destination for refugees, indicating geographical shift in demand. This in turn offers a golden opportunity for Ukrainian e-commerce to expand into the EU space, which could benefit both Ukraine and the EU. Not only that, but the results of the study showed that Ukrainian e-commerce businesses might have two significant comparative advantages compared to non-EU businesses when it comes to expanding into EU market.

The first one being a close relation to EU legislative framework. While a lot of e-commerce businesses, coming from outside EU, might struggle when adapting strict conditions, Ukrainian marketplaces might have a significantly easier time, since a lot of these conditions are already met, which again creates that much more favorable conditions for expansion. The second quite significant and rare advantage is in the fact that Ukrainian migrants create preexisting demand and awareness about Ukrainian businesses in EU. Comparing models using regression analysis across multiple countries has revealed a direct effect of migration on the e-commerce market in multiple regions. This corresponds to the results of literary analysis. Thus, the hypothesis that Ukrainian e-commerce businesses have a significant advantage, influenced by the substantial migration wave caused by the full-fledged war in Ukraine, has been confirmed.

These findings make a meaningful contribution to the existing body of research on migration-driven economic integration and digital commerce. While prior studies have documented migration's macroeconomic effects – Kozlovskyi et al. (2024) established that Ukrainian migration contributed a measurable GDP uplift to Poland – and Zatonatska et al. (2022) forecasted directional growth in EU e-commerce markets as a consequence of displacement, neither line of research quantified the relationship between migration inflows and e-commerce revenue penetration at the country level, nor framed legislative proximity and diaspora demand as joint competitive assets. This study bridges that gap by providing multi-country regression evidence for the migration–e-commerce nexus while simultaneously articulating, on an empirical basis, why Ukrainian platforms are structurally better positioned to capture this demand than most non-EU competitors. The subject remains vastly understudied given the exceptional scale and geographic concentration of Ukrainian forced migration, and the present analysis offers one of the first quantitative frameworks for evaluating it.

The obvious factors that pose the biggest risk for Ukraine's e-commerce potential in EU are economic crisis and war, which are closely related, and can't be really influenced by e-commerce sector, thus Ukrainian e-commerce would benefit from shifting attention and the resources where it's going to make the most difference. First, as EU has many Ukrainian refugees, it makes sense for Ukrainian e-commerce to target directly these migrants as this not only helps increase sales from the get go and cut on marketing expenditures as people are already familiar with the products and brands, but can also increase favorability amongst European population as Ukrainians can help spread good reputation reinforcing positive effect, thus achieving two goals at the same time and maximizing the outcome.

Time-series model forecast further proofs the need for Ukrainian e-commerce expansion as according to calculation by the end of 2026 Ukraine risks loosing third of regular e-commerce customers due to forced migration into EU, some of which will permanently relocate. With the unprecedented demand in the EU market for Ukrainian exports, it is logical for Ukrainian marketplaces to shift their focus towards the EU. This shift could not only facilitate a smoother transition and potentially increase the presence of Ukrainian businesses abroad but also help restore the diminishing sales in Ukrainian e-commerce to their original levels.

Additionally, as study showed, Ukraine should take advantage of its advancements in digital payment systems. This could be a serious pivoting stone for Ukrainian e-commerce, distinguishing them amongst competitors with

users. This can also help develop EU market by the means of infiltrating these technologies into its network, which could pose a beneficial alliance for EU.

Limitations and future research. While this study provides foundational insights into migration-driven e-commerce expansion, it relies on linear regression and Holt-Winters Exponential Smoothing models that inherently assume the continuity of current demographic trends. A primary limitation to consider is the sensitivity of these models to sudden structural breaks. In the event of a mass repatriation of Ukrainians, the Holt-Winters model would require recalibration, as its current weighting mechanism is optimized for identifying ongoing trends rather than forecasting rapid demographic reversals.

Consequently, future research should explore dynamic, scenario-based modeling to evaluate market resilience under various demographic contractions. It will be important to develop adaptation strategies for Ukrainian e-commerce enterprises to manage a potential downscaling of EU operations while seamlessly re-absorbing returning domestic demand. Additionally, investigating post-return consumer behavior will be essential to determine whether cross-border e-commerce habits and digital payment integrations will persist beyond the immediate migration crisis.

Authors' contribution: Yehor Pahkevych – conceptualization, literature review and theoretical framework development, methodology design, writing – original draft and editing, data analysis, formulation of conclusions; Liudmyla Zagoruiko – empirical data collection and validation, visualization, compilation of the bibliography.

Sourses of funding. The authors declare that there was no external funding for the conduct of this study and preparation of the manuscript for publication.

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Отримано редакцією журналу / Received: 20.02.26
Прорецензовано / Revised: 04.05.26
Схвалено до друку / Accepted: 09.05.26
Опубліковано / Published: 27.06.26

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УКРАЇНСЬКА ЕЛЕКТРОННА КОМЕРЦІЯ В ЄС: МІГРАЦІЙНО ЗУМОВЛЕНИЙ ФЕНОМЕН

В с т у п . ***Повномасштабне російське вторгнення в Україну спричинило масштабну хвилю міграції, що суттєво змінила демографічний та економічний ландшафт Європейського Союзу. Це переміщення населення призвело до виникнення унікального явища: різкого зниження внутрішнього споживчого попиту в Україні, поєднаного з одночасним зростанням попиту на знайомі товари та послуги серед української діаспори в ЄС. У такому контексті виникає критична необхідність проаналізувати, як цей демографічний зсув впливає на стратегічне розширення українських підприємств електронної комерції на європейські ринки з метою мінімізації внутрішніх втрат. Основною метою цього дослідження є оцінювання стратегічного впливу української міграції на розвиток і доходи підприємств електронної комерції на ринку ЄС. Крім того, дослідження спрямоване на оцінювання порівняльних переваг українських маркетплейсів – зокрема щодо наявного попиту та законодавчої узгодженості – а також на формування рекомендацій щодо їхньої успішної інтеграції в економічний простір ЄС.***

М е т о д и . ***Методологічна основа дослідження базується на кількісному підході. Лінійний регресійний аналіз проведено з використанням даних за 2010–2023 рр. для дослідження взаємозв'язку між обсягами інтернет-продажів, кількістю мігрантів, рівнем інвестицій і часткою підприємств у чотирьох ключових європейських ринках: Німеччині, Польщі, Чехії та Іспанії. Додатково модель експоненціального згладжування Гольта – Вінтерса була застосована до історичних даних про біженців із 31 європейської країни для побудови прогнозу часових рядів щодо тенденцій української міграції до 2026 р. з урахуванням компонентів тренду та сезонності.***

Р е з у л ь т а т и . ***Аналіз виявив позитивний зв'язок між обсягами міграції та інтернет-продажами в Німеччині та Іспанії, з граничною статистичною значущістю в Польщі, тоді як інвестиційні чинники відігравали більшу роль у Чехії. Прогноз за моделлю Гольта – Вінтерса демонструє подальшу висхідну тенденцію вимушеної міграції, передбачаючи, що загальна кількість українських біженців у ЄС досягне приблизно 5 млн до кінця 2026 р. Це відповідає потенційній втраті близько третини активної довоєнної клієнтської бази електронної комерції в Україні, що свідчить про значний географічний зсув купівельної спроможності споживачів.***

В и с н о в к и . ***Дослідження підтверджує, що хвиля міграції становить суттєву конкурентну перевагу для розширення української електронної комерції, зумовлену прямим попитом із боку діаспори та зниженими маркетинговими бар'єрами. Аналіз показує, що українські маркетплейси мають виразні сильні сторони, зокрема й узгодженість із законодавчими рамками ЄС та розвинені цифрові платіжні системи. Відповідно, зміщення фокусу на ринок ЄС є не лише стратегією розширення, а й необхідним кроком для компенсації скорочення внутрішнього ринку. Орієнтація на демографічну групу біженців створює стратегічну точку входу для ширшої ринкової інтеграції та відновлення доходів.***

К л ю ч о в і с л о в а : ***е-комерція, ринок ЄС, міграційні процеси, економічна інтеграція, онлайн-маркетплейс.***

Автори заявляють про відсутність конфлікту інтересів. Спонсори не брали участі в розробленні дослідження, у зборі, аналізі чи інтерпретації даних, у написанні рукопису та в рішенні про публікацію результатів.

The authors declare no conflicts of interest. The funders had no role in the design of the study, in the collection, analyses or interpretation of data, in the writing of the manuscript, or in the decision to publish the results.