Modelling the Impact of International Migration on Economic Development of a Country: Case Study of Ukraine

*Viktoriia ADAMYK – Liana CHERNOBAY – Oleh KUZ'MIN – Sviatoslav MALIBRODA**

Abstract

The article presents an attempt to combine some of the links between migration and development into a model to evaluate the influence of migration on economy of sending and receiving countries and then define the factors of this kind of an influence. Developed model describes the migration influence on GDP, consumption, budget revenues and expenses, current account balance receipts and expenditures, labor force, unemployment rate. Calculation methodology with limitation for use is provided. The end of the article presents the results of calculations for Ukraine as the sending country according to the proposed model during 2010 – 2015.

Keywords: *migration and development, migration impact, migration effect, modelling*

JEL Classification: F22, F63, O15

Introduction: Background and Relevance of the Study

The study of migration has changed qualitatively over the last 50 years, from becoming a separate discipline in the social sciences to the emergence of different lines of narrow research using a multidisciplinary approach (Lee, Carling and Orrenius, 2014). The variety of existing theories is viewed by King (2012) through groups of theories suggested by the author: „push-pull theory and the neoclassical approach; migration and development transitions; historical-structural and political economy models; the role of systems and networks; the 'new

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economics' of migration". From more practical side Bastia (2013) highlights the growth of migration and development debates in academic and policy-makers circles.

One strand of research emphasizes the need to study the migration managing and the economic development separately, though admitting to the possibility that migration could produce positive effects (Skeldon, 2008). In recognizing the extreme complexity of the global development and international migration problem, some scientists tend to artificially separate the cause and effect linkages of international migration from a broader set of socio-economic development problems faced by national economies (Haas, 2010). Wihtol de Wenden (2018) provides the following point of view: „Contrarily to common views, there is no substitutability between development and migration: migration is a factor of human development but, at short term, development is also a factor of migration." Another strand of research underscores the lack of direct linkages between and international migration and the concepts of poverty, economic development, and population growth, social and political transformation. On the subject of previous saying, the strategy of cutting migration is not viewed by authors as a part of the poverty reduction policy (Nyberg-Sørensen, Hear and Engberg-Pedersen, 2002). However, there is an increase in a quantity of migration researches considering more complex links between migration and development (Clemens, Özden and Rapoport, 2014).

This article presents an attempt to combine some of the links between migration and development into a model to evaluate the influence of migration on economy of sending and receiving countries and then define the factors of particular an influence. Developed model describes the migration influence on GDP, consumption, budget revenues and expenses, current account balance receipts and expenditures, labor force, unemployment rate. Calculation methodology with limitation for use is provided. The end of the article presents the results of calculations for Ukraine as the sending country according to the proposed model during 2010 – 2015. Input data, its sources and interim calculations are given in the Appendices.

1. Literature Review

First, it is necessary to define the notion of economic development and its relation to the migration. Among the numerous definitions, we find the most concise and overall one was articulated by O'Mara (2017), who considers economic development as an increase in the economic wealth of a country, which, in its turn, provides welfare for its inhabitants. In relation to migration, this

means that the migration results in a change in the economic wealth of a country, which, in its turn, provides welfare for its inhabitants.

As mentioned earlier, concerning migration and development there is no common opinion on positive or negative influence of migration on economic development. Gamlen (2014) points out that migration and development 'pessimism' or 'optimism' are prevailing cyclically depending on new theoretical and practical evidences.

The movement of people between countries which is the sense of migration is the starting point for research of migration influence on economic development.

The first and probably most obvious is the changing labor market conditions of both countries. It is interesting that essentially similar processes can generate different consequences in different countries. The serious research report Munz et al. (2006) presents numerical empirical evidence concerning links between migration and the labor market. The first finding says that there is a little impact of migration on native worker's wages (Longhi, Nijkamp and Poot, 2004). A 1% increase in the share of migrants in the labor force leads to a decrease in local worker's wages just for 0.1% due to the mentioned report. At the same time, they report a 0.1% wage increase in Italy when migrants' numbers increased by 1%. Another study (Dustman et al., 2003) presented in the report suggest that the wages of native workers in the UK are not influenced by migration. Another study of the relationship between the number of immigrants and the wages of local workers (Borjas, 1995) shows that a 1% increase in the number of immigrants decreases the wage of local workers by 0.3% in the United States.

However, sending countries might face problems losing their labor force. Evidence from Ukraine, which has faced serious economic crisis in 2014 and thus outflow of the labor force, previses limitations for further development due to lack of labor force on the internal labor market (Pozniak, 2016). Grenčiková, Skačkauskienė and Španková (2018) argue that emigration might be a reason for the labor force shortage in sending countries and also lead to deterioration of labor force by losing high qualified, educated and creative workers. According to recent research by Wachowska (2018), the emigration of 830 scientists from Poland over a period of 9 years has resulted in a loss of 1720 inventions in Poland. The author emphasizes that the number of inventions made by Polish inventors abroad (within the framework of the Patent Cooperation Treaty) exceeds the number of those realized inside the country by 120%. Still, it also brings benefits for sending countries. Skeldon (2008) notes that the knowledge, obtained by migrants in the receiving countries, can be later used efficiently in the home country, thus contributing to the development of its economy.

Also, another link between migration and development that lies through remittances then moves to consumption and GDP increase in sending countries. The World Bank Group's Migration and Development Brief 28 (Ratha et al., 2017), recognize remittances as an important source of foreign currency inflows for a number of countries. According to the mentioned report, remittances flow to developing countries are larger than the private debt, portfolio equity, and official development assistance, but they are somewhat smaller than the foreign direct investments. However, remittance flows tend to exhibit more stable dynamics during periods of economic instability compared with other financial flows. In 2016, according to the Migration and Remittances Data (n.d.), there were 48 countries with more than 5% share of remittances in GDP, in 22 countries, the ratio of personal remittances to GDP equalled 10 to 20%, and for 8 countries this indicator exceeded to 20%. It is an obvious fact that remittances sent to families of the migrants support their well-being by covering a larger part of consumption expenses, which, in turn, stimulates aggregate demand and GDP growth in the countries of migrants' origin. Thus, it has been proved that a 10% increase in the share of remittances in the GDP of a country can reduce the share of people who live below the poverty line by 1.6% (Page and Adams, 2003). The studies performed in Ukraine based on the assessment of the marginal propensity to consume and to purchase imported goods and services show that remittances from abroad contributed (via consumption) from 2.1% to 4.0% of the GDP in 2012 (Kravchuk, 2013). It is necessary to say that the share of personal remittances in the GDP of Ukraine in 2012 equalled 4.807% according to the data of Migration and Remittances Data. (n.d.). Thus, migration through personal remittances received by countries of origin has a positive impact on their internal consumption; contributes to GDP growth and poverty reduction.

There are not so many evidences about link between remittances and development in migrant-receiving countries. A model, developed by Olney (2015) shows a 0.06% decrease in native worker's wages with a 1% increase of remittances and therefore a decrease of domestic consumption. However, as mentioned above, the native worker's wages decrease with increasing the number of migrants. Remittances increase when the number of migrants is increasing, so remittances might respond to the change in the number of migrants in the receiving country. Therefore, it seems that there is a cause-effect link between remittances and native worker's wages. However, it is still the link between the number of migrants and native worker's wage. Another link regards pressure on the current account balance which occurs when remittances increase (Chernobay, Adamyk and Malibroda, 2019). However, authors note that not all the amount of remittances can be treated as expenditures of the migrant-receiving country, as

the migrant's wage (the source of remittances) might be paid by a country that imports goods or services produced with migrant's labor from the migrant-receiving country.

A few more evidence comes from different areas. The simulation provided by World Bank researchers (World Bank Group, 2015) shows that an increase in the number of low-skilled labor migrants by 10% in Malaysia contributed to the growth of the real GDP of the country by 1.1%. Also, the authors provide evidence of the positive influence of migration on the Malaysia labor market by raising employment and wages and public revenues, as a result. As the opposite, Roshchina and Bordanova (2017) note that emigration leads to a decrease in domestic consumption due to the physical absence of people who migrate and decreasing public revenues due to fewer taxpayers' numbers. Nairn (2002) leads us to conclude that an increase in the number of migrants produces a positive influence on trade between the sending and receiving countries. A 10% increase in migration to the USA increases exports to the migrant-sending country on average by 4.7%, while imports from the migrant-sending country to the USA increased by 8.3%.

For further research, we use links and evidence about the influence of migration on GDP and consumption; budget revenues and expenses; current account balance receipts and expenditures; the labor force.

2. Data and Research Methodology

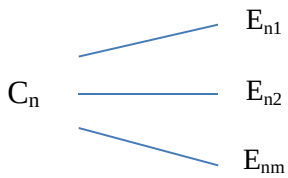
The basic point for the development of a suggested approach to the assessment of the impact of international migration on economic development is to establish a clear distinction between such notions as „the consequence of international migration" and „the effect of international migration" by recognizing differences in their nature. We use the Cambridge Dictionary (n.d) definition of 'consequence' as a basis to define „the consequence of international migration" (hereafter 'the consequence') as a direct outcome of a specific action or a situation that has occurred in the process of migration. For example, personal remittances arise in the process of migration. The „effect of international migration" (hereafter 'the effect') is understood as the result of the influence of international migration consequences on the economic development, which can be measured with the help of respective indicators.

It is important to note that one consequence of international migration can produce more than one effect of international migration (see Figure 1). For example, an outflow of the labour force from a country of origin can bring about such effects as a decrease in the size of the labour force in the structure of population,

a decrease in the level of unemployment, a decrease in state budget revenues from personal income taxes, and decreases in consumption and GDP.

F i g u r e 1

Connections between the Consequences and the Effects of International Migration



Note: Cn – consequence of international migration; *n* – number of consequences of international migration; *Enm* – m-th effect of *n*-th consequence of international migration; *m* – number of effects that correspond to *n*-th consequence of international migration.

Source: Developed by authors.

The calculation of the effect of international migration requires a set of indicators to be used. Formally, this relationship can be defined as:

$$E_{nm} = f(S_{nm}) \tag{1}$$

where

S_{nm} – a set of indicators required to calculate the effect E_{nm}.

It is important to calculate the net effect of migration as the same indicator is influenced by both the inflows and outflows migrant movements (Sriskandarajah, 2005, p. 6). As the countries involved in migration processes are usually the recipients and the donors of migrants at the same time, in order to determine the net impact of migration, it is necessary to calculate the compound impact of all the effects linked to a specific indicator of economic development.

We can assume that the net impact of migration effects on specific economic development indicator (e. g., GDP) corresponds only to that part of it, which is caused by international migration. Thus, hereinafter we will use 'partial economic development indicators' (hereafter 'PDI') to describe the net impact of migration effects on specific indicators. The calculation of PDI requires a set of effects to be used. Formally, this relationship can be defined as:

$$PDI_k = f(S_k) \tag{2}$$

where

PDI_k – partial economic development indicator;
k – number of economic development indicators;
S_k – set of effects required for calculation of the k-th partial economic development indicator.

Taken together, the dependencies between the consequences, the effects, and the partial economic development indicators form a Model of the impact of international migration on economic development (see Figure 2):

Figure 2

A Model of the Impact of International Migration on Economic Development

Source: Developed by authors.

The proposed model allows assessing the impact of international migration on economic development of a country, through measurement of net migration impact on the specific indicators. It also allows determining which specific effects produced the impact, which of those effects produced a positive or negative impact, and which consequences brought about the identified effects.

To improve the accuracy of assessing the impact of migration, incoming data must be relevant. It is extremely important with data about migration as there are a few issues. The data for 'the number of migrants received/sent' and its structure might appear underestimated and/or inaccurate because of the problems with official migration statistics such as unrecorded illegal migration or absence of appropriate record-keeping for migrants. Data considering remittances might also be underestimated as just a part of transfers are made via official channels which are the source for particular data. See Annex 1 for a full list of limitations and its description.

To assess the impact of migration on economic development The Method of assessing (hereafter 'Method') was developed. The method comprises four sequential stages.

Each stage involves using particular tools to measure the impact of international migration on economic development. The suggested tools include:

- matrices of interdependencies between the consequences and the effects for the countries of origin (Table 1) and the destination countries (Table 2), which are used during the first stage of the assessment process;
- the list of indicators (Table 3) that are using for calculation;
- formalization of calculations for the effects of international migration (Table 4), which is performed at the second stage of the assessment process;
- formalization of calculations for the partial economic development indicators (Table 5), which is performed during the third stage of the assessment process;
- an extended model of the impact of international migration on economic development (Figure 3), which is meant to facilitate better understanding of the Method and can be used at each of the stages.

The notation used in the tools corresponds to notation that is used in Formulas 1 and 2 and Figure 1. Additionally, symbols I_j were used in Tables 1 and 2 to represent indicators (see Table 3) within the sets of indicators (S_{nm}) that are required for calculation of the effect E_{nm}.

The first stage sets out the following tasks: 1. to form the list of effects for assessment of the impact of international migration on economic development; 2. to form the list of indicators for calculation of the selected effects; 3. to determine the temporal and geographic scope of the study.

To accomplish the set tasks, we use matrices of interdependencies between the effects and the consequences of international migration for the country of origin (Table 1) and the destination country (Table 2).

Table 1

Matrix of Interdependencies among the Consequences and Effects of International Migration and Partial Economic Development Indicators and Sets of Indicators Required to Calculate Effects for a Country of Origin

n	Consequences of international migration (C_n)	Effects of international migration (E_{nm})	Partial indicators of economic development (DI_k)	Sets of indicators required for effect calculations (S_{nm})
1	2	3	4	5
1	Remittances inflow	E_{11}«An increase in current account balance receipts »	PDI_5«Current account balance receipts»	I_1, I_9
		E_{12}«An increase in consumption due to inflow of remittances»	PDI_2 «Consumption»	I_1, I_6, I_7
		E_{13}«An increase in GDP due to increased consumption»	PDI_1 «GDP»	I_1, I_5, I_7, I_8
2	Depopulation	E_{21}«A decrease in unemployment»	PDI_7 «Unemployment»	I_4, I_{12}, I_{13}
		E_{22}«A decrease in social expenditures»	PDI_4 «State budget expenditures»	I_4, I_{11}, I_{14}, I_{17}
		E_{23}«A decrease in tax receipts due to decreased number of taxpayers»	PDI_3 «State budget revenues»	I_4,I_{12},I_{15},I_{16}
		E_{24}«A decrease in consumption due to outflow of population»	PDI_2 «Consumption»	I_4,I_{11}
		E_{25}«A decrease in GDP due to decreased consumption»	PDI_1 «GDP»	I_4, I_5,I_6,I_8,I_{11}
		E_{26}«A decrease in the size of labour force»	PDI_8 «Labour force»	I_4, I_{12}

Source: Developed by authors.

As already mentioned above, when being involved in international migration processes, the country is receiving migrants from abroad and sending migrants abroad at the same time. To measure the impact of international migration on economic development of the country, the economic effects for this country should be identified from the perspective of a receiving country, as well as from the perspective of a sending country.

Table 2

Matrix of Interdependencies among the Consequences and Effects of International Migration and Partial Economic Development Indicators Taking into Account Sets of Indicators Required to Calculate Effects for a Destination Country

n	Consequences of international migration (C_n)	Effects of international migration (E_{nm})	Partial indicators of economic development (DI_k)	Sets of indicators required for effect calculations (S_{nm})
1	2	3	4	5
Positive consequences				
3	Population growth	E_{31}«An increase in internal consumption due to inflow of migrants»	PDI_2 «Consumption»	I_3, I_6, I_{11}
		E_{32}«An increase in GDP due to increase in internal consumption»	PDI_1 «GDP»	I_3, I_5, I_6, I_8, I_{11}
		E_{33}«An increase in tax receipts from wages of employed migrants»	PDI_3 «State budget revenues»	I_3, I_{12}, I_{15}, I_{16}
		E_{34}«An increase in the size of the labour force»	PDI_8 «Labour force»	I_3, I_{12}
Negative consequences				
4	Remittances outflow	E_{41}«An increase in current account balance expenses»	PDI_6 «Current account balance expenses »	I_2, I_{10}

Source: Developed by authors.

When the list of effects is formed, it is necessary to determine the indicators (Ij) necessary for the calculation of the selected effects (see Table 3 for list of Indicators), in accordance with the sets (Snm) of indicators (see Tables 1 and 2).

Table 3

The List of Indicators (I_j)

Indicator code	Indicator
1	2
I_1	Personal remittances, received
I_2	Personal remittances, sent
I_3	Migrants, received
I_4	Migrants, sent
I_5	GDP (current US$)
I_6	Final consumption expenditures
I_7	Propensity to consume
I_8	Propensity to import
I_9	Current account balance, receipts
I_{10}	Current account balance, expenses
I_{11}	Population, total
I_{12}	Labor force, total
I_{13}	Unemployment rate
I_{14}	State budget, expenditures (social measures)
I_{15}	State budget, revenue
I_{16}	State budget, revenue (Income Tax)
I_{17}	State budget, expenditures

Source: Developed by authors.

The time limits of the study should also be determined. One calendar year is considered to be a single study period. It should be noted that the dynamics of international migration are characterized by sharp bursts, thus high indicator's fluctuations should not embarrass if the data source for research is adequate.

Also, geographical scope of the study might be determined to facilitate calculations. For example, 98.1% Migration and Remittances Data (n.d.) of personal remittances that were received by Mexico in 2016 originated in the USA. Similar data were observed in previous years. Thus, assessing the impact of international migration on economic development of Mexico, it would be feasible to concentrate solely on bilateral migration flows between Mexico and the USA.

T a b l e 4

Formalization of Calculations for the Effects of International Migration

Notation	Description of effects (E_{nm})	Formulas for calculation ($E_{nm} = f(S_{nm})$)
E_{11}	An increase in current account balance receipts	$\frac{I_1}{I_9} * 100\%$
E_{12}	An increase in consumption due to inflow of remittances	$\frac{K_1 * I_1 * I_7}{I_6} * 100\%$
E_{13}	An increase in GDP due to growth in consumption	$\frac{I_1 * K_1 * I_7 * (1 - I_8)}{I_5} * 100\%$
E_{21}	A decrease in unemployment	$\frac{K_2 * I_4 * 100\%}{I_{12} * I_{13}} * 100\%$
E_{22}	A decrease in social expenditures	$\frac{K_3 * I_4 * I_{14}}{I_{11} * I_{17}} * 100\%$
E_{23}	A decrease in tax revenues due to decreased number of taxpayers	$\frac{K_4 * I_4 * I_{16}}{I_{12} * I_{15}} * 100\%$
E_{24}	A decrease in consumption due to outflow of population	$\frac{K_5 * I_4}{I_{11}} * 100\%$
E_{25}	A decrease in GDP due to decreased consumption	$\frac{K_5 * (1 - I_8) * I_6 * I_4}{I_{11} * I_5} * 100\%$
E_{26}	A decrease in the size of labour force	$\frac{K_2 * I_4}{I_{12}} * 100\%$
E_{31}	An increase in internal consumption due to inflow of migrants	$\frac{K_6 * I_3}{I_{11}} * 100\%$
E_{32}	An increase in GDP due to increase in domestic consumption	$\frac{K_6 * I_6 * (1 - I_8) * I_3}{I_{11} * I_5} * 100\%$
E_{33}	An increase in tax receipts emanating from wages of employed migrants	$\frac{K_7 * I_3 * I_{16}}{I_{12} * I_{15}} * 100\%$
E_{34}	An increase in the size of the labour force	$\frac{K_8 * I_3}{I_{12}} * 100\%$
E_{41}	An increase in current account balance expenses	$\frac{I_2}{I_{10}} * 100\%$

Source: Developed by authors.

The task of the second stage is to search for data and preparing input data in correspondence with the list of indicators determined during the first stage, taking into account the temporal and geographical scope of the study.

In the third stage, the task is to calculate the chosen effects according to developed formulas (see Table 4).

Correction coefficients (Ki) introduced to formulas are used to improve calculation accuracy. Use Ki = 1 for simplified calculations but be aware that obtained results might be over- or underestimated. See limitations for effects E_{11}, and E_{12} below. See Annex 1 for full list of limitation.

The effect E_{11} „An increase in current account balance receipts“ is calculated as the share of remittances in the revenue structure of current account balances. The effect E_{11} is conditioned by consequence C_1 „Remittances inflow“.

The effect E_{12} „An increase in consumption due to inflow of remittances“ is calculated using the propensity for consumption indicator. As it is unknown whether the consumption of families receiving remittances is fully consistent with the pattern of consumption in the country as a whole.

Therefore, a K_1 coefficient was introduced in the calculation procedure. K_1 coefficient adjusts the consumption of migrant families relative to the average consumption across the country. For example, if the propensity for consumption of families receiving remittances is 10% higher than the average, the value of the K_1 ratio equals 1.1. For simplified calculation, the value of the coefficient K_1 equals 1. Thus, the obtained effect value may be underestimated compared to the real. The effect of E_{12} is conditioned by consequence C_1 «Remittances inflow».

The task of the fourth stage is to calculate the partial economic development indicators (see Table 5) and to assess the obtained results according to the suggested criteria, which is to make a conclusion about the influence of international migration on economic development. If the calculated partial economic indicator satisfies the set criterion, then we can conclude that international migration produces a positive impact on economic development and vice versa.

To complete this stage, it is necessary to calculate partial economic development indicators, evaluate the obtained results and draw the conclusions in an arbitrary form.

The causal relationships between the consequences and the effects of international migration (see Tables 1 and 2) and the functional connections between the effects and partial economic development indicators (see Table 5) can be used to identify which effects and consequences of international migration were major in shaping the value of PDI_i, suggesting a positive impact of international migration and vice versa.

Table 5

Formalization of Calculations for Partial Economic Development Indicators

k	Partial economic development indicators (PDI_k)	Sets of indicators required for calculation of the *k*-th partial economic development indicator (S_k)	Formulas for calculating partial economic development indicators ($PDI_k = f(S_k)$)	Impact assessment criteria
1	GDP	E_{13}, E_{25}, E_{32}	$PDI_1 = E_{13} - E_{25} + E_{32}$	$PDI_1 > 0\%$
2	Consumption	E_{12}, E_{24}, E_{31}	$PDI_2 = E_{12} + E_{24} + E_{31}$	$PDI_2 > 0\%$
3	State budget revenues	E_{33}, E_{23}	$PDI_3 = E_{33} - E_{23}$	$PDI_3 > 0\%$
4	State budget expenditures	E_{22}	$PDI_4 = E_{22}$	$PDI_4 > 0\%$
5	Current account balance receipts	E_{11}	$PDI_5 = E_{11}$	$PDI_5 > 0\%$
6	Current account balance expenses	E_{41}	$PDI_6 = E_{41}$	$PDI_6 = 0\%$
7	Unemployment	E_{21}	$PDI_7 = -E_{21}$	Depends on country specifics
8	Labour force	E_{33}, E_{26}	$PDI_8 = E_{34} - E_{26}$	$PDI_8 > 0\%$

Source: Developed by authors.

Considering all the proposed tools together, it is possible to present the Model in an extended form (Figure 3) showing all the consequences, effects, partial economic development indicators and functional linkages among them, as well as sets of indicators required for calculation of the effects and sets of effects required for calculation of the partial economic development indicators.

3. Empirical Results

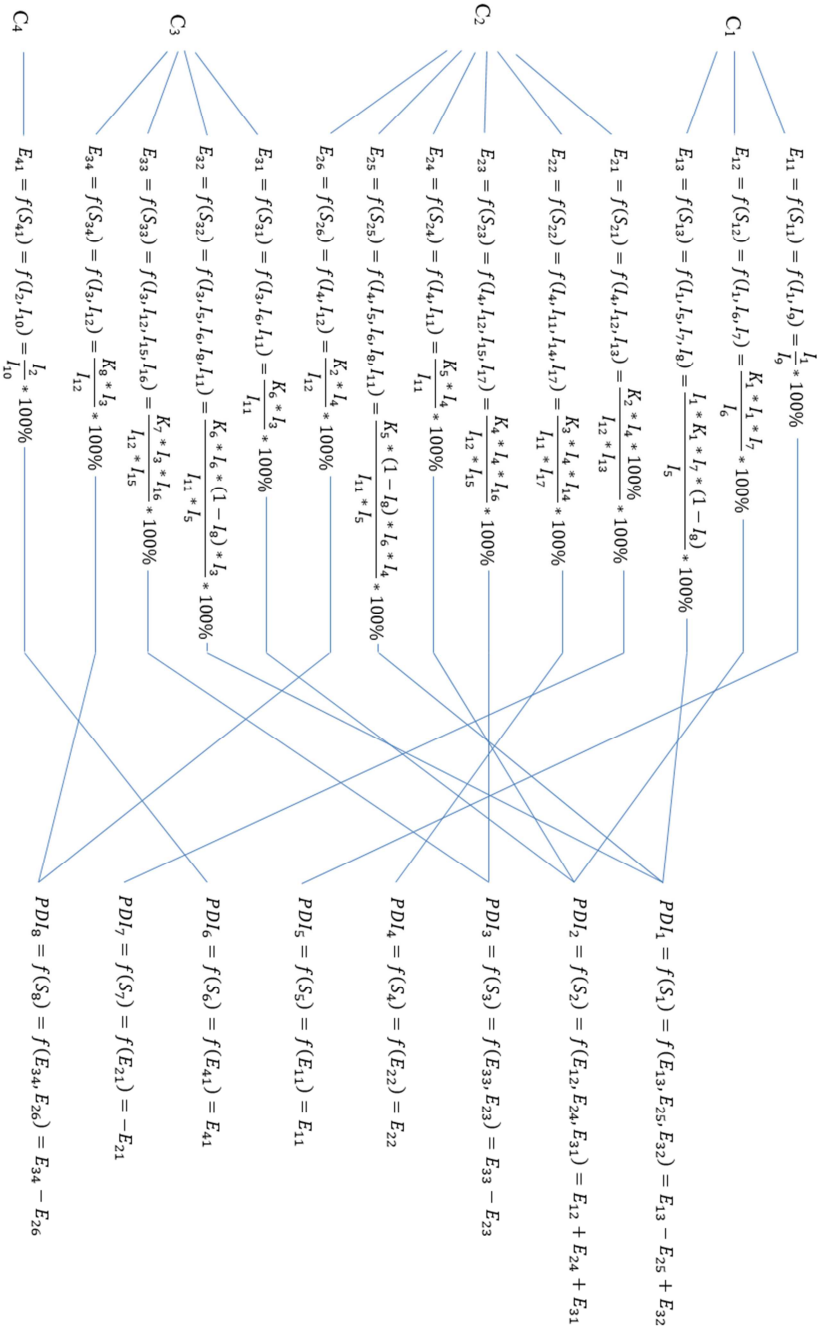
We applied the approach developed in this study to assess the impact of international migration on the economic development of Ukraine.

According to the tasks within the first stage of the assessment procedure, we formed a list of effects for evaluation based on the criterion of international migration consequences. Thus, the list includes the following effects: E_{11}, E_{12}, E_{13}, E_{21}, E_{22}, E_{23}, E_{24}, E_{25}, E_{26}. The temporal scope of the study includes the period from 2010 until 2015. The geographical scope of the study covers the migrant movements between Ukraine and the EU countries. The list of indicators required for calculation of the selected effects includes all indicators shown in Table 2, except for I_2, I_3, I_{10}.

The choice of the effects, as well as temporal and geographic dimensions, is explained by the fact that several factors, such as the economic crisis and the military conflict in the East of Ukraine, have caused a sharp increase in the intensity of emigration starting from 2014. See Annex 2 for statistics and its sources. Main destinations for migration were mostly the EU countries, particularly Poland, Italy, Czech Republic (Malynovska, 2016).

Figure 3

Extended Model of the Impact of International Migration on the Economic Development



Source: Developed by authors.

The results of calculations are shown below (see Table 6).

T a b l e 6

Calculation Results for International Migration Effects in Ukraine for Migration Flow between Ukraine and the EU over the Period from 2010 to 2015, %

E_{nm}	Effect	2010	2011	2012	2013	2014	2015
E_{11}	An increase in current account balance receipts	7.53	7.15	6.65	10.33	9.89	10.04
E_{12}	An increase in consumption due to inflow of remittances	4.12	4.12	3.70	5.27	5.51	6.42
E_{13}	An increase in GDP due to growth in consumption	1.67	1.51	1.40	2.29	2.38	2.49
E_{21}	A decrease in unemployment	46.21	48.92	55.13	66.36	55.59	67.51
E_{22}	A decrease in social expenditures	0.19	0.20	0.24	0.27	0.29	0.35
E_{23}	A decrease in tax receipts due to decreased number of taxpayers	0.63	0.60	0.65	0.80	0.87	0.95
E_{24}	A decrease in consumption due to outflow of population	1.88	1.93	2.07	2.39	2.59	3.10
E_{25}	A decrease in GDP due to decreased consumption	0.77	0.71	0.78	1.04	1.12	1.20
E_{26}	A decrease in the size of labour force	3.74	3.84	4.15	4.76	5.15	6.17

Source: Calculated by authors.

At the fourth stage, we calculated partial economic development indicators in accordance with the effects and conditions specified at the first stage of our analysis (see Table 6).

T a b l e 7

Results of Calculations for Partial Economic Development Indicators in Ukraine for Migration Flows between Ukraine and the EU over the Period from 2010 to 2015

k	Partial economic development indicators (PDI_k)	2010	2011	2012	2013	2014	2015	Impact assessment criteria
1	GDP	0.909	0.801	0.618	1.251	1.261	1.289	$PDI_1 > 0\%$
2	Consumption	2.235	2.184	1.630	2.885	2.921	3.325	$PDI_2 > 0\%$
3	State budget revenues	–0.626	–0.597	–0.653	–0.798	–0.873	–0.946	$PDI_3 > 0\%$
4	State budget expenditures	0.186	0.203	0.239	0.273	0.288	0.350	$PDI_4 > 0\%$
5	Current account balance receipts	7.529	7.153	6.645	10.326	9.889	10.039	$PDI_5 > 0\%$
7	Unemployment	–46.20	–48.91	–55.12	–66.36	–55.58	–67.51	–
8	Labour force	–3.743	–3.845	–4.151	–4.758	–5.153	–6.171	$PDI_8 > 0\%$

Source: Calculated by authors.

The results of calculations for partial economic development indicators let us assess the impact of international migration on economic development of Ukraine as a country of emigration.

On the whole, international migration from Ukraine into the EU produced an ambivalent impact on the Ukrainian economy throughout the analysed period. We can assert that international migration had a positive impact on 5 out of 7

analysed economic development indicators, in particular contributing to: an increase of GDP, consumption, in current account balance receipts; a decrease in state budget expenditures, and in the level of unemployment. The negative impact of international migration occurred in a decrease in state budget revenues and in the size of the labour force in the country.

International migration contributed about 1% growth of Ukrainian GDP per year. Also, it caused a minimum 1.63% in 2012 and a maximum 3.325% growth of consumption. The share of remittances in the current account balance was a minimum of 6.645% in 2012 and a maximum of 10.326% in 2013. However, the labour force decreasing was a minimum of 3.734% in 2010 and a maximum of 6.171% in 2015. See. Annex 3 for a detailed explanation of the results obtained for each partial economic development indicator.

Conclusions

International migration is the subject of scientific debate as it gives rise to many effects for the countries involved in these processes, as well as for the whole world. However, there is no common view concerning the positive or negative impact of migration, particularly, on economic development. The literature review shows that a variety of migration-development links have been researched to describe and assess the impact of international migration on economic development. A few issues occur with migration research. First, the data accuracy because of illegal migration and, second, similar processes cause different effects from country to country.

Developed Model of the impact of international migration on economic development (see Figure 2 and 3) is suggested for conducting fast assessing of migration impact taking into account cause-effect relations for clear defining its positive or negative influence. The suggested Model comprises three main blocks describing, first, the consequences of international migration which represent direct outcomes of the migration; second, the effects of international migration produced by the consequences, and third, and the partial indicators of economic development.

In order to support further calculation, a step-by-step Method of assessing was developed. It consists of 4 stages and uses 5 tools (see Table 1, 2, 3, 4, and 5).

The Model and The Method have been used for assessing the impact of international migration on the economic development of Ukraine during 2010 – 2015. Because of the mass emigration from Ukraine to Europe, assessing was performed for Ukraine-EU migration flows. The study is based on the data from publicly available sources, such as the International Organization for Migration, the World Bank and the State Statistical Service of Ukraine.

The findings show that international migration had a positive impact on 5 out of 7 economic development indicators. Some findings are, remittances inflow caused by emigration contributed 1.289% of GDP and 3.325% of consumption in 2015. The positive impact of decreasing budget social expenditures by 0.35% was accompanied by a negative decline in state budget revenues from income tax by 0.946%. Migration also contributed 10.039% of the current account balance receipts. The level of unemployment in Ukraine decreased by 67.51% compared with the base year, following, however, a 6.171% decline in the size of the country's labour force.

The Model and the Method are simplified at this stage of research that requires the use of limitations. Further improvements include first, separating effects for different types of migration (i.e. labour, family, or refugee migration), second, developing of an approach of calculating the effects that avoids the need for using some limitation, third, developing a single indicator that aggregates the impact of different effects.

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Annex 1

List of Limitations

The effect E_{11} „An increase in current account balance receipts“ is calculated as the share of remittances in the revenue structure of current account balances. The effect E_{11} is conditioned by consequence C_1 „Remittances inflow“.

The effect E_{12} „An increase in consumption due to inflow of remittances“ is calculated using the propensity for consumption indicator. As it is unknown whether the consumption of families receiving remittances is fully consistent with the pattern of consumption in the country as a whole. Therefore, a K_1 coefficient was introduced in the calculation procedure. K_1 coefficient adjusts the consumption of migrant families relative to the average consumption across the country. For example, if the propensity for consumption of families receiving remittances is 10% higher than the average, the value of the K_1 ratio equals 1.1. For simplified calculation, the value of the coefficient K_1 equals 1. Thus, the obtained effect value may be underestimated compared to the real. The effect of E_{12} is conditioned by consequence C_1 „Remittances inflow”

The effect E_{13} «An increase in GDP due to growth in consumption» calculation does not take into account the consumption multiplier. Thus, the obtained effect value may be underestimated compared to the real. The use of the K_1 coefficient has the same limitations as for the effect E_{12}. The effect E_{13} is conditioned by consequence C_1 „Remittances inflow“.

The calculation of effect E_{21} «A decrease in unemployment» does not take into account the proportion of migrants can be classified as labor force, thus the K_2 coefficient was introduced. K_2 coefficient captures what proportion of the total number of migrants belongs to the labor migrants. For example, if the share of labor migrants in the structure of migrants is 90%, then the coefficient value equal to 0.9. For a simplified calculation, the coefficient K_2 value equals 1. So, the obtained effect value may be overestimated for simplified calculations. The effect E_{21} is conditioned by consequence C_2 «Depopulation».

The effect E_{22} «A decrease in social expenditures» is calculated using the average cost of social protection per person indicator. As migrants are physically absent in sending country, it can be assumed that the cost of social protection for persons involved in international migration is lower than the cost of social protection for persons living in the sending country permanently. Also, international migration involves more economically active population then populations as retirees or other persons who need social protection first. Hence, the K_3 coefficient was introduced, which takes into account the deviation of social protection expenditures per migrant compared to social expenditures per person on average in the country. For example, if the cost of social protection per migrant is 60% lower than the average cost of social protection across the country, the value of the K_3 ratio equals 0.4. For simplified calculation, the coefficient value will be 1. So, the obtained effect value may be overestimated for simplified calculations. The effect E_{22} is conditioned by consequence C_2 „Depopulation“.

The effect E_{23} «A decrease in tax revenues due to decreased number of taxpayers» is calculated using the budget revenue from income tax per person indicator. Some of the migrants may have been unemployed before the migration or had low wages or had wages lower than average across the country. As it is not known exactly which part of the migrants had paid the income tax before the migration, and to what extent, the K_4 coefficient was introduced. K_4 coefficient adjusts budget revenue from income tax per person used for calculations relative to the average across the country. For example, if the budget revenue from income tax per person for those who migrate is 40% less than the country average, then the K_4 ratio equals 0.6. For simplified calculation, the value of the coefficient K_4 equals 1. So, the obtained effect value may be overestimated for simplified calculations. The effect E_{23} is conditioned by consequence C_2 «Depopulation».

The effect E_{24} «A decrease in consumption due to outflow of population» is calculated using the consumption per person indicator. As it is not known exactly whether the consumption of persons who migrated is fully consistent with the pattern of consumption in the country as a whole, the K_5 coefficient was introduced. K_5 coefficient adjusts the consumption of persons who migrated relative to the average consumption across the country. For example, if the propensity for consumption of persons who migrated was 20% less than the average, the value of the K_5 ratio equals 0.8. For simplified calculation, the value of the coefficient K_5 equals 1. So, the obtained effect value may be overestimated for simplified calculations. The effect E_{24} is conditioned by consequence C_2 «Depopulation».

The effect E_{25} «A decrease in GDP due to decreased consumption» calculation does not take into account the consumption multiplier. Thus, the obtained effect value may be underestimated compared to the real. The use of the K_5 coefficient has the same limitations as for the effect E_{24}. The effect E_{25} is conditioned by consequence C_2 «Depopulation».

The effect E_{26} «A decrease in the size of labour force» is calculated by reducing the labor force by the number of migrants. As it is unknown what proportion of migrants can be classified as labor force, the K_2 coefficient was introduced. The use of the K_2 coefficient has the same limitations as for the effect E_{21}. The effect E_{26} is conditioned by consequence C_2 «Depopulation».

The effect E_{31} «An increase in internal consumption due to inflow of migrants» is calculated using the consumption per person indicator for migrants arrived. As it is unknown whether the consumption of migrants arrived is fully consistent with the pattern of consumption in host country, the K_6 coefficient was introduced. K_5 coefficient adjusts the consumption of migrants arrived relative to the average consumption in the host country as a whole. For example, if the migrant's propensity to consume is 60% lower than the average propensity to consume in the country, the K_6 ratio will be 0.4. For simplified calculation, the value of the coefficient K_6 equals 1. So, the obtained effect value may be overestimated for simplified calculations. The effect E_{31} is conditioned by consequence C_3 «Population growth».

The effect E_{32} «An increase in GDP due to increase in domestic consumption» calculation does not take into account the consumption multiplier. Thus, the obtained effect value may be underestimated compared to the real. The use of the K_6 coefficient has the same limitations as for the effect E_{31}. The effect E_{32} is conditioned by consequence C_3 «Population growth».

The effect E_{33} «An increase in tax receipts emanating from wages of employed migrants» is calculated using the budget revenue from income tax per person indicator. Some of the migrants may have lower wage than average in the host country. Thus, as the average income tax paid by migrant may differ from the average in the host country, K_7 coefficient was introduced. K_7 coefficient adjusts budget revenue from income tax per person used for calculations of effect E_{33} relative to the average across the country. For example, if the budget revenue from income tax per person paid by migrants is 30% less than the country average, the K_7 ratio equals 0.7. For simplified calculation, the value of the coefficient K_7 equals 1. So, the obtained effect value may be overestimated for simplified calculations. The effect E_{33} is conditioned by consequence C_3 «Population growth».

The effect E_{34} «An increase in the size of the labour force» is calculated by adding to the labor force the number of migrants who have arrived. As it is unknown what proportion of migrants can be classified as labor force, the K_8 coefficient was introduced. K_8 coefficient captures what proportion of the total number of migrants belongs to the labor migrants. For example, if the share of labor migrant in the structure of migrants in host country is 80%, the coefficient values equals 0.8. For simplified calculation, the coefficient K_8 value equals 1. So, the obtained effect value may be overestimated for simplified calculations. The effect E_{34} is conditioned by consequence C_3 «Population growth».

The effect E_{41} „An increase in current account balance expenses“ is calculated as the share of remittances in the expenses structure of current account balances. The effect E_{41} is conditioned by consequence C_4 «Outflow of funds».

Annex 2

Input Data for Assessing the Impact of International Migration on Economic Development of Ukraine in 2010 – 2015

Indicator code	Indicator	Measurment unit	Year						
			2010	2011	2012	2013	2014	2015	2016
1	2	4	5	6	7	8	9	10	11
I_1	Personal remittances, received	USD bn.	5.60	6.72	6.50	9.67	7.35	5.85	6.15
I_2	Personal remittances, sent	USD bn.	2.30	2.70	2.59	4.11	4.46	3.80	3.73
I_3	Migrants, received	mln.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I_4	Migrants, sent	mln.	0.86	0.88	0.94	1.09	1.17	1.40	0.00
I_5	GDP (current USD)	USD bn.	136.01	163.16	175.78	183.31	133.50	91.03	93.27
I_6	Final consumption expenditures	USD bn.	113.11	137.34	152.82	166.35	120.30	77.52	78.26
I_7	Propensity to consume	–	0.83	0.84	0.87	0.91	0.90	0.85	0.84
I_8	Propensity to import	–	0.51	0.56	0.56	0.52	0.52	0.54	0.56
I_9	Current account balance, receipts	USD bn.	74.38	93.89	97.82	93.62	74.36	58.22	57.52
I_{10}	Current account balance, expenses	USD bn.	77.40	104.12	112.15	110.13	78.96	56.61	58.86
I_{11}	Population, total	mln.	45.87	45.71	45.59	45.49	45.27	45.15	45.00
I_{12}	Labour force, total	mln.	23.06	22.97	22.72	22.84	22.73	22.66	22.56
I_{13}	Unemployment rate	mln.	8.10	7.86	7.53	7.17	9.27	9.14	9.20
I_{14}	State budget, expenditures (social measures)	UAH bn.	37.4	43.8	57.0	57.8	58.2	76.8	110.7
I_{15}	State budget, revenue	UAH bn.	345.5	430.6	478.9	483.4	494.2	720.4	877.2
I_{16}	State budget, revenue (Income Tax)	UAH bn.	51.0	60.2	68.1	72.2	75.2	100.0	138.8
I_{17}	State budget, expenditures	UAH bn.	377.9	416.9	492.5	505.8	523.1	679.9	835.6

Source: Developed by authors. See next table for data sources.

Links for Data Sources

Indicator code	Indicator	Data Source
1	2	3
I_1	Personal remittances, received	<http://www.worldbank.org/en/topic/migrationremittancesdiasporaissues/brief/migration-remittances-data>
I_2	Personal remittances, sent	<http://www.worldbank.org/en/topic/migrationremittancesdiasporaissues/brief/migration-remittances-data>
I_4	Migrants, sent	<http://iom.org.ua/sites/default/files/ff_eng_10_10_press.pdf>
I_5	GDP (current US$)	<https://data.worldbank.org/indicator/NY.GDP.MKTP.CD>
I_6	Final consumption expenditures	<https://data.worldbank.org/indicator/NE.CON.TOTL.CD>
I_7	Propensity to consume	<https://data.worldbank.org/indicator/NE.CON.TETC.ZS>
I_8	Propensity to import	<https://data.worldbank.org/indicator/NE.IMP.GNFS.ZS>
I_9	Current account balance, receipts	<http://www.imf.org/external/datamapper/datasets/BOP>
I_{10}	Current account balance, expenses	<http://www.imf.org/external/datamapper/datasets/BOP>
I_{11}	Population, total	<https://data.worldbank.org/indicator/SP.POP.TOTL>
I_{12}	Labour force, total	<https://data.worldbank.org/indicator/SL.TLF.TOTL.IN>
I_{13}	Unemployment rate	<https://data.worldbank.org/indicator/SL.UEM.TOTL.ZS>
I_{14}	State budget, expenditures (social measures)	<https://www.treasury.gov.ua/ua/file-storage/vikonannya-derzhavnogo-byudzhetu>
I_{15}	State budget, revenue	<https://www.treasury.gov.ua/ua/file-storage/vikonannya-derzhavnogo-byudzhetu>
I_{16}	State budget, revenue (Income Tax)	<https://www.treasury.gov.ua/ua/file-storage/vikonannya-derzhavnogo-byudzhetu>
I_{17}	State budget, expenditures	<https://www.treasury.gov.ua/ua/file-storage/vikonannya-derzhavnogo-byudzhetu>

Source: Developed by authors.

Annex 3

An Explanation of the Obtained Results for Each Partial Economic Development Indicator

1. International migration had a positive impact on the Ukraine's GDP throughout the entire period under study. In particular, as much as 2.49% of GDP in 2015 can be attributed to the impact of effect E_{13} brought in by consequence C_1 «Remittances inflow»; however, 1.2% of this percentage amount turned out as unrealized gains due to the impact of effect E_{25} produced by consequence C_2 «Depopulation»; therefore, the net impact of migration on the GDP of Ukraine in 2015 was 1.29%.

2. International migration had a positive impact on consumption in Ukraine throughout the entire period under study. In particular, 6.425% of total consumption in 2015 can be attributed to the impact of effect E_{12}, which was generated by consequence C_1 «Remittances inflow»; however, 3.1% of this amount failed to materialize due to the impact of effect E_{24}, which was produced by consequence C_2 «Depopulation»; therefore, the net impact of migration on consumption in Ukraine in 2015 was 3.325%.

3. International migration produced a negative impact on Ukraine's state budget revenues throughout the entire period under study. In particular, 0.946% of state budget revenues in 2015 were not collected due to the impact of effect E_{23}, which was brought in by consequence C_4 «Depopulation»; thus, the net impact of migration on the state budget revenues of Ukraine in 2015 was –0.946%.

4. International migration produced a positive impact on Ukraine's state budget expenditures throughout the entire period under study. In particular, the amount of state budget expenditures in 2015 could have been larger by 0.35% compared to factual outlays, the reduction being the result of the impact of effect E_{22}, which emerged due to consequence C_2 „Depopulation", thus, the net impact of migration on Ukraine's state budget expenditures in 2015 was –0.35%.

5. International migration had a positive impact on the amount of current account balance receipts of Ukraine throughout the entire period under study. In particular, 10.039% of total current account balance receipts in 2015 can be attributed to the impact of effect E_{11}, which was brought about by consequence C_1 «Remittances inflow»; thus, the net impact of migration on Ukraine's Balance of Payments in 2015 was 3.325%.

6. International migration had a positive impact on the level of unemployment in Ukraine throughout the entire period under study. In particular, the level of unemployment in 2015 could have been higher by 67.51% compared with its actual level, but this potentially negative development was curtailed by effect E_{21} produced by consequence C_2 „Depopulation"; thus, the net impact of migration on the level of unemployment in Ukraine in 2015 was –67.51%.

7. International migration had a negative impact on the labour force in Ukraine throughout the entire period under study. Thus, in 2015, as much as 6.171% of the labour force were abroad, which can be attributed to the impact of effect E_{26}, which was produced by consequence C_2 „Depopulation"; thus, the net impact of migration on the size of the labour force in Ukraine in 2015 was 6.171%.