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Social and economic development of Ukraine: Modelling the migration factor impact[1]

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Abstract: The paper aims to analyse the dependence of the economic and social development of Ukraine on migration factors (human resources and remittances) in the years 2002–2020. It proves the strength of the impact of human resources outflow and remittances on the labour market (employment) and other variables capturing the level of economic and social development. Based on the calculated social and economic development composite indicators the paper detects the migration gaps in the development of the economic system and social domain depending on the human resources outflow and remittances inflow. The results of the empirical research show a positive causal relationship between social development environments and migration and a mixed impact of the migration factor on economic system.

Keywords: economic growth, social development, migration, remittances, causality, Granger test, gaps.

JEL codes: C32, E29, J61.

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Introduction

In conditions of the current globalization and consistently growing mobility migration processes (from the viewpoint of their growing scale, intensity and change of structural features, namely the growing level of the quality of human capital participating in the processes) have an increasing impact on the development of countries and even entire macroregions. For Ukraine, the current military and political-economic crisis and related macroeconomic instability and high social vulnerability of the population have intensified the scales of labour migration. International migration is a cause of growing socio-demographic imbalances, e.g. depopulation of settlements, reduction of demographic and labour capacity, growing social inequality, education devaluation, the disappearance of the middle class. Migration aggravated social and economic development challenges, including the loss of resources capacity (intellectual-personnel, financial-investment, innovative-technological), and destabilization of economic reproduction and recovery processes.

The main channels that boost migration's impact on economic and social development are the outflow of human resources, especially amongst the young and economically active population and the inflow of remittances that have a medium-run and long-run impact. The remittances contribute to the optimization of consumption and a growing savings and investment capacity thus securing access to financial resources (Přívara & Trnovský, 2021; Mondal & Khanam, 2018; Stojanov, Němec, & Žídek, 2019). In addition to the growing income of households' migration and incoming remittances increase investment in social security such as in healthcare and education and infrastructure development (Jayaraman, Choong, & Kumar, 2010; Alpaslan et al., 2021).

The impact of migration on socio-economic development is two-fold for a country which is a human resources donor. Meanwhile the causal relationship of remittances and the development of the economic system and social domain is the least conflicting because it is characterized by a direct short-term impact (Zuniga, 2011). Remittances positively impact the macroeconomic stability as they contribute to financing the foreign trade deficit and fiscal consolidation and prevent exchange rate fluctuations (Jawaid & Raza, 2014; Kumar, Stauvermann, Patel, & Prasad, 2018). On the individual level (migrant, household) the economic effect of remittances is displayed in the possibility of efficient financial management reducing the insolvency and social vulnerability and the generation of financial capacity for the development of small businesses (Ogunniyi, Mavrotas, Olagunju, Fadare, & Adedoyin, 2020; Přívara & Trnovský, 2021). Therefore, the target-oriented realization of remittances allows the securing of sustainable development of the national economy and the resilience of the economic system and increasing the innovative-investment capacity of the country.

However, Ukraine used to be characterized as a country with a large migration capacity. The intensification of international migration substantially impact the economic growth and the development of the social domain. Therefore, the analysis of the impact of migration on the socio-economic development of the country is increasingly relevant. Its application allows the drawing of practical conclusions regarding the following: firstly the migration's impact on development; secondly, migration's impact on the different quality of life and economic development indicators in different time lags; thirdly, constructing composite indicators of socio-economic development if (1) migration is not controlled; (2) human resources outflow is the social development indicator and remittances—the economic indicator.

The unique form of the study is to analyse the links between migration and social and economic development of the country in the temporal- aspect (projection of two flows: human resources and remittances). The methodological and applied significance of this approach, unlike other studies of migration and socio-economic development (Mulska, Levytska, Panchenko, Kohut, & Vasyltsiv, 2020; Meyer & Shera, 2017) is a more thorough study of the causality of migration, the socio-economic consequences through the identification of causal relationships between the socio-economic development environment and migration processes.

This paper offers a modelling of the impact of migration on the socio-economic development of a country (using the example of Ukraine). The research is based on and develops the previous studies of the authors in terms of identification of causes and factors of the intensification of migration aspirations, factors of migration in the EU countries, substantiation of migration scenarios and their impact on the socio-economic development of the country in different time lags (Boiko, Mulska, Baranyak, & Levytska, 2021).

The analysis of the relationship between migration and social development and the economic growth of a country help develop a qualitative informational-analytical basis to substantiate decisions on migration policy. This means to maximize prospective benefits (employment development, a national income increase, an increase in the level of the competitiveness of the national economy competitiveness, an increase in the security of intellectual-personnel security, tax revenues maintenance) and a minimization of prospective losses and threats (economic exploitation, distant families, social orphanhood, 'immigration ghetto', the workers deficit, loss of prospective tax revenues, growth of social inequality, brain drain, loss of investment in human capital). Therefore, this research in investigating the impact of migration on the socio-economic development of the country considers the specifics of state migration policy that has been mapped and further developed based on a certain informational-analytical framework. These aspects are systemically outlined by Martin (2007); Mounier (2007); Wingens (2016). The research aims to carry out a complementary analysis of the dependence of national economy development on

migration factors in terms of two flows—human resources and remittances; to detect migration gaps in the social domain and the development of the economic system in Ukraine. The objectives of the study are the identification of causality of migration and indicators of the socio-economic development of Ukraine both in general and specific indicators; identification of the direction and extent of the impact of migration processes in different run-lags; modelling the impact of migration on the social and economic development which identify gaps in the situation. .

The paper is structured as follows. The first section presents the literature review. The second one depicts the data and methodology. The third section presents the results of the research. The fourth is devoted to the authors' opinion and discusses remarks about the obtained results. The last section presents concluding remarks.

1. Literature review

The socio-economic development of a country is the object of different studies that show the way it is defined by a wide range of various internal and external factors. Meanwhile, most factors are proven to have both positive and negative impacts while they can have no relationship with the social and economic growth. Paying attention to the results of the current most relevant publications the problem of the course of migration, the change in their intensity, forms and consequences is the most addressed among the preconditions and challenges of economic growth (Andersson & Siegel, 2020; Dastidar, 2017).

Overall with the spread of dynamic globalization processes migration is a natural phenomenon and existential feature of the development of every society. as well as a better meeting of social, labour and other needs of a migrant and the development of a country that is the migration donor (investment, mitigation of labour-surplus condition, knowledge import, experience exchange, etc.). Meanwhile when the volumes of external migration become critical namely in the areas of intellectual, labour and the permanent migration of youth (families) and new forms of the migration of businesses, intellectual property and technologies they threaten the sustainable development of the national economy and proper functioning of the social domain. The confirmation of the above mentioned can be found in the studies of Miller (1998); Guild and van Selm (2005) (general issues of international and national security of countries and macroregions in conditions of high migration mobility) and in purely functional areas: Adamson (2006) and Angenendt (2008) (growing threats to social security of the state as a consequence of mass illegal migration with the consequences of burden on the social system of hosting countries), Bermejo (2009), Faist (2004) (problem of extremism that has acquired mobility along with migration using the example of the countries of Western

Europe and the USA during the events of 11 September 2001), Gordon (2014), Donais (2018) (new vision of security sector reform as the consequence of the impact of migration with the focus on the development of a new system of relationships between the country and the society hosting migrants), Lupak, Boiko, Kunytska-Iliash, and Vasyltsiv (2021), Docquier (2018) (macroeconomic threats of proper functioning of the domestic market and spatial imbalances in the regions with high and low migration activity and prevalence of certain kinds and types of migration).

Migration is both the consequence and factor of impact on socio-economic development. Therefore, when examining the relationships between socio-economic development and migration it is essential to rely on the studies of Ceyhan and Tsoukala (2002), Bilan (2017), Voznyak. Mulska, and Bil (2021) and other researchers who explain the factors that are key in terms of decision-making on migration. It helps understand the problems that lead to migration and substantiate the priorities and decisions of state policy of migration intensity and volume management and it demonstrates the positive impact on the processes of social and economic development of territories.

In economic research the impact of migration on economic growth is mainly analyzed from two perspectives: (1) migration intensity (frequency of border crossings) and (2) remittances. Therefore, the differentiation during identification of the impact of migration on the socio-economic development of the country from these two perspectives is reasonable. The factors and relationships of human movement intensity and its consequences for social and economic systems of the country are quite comprehensively addressed by Boboc, Vasile, and Todose (2012), Gómez and Giráldez (2017) in terms of growing scales of forced migration (Becker & Ferrara, 2019), intellectual capital and related property and non-property rights (Kutsyk, Lupak, Kutsyk, & Protsykevych, 2020).

In turn the foundations for the intensification of factors and consequences of the impact of migration on socio-economic development from the perspective of remittances are formed by Catrinescu, Leon-Ledesma, Piracha, and Quillin, (2009), Fayissa and Nsiah (2010), Cooray (2012), Alkhathlan (2013) (the impact of remittances on the economy in general), Fromentin (2017), Meyer and Shera (2017) (the impact of remittances inflows on the development of financial sector and financial services market).

The experience of many countries demonstrates the importance on the one hand of monitoring and analysis and on the other the use of migration management tools in terms of regulating capital flows (remittances, investments, etc.) for human resource donor countries (Orrenius & Zavodny, 2012; Escribà-Folch, Meseguer, & Wright, 2015; Mosley & Singer, 2015) as remittances are a source of foreign currency and create a multiplier effect on the economy as a whole while reducing demand for social spending (Brand, 2006; FitzGerald & Cook-Martín, 2014). Research by Deshingkar (2022), Jia, Molloy, Smith, and Wozniak (2022), Hammer and Hertweck (2022) deepens knowledge in terms

of a state policy of migration capital management directing it to the areas of economic and social life expanding the horizons of this problem from investment to socio-cultural relationships, household well-being, quality characteristics and life satisfaction, relationships in the domestic labour market when there is a close link between migration, remuneration, savings and transfers.

An essential theoretical and simultaneously socio-economic foundation in the empirics of the relationship between migration and socio-economic development is grounded in contemporary international migration theories such as the new economics of labour migration, the push-pull theory, the institutional approach theory, the world systems theory of migration, cumulative causation of migration, relative inequality theory of migration, etc. Their bases are largely supplemented, developed and adjusted to the specifics of current trends and consequences of migration in the studies that provide new methodological approaches to the analysis of the impact of migration on the socio-economic development of a country and its territories (Nyberg-Sorensen, Hear, & Engberg--Pedersen, 2002; Rahman, 2013; Baele, & Sterck, 2015; Basarabă, & Nistor, 2015; Donou-Adonsou, & Lim, 2015; Škuflić, Krpan, & Žmuk, 2018; Kagan, 2019); specify the results of critical (by volumes and negative consequences) migration against the development of human capital (Kuzmin, Bublyk, Shakhno, Korolenko, & Lashkun, 2020; Wielechowski, 2021), falling living standards and quality of life and reducing the wellbeing of households (Shpak, Bublyk, & Rybytska, 2017).

2. Data and methodology

To carry out the research of the impact of migration on the socio-economic development of Ukraine the following hypothesis is developed and tested:

H: International migration is beneficial for social and economic development in the short run and has a f mixed impact on Ukrainian economy and society in the long run.

The research procedure consists of four stages:

I. Generation of the empirical indicator of migration processes from two perspectives: the intensity of external migration from Ukraine and remittance inflows in the country's economy.

II. Evaluating the causality of migration and indicators of socio-economic development of Ukraine based on the Granger causality test.

III. Constructing composite indicators of socio-economic development of Ukraine considering two scenarios when (1) migration is not the indicator of the country's socio-economic development; (2) human resources outflow volumes are the indicator of social development and remittance volumes are the indicator of economic development.

IV. VAR modelling the impact of migration processes on the composite indicator of socio-economic development of Ukraine.

I. Calculation of external migration intensity has informational-analytical limits related to the lack of formalized statistical information on migration in Ukraine.

The empirical indicators of migration in Ukraine are the number of arrivals, departures and balances of external migration which demonstrate a change in the population due to changes in the place of registration. The State Statistics Service of Ukraine conducted several studies on labour migration but there is no systematic monitoring of migration.

Thus the international migration intensity in Ukraine from 2005 to 2020 decreased. 2005–2007 and 2018–2019 were the period of the largest volumes, as well as indicators of the ratio of migrants to the unemployed and economically active population (Figure 1). For comparison in 2002 and 2020 the international migration intensity (change of permanent residence) amounted to 76.3 thousand and 19.1 thousand people and the share of migrants to unemployed –3.58% and 1.14%, respectively. In 2020 in comparison to 2002 the international migration and immigration intensities in Ukraine decreased by 57.1 thousand people and 16.1 thousand people accordingly. However, such

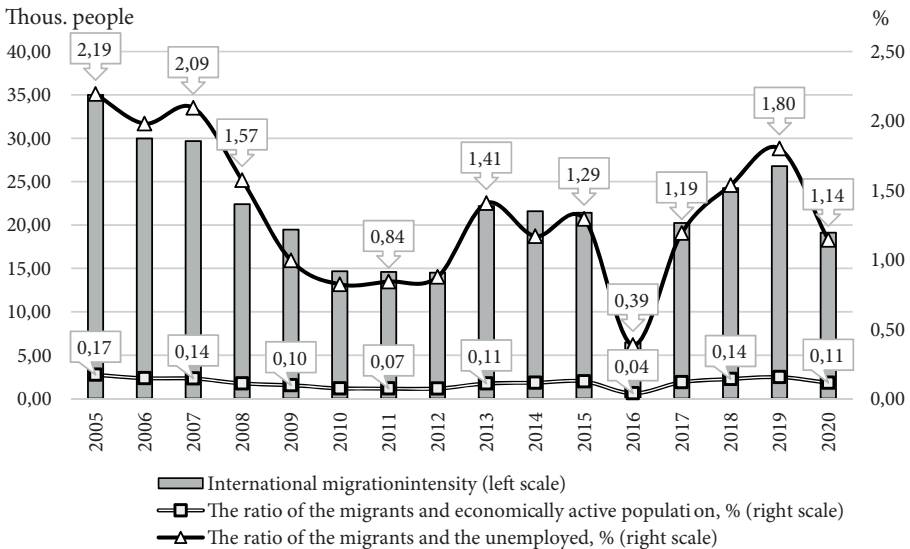**Figure 1. International migration, shares of migration into economically active population and unemployment in Ukraine in the years 2005–2020**

Note: 2014–2020—without considering the temporarily occupied territory of the Autonomous Republic of Crimea and part of the temporarily occupied territories of Donetsk and Luhansk regions.

Source: Based on data of the State Statistics Service of Ukraine.

a positive dynamic does not indicate a decrease in the volume of external migration or an increase in the immigration attractiveness of Ukraine and demonstrates a lack of accounting for international migration statistical data.

The change in the migration vector from 'Ukraine–Russian Federation' to 'Ukraine–Poland' after 2014 resulted in a significant lack of accounting for the value of remittances due to a small share of official transfers from Poland. This trend was the impetus for changing the methodology for accounting for remittances of employees abroad which is based on the use of mirror statistics of the main recipient countries of human resources to calculate the value of remittances by the NBU Department of Statistics and Reporting. The main result of the recalculation was more realistic data on the volume of remittances in Ukraine and their share relative to the country's GDP. It is worth noting that the ratio of remittances to the country's GDP from 2005 to 2014 ranged from 2.8% to 4.2%. From 2015 to 2020 there was an increase in the ratio of remittances to the country's GDP by three times from 2.8% in 2005 to 9.2% in 2020.

The intensification of international in Ukraine started after 2014 due to socio-economic and socio-political turbulence. The level of remittance inflows in the national economy in 2006–2011 was stable and amounted to €91.7 to 110.03 *per capita* while it declined substantially in 2014 due to reduced economic stability and an aggravated political situation in the country.

The absence of realistic statistical data on international migration volumes has determined the selection of a specific empirical indicator—external migration intensity level. The data of the State Border Guard Service of Ukraine on departures of Ukrainian citizens abroad in 2005–2020 were the statistical foundation for the calculation of the empirical variable. The external migration intensity level in Ukraine is calculated by the Equation (1)

$$MIGR_t^{ua} = \frac{DEP_t^{ua}}{NP_t^{ua}} \tag{1}$$

where: $MIGR_t^{ua}$ is external migration intensity level in the t period; DEP_t^{ua} is number of Ukrainians leaving abroad (except for vacations, tourist and business trips) in the t period; NP_t^{ua} is the number of people in the country at the end of the t period.

The remittances inflow intensity is calculated as a ratio of the value of remittances through formal and informal channels to the number of people in the country (Equation 2).

$$TRANSF_t^{ua} = \sum \frac{Transf_t^i}{NP_t^{ua}} \tag{2}$$

where: $TRANSF_t^{ua}$ is remittances inflow intensity in the t period; $Transf_t^i$ is the value of remittances by i transfer channels in the t period.

The dynamics of the empirical indicator of migration in Ukraine in the context of two channels – the intensity of external migration of Ukraine (calculated based on formulas (1)) and remittances (formula 2) are presented in Table 1.

Table 1. Empirical indicators of migration in Ukraine in the years 2005–2020

Period	Empirical migration indicator				
	remittances			human resources outflow	
	remittances through formal channels, *per capita*, €	remittances in general, *per capita*, €	the share of remittances in the total gdp, %	number of border crossings, thous. people	intensity of external migration, ratio to the overall population
2005	48.85	91.75	2.8	1411.49	0.03
2006	50.69	97.33	2.9	1440.29	0.031
2007	48.81	93.87	3.1	1469.69	0.032
2008	46.46	91.02	3.4	4388.98	0.095
2009	39.07	83.43	4.6	5320.44	0.115
2010	40.8	96.09	4.1	6496.8	0.141
2011	47.03	110.14	4.1	7587.09	0.166
2012	49.56	128.32	4.1	8147.52	0.179
2013	47.7	141.15	4.5	9526.36	0.209
2014	36.15	108.04	4.8	9835.4	0.217
2015	59.71	146.15	7.6	12209.27	0.284
2016	57.89	159.14	8.1	13620.35	0.319
2017	62.15	192.23	8.2	14379.76	0.338
2018	63.89	221.82	8.5	14402.78	0.34
2019	69.98	235.33	8.9	16715.01	0.40
2020	72.58	242.41	9.2	6793.790	0.16

Source: Based on data of the State Statistics Service of Ukraine using Equations (1) and (2).

II. A system of social (unemployment, economic activity level, average wages, disposable income, consumer price index, households' aggregate food expenditures) and economic (foreign direct and capital investment, GVA, small business entities, retail trade turnover, foreign economic activity volumes, wage bill as a percentage of GDP) development indicators is constructed to list the elements of socio-economic development of the country and determine the causal effect for the empirical indicator of external migration. Based on previous studies (Kumar et al., 2018; Mulska et al., 2020; Levytska et al., 2020), the

set of variables capturing the country's socio-economic development includes thirteen measures consolidated into two groups (Table 2).

Table 2. Social and economic development variables

No.	Variable	Abbreviation	Details
Social development			
1.1.	Unemployment among the population aged 15 to 70	UNEMPL	% of the EA population aged 15 to 70
1.2.	Economic activity of the population aged 15 to 70	EAR	% of the population of the age
1.3.	Average monthly nominal wages	WAGE	on average per a full-time employee, €
1.4.	Disposable income	INCOME	*per capita*, €
1.5.	Consumer price index	CPI	% of the previous year
1.6.	The share of households' food expenditures	EXPENS	%
Economic development			
2.1.	Foreign direct investment	FDI	*per capita**, €
2.2.	Capital investment	FPI	*per capita**, €
2.3.	Gross Value Added	GVA	*per capita**, €
2.4.	Small business entities	UNITS	per 10,000 of the population
2.5.	Retail turnover of retail trade businesses	RETAIL	*per capita**, €
2.6.	Foreign trade volumes	FEA	*per capita**, €
2.7	The share of enterprises introducing innovations (goods and/or technological processes)	INRATE	of the total number of industrial enterprises, %
2.8	Gross Domestic Product	GDP	*per capita**, €

Note: * expressed in current prices.

Source: Own elaboration using expert method based on data of Economic statistics / Macroeconomic statistics / Trends in business activity (2005–2020), Income and living conditions (2005–2020), The social protection (2005–2020) of State Statistics Service of Ukraine.

The causality between migration and the socio-economic development of the country can be evaluated based on the Granger causality test. For the study social and economic development variables in Ukraine (Table 1) are presented in the form of relative / specific values which ensures their comparability over time. The raw data from 2005 to 2020 are displayed in Table A1. The Granger test consists of three stages:

1) converting the source data into logarithms;
2) selection of the number of time lags (for the study, three lags were selected: short-run (lag 1), medium-run (lag 2) and long-run (lag 3), for which the relationship between migration and socio-economic development variables is checked;
3) verification of the null hypotheses.

III. The method of an integrated assessment of the level of social and economic development of Ukraine involves the use of a multiplicative approach based on the principal component analysis decomposing the data to project it to a lower-dimensional space. The provision of information and analytical support for assessing social and economic development and the selection of indicators was carried out on the principles of validity, universality, and comparability.

The method assumes standardizing indicators of social and economic development to bring the data to a homogeneous series of values in order to calculate the significance of each indicator within the group and the weight coefficients of groups of indicators. The calculation of the composite indicators of the social and economic development consists of the following stages:

1. *Standardization of indicators-stimulators according to Equation (3) and indicators-de-stimulators according to Equations (4):*

$$z_{it}^{s} = {x_{it}} \big/ {x_{maxt}} \tag{3}$$

$$z_{ij}^{d} = {x_{mint}} \big/ {x_{ij}} \tag{4}$$

where: z_{it}^{s}, z_{it}^{d} is normalized values of the *i-th* stimulator and the *i-th* de-stimulator accordingly in the *t-th* time interval; x_{it} is initial indicator values in the *t-th* time interval; x_{maxt}, x_{mint} are maximum and minimum values of the *i-th* indicator in the t-*th* time interval.

2. *Determination of indicator weights within the v-group based on the principal component assessment by Equation (5):*

$$w_{i}^{v} = {\left| F_{iv} \right|} \big/ {\sum_{i}^{n} \left| F_{in} \right|} \tag{5}$$

where: w_{i}^{v} is a weight of the *i-th* indicator in *v*-group; is a value of the principal component of the *i-th* indicator in *v*-group; *n* is the number of indicators in the *v*-group.

3. *Calculation of weight coefficients of indicators within each group (Equation 6):*

$$I_{it}^{v} = z_{it}^{w_{i}^{v}} \tag{6}$$

where I_i^v is a partial weight coefficient of the *i-th* indicator in the *t-th* time interval of the *v*-group; is normalized values of the *i-th* indicator in the *t-th* time interval.

    4. *Group coefficients of social and economic development* are calculated using a multiplier approach (Equations 7 and 8).

$$ISD_t = \prod_i^t I_{it}^{Isd} \tag{7}$$

$$IED_t = \prod_i^t I_{it}^{Ied} \tag{8}$$

where: ISD_t, IED_t are levels of the social and economic development accordingly in the *t-th* time interval of the *v*-group; I_{it}^{isd}, I_{it}^{ied} are partial weight coefficient of the *i-th* indicator in the *t-th* time interval of the social and economic development groups' accordingly.

    5. *Construction of composite indicators of social and economic development* (*Equation* 9):

$$ISED_t = \prod_v^t \widetilde{ID_{tv}} \tag{9}$$

where $ISED_t$ is an composite indicator of social and economic development in the *t-th* time interval; $\widetilde{ID_{tv}}$ is a weight coefficient of the *v*-group in the *t-th* time interval.

To verify the hypothesis of the existence of a causal link between migration and the social and economic development of the country a methodology for determining the migration gap was constructed and tested which made it possible to establish the impact of migration as a factor in the development of the social sphere (Equation 10) and the economic system (Equation 11). To calculate the migration gap a systematic matrix approach was used according to which human resource outflows are included as an indicator of social development and remittances are used as an indicator of economic development.

$$
\begin{aligned}
Gap_t^{ISD} = ISD_t &\begin{pmatrix} \text{UNEMPL}_t & \text{EAR}_t & \text{WAGE}_t \\ \dots & \dots & \dots \\ \text{INCOME}_t & \text{WAGE}_t & \text{CPI}_t \end{pmatrix} - \\
+ ISD_t^{migr} &\begin{pmatrix} \text{UNEMPL}_t & \text{EAR}_t & \text{WAGE}_t \\ \dots & \dots & MIGR_t \\ \text{INCOME}_t & \text{WAGE}_t & \text{CPI}_t \end{pmatrix}
\end{aligned} \tag{10}
$$

$$Gap_t^{IED} = IED_t \begin{pmatrix} \text{FDI}_t & \text{FPI}_t & \text{GVA}_t \\ \dots & \dots & \dots \\ \text{UNITS}_t & \text{FEA}_t & \text{FEA}_t \end{pmatrix} -$$

$$+ IED_t^{migr} \begin{pmatrix} \text{FDI}_t & \text{FPI}_t & \text{GVA}_t \\ \dots & \dots & \text{TRANSF}_t \\ \text{UNITS}_t & \text{FEA}_t & \text{FEA}_t \end{pmatrix} \quad (11)$$

where: Gap_t^{ISD} is the migration gap of the development of the social sphere in the *t-th* time interval; Gap_t^{IED} is migration gap of the economic development in the t-*th* time interval; ISD_t^{migr} is the level of development of the social sphere, in which human resources outflow is an indicator of the social sphere development in the *t-th* time interval; IED_t^{migr} is the level of economic development at which remittances is an indicator of the development of the economic system in the *t-th* time interval.

IV. To model the impact of migration on the composite indicator of social and economic development the VAR method was used which allows for the estimation of simultaneous relationships between values.

3. Empirical results

3.1. Migration—social and economic development nexus

Minimizing the negative consequences, risks and threats of emigration as well as the use of migration potential to accelerate the pace of economic growth requires high-quality and effective regulation of migration which include cash and other transfers from labour migrants. The effectiveness of a migration policy depends on high-quality and comprehensive information and analytical support which affects the adoption of informed decisions by state and regional authorities to curb migration flows and stimulate re-emigration.

To determine the optimal number of lags for the modelling the EViews software and the maximum lag test were used which made it possible to choose four lags. The Dickey-Fuller stationarity test was used to study the character of the variables. The verification of the causality of relationship between migration and socio-economic development indicators in Ukraine (Table 3) shows the intensity of external migration and unemployment has a cause-and-effect relationship in a short run. Meanwhile the test for a relationship between remittances and average monthly wages, consumer price index and the share of households' food expenditures confirms the hypothesis that remittances impact the financial situation of households. In this time frame the research proves the impact of human resources' migration on the economic development of Ukraine

represented by such indicators as capital investment and the turnover of retail businesses, small business entities and the share of enterprises introducing innovations. It is worth mentioning that the causal impact of remittances on the indicators of the country's economic development is not observed in the first-time lag. Therefore, international migration boosts development internal con-

Table 3. The Granger causality test for migration and socio-economic development variables of Ukraine in the years 2005–2020

Variables	Human resources outflow/Lags				Remittances/Lags			
	1	2	3	4	1	2	3	4
Social domain development								
UNEMPL	9.863 (0.009*)	9.572 (0.008*)	4.056 (0.083*)	183.809 (0.005*)	0.000 (0.989)	0.020 (0.979)	0.058 (0.979)	0.102 (0.972)
EAR	0.148 (0.709)	0.217 (0.809)	4.452 (0.070*)	4.452 (0.071*)	0.083 (0.779)	0.592 (0.576)	2.173 (0.209)	8.307 (0.100*)
WAGE	0.246 (0.630)	0.333 (0.726)	4.580 (0.067*)	1.633 (0.413)	3.591 (0.085*)	0.787 (0.487)	0.463 (0.721)	0.124 (0.755)
INCOME	0.037 (0.851)	2.518 (0.101*)	3.759 (0.094*)	4.605 (0.100*)	1.105 (0.316)	0.106 (0.901)	0.302 (0.823)	0.074 (0.983)
CPI	0.0893 (0.771)	0.191 (0.830)	0.130 (0.938)	0.130 (0.938)	2.646 (0.100*)	6.066 (0.025**)	3.392 (0.100*)	3.930 (0.213)
EXPENS	1.241 (0.289)	0.641 (0.552)	1.046 (0.448)	1.047 (0.448)	22.295 (0.000***)	7.506 (0.015**)	8.377 (0.021**)	2.324 (0.322)
Economic development								
FDI	0.078 (0.785)	10.633 (0.005**)	1.295 (0.372)	1.295 (0.372)	0.528 (0.483)	0.365 (0.705)	0.998 (0.466)	0.769 (0.632)
FPI	1.618 (0.100*)	4.409 (0.051*)	7.053 (0.030**)	7.053 (0.030**)	0.461 (0.511)	0.269 (0.071*)	0.631 (0.626)	0.449 (0.076*)
GVA	0.003 (0.955)	3.004 (0.106*)	4.021 (0.084*)	2.609 (0.296)	1.255 (0.286)	0.088 (0.916)	0.066 (0.976)	0.027 (0.997)
UNITS	2.801 (0.100*)	0.422 (0.669)	1.470 (0.329)	4.355 (0.100*)	0.034 (0.857)	3.404 (0.085*)	2.209 (0.102*)	1.197 (0.502)
RETAIL	1.860 (0.100*)	2.315 (0.100*)	4.098 (0.081*)	8.524 (0.100*)	0.209 (0.656)	0.941 (0.429)	1.221 (0.093*)	0.367 (0.802)
FEA	0.022 (0.885)	4.860 (0.041**)	26.398 (0.002**)	26.398 (0.002**)	0.011 (0.917)	0.021 (0.979)	0.219 (0.879)	0.051 (0.991)
INRATE	3.459 (0.089*)	2.748 (0.100*)	1.058 (0.444)	8.524 (0.100*)	0.438 (0.522)	2.065 (0.101*)	2.489 (0.094*)	3.666 (0.100*)
GDP	0.049 (0.829)	4.405 (0.051*)	6.332 (0.037**)	6.332 (0.037**)	1.759 (0.211)	0.296 (0.752)	0.139 (0.032**)	0.027 (0.097*)

Notes: ***, **, *—error at 1%, 5%, and 10%. Calculated in the EViews 11 software package.

Source: Based on data of Table 2.

sumer market due to the growth of consumption and the trade in goods and services (author's claim).

The development of the social domain in Ukraine is characterized by the dependence of unemployment on the migration of human resources in every considered time lag which is verified with 95% probability and the absence of an impact of remittances on the labour force. In the second time lag there is a causal relationship between migration and disposable income, remittances and the share of expenditures on food in total consumer spending as well as the consumer price index. It is worth mentioning that in this time lag the impact of human resources on economic development parameters is significant (excluding variable small business entities). Moreover, there is a causal relationship between remittances and capital investment, small business entities and the share of business entities engaged in innovative activity. It demonstrates the relationship between remittances and capital resources and testifies to the growth of business competitiveness.

These assumptions are confirmed in the third time lag where the socio-economic development of Ukraine is largely stipulated by remittances. Interestingly remittances have a causal relationship in three-time lags with such social domain indicators as the consumer price index and the share of food expenditures. Meanwhile, there is a stronger causal relationship between human resources' migration and indicators in the social domain and the development of the economic system in the third- and fourth-time lags. Furthermore, there is a relationship between the intensity of external migration in Ukraine and the level of economic activity of the population, average monthly nominal wages (in the third lag alone) and disposable income. Migration of human resources in the short run is a tool to restore the balance of the national labour market and reduce unemployment and the number of the vacant positions available for the economically active population. However, over a medium-term period it can be observed that the aggravation of structural imbalances in the labour market leading to staff shortages and intensification of the outflow of youth and highly qualified staff. There is an impact on the share of innovative enterprises and DGP as well as capital investment and foreign economic activity of the country. It is worth noting that the human resource outflow has a relationship with the GVA in the medium term which is not typical for remittances (Siddique, Selvanathan, & Selvanathan, 2012; Clemens, 2014).

Table 4 shows the summary of results obtained in the analysis of causality for migration and socio-economic development in Ukraine. The causality relationship between the intensity of external migration and unemployment, capital investment and retail turnover is observed in almost every analysed time lag. The relationship between the level of remittances inflows and the share of innovative enterprises and GDP of the country is observed in the medium and long run. It is worth mentioning that the analysis results confirm the ambiguity and complexity of the nature of migration.

Table 4. Granger causality between migration, social and economic development in Ukraine in the years 2005–2020

Social domain development

Variables	Migration flows	Lags			
		1	2	3	4
UNEMPL	MIGR	+	+	+	+
	TRANSF				
EAR	MIGR			+	+
	TRANSF				+
WAGE	MIGR			+	
	TRANSF	+			
INCOME	MIGR		+	+	+
	TRANSF				
CPI	MIGR	+		+	
	TRANSF		+		
EXPENS	MIGR	+	+	+	
	TRANSF				

Economic development

Migration flows	Variables	Lags			
		1	2	3	4
FDI	MIGR		+		
	TRANSF				
FPI	MIGR	+	+	+	+
	TRANSF	+	+	+	
GVA	MIGR		+	+	
	TRANSF				
UNITS	MIGR	+			+
	TRANSF	+	+		
RETAIL	MIGR	+	+	+	+
	TRANSF		+		
FEA	MIGR		+	+	+
	TRANSF				
INRATE	MIGR	+	+		+
	TRANSF		+	+	+
GDP	MIGR		+	+	+
	TRANSF			+	+

Note: "+" means there is a relationship

Source: Based on Table 3.

In Ukraine since 2014 military operations have been conducted and a characteristic feature related to the military-political situation and other external hybrid interventions in internal socio-economic processes and aggravation socio-economic instability. This factor undoubtedly encourages migration and the () same thing and capital abroad. Migration activity is sigmoidal (Levytska et al., 2020; Mulska et al., 2021) and is larger if crises increase and volumes decrease or develop into permanent, discrete migration or into internal movements with further stabilization (Ogunniyi et al., 2020; Andersson et al., 2020). Therefore, it is important to consider this specificity precisely when resolving the most problematic aspects within the short-run lag in particular in the process of forming and implementing a proactive state policy. Firstly, the monitoring and control of the quality of and personnel in a particular professional, and the characteristics of migrants. Secondly, managing the trajectory of their migration abroad and stimulating their return, have they stable ties with the family at home country. Thirdly, stabilization of the country's financial system and popularization of capital placement in the domestic market.

3.2. 'Migration gap' and dynamic link between migration and socio-economic development in Ukraine

Detection of an impact of migration on socio-economic development in Ukraine requires the calculation of indicator of the socio-economic development level in the country based on the use of a multiplicative approach with the calculation of the values of the main components for all indicators and group components. The authors' methodology allows for the standardization of socio-economic development indicators, the detection of the structure of the relationship between indicators and groups of parameters and the calculation of the weighted significance of each indicator within the group and the weighting coefficients of indicator groups. The informational-analytical basis for evaluation of the country's socio-economic development was mapped and the variables were selected following the principles of validity, universality and comparability (Table A1).

The calculation of the socio-economic development composite indices requires the accomplishment of six tasks tested in two phases: (1) excluding the empirical parameters of migration in the system of indicators; (2) including the empirical parameter of migration in the group of socio-economic development indicators.

Based on the results of standardization the weight of each indicator in groups standardised in two phases of socio-economic development composite indicator is determined. The highest significance levels in the social development group account for disposable income (24.2%) and average monthly nominal wages (22.62%), while unemployment has the lowest weight significance coefficient (4.79%). It is worth mentioning that the structure of weight coefficients has not changed with the consideration of external migration intensity yet the weight significance of migration for the development of in the social domain

is 13.47%, which is 6.32 p.p. more than the share of households' food expenditures and 8.28 p.p. less than the weight coefficient of wages.

In the economic development group GDP (15.51% and 14.47%) and GVA (15.42% and 14.20%, respectively) are quite significant. The weight of remittances is 7.15% and is the lowest in the group.

The weight coefficients serve as necessary inputs for the calculation of composite indicators of social and economic development in Ukraine in 2005–2020 (Figures 2 and 3). The obtained results allow the detection of the migration gap in the development of the social domain in Ukraine. The highest social development levels were in 2013 (0.952) but if the outflow of human resources are considered the highest rates of social domain development were also in 2012 and 2013. The migration gap in the period was 0.190–0.213. It is worth mentioning that the impact of migration on social development in 2008–2020 was quite significant and amounted to 0.103 (2008) to 0.258 (2020). The growing impact of the human resource outflow on the development of the social domain was observed since 2015.
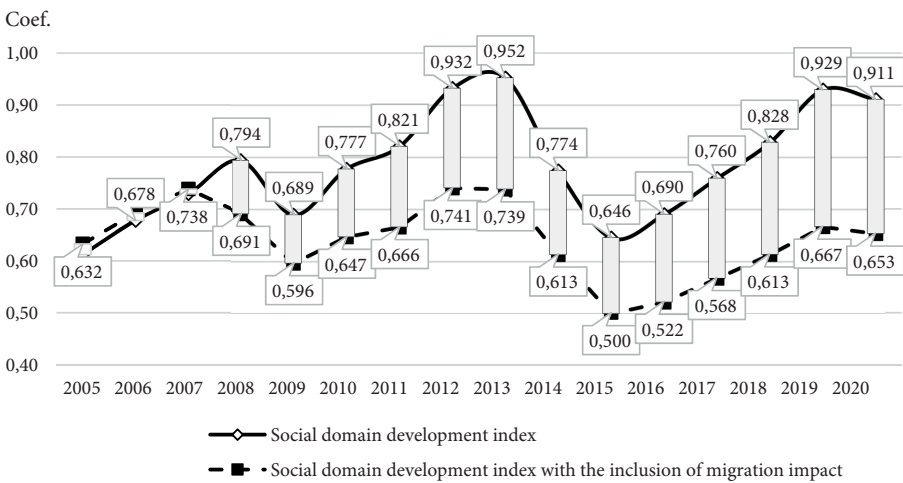

Figure 2. Social domain development indices in Ukraine in the years 2005–2020 (human resources outflow impact)
Source: Based on data of Table A1 using Equations (4)–(10).

The impact of remittances on the economic development of Ukraine in 2005–2020 was not as significant as the impact of human resources which is the cause of either poor recording of remittance volumes or irrational use of the money supply by migrants and unrecorded financing of the country's economy by remittances. From 2015 to 2020, the difference between indicators as 0.006 (2015) to 0.16 (2019).

The composite indices of socio-economic development in Ukraine (Figure 4) ranged from 0 to 1. The growth of the index shows the improvement of socio-
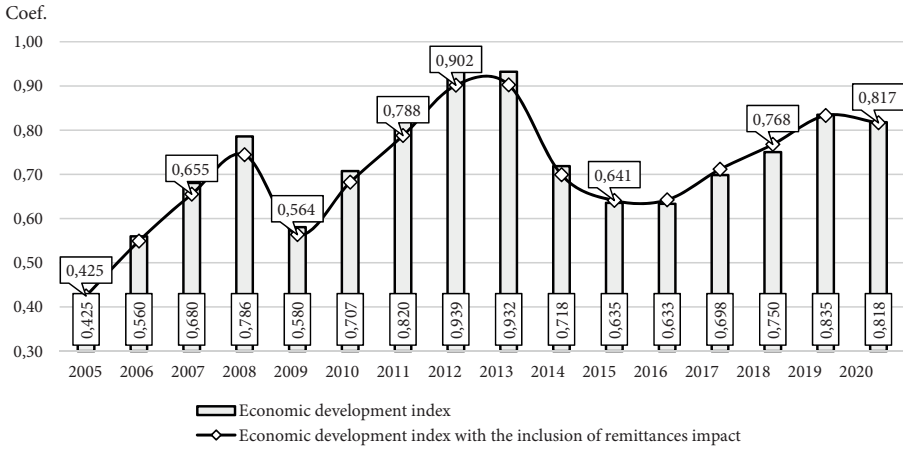
Figure 3. Economic development indices in Ukraine in the years 2005–2020 (remittances impact)
Source: Based on data of Table A1 using Equations (4)–(9) and (11).

economic development in the country and the increasing multiplicative effect of external migration. Top values of the composite indices in the period under research were observed in 2012–2013 amounting to 0.936 and 0.942, respectively. The start of military conflict in the east of the country and the annexation of Crimea in 2014 affected the socio-economic development of the country causing growing labour emigration. Obviously the migration gap in socio-economic development in Ukraine was the highest during the 2014–2016 crisis. A substantial reduction of the values of socio-economic development indices was observed in 2015 and 2016 in that the index declined to 0.640 which is
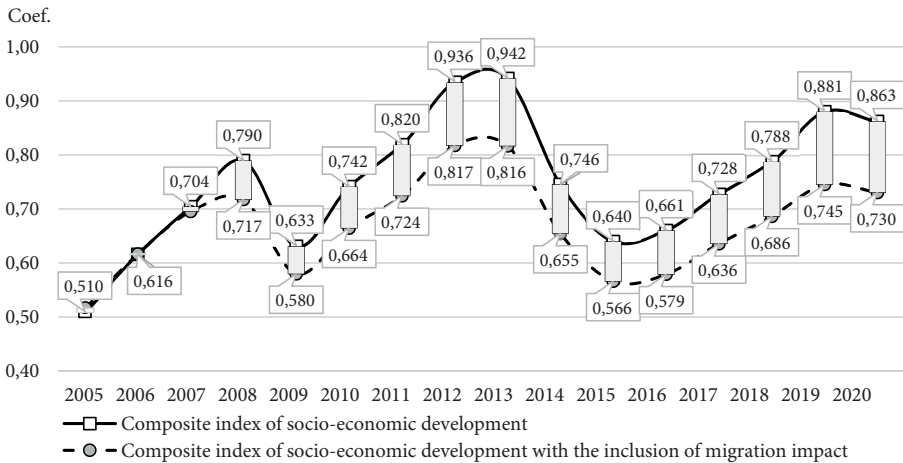

Figure 4. Composite indices of socio-economic development of Ukraine in the years 2005–2020 ('migration gap')
Source: Based on data of Table A1 using Equations (10) and (11).

47.2% less than in 2014. In 2020 the migration gap of socio-economic devel-
opment was 0.133 while in 2009, it amounted to 0.053.

The detection of a dynamic relationship based on VAR modelling between
the time series of migration in terms of human resources, remittances and so-
cio-economic development of Ukraine allows to moderate the migration pol-
icy considering the priority directions of the national economy development
(Table 5). For VAR modelling it was chosen self-acting (automatic) selection
of lags according to the Schwartz criterion (as a result, the research is based on

**Table 5. Dynamic relationship between migration and socio-economic
development of Ukraine in the years 2005–2020**

Human resources outflow				Remittances inflow			
Variables	ISD	IED	ISED	Variables	ISD	IED	ISED
c	0.543 (0.248**)	0.519 (0.181**)	0.529 (0.194**)	c	0.930 (0.414)	0.002 (0.003*)	0.307 (0.260*)
MIGR	−0.112 (0.210*)	−0.041 (1.385*)	0.043 (1.296**)	TRANSF	0.006 (0.004**)	0.231 (0.228*)	0.260 (0.003*)
MIGR (−1)		−2.212 (1.572*)	−1.721 (1.438*)	TRANSF (−1)	0.002 (0.004**)		
MIGR (−2)		2.441 (1.398**)	−1.900 (1.296*)	TRANSF (−2)	−0.007 (0.004*)		
				TRANSF (−3)	−0.004 (0.004**)		
ISD (−1)	0.543 (0.248***)			ISD(−1)	0.713 (0.389**)		
IED (−1)		0.666 (0.296*)		ISD(−2)	0.059 (0.516*)		
IED (−2)		−0.329 (0.268*)		ISD(−3)	−0.779 (0.428**)		
ISED (−1)			0.721 (0.312**)	IED(−1)		0.533 (0.204**)	
ISED (−2)			−0.408 (0.289*)	ISED (−1)			0.835 (0.301*)
				ISED (−2)			−0.412 (0.250*)
R^2	0.854	0.659	0.789	R^2	0.781	0.786	0.666
DW	2.303	1.561	1.716	DW	2.314	1.502	2.136
F-statistic	3.009	1.828	1.923	*F*-statistic	2.035	3.452	2.620

Note: ISD is social domain development index; IED is economic development index; IISED
is composite index of socio-economic development; R^2 is coefficient of determination; DW is
Durbin Watson statistics; *F*-statistic is *t*-test.

Source: Authors' own elaboration based on data of Table 2 and A1 using EViews 11 software.

two lags). The growing intensity of external migration is the cause of the declining social development level in Ukraine by 0.11%, while growing remittances foster the growing level of social domain development by 0.006% in the current period and by 0.002% in a one-year time lag. It is worth mentioning that remittances have a negative impact on social development in the two-three-year time lags (0.007% and 0.004%, respectively).

The impact of migration on the composite index of economic development is significant in one-two-year time lags (elasticity coefficient is 2.44). Interestingly the impact of remittances on the empirical parameter of economic development is 0.23. There are two types of impact of migration on the composite index of socio-economic development: (1) direct moderate impact in current dynamics (elasticity coefficient is 0.04), (2) statistically significant negative impact in the short and medium term (1.72 and 1.90, respectively). The impact of remittances on the composite index of socio-economic development of Ukraine is 0.26 in current dynamics indicating the lack of a multiplicative effect. The results can also indicate the low investment activity of labour migrants and their family members as well as the lack of economic effect of remittances for capital investment.

4. Discussion

A comprehensive analysis of the impact of migration on the socio-economic development of Ukraine considered two channels: human resources outflow and the inflow of remittances. Human resources outflow as well as remittances which clearly affect the social and economic development. Both the direction and intensity of such influence vary in different time lags. However, the relevant connections are not unambiguous and require additional consideration. Firstly, the combinations (a unique combination at a certain point in time) of the force of influence of leading factors that can strengthen or weaken each other and all processes in general; secondly the factors of the external situation (pull-push factor system in the countries—recipients of migrants), which can level or, conversely, accelerate internal changes and shifts which additionally affect the intensity of migration and capital; thirdly socio-economic development can be conditioned by factors that replace losses from migration (such as the means and potential of digitalization, the introduction of advanced high-tech innovations, robotics, IoT, fully automated industries, etc.). Therefore, the complementary causality research of migration and socio-economic development involves the use of a multi-stage approach with the formation of a system of variables and empirical indicators, assessment of causal relationships and migration potential. This approach identifies the benefit and disadvantages of migration for the economy and society as well as carrying out a simulation modelling of socio-economic development in considering the changes in the scale of migration flows.

The research on migration and its impact on social and economic development from the perspective of the country-donor of human resources and recipient of remittances mostly relies on the methods of indicative economic analysis and econometric modelling of the link between migration and economic growth (Andersson & Siegel, 2020; Dastidar, 2017; Siddique et al., 2012; Cooray, 2012; Faist, 2004; Fayissa & Nsiah, 2010; Tamasauskiene & Žičkienė, 2021). The research results confirm the causality between migration and social and economic development—the structural balancing of the labour market (equalization of supply and demand) (Hammer & Hertweck, 2022; Mosley & Singer, 2015; Gómez & Giráldez, 2017), improvement of households' material and financial situation (Přívara & Trnovský, 2021; Mondal & Khanam, 2018), development of the domestic consumer market (Jawaid & Raza, 2014; Kumar et al., 2018), increase in the investment capacity of economic sectors through capital investments in the form of remittances (Meyer & Shera, 2017; Ning, Molloy, Smith, & Wozniak, 2022; Orrenius & Zavodny, 2012; Becker & Ferrara, 2019). The results of the assessment of the causality between migration and the socio-economic development of Ukraine made it possible to identify a Granger-causality relationship in four lags. In the short-run lag of international migration and unemployment has the close link, in return the causal link it was determined between remittances and such indicators as average monthly nominal wage, the consumer price index, and the share of total household spending on food. In other lags there is a causal relationship between migration and disposable income, remittances and total expenditure, as well as the consumer price index. The connection between remittances with capital investments, the number of small enterprises and the share of those business entities that carry out innovative activities has been identified. Remittances are beneficial for the capital market and economic growth in Ukraine as a whole.

In this paper, the composite indices of social and economic development are calculated which made it possible to identify migration 'gaps' in the development of the social sphere and the economic system of Ukraine. The values of the migration 'gap' of economic and social development grew during periods of crises. The dynamics of composite indices confirm that the social and economic development is determined by an increase in the multiplier effect during periods of the increasing intensity of external migration.

The authors' empirical study confirms the hypothesis of the existence of not only a single-vector relationship between the factor of migration and economic growth but the presence of causality between human resources outflows and remittances in the various lags and thus their consequences for the socio-economic system. Social and economic development serves as a factor in the intensification of migration and in determining the lag of emigration and is also a multiplicative result of migration which is manifested in the areas of economic recovery and growth, social stability and a reduction of social inequality. Migration processes are polyaspective and their impact is multifac-

eted and diverse with a differentiated level of threats to sustainable economic development. Therefore, the formation of a more thorough approach to the analysis of the links and impact of migration and remittances has applied importance. This approach requires to use a special tool for forming a body of proper information and an analytical base. To achieve the priorities of social and economic development of the national economy migration policy needs to involve determining data on causality link between human resources outflow, remittances, different indicators of economic system and society. An effective migration policy requires the construction of an optimal package (aggregate) of measures the implementation of which will allow a minimization of risks and an efficient use the potential of the human resources outflow and incoming remittances as well as obtain the maximum benefit of migration for the economy and the social sphere.

Conclusions

The research hypothesis was confirmed: migration is beneficial for social and economic development in the short run and indicates a mixed link between the Ukrainian economy and society in the long run. International migration intensity from 2005 to 2020 increased thirteen times, the level of remittances into the economy increased by 20.5 times, from 91.7 € *per capita* in 2005 to 242.41 € *per capita* in 2020.

The results of the verification of the Granger-causality of migration and socio-economic development of Ukraine detected the causal relationship in four lags. In the short run international migration intensity has causality link with unemployment by reducing its volume. Remittances have an impact on average monthly nominal wages, the consumer price index and the share of households' food expenditure. In other time lags there is a causal relationship between migration and disposable income, remittances and aggregate food expenditures as well as the consumer price index. The research points to the relationship between remittances and capital investment, small business entities and the share of business entities involved in innovative activity. Remittances are beneficial for development the capital market and ensuring economic growth in Ukraine.

The composite index of the country's socio-economic development permits the detection of the migration gaps in the development of the social domain and economic system of Ukraine. The migration gap in economic and social development increased in the period of the 2014–2015 systemic crisis. The dynamics of the composite indices confirms that the economic growth is defined by increasing multiplicative effects in the periods of international migration intensification. Migration gaps in socio-economic development were the highest in 2014–2016.

To test the robustness of the causality relationship between migration and social and economic development it is advisable to diversify the migration policy according to the character of the link between migration and economic growth in a different lag. Firstly support (educational and labour exchange programmes, professional training, temporary employment abroad) short-run labour and educational migration; secondly, to intensify programmes to encourage the remigration by means of profitable investment of their migratory capital, the creation of small businesses, self-employment and introduction of progressive start-ups in the home country; thirdly, to implement a permanent labour market balancing policy by the creation of new competitive jobs for the preservation of employment for youth and highly skilled workers.

At the same time the focus is on the limitations of the methodological approach in modelling the impact of the migration factor on social and economic development:

a. the choice of indicators of social and economic development and their grouping carried out by the expert method and which creates discussion about the use of purely economic or social indicators (for example, the consumer price index);
b. discussion on determining the character of the influence of indicators on the resulting variable subject to the use of the various method of assessment (e.g., the indicator 'The share of households' food expenditure' has a mixed impact on empirical variable) and therefore there is a risk of the dependency obtained results on the methodological toolkit;
c. the results of the causality test and VAR modelling have a separate methodological vacuum in interpreting the impact of migration on the combined indicator of socio-economic development (e.g., the Granger test shows a causal relationship with almost all social indicators and partly with economic ones while the results of VAR modelling which combined indicators used confirmed the causality of migration and social and economic development in only two lags).

The prospects for further scientific research and economic discourse in the field of 'the migration – development nexus' would be a verification of the factors of migration causality, economic growth and economic security, the impact of remittances on social protection and quality of life as well as the identification of critical and optimal ranges of human resource outflow to ensure the sustainability of the socio-economic system and international remittances —to ensure the financial autonomy of the national economy.

Appendix

Table A1. Social and economic development variables in Ukraine in the years 2005–2020

Parameters	Years															
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Social domain																
Unemployment among the population aged 15 to 70,% of EA of population aged 15 to 70	7.2	6.8	6.4	6.4	8.8	8.1	7.9	7.5	7.2	9.3	9.1	9.3	9.5	8.8	8.2	9.5
Economic activity of the population aged 15 to 70,%	62.2	62.2	62.6	63.3	63.3	63.7	64.3	64.6	65.0	62.4	62.4	62.2	62.0	62.6	63.4	62.1
Average monthly nominal wages (on average per a full-time employee), €	126.1	164.2	195.2	234.5	175.3	212.6	237.4	294.6	307.7	221.4	173.1	183.2	236.8	275.8	362.6	380.1
Disposable income of the population (*per capita*), €	1062.4	1225.7	1435.0	1814.6	1343.7	1742.4	1916.1	2454.4	2518.3	1762.1	1312.6	1310.7	1525.4	1801.8	2125.3	2273.8
Consumer price index,% of the previous year	113.5	109.1	112.8	125.2	115.9	109.4	108.0	100.6	99.7	112.1	148.7	113.9	114.4	110.9	107.9	102.7
The share of households' food expenditures (per a household per month),%	48.7	50.2	51.4	48.9	50.0	51.6	51.3	50.2	50.1	51.9	53.1	49.8	47.9	47.7	46.6	52.7
Economic system																
Foreign direct investment (*per capita*), €	152.7	289.5	341.4	435.3	553.3	639.2	711.9	821.8	854.9	894.2	805.6	678.5	648.0	631.0	676.3	594.8
Capital investment (*per capita*), €	309.0	428.1	593.7	656.3	304.4	392.9	514.8	629.7	556.8	326.0	264.1	298.7	353.2	424.8	515.7	397.7
Gross value added (*per capita*), €	1332.3	1680.1	2081.1	2425.4	1655.4	2049.4	2298.1	2693.0	2764.4	1936.8	1624.2	1672.4	1971.9	2215.3	2836.1	2677.4

Parameters	Years															
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Small business entities (per 10,000 of the population)	70.0	72.0	76.0	72.0	75.0	78.0	77.0	76.0	82.0	76.0	77.0	68.0	81.3	80.7	80.4	81.1
Retail turnover of retail trade businesses (*per capita*), €	310.7	441.1	557.6	690.8	460.5	580.2	689.4	864.4	895.9	614.0	468.8	459.6	458.9	479.0	480.0	679.4
Foreign trade (*per capita*), €	1340.9	1622.1	1958.1	2515.6	1552.1	2120.4	2683.7	2964.7	2662.6	2078.9	1885.6	1894.2	2234.0	2331.9	2238.3	3506.2
The share of enterprises introducing innovations (goods and/or technological processes), of the total number of industrial enterprises,%	8.2	10.0	11.5	10.8	10.7	11.5	12.8	13.6	13.6	12.1	15.2	16.6	14.3	15.6	13.8	14.9
GDP (*per capita*), €	1459.9	1853.2	2261.9	2659.9	1825.2	2241.0	2565.0	3000.8	3035.6	2280.1	1907.3	1974.2	2333.1	2619.2	3266.6	3280.2

Source: Based on the data of the State Statistics Service of Ukraine.

Table A2. Social and economic development variables in Ukraine with migration factor in the years 2005–2020 (standardization results)

Parameters	Years															
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Social domain																
Unemployment among the population aged 15 to 70,% of EA of the population aged 15 to 70	0.889	0.941	1.000	1.000	0.727	0.790	0.810	0.853	0.889	0.688	0.703	0.688	0.674	0.727	0.780	0.674
Economic activity of the population aged 15 to 70,%	0.957	0.957	0.963	0.974	0.974	0.980	0.989	0.994	1.000	0.960	0.960	0.957	0.954	0.963	0.975	0.998
Average monthly nominal wages (on average per a full-time employee), €	0.348	0.453	0.538	0.647	0.484	0.586	0.655	0.813	0.849	0.611	0.477	0.505	0.653	0.761	1.000	0.332
Disposable income of the population (*per capita*), €	0.422	0.487	0.570	0.721	0.534	0.692	0.761	0.975	1.000	0.700	0.521	0.520	0.606	0.715	0.844	0.467
Consumer price index, % of the previous year	0.878	0.914	0.884	0.796	0.860	0.911	0.923	0.991	1.000	0.889	0.670	0.875	0.872	0.899	0.924	0.971
The share of households' food expenditures (per a household per month),%	0.957	0.928	0.907	0.953	0.932	0.903	0.908	0.928	0.930	0.898	0.878	0.936	0.973	0.977	1.000	0.884
Intensity of external migration, coef.	1.000	0.973	0.948	0.315	0.259	0.211	0.180	0.167	0.143	0.138	0.105	0.094	0.088	0.088	0.075	0.187
Economic system																
Foreign direct investment (*per capita*), €	0.171	0.324	0.382	0.487	0.619	0.715	0.796	0.919	0.956	1.000	0.901	0.759	0.725	0.706	0.756	0.257
Capital investment (*per capita*), €	0.471	0.652	0.905	1.000	0.464	0.599	0.784	0.959	0.848	0.497	0.403	0.455	0.538	0.647	0.786	0.664
Gross value added (*per capita*), €	0.470	0.592	0.734	0.855	0.584	0.723	0.810	0.950	0.975	0.683	0.573	0.590	0.695	0.781	1.000	0.498

Parameters	Years															
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Small business entities (per 10,000 of the population)	0.854	0.878	0.927	0.878	0.915	0.951	0.939	0.927	1.000	0.927	0.939	0.829	0.991	0.984	0.980	0.838
Retail turnover of retail trade businesses (*per capita*), €	0.347	0.492	0.622	0.771	0.514	0.648	0.770	0.965	1.000	0.685	0.523	0.513	0.512	0.535	0.536	0.457
Foreign trade (*per capita*), €	0.452	0.547	0.660	0.849	0.524	0.715	0.905	1.000	0.898	0.701	0.636	0.639	0.754	0.787	0.755	0.382
The share of enterprises introducing innovations (goods and/or technological processes), of the total number of industrial enterprises,%	0.494	0.602	0.693	0.651	0.645	0.693	0.771	0.819	0.819	0.729	0.916	1.000	0.861	0.940	0.831	0.550
GDP (*per capita*), €	0.447	0.567	0.692	0.814	0.559	0.686	0.785	0.919	0.929	0.698	0.584	0.604	0.714	0.802	1.000	0.445
Remittances through formal channels, *per capita*, €	0.390	0.414	0.399	0.387	0.355	0.408	0.468	0.545	0.600	0.459	0.621	0.676	0.817	0.943	1.000	1.000

Source: Based on the data of Table 2 and Table A1.

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