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Massive Migration and its Effect on Human Capital and Growth: The Case of Western Balkan and Central and Eastern European Countries

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This study has been developed in the framework of research networks initiated and monitored by wiiw under the premises of the GDN–SEE partnership.

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GDN Working Paper

Massive Migration and its Effect on Human Capital and Growth: The Case of Western Balkan and Central and Eastern European Countries[1]

by Michael Landesmann and Isilda Mara

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Abstract

We analyse the effect of massive migration particularly from the Western Balkans and the Central and Eastern European countries on human capital and growth. In our analysis, we use a system of three equations to estimate simultaneously the effect of migration on human capital and on growth. An important driver of migration is chain migration, as well as the unemployment and income differentials between developing and developed countries. Overall, our findings suggest that migration of highly skilled from the Western Balkan and Central Eastern European countries has been beneficial to economic growth and income convergence of these countries. Our analysis supports the positive impact of low-skilled migration on the composition of human capital in the source countries.

Keywords: migration, brain drain, brain gain, economic growth, human capital

JEL classification: F22, J24, O15, O40

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1. Introduction

The early 1990s marked the beginning of a new era for the Western Balkan countries (WBC) and the European Union's new Member States (EU-NMS) which has been characterised by striking dynamics in economic, social and demographic terms. In particular, high unemployment rates and poverty, but also the dissolution of Yugoslavia, wars in the early 1990s, and thereafter the transition from a centralised to an open economy caused massive migration from the WBC. More than 6 million citizens[2] – out of a population of 22.8 million in the 1990s – have left the WBC. The increased labour migration, especially in the last two decades, may represent a drain on human capital and consequently the economies of less developed countries – a trap for poor economies to continue to remain poor.

The literature, both theoretical and empirical, suggests that the effect of migration on human capital and on growth can go in two directions: brain gain but also brain drain can occur depending on the magnitude of migration and the composition of migrants who move abroad. Migration especially of the highly skilled – 'siphoned off' from developing economies – generates not only brain drain but also brain gain (Stark, 1998; Peri and Mayr, 2010; Chen, 2008, 2009; Mountford, 1997). The reason for the latter is that under conditions of endogenous human capital accumulation and uncertain successful migration, human capital might increase sufficiently to offset the brain drain and increase the growth of the developing economy (Mountford, 1997). Different migration probabilities for the low- and high-skilled might also contribute to further brain gain and spur economic growth in both the short and the long run (Chen, 2009).

Empirical studies about the effect of migration on human capital and growth in the WBC and NMS are almost inexistent, mainly due to the lack of harmonised data on migration. Among the few exceptions are Baine et al. (2006); but despite the large set of countries included in the analysis, the WBC and NMS are underrepresented.

To our knowledge, the present study is the first to attempt to test empirically how migration has affected the economies and human capital in WBC and NMS in the two decades starting from 1990. We use a new dataset on migration that distinguishes between low-, medium- and high-skilled migration (Brücker et al., 2013) and provides data for 195 countries, including the WBC and NMS, during the period 1980-2010.

The scope of this empirical analysis is to provide new evidence, first, about the effect of massive migration on human capital accumulation – whether it generates more of a drain or gain on human capital – and, second, whether migration spurs further economic growth also through the channel of remittances. In particular, we study the dynamic effects of human capital and migration on growth but also the role of other factors in determining economic growth in the WBC and NMS.

We implement different econometric methodologies to test our hypothesis. First, we apply a generalised method of moment (GMM) estimation to a dynamic panel data model to examine whether migration leads to higher or lower economic growth over the period of investigation.

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[2] Source: World Bank estimates based on the Migration and Remittances Factbook 2016, which includes new bilateral data on migration stocks (World Bank, www.worldbank.org/prospects/migrationandremittances).

Second, to address the endogeneity issue of migration with human capital, and the endogeneity of human capital with growth, we implement a conditional mixed process (CMP) on a system of equations. We run the model first for a large set of countries, including the EU-15, Eastern Partnership countries, WBC and NMS.[3]

We distinguish between different skill levels of migrants and their effect on human capital and growth. Our results support the positive effect of low skilled migration in the average level of human capital but no effect on output per capita. First this is a compositional effect and secondly as argued in Stark and Byra (2012) in the short run migration of the low skilled is expected to increase the average level of human capital due to better migration prospective as well as an increase of wages in the domestic labour market for the low skilled.

In addition the results confirm that high skilled migration has contributed positively to output per capita growth. This finding is in line with Sorger et al (2013) who sustains that is the leakage of high skilled migration that lubricates the engines of growth through further human capital formation in the long run motivated by better migration prospects.

Overall migration strongly depends on the previous stock of migrants, confirming the role of network or chain migration on mobility. Push factors such as unemployment differentials between the country of origin and high-income destination countries appear to contribute to further migration.

The rest of the work is structured as follows: Section 2 introduces the empirical and theoretical literature. Section 3 presents some stylised facts about migration, human capital and growth in the WBC and NMS during 1990-2010. Section 4 presents the methodology and empirical specification. Section 5 reports the main estimation results and Section 6 summarises the main findings and presents conclusions.

[3] The countries under investigation consist of the six Western Balkan countries (Albania, Croatia, Montenegro, the Former Yugoslav Republic of Macedonia, Serbia and Bosnia and Herzegovina), the European Union's new Member States (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia, Cyprus and Malta), the Eastern Partnership countries (Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine) and the EU-15 countries.

2. Literature review

a. How does human capital affect growth?

The theoretical and empirical literature provides support for the important role of human capital in the process of industrialisation (Galor and Moav, 2002; Galor, 2011; Becker at al., 2011). Its role has evolved over time and the replacement of physical capital by human capital is considered as the prime engine of economic growth (Galor, 2011). Accordingly, it is argued that, while in the first phase of the industrial revolution human capital played a minor role in the production process, technological change and the move towards a service economy during the second phase induced a higher demand for human capital and skilled labour. Consequently, massive educational reforms occurred in response to higher demand for skills[4]. Countries which implemented earlier public education reforms benefited more from the rising skill requirements followed by rapid growth. In other countries, the underinvestment in human capital induced slower growth. As a consequence of the disparity in human capital formation, divergent development patterns have emerged across countries.

The effect of human capital on growth goes, first, through the creation of new technologies and, second, through diffusion processes of such technologies. The former requires high-skilled workers, the latter medium- and low-skilled ones (Nelson and Phelps, 1966). In developing countries, as Lucas (2005) argues, the role of human capital for growth is more in the form of technology adoption than innovation.

b. How does emigration affect human capital in the sending country?

The literature argues that migration of the highly skilled can cause a human capital/ brain drain for the origin country. But at the same time this phenomenon is likely to produce also human capital/brain gain, Mountford (1997), Stark et al (1998). The hypothesis is that higher returns to human capital from migration induce to further human capital formation which could result to human capital/brain gain for the origin country if a part of those who enhance their skills end up to not migrate, Stark and Wang (2002). Furthermore, probabilities to migrate might be different for the low or the highly skilled. If only the highly skilled workers would have the possibility to migrate the origin country would end up with a lower average level of human capital. The opposite is true if only the low skilled are assumed to have the possibility to migrate. Especially, in the short run the higher possibility to migrate for the low skilled is followed by an increase in the average level of human capital, Stark and Byra (2012). Whereas in the long run the country might avoid brain drain but it is likely to end up experiencing brain depletion resulting from the decline of skilled workers in term of quantity – more prefer to remain unskilled - despite the increase in quality – skilled workers becoming more skilled due to higher wages per unit of human capital, Stark and Byra (2012).

Faini (2001) provides evidence that higher secondary school enrolment is more likely to be accompanied by emigration of tertiary graduates. Furthermore, it is very likely that brain drain is detrimental to developing countries if emigration of the highly skilled is at the level of 20%

[4] In continental Europe (France, Sweden and Prussia) the promoter of human capital formation, as an essential adjunct to growth, was the state, while in England it was mainly the capitalists who started to recognise the role of technical education for the provision of skilled labour (Galor, 2011).

and/or the level of tertiary education in the origin country is at 5% (Beine et al. 2001, 2008). For example, Beine et al. (2008) find that emigration of highly skilled has been beneficial in the case of Albania and Bulgaria, but detrimental to Hungary. Still, the study explores cross section data and doesn't distinguish for different education level of migrants as such constraining the analysis about the effect of overall migration in human capital.

How does migration affect human capital and consequently growth?

Modern theories of endogenous growth do not only focus on human capital formation and its effect on economic growth but also consider the effects of migration on education and consequently its effects on growth. Accordingly, human capital is a major determinant of growth but emigration – particularly of the highly skilled, if accompanied by the brain drain phenomenon – can be detrimental to growth.

Such a detrimental effect may occur mainly because of a reduction in the supply of skilled people (Grubel and Scott, 1996; Mijagiwa, 1991; Lucas, 1988, 2005) and Beine et al. (2001), At the same time, brain drain might increase investment in human capital in the longer-run because education provides a better chance to emigrate. The probabilities of a successful migration experience are, however, different for different skill groups (Mountfold, 1997; Stark et al., 1997, 1998; Baine et al., 2001, 2006). These two effects work in opposite directions. If the former is stronger, the net effect on growth will be negative, if the latter is stronger, the net effect on growth is expected to be positive.

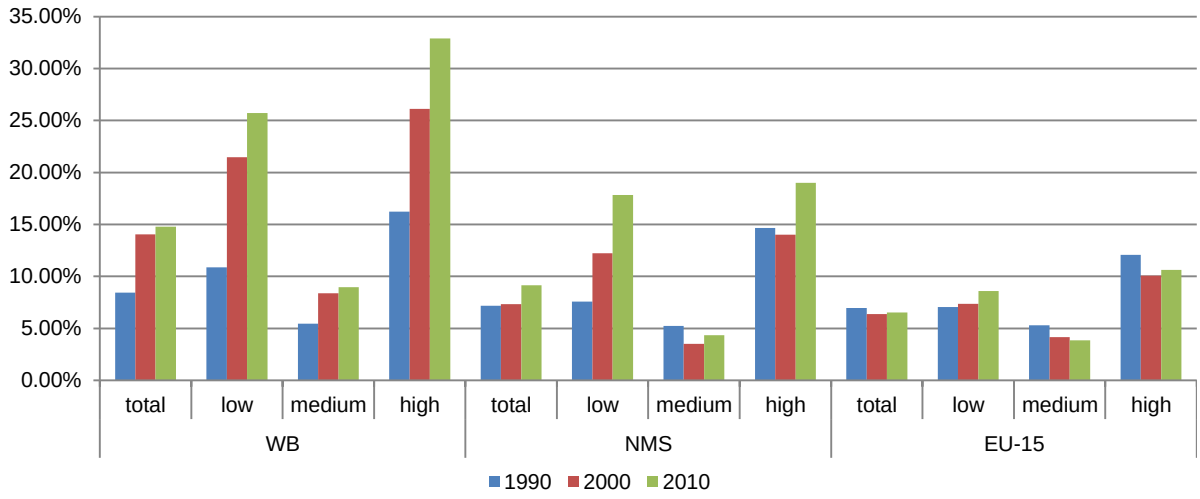
Empirical studies which investigate the effect of migration on human capital and furthermore on growth found that emigration of the highly skilled is likely to reduce the growth rate of GDP per capita, which works through the change in the level and the composition of human capital (Di Maria and Lazarova, 2009). Nevertheless, the results different with size and developmental gap of the sending country.

Other studies provide support for a positive effect of migration on human capital (Stark, 1998; Peri and Mayr, 2010). First, the perspective of better employment opportunities in the destination country is an incentive to raise the level of human capital in the country of origin – by continuing to higher levels of education – which consequently contributes to growth if only a share of those trained opt in the end for migration (Stark, 1998). Second, there is a potential for brain gain through return migration, bringing home know-how, experience, human and financial capital acquired abroad and thus contributing to further growth (Peri and Mayr, 2010).

3. Stylised facts

Since the early 1990s, the emigration rate from the WBC and NMS has increased dramatically, both for the low- and high-skilled, to 25% (from 11% in 1990) and to 33% (from 26% in 1990), respectively[5] (see Figure 1 below).

Figure 1: Emigration rates

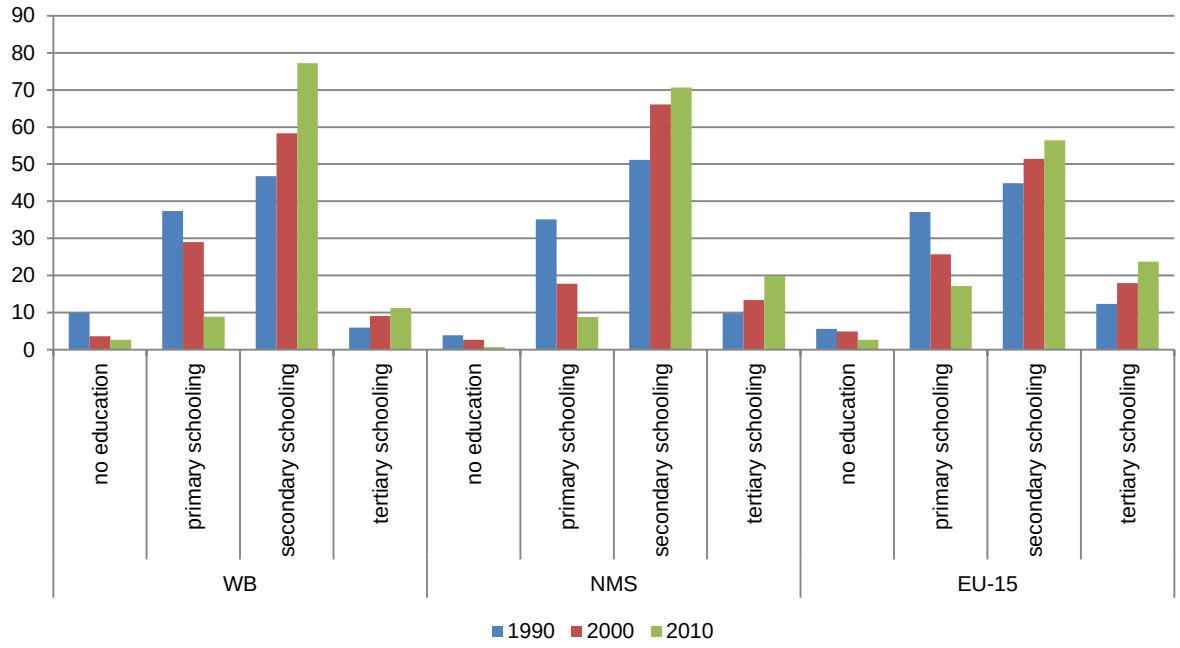


Source: Own elaboration using IAB Brain Drain Database, Brücker et al. (2013).

Countries such as Albania faced very high and continuously increasing emigration rates, from 5% in 1990 to 18% in 2010. In Bosnia and Herzegovina, the emigration rates between 1995 and 2000 reached close to 22%, mainly due to the war. Also the rest of the WBC have experienced important migratory movements (see Annex for details).

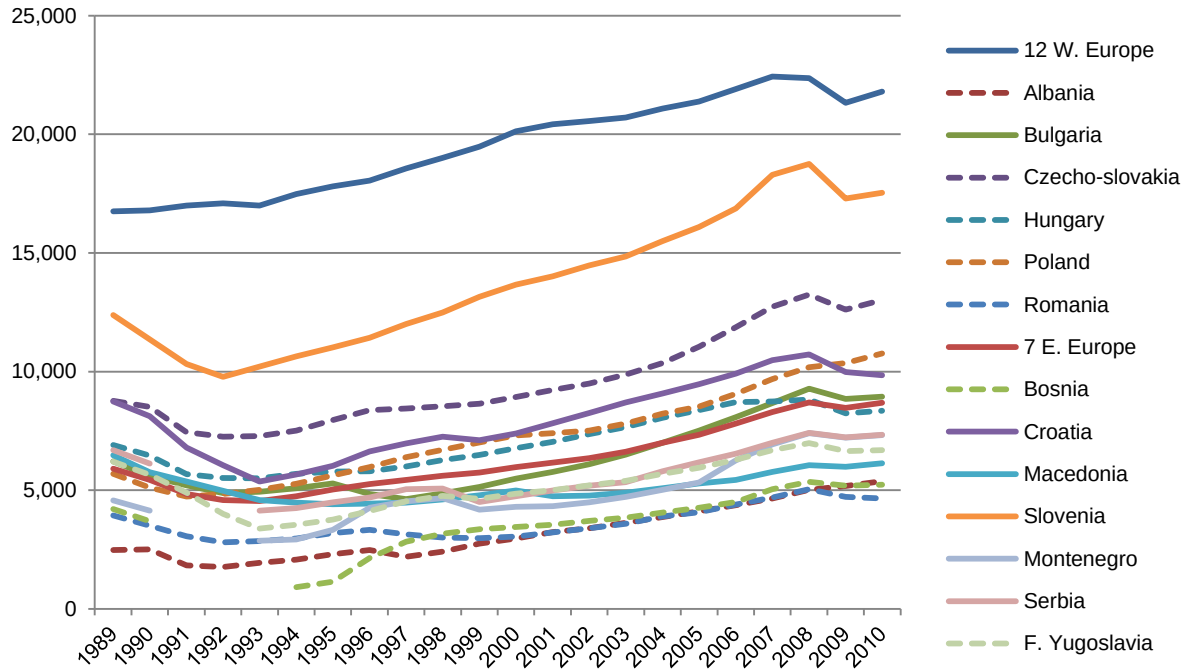
[5] Data source: Brücker et al. (2013). For any given skill level and year, the emigration rate is defined as the total migrant population from a given source country divided by the sum of the migrant and resident population in the same source country. High skilled migration is defined as the ratio between migrants with tertiary education originating from a given origin country into 20 OECD countries at appoint time divided with the sum of migrants and population aged 25+ of that country with tertiary level of education. The same applies for low and medium skilled migrants. Low skilled category includes lower secondary, primary and no schooling; medium-skilled category includes those with high-school certificate or equivalent and highly skilled category includes higher than high-school leaving certificate or equivalent, Brücker et al. (2013). Such emigration rates provide the loss of potential workforce by skill level due to migration.

Figure 2: Education level of the population in the NMS, WB-5 and EU-15 countries



Source: Own elaboration using Education Level Database, Barro and Lee (2013).

Figure 3: GDP per capita, 1990-2010



Source: Own elaboration using the Maddison Project, http://www.ggdc.net/maddison/maddison-project/home.htm, 2013 version.

Patterns in terms of educational attainment and human capital developments during the period 1990-2010, suggest that in the WBC the fraction of people with only primary education

level shrank significantly, from 37% to 9%; the fraction of those with secondary schooling reached 77% in 2010 compared with 47% in 1990; and the tertiary education level almost doubled, from 5.9% to 11.3%. The share of those with completed tertiary education is still only about half of that in the NMS and EU-15 but the improvement in the level of secondary schooling is remarkable.

The trend of GDP per capita (Figure 3) suggests that for a number of the WBC the level of GDP per capita has increased substantially (for instance, it almost doubled in Albania, and more than tripled in Bosnia and Herzegovina). Nevertheless, it is significantly lower in the WBC than in the EU-15 economies and also convergence to the level of the NMS is proceeding slowly.

What emerges from the trends on migration, human capital, and GDP per capita indicates that the Western Balkan countries have experienced significantly higher emigration rates than other countries. Human capital and education level compositions have been improving, with an important shift from primary to secondary education levels. The share of those with tertiary degrees has more than doubled, but still stands significantly below the level of NMS and EU-15 countries. GDP per capita has been moving upwards but at a pace indicates a rather slow convergence of WB economies to the level of the EU or richer economies.

4. Methodology and econometrics analysis

a. Panel data model and GMM estimation

We start with estimating a growth equation. In this first specification we present a panel data analysis applied to a sample of 39 developed and less developed countries, including WBC (6 countries), NMS (12 countries), EU-15 and EaP (Eastern Partnership, 6 countries) over the period 1990-2011. The growth equation will depend on human capital and migration – taken as exogenous – and a set of control variables to take account of potential effects of other determinants on growth. This specification will serve as a benchmark and will allow testing our hypothesis in a dynamic setting by implementing the GMM (Generalised Method of Moments).

Accordingly, the growth equation includes the traditional variables (such as private and public investment, human capital, institutional variables, etc.) and also other determinants such as foreign direct investment and trade openness as indicated in Vandebussche et al. (2006). Thus, equation (1) becomes:

$$g_{it} = \alpha_1 gdp_{i,t-1} + \alpha_2 polit_{it} + \alpha_3 p_{g_{it}} + \alpha_4 inv_{it} + \alpha_5 inf_{it}$$

$$+\alpha_6 FDI_{it} + \alpha_7 EXP_{it} + \alpha_8 IMP_{it} +$$

$$\alpha_9 gov\_exp_{it} + \alpha_{10} hc_{i,t} + \alpha_{11} m_{fit} + \alpha_{12} rem_{it} + \varepsilon_{1it} \qquad (1)$$

where:

- g_{it} indicates GDP per capita growth of country *i* at time *t*
- $gdp_{i,t-1}$ level of GDP per capita of country *i* at time *t-1*
- $p_{g_{it}}$ population growth of country *i* at time *t*
- $polit_{it}$ political in/stability of country *i* at time *t* proxied using the Freedom House Index which measures the degree of political rights and civil liberties represented in a country
- inv_{it} investments as a share of GDP of country *i* at time *t*
- inf_{it} inflation rate measured by growth rate of consumer price index (WDI data) of country *i* at time *t*
- FDI_{it} ratio of FDI net inflow to GDP of country *i* at time *t*
- EXP_{it} share of exports to GDP of country *i* at time *t*
- IMP_{it} share of imports to GDP of country *i* at time *t*
- gov_exp_{it} government expenditure as a share of GDP of country *i* at time *t*
- $hc_{i,t}$ human capital accumulation[6] (see details in Annex Table A2 for definition) of country *i* at time *t*

[6] **Human capital index** is measured by average years of schooling of the population aged 15+ (Barro and Lee, 2013) assumed to have different rates of return which are higher for earlier years of schooling than the later ones, Psacharopoulos(1994). As the authors argue a measurement of human capital which leaves out the returns from experience and the quality of schooling falls short of being accurate but still the heterogeneity in returns for primary, secondary and tertiary education - present across countries - is accounted for. The data are attained from PENN World Tables 8.1. For further details see Inklaar and Timmer (2013), p. 38.

- $\boldsymbol{m_{fit}}$ migration rate of country *i* at time *t* defined as the total migrant population from a given source country divided by the sum of the migrant and resident population in the same source country (Brücker et al., 2013)
- $\boldsymbol{rem_{it}}$ share of remittances to GDP of country *i* at time *t*.[7]

We run GMM estimates with a lagged dependent variable. As instruments – apart from the lagged dependent variable – we have considered the degree of urbanisation, population density, visa facilitation agreements and share of agricultural land. The reliability of GMM estimates has been tested by applying Sargan (1958) and Hansen J-statistic tests. Results are presented in Table 1 below.

Model 1.1 presents two-step GMM estimates of the growth rate of GDP, g_{it} , including a number of control variables, human capital, migration and only the first lag of gdp_{it} . For Model 1.2 and Model 1.3, respectively, the second and third lag of gdp_{it} have been considered and applied for the whole sample of 39 countries. Further on, in Model 1.4, the estimates have been replicated for the sub-sample of WBC and NMS.

[7] Further details about the variables are provided in Annex Table A2.

Table 1: GMM estimates of the growth rate of real GDP

	Model 1.1 Full sample	Model 1.2 Full sample	Model 1.3 Full sample	Model 1.4 WBC_NMS sample
gdp (t-1)	0.0334*	0.0424***	0.0421***	0.0926*
	(0.0153)	(0.00623)	(0.00842)	(0.0532)
gdp (t-2)	-0.0423***	-0.0443**		
	(0.0126)	(0.0143)		
gdp (t-3)	0.000473			
	(0.00921)			
m_it	1.416*	1.675*	2.334***	7.458
	(0.834)	(0.746)	(0.520)	(5.785)
hc_it	0.629***	0.821***	1.084***	0.404
	(0.146)	(0.171)	(0.195)	(0.768)
polit_it				
	0.0985	0.0259	0.0968	0.0586
	(0.110)	(0.101)	(0.0911)	(0.197)
pg_it				
	-0.0357*	-0.0462*	-0.0285*	0.0837
	(0.0214)	(0.0211)	(0.0169)	(0.119)
inv_it				
	0.0315***	0.0278***	0.0332***	-0.00338
	(0.00784)	(0.00800)	(0.00678)	(0.0360)
inf_it				
	-0.147**	-0.113***	-0.105*	-0.168*
	(0.0523)	(0.0311)	(0.0412)	(0.0713)
EXP_it				
	0.774**	0.540*	0.484*	1.109**
	(0.242)	(0.239)	(0.259)	(0.427)
IMP_it				
	-1.074***	-0.986***	-1.063***	-0.856*
	(0.237)	(0.286)	(0.255)	(0.336)
FDI_it				
	0.0110	0.0163*	0.0142**	0.00333
	(0.00933)	(0.00769)	(0.00484)	(0.0146)
gov_exp_it				
	0.00127	0.0101	0.0179	-0.0295
	(0.0119)	(0.00983)	(0.0111)	(0.0338)
rem_it				
	0.164***	0.198***	0.229***	0.0650
	(0.0314)	(0.0350)	(0.0389)	(0.229)
_cons	0.154	0.266	-0.164	-1.193
	(0.603)	(0.454)	(0.264)	(0.725)
N	741	757	794	378
Hansen's J chi2	13.9797	13.3359	12.5353	4.00425
Hansen's Jp	0.9476	0.9721	0.9877	0.5488
Two step	Yes	Yes	Yes	Yes
Wmatrix	Newey-West	Newey-West	Newey-West	Newey-West

Instruments: degree of urbanisation, population density, visa facilitation agreement and share of agricultural land.
Standard errors in parentheses. * $p < 0.10$, ** $p < 0.01$, *** $p < 0.001$.

The results show that the effect of gdp with one- and two-year lags is positive and statistically significant whereas for the three-year lags the effect is no longer significant, suggesting that positive effects of past levels of GDP last for the first two years but then disappear. Migration, remittances and human capital appear to have a positive effect on growth. Other controls such as public investment, foreign direct investment and exports have a significant and positive effect on growth while population growth, imports and inflation seem to negatively affect growth. The sign of the control variables and, most importantly, migration, remittances and human capital remains unchanged across Models 1-3. The estimation results for the subsample of the WBC and NMS show positive and significant effects only for the first-year lag of GDP as well as exports. Negative and significant effects of imports and inflation on growth are again confirmed. But as concerns migration and human capital, the coefficients are no longer positive and significant. The difficulty with GMM estimates is that usually they tend to work well for panels with a large N and small T. This might also be the reason for results turning out to become insignificant in the subsample of WBC and NMS.

b. Conditional mixed process estimation

As has been shown in the first specification, the effect of migration, remittances and human capital on growth may be positive. However, the effect of migration on economic growth through the role of human capital cannot be captured in this setting. Therefore, we proceed by applying an approach similar to Beine et al. (2001, 2008) which consists of a *three-equations system* referring to migration, human capital and economic growth. In the first equation, the migration decision depends on wage and unemployment differences between sending and receiving countries, population density, and restrictions on migration (e.g. immigration quotas or visa regimes). In the second equation, human capital depends on the migration rate, public expenditure on education, and other determinants affecting human capital formation. In the third equation, growth (the GDP per capita growth rate) depends on migration, human capital, and other determinants related to investment, consumption, attraction of foreign direct investment, trade openness, and political in/stability.

Exclusion restrictions entering the migration equation are population density, the change in migration regimes such as visa facilitation agreements, and available agricultural land in per cent of total land. For robustness checks we have first estimated the system over a sample of 39 countries, including regional dummies for WBC, NMS and EaP countries, respectively. Furthermore, we have estimated the system accounting for migration by different skill levels, aiming to capture the effect of chain migration for specific skill levels on human capital and growth.

Accordingly, the system of equations is defined as follows:

$$g_{it} = \alpha_1 gdp_{i,t-1} + \alpha_2 X_{it} + \gamma_1 hc_{i,t} + \gamma_2 m_{fit} + \varepsilon_{1it} \quad (2.1)$$

$$h_{it} = \beta_1 hc_{i,t-1} + \beta_2 Y_{it} + \varphi_1 m_{fit} + e_{2it} \quad (2.2)$$

$$m_{fit} = \vartheta_1 m_{fi,t-1} + \vartheta_2 Z_{it} + \tau visa_{fit} + \varepsilon_{3fit} \quad (2.3)$$

X_{it} in the growth equation (GDP per capita growth) includes the traditional variables (such as private and public investment, human capital, institutional variables, etc.) and also other determinants such as foreign direct investment and trade-related variables as indicated in

Vandebussche et al. (2006). Thus, equation 2.1 is similar to equation 1 in the first specification.

In equation 2.1, the human capital index[8] depends on the migration rate by skill/education level and other determinants which affect human capital formation such as public expenditure on education, total factor productivity, degree of urbanisation and remittances:

$$h_{it} = \beta_1 hc_{i,\,t-1} + \beta_2 TFP_{it} + \beta_3 urb_{it} + \beta_4 \exp\_edu_{it} + \beta_5 \mathrm{rem}_{it} + \varphi_1 m_{fit} + e_{2it}$$

The migration equation (equation 2.3) is determined as below:

$$m_{fit} = \vartheta_1 m_{fit-1} + \vartheta_2 \ln\left(\frac{w_{ft-1}}{w_{it-1}}\right) + \vartheta_3 \ln\left(\frac{u_{it-1}}{u_{ft-1}}\right) + \vartheta_4 \ln(pop\_den_{it}) +$$

$$\vartheta_5 polit_{\,it} + \tau_1 visa_{\,fit} + \ln(agr)_{\,it} + \varepsilon_{1fit}$$

with the macroeconomic determinants being:

› m_{fit} refers to the stock of migrants residing in destination country (f) (country f is represented by the OECD countries) as a share of the population from sending country (i), as defined in Brücker et al. (2013);

› m_{fit-1} is the lag of the dependent variable, as a proxy for network effects;

› wage rates in the foreign and the country of origin, correspondingly w_{ft} and w_{it}, to proxy expectations about the level of earnings in the foreign and the home country, with the foreign country being represented by the OECD countries;

› u_{ft} and u_{it} represent the employment rates in the respective foreign country and the country of origin, with the foreign countries being represented by the OECD countries;

› $polit_{\,it}$ defined as before;

› pop_den_{it} stands for the population growth of the sending country, which implies that countries with a higher population density as compared to those with a lower one have higher emigration potential;

› $visa_{\,fit}$ stands for the visa facilitation agreements applied to the sending country, which implies that such agreements boost further mobility but are less likely to affect human capital and growth;

› $\ln(agr)_{\,it}$ availability of agricultural land as % of total land area.

[8] Index of human capital per person is a synthetic index, based on years of schooling (Barro and Lee, 2012) and returns to education (Psacharopoulos, 1994; Caselli, 2005), attained from PENN World Tables 8.1. For further details see Inklaar and Timmer (2013), p. 38.

› The estimation of the three-equations system aims to simultaneously assess, first, the effect of emigration on human capital and, second, its effect on growth. Apart from simultaneity, reverse causality might appear. GDP growth is the dependent variable of the first equation, while the human capital and migration variables enter as exogenous variables in the first equation. In the second equation of human capital, migration also enters as an explanatory variable. Accordingly, growth and human capital has to be estimated recursively. For that we would need to introduce exclusion restrictions in each equation – the human capital and the migration equation – but not into the growth equation. To address this issue we implement a conditional mixed process (CMP), which allows estimating multi-equation systems in which the data generating process is recursive. As we have to deal with the simultaneity problem which causes endogeneity we include a number of instruments in the human capital and migration equations.

As for the human capital equation, a variable that might be relevant for human capital is suggested to be the degree of urbanisation. This variable might be considered as a proxy of the physical distance from the education centres which certainly will affect human capital. The literature sustains that the effect of urbanisation on human capital is positive for certain levels of development, Glaeser (2001), Bertinelli (2004), Spence et al (2009), Glaeser and Mare (2001) and argue that the rate of skill acquisition and accumulation is higher in urban areas. Cities with strong human capital basis grow faster than those without, Glaeser and Mare (2001). Despite, there is a risk of development trap and no economic growth associated with urbanisation if the initial level of technology is low, Bertinelli (2003). Overall, the causality whether urbanisation foster growth or vice versa is difficult to be established, but the literature sustains that they are quite linked to each other, Spence et al(2009).

› In the migration equation, reverse causality has been addressed by including two instruments, visa facilitation agreements and the logarithm of available agricultural land. The former instrument is used as a proxy for legal facilitation of mobility which might have an effect on emigration, but its effect on human capital or growth is not directly evident. Visa facilitation agreements do not distinguish between different skill levels; hence the probability of migration of both low- and high-skilled is similarly affected. In our context the instrumental dummy of visa facilitation agreements applies only to EU-15 towards WBC and NMS. Therefore, its effect on migration might be underestimated if we consider that our dependent variable includes emigration to OECD countries as well. Another variable, availability of agricultural land, has been introduced in order to capture potential emigration due to population movements from rural to urban areas. As opposed to the size of the country, which might be another instrument to consider, this variable may change over time. The validity of the instruments has been tested running each equation separately by 2SLS followed by Sargan and Hansen tests.

The main data sources of the indicators are as follows:[9]

Migration-related indicators: IAB Brain Drain Database, Brücker et al. (2013). The IAB Brain Drain Database provides information for 20 OECD destination countries by gender, country of origin and education level, for the years 1980-2010, complemented with international migration datasets compiled by Docquier et al. (2013).

[9] Further details about the data sources are provided in Annex Table A2.

Education-related indicators: PENN World Table (covering the period 1950-2013).

Macroeconomic-related indicators: wiiw Database and World Bank Database.

5. Estimation results

The system of equations has been estimated using the conditional mixed process (CMP) following Roodman (2011). In Table 2, Model 2.1 presents the results using the entire sample of 39 countries.

Models 2 to 5 present the results for the subsample of the WBC and NMS respectively accounting for total migration and separately for high-, medium- and low-skilled migration. Model 2.6 estimates the system of equations excluding migration from the determinants of output per capita growth equation aiming to separate its effect on output per capita growth. All equations include country and time dummies.

How does migration affect human capital and consequently growth?

The estimation results provided for the whole sample (Table 2, Model 2.1) suggest that first migration is positively affected by unemployment differentials, confirming that a relatively high unemployment rate in the country of origin is a strong push factor. At the same time, having already a high share of migrants abroad is a strong pull factor that positively affects migration. While human capital is shown to positively affect growth, no significant effect is found concerning the effect of migration and remittances on human capital and consequently growth. Similar results are found for the subsample of WBC and NMS. These findings indicate that considering only the overall share of migrants abroad provides inconclusive results concerning the effect of migration on human capital and growth.

The issue of brain drain/gain can be properly addressed by distinguishing between the different skill levels in the context of emigration. Thus, after having looked at the impact of overall emigration on growth and human capital, we now turn to investigating its effect considering highly, medium- and low- skilled emigration separately.

Accordingly, Models 2.3-2.5 show that some positive effect on human capital is generated only in the case of low-skilled migration, suggesting that average level of human capital increases due to low-skilled migration particularly in the short run. The unemployment differential between the origin and destination country is a positive and significant push factor for the overall migration, whereas particularly for the medium skilled the push comes from income differential. In the short run, the positive effect on human capital due to low skilled migration is explained but the composition effect – less unskilled workers in the workforce will lead to an increase in the average level of human capital. This finding is in line with Chen (2009) who shows that higher migration of low-skilled workers may have a positive effect on human capital, both in the short and long run – which is possible if, first, more low-skilled workers are allowed to migrate and, second, by making greater investments in the education of children of low-skilled worker.

As concerns the effect of migration by different skill levels on growth, estimates show that only the migration of highly skilled has a positive effect on growth. This finding is in line with Mountford (1997) and Stark et al. (1997) who argue that migration of highly skilled, i.e. brain drain, can generate a positive effect on growth if successful emigration is uncertain and the investment in human capital by people who would like to raise their chances of migration exceeds human capital loss caused by emigration.

While high-skilled migration is expected to have a positive effect on growth, its effect on economic convergence can be captured by replicating Model 2.3, dropping the high skilled migration variable from the first equation. By comparing the results presented in Model 2.6 with those of Model 2.3 it becomes evident that in absolute terms the effect of the initial level of GDP per capita is higher. This finding suggests that migration has further and positively affected output growth of the low-income countries. This finding is in line with Taylor and Williamson (1997) based on the experience of massive migration in the late 19th century, where it is argued that output growth and convergence between low- and high-income countries was strongly affected by migration.

Human capital, as expected and sustained by a number of studies, has a positive effect on growth. Other macroeconomic determinants, such as the inflation rate, negatively affect economic growth.

The human capital estimation results demonstrate that the previous levels of human capital and total factor productivity and the degree of urbanisation significantly and positively affect human capital accumulation.

Table 2: CMP estimates of the growth rate of real GDP

	(Model 2.1) Full sample	(Model 2.2) Sample NMS and WB	(Model 2.3) High-skilled migration	(Model 2.4) Medium-skilled migration	(Model 2.5) Low-skilled migration	(Model 2.6) Growth convergence
Dependent Variable: GDP growth						
Log GDP per capita, t-1	-1.243***	-1.199***	-1.198***	-1.201***	-1.206***	-1.206***
	(0.0273)	(0.0437)	(0.0428)	(0.0430)	(0.0436)	(0.0431)
Migration	-0.266	1.991	1.587*	0.566	0.0608	
	(1.251)	(1.253)	(0.682)	(1.275)	(0.261)	
Human capital	11.69***	7.751***	8.460***	7.964***	7.623***	7.120***
	(1.017)	(1.287)	(1.368)	(1.323)	(1.307)	(1.254)
Political instability	0.0321	0.0208	0.0224	0.0238	0.0199	0.0203
	(0.0336)	(0.0425)	(0.0426)	(0.0423)	(0.0426)	(0.0428)
Population growth	-0.0109	-0.00221	-0.00291	-0.00160	-0.00168	-0.00298
	(0.00755)	(0.00996)	(0.00985)	(0.00988)	(0.0100)	(0.00995)
Investment, % GDP	0.00988***	0.00259	0.00249	0.00529	0.00472	0.00533
	(0.00266)	(0.00375)	(0.00361)	(0.00370)	(0.00344)	(0.00342)
Inflation	-0.0725***	-0.0540**	-0.0498**	-0.0519**	-0.0501**	-0.0551***
	(0.0135)	(0.0166)	(0.0167)	(0.0165)	(0.0167)	(0.0166)
FDI, % of GDP	0.00406	0.00430	0.00457	0.00422	0.00498	0.00480
	(0.00261)	(0.00372)	(0.00367)	(0.00367)	(0.00375)	(0.00371)
Imports, % of GDP	-0.550***	-0.185	-0.147	-0.241*	-0.215*	-0.254*
	(0.0839)	(0.119)	(0.121)	(0.116)	(0.114)	(0.112)
Exports, % of GDP	0.494***	0.0499	0.0224	0.112	0.0903	0.139
	(0.0858)	(0.132)	(0.133)	(0.129)	(0.126)	(0.123)
Government expenditures	-0.0214***	-0.0108*	-0.0121**	-0.0128**	-0.0127**	-0.0144**
	(0.00418)	(0.00472)	(0.00457)	(0.00472)	(0.00455)	(0.00447)
Remittances, % of GDP	-0.00300	-0.0471*	-0.0486*	-0.0400*	-0.0377*	-0.0346
	(0.0190)	(0.0234)	(0.0233)	(0.0232)	(0.0226)	(0.0224)
		(0.125)	2.668	3.440*	3.894*	4.484**
_cons	-0.844	3.596*	(1.711)	(1.634)	(1.584)	(1.541)
	(1.174)	(1.593)				
Human capital						
Human capital (t-1)	0.0244**	0.0489***	0.0524***	0.0530***	0.0406**	0.0548***
	(0.00764)	(0.0137)	(0.0144)	(0.0144)	(0.0133)	(0.0146)
Education expenditures, % of GDP	0.000639	-0.00378*	-0.00456**	-0.00499**	-0.00399*	-0.00470**
	(0.00104)	(0.00174)	(0.00166)	(0.00180)	(0.00166)	(0.00169)
Migration	0.0137	0.0667	-0.0512	-0.0113	0.0286*	-0.0237
	(0.0707)	(0.0827)	(0.0507)	(0.0818)	(0.0127)	(0.0496)
Urbanization	0.0707	0.180	0.357*	0.307*	0.294*	0.347*
	(0.0855)	(0.171)	(0.169)	(0.147)	(0.145)	(0.172)
TFP	-0.0603	0.666**	0.626**	0.645**	0.756**	0.591*
	(0.104)	(0.243)	(0.237)	(0.230)	(0.242)	(0.242)
Remittances	-0.00122	0.000299	0.000821	0.0000506	0.000402	0.000810
	(0.00121)	(0.00172)	(0.00168)	(0.00166)	(0.00172)	(0.00172)
_cons	1.059***	1.026***	0.969***	0.983***	0.979***	0.969***
	(0.0339)	(0.0716)	(0.0697)	(0.0639)	(0.0668)	(0.0714)
Migration						
Migration, t-1	0.891***	0.857***	0.881***	0.755***	0.813***	0.885***
	(0.0243)	(0.0531)	(0.0456)	(0.0470)	(0.0541)	(0.0464)
Unemployment differential, t-1	0.000702*	0.00118*	0.00147	0.000393	-0.00100	0.00150
	(0.000326)	(0.000611)	(0.00114)	(0.000546)	(0.00366)	(0.00115)
GDP per capita differential, t-1	0.000404	0.000391	0.000141	0.000890*	-0.00341	0.000109
	(0.000304)	(0.000568)	(0.00104)	(0.000511)	(0.00341)	(0.00105)
Political instability	0.000357	0.000860	-0.00185	0.000510	0.00638	-0.00186
	(0.000943)	(0.00158)	(0.00295)	(0.00138)	(0.00932)	(0.00295)
Population density	-0.000585	-0.0350*	0.00672	-0.0579**	-0.0459	0.000479
	(0.000940)	(0.0185)	(0.0322)	(0.0183)	(0.0911)	(0.0322)
Visa dummy	0.00218	0.000914	-0.00491	-0.00234	0.0208	-0.00532
	(0.00142)	(0.00370)	(0.00629)	(0.00325)	(0.0174)	(0.00632)
Agricultural land, log	0.000305	0.000116	-0.00208	-0.0000263	0.00603	-0.00178
	(0.000680)	(0.00110)	(0.00206)	(0.00103)	(0.00661)	(0.00209)
_cons	0.0227***	0.173*	0.0168	0.268**	0.304	0.0450
	(0.00643)	(0.0898)	(0.154)	(0.0866)	(0.432)	(0.154)
N	794	363	363	363	363	363

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.01$, *** $p < 0.001$, CMP estimates. Time and country dummies included.

6. Main findings and conclusions

In this study, we have analysed the phenomenon of migration to OECD countries and its direct effects on human capital and growth in the Western Balkan countries (WBC) and the EU's new Member States (NMS). The existing theoretical and empirical studies have shown that massive migration from lower-income countries can produce both brain drain and brain gain. The emigration effect on growth depends on how dominant brain drain is over brain gain affecting the stock of human capital.

Through a system of three equations, we estimated simultaneously the effect of migration on human capital and growth. The results indicate that in the context of the massive migration from the WBC and NMS, migration of the low-skilled has produced positive compositional effects on human capital in the country of origin, confirming Chen's (2009) theoretical findings. We also found some positive effect on growth from the migration of highly skilled, confirming the theoretical analysis of Mountford (1997) and Stark et al. (1997). The positive effect of overall migration on income convergence is also in line with Taylor and Williamson (1997) who also found that the massive migration in the late 19th century lifted income per capita levels in lower-income countries so that they were marginally higher than they would have been if no migration had occurred.

What the literature suggests is that the closer a country is to the global technological frontier, the more important becomes high-skilled human capital for further economic growth. For the WBC, which are quite distant from the frontier and where growth in productivity is more likely to occur primarily through the adoption of existing technologies – rather than by engaging in developing new technologies – an increase in the share of the population with secondary education is more important. Hence, in the case of the WBC, the increase in the number of those with secondary education, and the further improvement in the composition of human capital in the long-run also through the incentive of migration to higher-income countries, might generate brain gain and thus play a positive role in economic growth in these countries.

Overall, our findings show that the massive migration from the WBC and NMS of both low- and high-skilled workers has been beneficial to these countries: the human capital has benefited from the former and the output growth from the later. Although our group of countries may have gone through important population losses due to out-migration, the composition of human capital has improved. At the same time, emigration has contributed to alleviating labour market imbalances that emerged in the early 1990s. It thus also reduced the pressure on resources, which in turn may have contributed to the (marginally) higher increase in income per capita levels.

From the policy perspective, our analysis supports the role which high-skilled migration can play in supporting growth in lower-income economies and also impact of low-skilled migration on the composition of human capital in the source countries.

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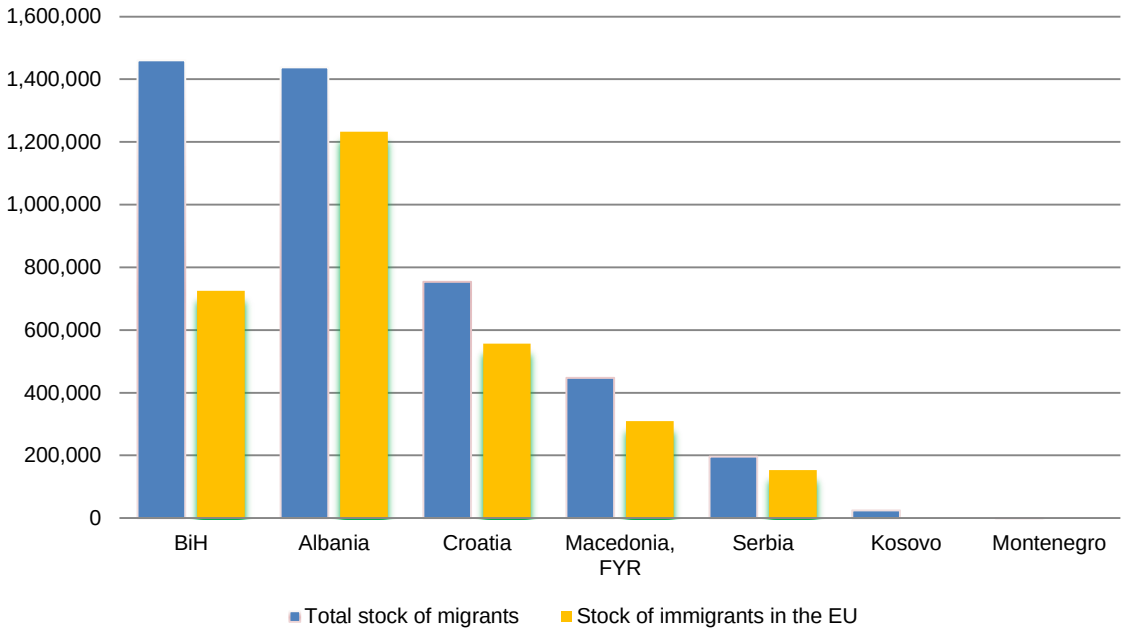
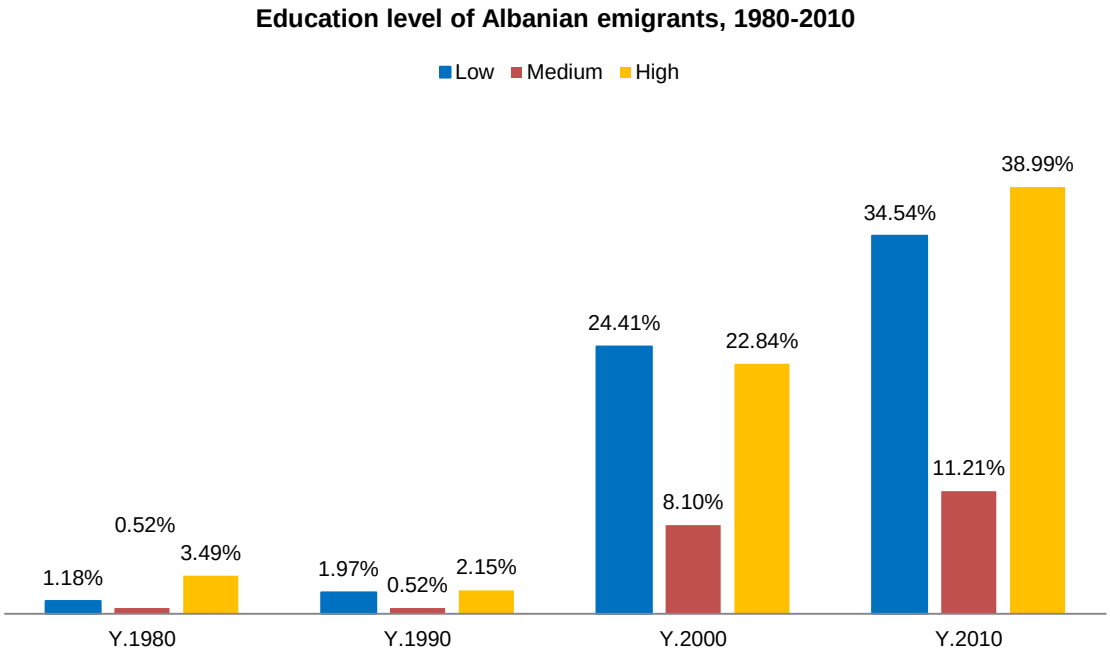
Annex

Figure A1: Total stock of migrants, Western Balkan countries: worldwide and in EU

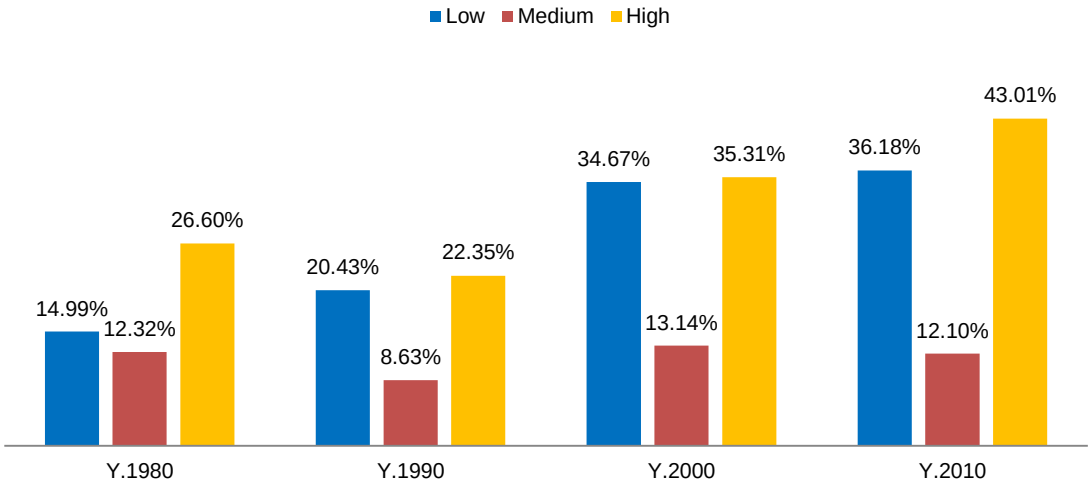


Source: World Bank, Global Bilateral Migration, 2010.

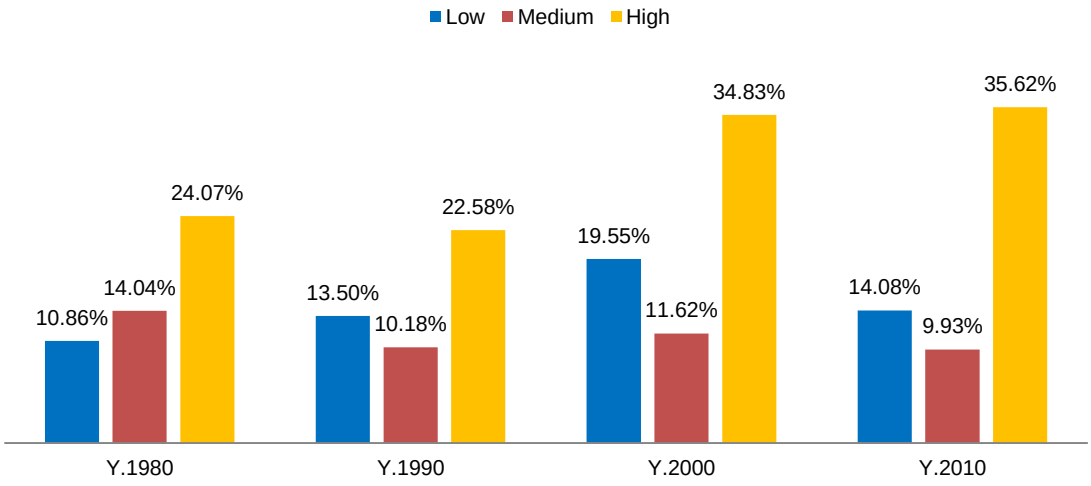
Figure A2: emigration rates by level of skills, 1980-2010



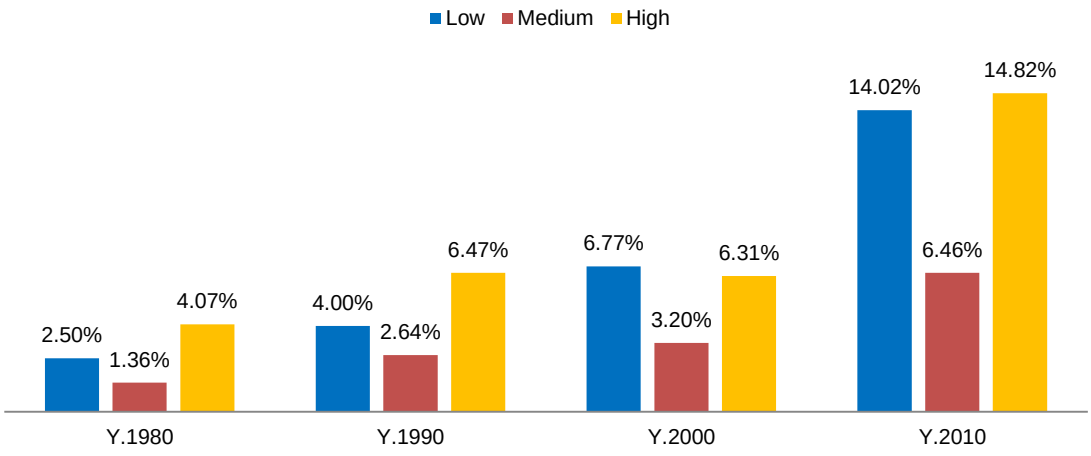
Education level of BiH emigrants, 1980-2010

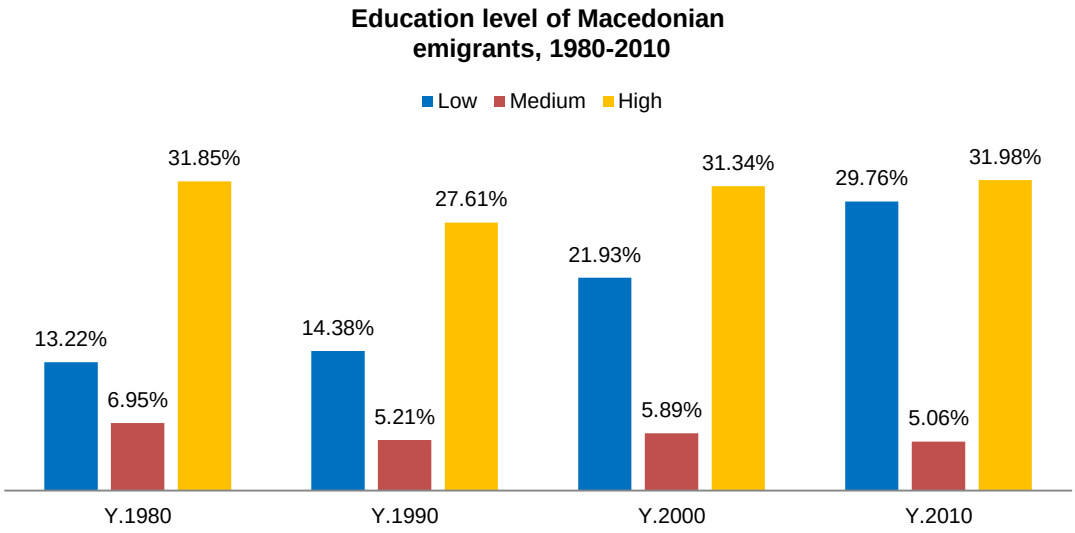


Education level of Croatian emigrants, 1980-2010



Education level of Serbian and Montenegro emigrants, 1980-2010





Source: Own elaboration using IAB brain drain database, Brücker et al. (2013).

Table A1: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP growth	719	0.25	0.76	-0.90	4.76
GDP_per capita in PPP	819	17839.04	10666.91	1161.98	45447.50
Unemployment rate	713	10.08	6.63	0.10	38.40
Population growth	537	-4.70	1.67	-11.05	5.65
Investment, % GDP	764	23.99	6.21	-0.69	59.77
Inflation rate	721	1.88	1.28	0.00	8.46
FDI, net inflows, % GDP	721	4.83	6.32	-16.15	50.97
Trade openness, % of GDP	784	88.90	33.66	23.20	189.00
Government expenditure, % of GDP	819	17.52	6.44	0.00	30.12
human capital	693	2.89	0.22	2.23	3.54
Education expenditure, % of GDP	556	4.97	1.32	1.85	9.90
Total factor productivity	818	0.07	0.03	0.01	0.18
Urbanisation	819	66.67	13.67	36.43	97.64
Total migration rate	819	6.90	6.47	0.00	30.00
High-skilled migration rate	819	13.09	10.80	0.90	52.00
Medium-skilled migration rate	819	4.28	4.12	0.20	24.70
Low-skilled migration rate	819	9.76	11.34	0.10	79.50
Political stability	650	0.63	0.48	0.29	2.00
Population density	809	136.43	193.53	2.54	1295.34
Visa	609	0.35	0.48	0.00	1.00
Agricultural land (% of land area)	326	42.55	15.1	12.34	72.04
Remittances as share of GDP	378	2,61	5,71	0	49,74

Table A2: Data source and description

	Description	Source	Link
Gross domestic product	Gross domestic product based on purchasing power parity (PPP) per capita GDP, current international dollar, units	International Monetary Fund, International Financial Statistics and Balance of Payments databases; World Bank, International Debt Statistics; World Bank and OECD GDP estimates	http://data.worldbank.org/
Unemployment	wiiw database	wiiw database	http://wiiw.ac.at
Government expenditure	govern_exp_consum as % of GDP	International Monetary Fund, International Financial Statistics and Balance of Payments databases; World Bank, International Debt Statistics; World Bank and OECD GDP estimates	http://data.worldbank.org/
Investment	Gross capital formation (% of GDP)	International Monetary Fund, International Financial Statistics and Balance of Payments databases; World Bank, International Debt Statistics; World Bank and OECD GDP estimates	http://data.worldbank.org/
Foreign direct investment, net inflows (% of GDP)	This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP.	International Monetary Fund, International Financial Statistics and Balance of Payments databases; World Bank, International Debt Statistics; World Bank and OECD GDP estimates	http://data.worldbank.org/
Trade (% of GDP)	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	World Bank national accounts data; OECD National Accounts data files	http://data.worldbank.org/
Inflation rate	Inflation, consumer prices (annual %)	International Monetary Fund, International Financial Statistics and Balance of Payments databases; World Bank, International Debt Statistics; World Bank and OECD GDP estimates	http://data.worldbank.org/
Population growth	Total population is based on the de facto definition of population	World Bank national accounts data; OECD National Accounts data files	http://data.worldbank.org/
Political stability	Freedom in the World Country Ratings, combined average ratings for Political Rights and Civil Liberties	Freedom House	https://freedomhouse.org/ https://freedomhouse.org/report-types/freedom-world
hc	Index of human capital per person, based on years of schooling (Barro and Lee, 2012) and returns to education (Psacharopoulos, 1994)	PENN World Tables	http://www.rug.nl/research/ggdc/data/pwt/pwt-8.1
TFP	Output-side real GDP at current PPPs (in million 2005 USD), capital stock at current PPPs (in million 2005 USD), number of persons engaged (in millions); calculated using PENN World Table 8.1 data	PENN World Tables	http://www.rug.nl/research/ggdc/data/pwt/pwt-8.1
Urbanisation	Urban population (% of total). Urban population refers to people living in urban areas as defined by national statistical offices. It is calculated using World Bank population estimates and urban ratios.	United Nations, World Urbanization Prospects	United Nations, World Urbanization Prospects. http://data.worldbank.org/
Public spending on education, total (% of GDP)	Public expenditure on education consists of current and capital government spending on educational institutions (both public and private), education administration as well as subsidies for private entities (students/households and other privates entities).	United Nations Educational, Scientific and Cultural Organisation (UNESCO) Institute for Statistics	http://data.worldbank.org/
Population density	Population density (people per km^2 of land area)	Food and Agriculture Organisation and World Bank population estimate	Food and Agriculture Organization and World Bank population estimates http://data.worldbank.org/
Agricultural land in km^2	Agricultural land	World Bank statistics	http://data.worldbank.org/
Visa facilitation agreement	Level dummy	Council Regulation 539/2001, Annex I-II	http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32001R0539
Migration data	25 years and older emigration rates, by country of origin and education level. For any given skill level and year, the emigration rate is defined as the total migrant population from a given source country divided by the sum of the migrant and resident population in the same source country.	H. Brücker, S. Capuano and A. Marfouk (2013), 'Education, gender and international migration: insights from a panel-dataset 1980-2010', mimeo	http://www.iab.de/en/daten/iab-brain-drain-data.aspx

Table A3: Visa facilitation agreements[10]

Country	Entry into force
Albania	2008
Armenia	2014
Azerbaijan	2014
Bosnia and Herzegovina	2008
Cape Verde	2014
Macedonia	2008
Georgia	2011
Moldova	2013
Montenegro	2008
Serbia	2008
Russia	2007
Ukraine	2013

Source: http://ec.europa.eu/dgs/home-affairs/what-we-do/policies/borders-and-visas/visa-policy/index_en.htm

[10] For CEE countries the information used has been attained from Council Regulation 539/2001, Annex I-II.