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Interrelationships between Human Capital, Migration and Labour Markets in the Western Balkans:

An Econometric Investigation

Isilda Mara and Michael Landesmann

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Interrelationships between Human Capital, Migration and Labour Markets in the Western Balkans:

An Econometric Investigation

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Abstract

The high outward mobility that has characterised the countries in the Western Balkan (WB) region over the past three decades is often seen as tightly linked to severe labour market imbalances and persistently low utilisation of human capital over time. To shed light on these issues, we estimate a system of equations that accounts for the effects of labour market determinants and human capital on migration and vice versa. The period under analysis is 2005-2019 and considers mobility from five of the WB countries to the EU15. The empirical results confirm the importance of wage gaps and their changes as an important pull factor for driving outward mobility from the WB region that can be persistent over time. Also, gaps in human capital emerge as a powerful determinant for explaining mobility into countries where returns on human capital are higher.

Preface

This report is produced within the regional study "Migration dynamics from a human capital perspective in the Western Balkans". The project was launched in 2020 by the European Training Foundation (ETF) and carried out and coordinated jointly with the Vienna Institute for International Economic Studies (wiiw). It aimed to shed light on the triangular relationships between human capital formation, labour markets and migration and to determine how the current functioning of education systems and labour markets affect migration.

Isilda Mara and Michael Landesmann from wiiw conducted this analysis using a pVAR approach – which attempts to analyse basic interrelationships regarding human capital, migration, labour force participation and labour utilisation, through an econometrically estimated simultaneous equation system. Following an approach used in Landesmann and Leitner (2015; based on Mitze et al, 2012) and implemented in the context of analysing intra-EU 28 labour mobility, the report analyses how human capital and labour markets adjust to migration flows in general, and high skilled migration in particular. The draft report benefitted from comments made by the wiiw (Hermine Vidovic, Sandra Leitner) and the ETF project team (Ummuhan Bardak, Mirela Gavoci, Mariavittoria Garlappi and Cristiana Burzio).

The high outward mobility that has characterised the countries in the Western Balkan (WB) region over the past three decades is often seen as tightly linked to severe labour market imbalances, low levels of human capital and persistently low utilisation of that capital over time. The period under analysis in this study is 2005-2019, five of the WB countries (Albania, Bosnia-Herzegovina, Montenegro, North Macedonia, Serbia) are considered as countries of origin and the destination countries are the member countries of the EU15.[1] Kosovo could not be included in the study as several essential (comparable) indicators were missing for the country that were necessary for estimating the model. The empirical results confirm the importance of wage gaps and their changes for migration that act as an important pull factor for driving outward mobility, which can be persistent over time. Also, gaps in human capital emerge as a powerful determinant for explaining outward mobility. The main implications of our findings are that gaps in human capital endowments and employability (or labour market conditions), especially of the more highly skilled in the WB countries, push outward mobility into countries where returns on human capital are higher.

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[1]   EU15 comprise the EU Member States prior to the EU's Eastern Enlargement in 2004 and 2007.

CONTENTS

TABLES AND FIGURES

Annex

ABBREVIATIONS

ADBI	Asian Development Bank Institute
CEE	Central Eastern Europe
ETF	European Training Foundation
EU	European Union
EU15	15 EU Member States prior to the EU's Eastern Enlargement in 2004
EU28	28 EU Member States after the last enlargement to Croatia in 2013
FD	First difference
FEV	Forecast-error variance
FEVD	Forecast-error variance decomposition
FOD	Forward orthogonal deviation
FES	Friedrich-Ebert-Stiftung (German Foundation)
FFP	Fund for Peace
GMM	Gaussian Mixture Models Approach
HC	Human Capital
HCI	Human Capital Index (World Bank)
HOS	Heckscher-Ohlin-Samuelson Model
ILO	International Labour Organisation
IRFs	Impulse Response Functions
LFP	Labour Force Participation
LU	Labour Utilisation
LU4	Labour Under-utilisation
MAIC	MMSC-Akaike information criterion
MBIC	MSC-Bayesian information criterion
MQIC	MMSC-Hannan and Quinn information criterion
pVAR	Panel Vector Autoregressive Model approach
PWT	Penn World Table
RCC	Regional Cooperation Council
VET	Vocational Education and Training
WB	Western Balkan region
WB5	Albania, Bosnia and Herzegovina, Montenegro, North Macedonia and Serbia
WDR	World Development Report
WEF	World Economic Forum
wiiw	The Vienna Institute for International Economic Studies

1. Motivation

Outward mobility from the Western Balkan (WB) countries is one of the highest in Europe. The total stock of migrants from the WB region is estimated at close to 4.6 million as of 2019 (UN Statistics, 2019; see Figure 1). This level is similar to the stock of Polish migrants abroad. However, in contrast, the population of the WB region is less than half as large as the population of Poland. What is even more striking is not only the fact that migration from WB with respect to its population is very high, but also that outward mobility has been persisting over time. The main destinations are European countries, which have attracted more than 75% of migrants from the WB region. Recent mobility dynamics suggests that Germany is absorbing a high share of migrants from the region.

Stuck in an economic and political transition for three decades, the countries in the region are lagging behind other countries in Central-Eastern Europe (CEE). Compared with other European countries, gaps in terms of earnings, employment and human capital have changed only marginally over this period. As such, the catching-up process and convergence with the economies of the European Union (EU) has been protracted. Even though new jobs have emerged over the past decade, their number has been insufficient to overcome high unemployment rates, especially among the young. Many of these new jobs were in the category of self-employment, which is seen as a precarious status in the region, or they were in those sectors of the economy that are labour-intensive and mostly offer salaries at the minimum mandatory wage level (wiiw and World Bank, 2018, 2019, 2020).

Figure 1 / Stock of migrants abroad, country of birth, in million
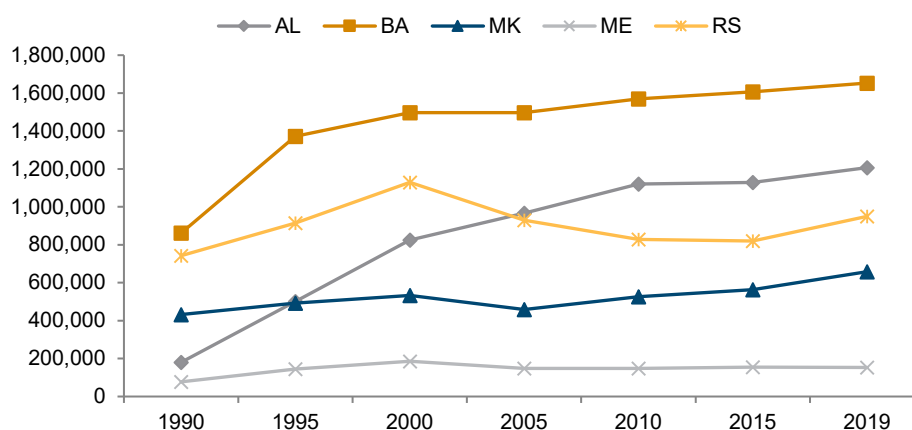
Source: United Nations, Department of Economic and Social Affairs, Population Division (2019).

One anomaly of the labour market is the high level of 'labour underutilisation' while human capital – proxied by average years of schooling – has been rising (see Figure 2). Labour underutilisation[2] is often

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[2] Labour underutilisation rate has been obtained from ILO statistics and is defined as follows:
(labour underutilisation (LU4) = (Unemployed + Potential labour force +Time related under employment) / (Labour force + Potential labour force). Further details are provided in Table A1 in the Annex.

used as a proxy for indicating the capability of a country to utilise human capital (ILO, 2013).[3] Consequently, a high rate of labour underutilisation, low levels of earnings and rising human capital in the region suggest that push factors to move abroad in search for better work, earnings and life prospects continue to be strong (Mara, 2019).

Recent public opinion surveys conducted in the region (see RCC, 2020, but also FES, 2019) indicate that labour market and employment prospects continue to be important drivers of outward mobility in the region, explaining more than 70% of the motives for moving out of the region.

Figure 2 / Labour market and human capital indicators
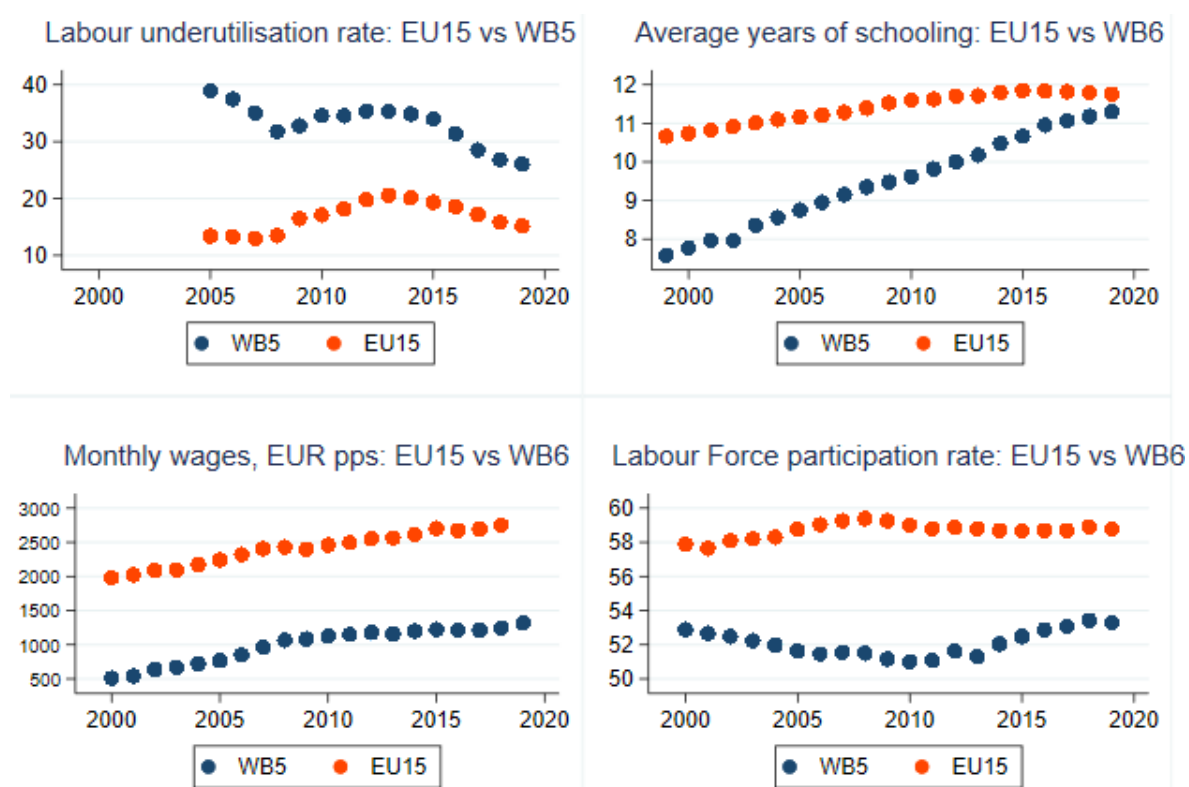
Note: No information is available on Kosovo about labour underutilisation, hence WB5 is indicated instead of WB6. EU15 comprise the EU member countries prior to the EU's Eastern Enlargement in 2004 and 2007.
Sources: ILO; wiiw; Jobs Gateway database; UNESCO.

The migration-economic development nexus, although quite intensively researched, is still inconclusive. The question of whether migration is simply the outcome of the malfunctioning of the economies and societies of the countries in the region or whether it is instead an important factor affecting economic developments and prospects remains a vital research topic that needs to be investigated further. Certainly, one appropriate approach is a look at the dynamics, causal interrelationships and a proper investigation of a number of determinants that may be part of a vicious circle, where outward migration may initially be a symptom of an inefficient economy but then switches to become a significant cause of its malfunctioning.

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[3] https://ilostat.ilo.org/resources/methods/forms-of-work/#underutilization

Accordingly, the purpose of this study is to understand how differences in the characteristics of the labour markets in the five WB countries (Albania, Bosnia-Herzegovina, Montenegro, North Macedonia, Serbia) with respect to the EU-15 countries[4] – which are the main destinations of migrants from the region – affect mobility; to look at the implications of mobility for employment, wages, human capital formation and labour utilisation; and finally, to understand how these indicators are inter-connected. Kosovo could not be included in the study as several essential (comparable) indicators were missing for the country that were necessary for estimating the model.

To shed light on these issues, the proposed methodology consists of estimating a system of equations. Within the system each equation will account for the effects of labour market indicators and human capital on migratory movements and vice versa. Determinants of mobility will be taken as endogenous. Change in outward mobility is expected to depend on origin and destination country differences in employment, labour utilisation, human capital endowment and expected level of earnings. We have followed a similar approach to that employed by Mitze (2012) to analyse regional mobility in Germany, as well as the approach of Landesmann and Leitner (2015) to analyse push and pull factors of mobility in the EU28.

The rest of the study is organised as follows. In section 2 we provide a brief review of the literature on labour market conditions, human capital dynamics and implications for migration. We then continue with a description of the methodology and data sources utilised for the empirical analyses in section 3. The estimation results are presented in section 4, and the main findings and conclusions follow in section 5.

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[4]   EU15 comprise the EU member countries prior to the EU's Eastern Enlargement in 2004 and 2007.

2. Literature review

Drivers of mobility: The existing literature provides a good understanding of the drivers of mobility, which are often related to relatively high wage differentials and differences in employment opportunities between countries. In the context of the Western Balkan countries, gravity modelling analysis found that ethnic ties, earnings differentials and better work prospects abroad are important push and pull factors for outward mobility from the region (Landesmann et al., 2015b; Mara et al., 2019). More recent literature has been listing dissatisfaction with the state of affairs and mistrust in public institutions among the push factors for leaving the region (RCC, 2019, 2020; FES 2019), while economic determinants remain predominant drivers of emigration from the region.

Migration and labour market implications: While we have comprehensive knowledge about push and pull factors for mobility, the same cannot be said of the impact of migration on sending countries' labour markets and human capital. High outward mobility from the region has been crucial for alleviating labour market disequilibria and reducing high unemployment rates, predominant among the countries in the region. The employment rate has improved, but the region is characterised by a high level of underemployment of human capital (WEF, 2017). Low employment rates combined with high unemployment rates (especially among the young) – in comparison with the EU15 – point to a substantial underutilisation of the workforce (see Figure 2 for more details). Despite improvements in the educational attainment level of the available labour force, there are shortages of skilled workers emerging in the WB countries (RCC, 2019). Skills acquired in the education system do not match the skills required by the labour market (RCC, 2019). Other studies argue, furthermore, that a rapid increase in tertiary education enrolment in developing countries may generate lower returns to college education, leading to over-education and professional underemployment (Yamada and Lavado, 2018).

The literature on these issues suggests a number of effects of migration on the labour market, especially as far as labour market participation, labour supply and utilisation as well as the earnings structure are concerned. Theoretically, Fan and Stark (2007, 2011) argue that the wages of non-migrants may be negatively affected by high-skilled emigration as the more productive workers leave. The selection of migrants from the pool of employed or unemployed is likely to have labour market implications. Škuflić and Vučković (2018) show that emigration may even be associated with rising unemployment rates in the sending countries if those who emigrate are from the pool of the employed rather than the unemployed and if the skills gap between those who leave and those who stay is large. Elsner (2015) argues that the emigration effect on sending countries' wages depends strongly on the number and skills of the emigrants. Massive high-skilled migration would lower wages for everyone as the overall economy would become less productive. Emigration from the pool of employees, on the other hand, may have ambiguous effects and would depend on whether those who leave can be replaced by those who stay (Asch, 1994; Elsner, 2015). A low likelihood of high skilled being replaced by low skilled might further increase unemployment or reduce productivity if emigration of high skilled employees is prevailing.

Migration and human capital implications: From an international perspective, the Western Balkan countries have a low ranking in terms of human capital utilisation, (WEF, 2017).[5] The World Bank's Human Capital Index, which measures how improvements in education and health outcomes will affect the productivity of workers in the future, suggests that the region suffers from low investment in human capital (WDR, 2019).[6] Emigration, being high both among the low- and the high-skilled, has an impact on this outcome (wiiw and World Bank, 2018). The phenomenon of brain drain has been significant and has been on the rise especially over the period 2017-2019: from an index ranging between 0 (low) and 10 (high), Albania's ranking was estimated at 7.8 as of 2019, while for other WB countries the indicator of brain drain was estimated to range between 4 and 6 (Fund for Peace, 2020).[7]

The literature on migration and its effects on the sending countries – especially as far as implications for human capital and labour markets are concerned – remains inconclusive. A number of studies with an international coverage argue that in the long run massive migration may generate both brain drain and brain gain (Beine et al., 2008; Docquier, 2014; Djajić et al., 2019). Quite often its detrimental effects are stressed more than the positive ones, based on the assumption that skilled migration may be detrimental to development (Clemens, 2016). These studies argue that migration may be especially detrimental to developing countries whose working-age population with tertiary education hovers around 5%, while emigration from this group exceeds 20%. Emigration is thus likely to have a significant impact on the level and composition of human capital, and consequently growth potential (Di Maria and Lazarova, 2012).

However, other studies highlight that better migration prospects may incentivise human capital formation in the long run (Stark and Wang, 2002; Sorger et al., 2013). Human capital formation could then result in human capital/brain gain for the country of origin if some of those who improve their skills end up not migrating (Stark and Wang, 2002). In another setting, where low-skilled migration prevails, the consequence may be a decline in the average level of human capital due to a lowering of incentives to skills formation (Byra and Stark, 2012). Another relevant factor to consider is the time lag between brain drain – the negative effect on human capital stock due to high-skilled migration – and brain gain – additional investment in human capital and educational enhancement. The net effect depends on which

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[5]   Global Human Capital Report (2017), page 9; World Economic Forum (WEF). The Global Human Capital Index reflects the degree of effective human capital utilisation in a given country relative to the ideal outcome. https://weforum.ent.box.com/s/dari4dktg4jt2g9xo2o5pksjpatvawdb

[6]   World Bank (2019), World Development Report. https://www.worldbank.org/en/publication/wdr2019. The World Bank Human Capital Index (HCI) measures how improvements in the current education and health level will affect the productivity of the next generation of workers. It measures the level of human capital that a child born e.g. in 2000 can expect when reaching the age of 18. The HCI ranges between 0 and 1. The index is measured in terms of the productivity of the next generation of workers relative to the benchmark of fully completed education and full health. On a scale of 0 to 1, the WB scores are as follows: 0.53 for North Macedonia; 0.56 for Kosovo; 0.62 for Albania, Bosnia and Herzegovina, Montenegro; and 0.76 for Serbia as of 2018. For comparison, Central and East European countries show higher HDI scores (e.g. Slovenia has an HDI score of 0.79, the Czech Republic has an HDI score of 0.78, and Slovakia has an HDI score of 0.69).

[7]   Source: Fund for Peace, https://fragilestatesindex.org/comparative-analysis/. Human Flight and Brain Drain Index, 0 (low) - 10 (high), 2019. Country rankings: The average for 2019 based on 176 countries was 5.55 index points. The index considers the economic impact of human displacement (for economic or political reasons) and the consequences this may have on a country's development. This may involve the voluntary emigration of the middle class – particularly economically productive segments of the population, such as entrepreneurs or skilled staff such as physicians – due to economic deterioration in their home country and the prospect of better opportunities abroad. Index scores are calculated by combining pre-existing quantitative data sets, content analysis, and qualitative expert analysis. More details are provided in the following link: https://fragilestatesindex.org/methodology/.

of the two effects will dominate. Groizard and Lull (2006) found that the ex-post migration incentive effect on human capital may be very low to overcome the drop in its stock due to high skilled emigration – independent of the probability of migration being low or high.

Return migration is another way in which sending countries benefit as a result of the transfer of the experience and know-how acquired abroad (Mayr and Peri, 2009). Return students who graduated abroad, scientists and researchers enrolled at universities and research institutes abroad and the scientific diaspora can benefit sending countries through knowledge transfer or knowledge spillover effects, often combined with existing international networks (Chevalier, 2014). In addition, return migration is found to be positively associated with the quality of institutions at home. This is achieved through the 'transfer of norms' mechanism or social and cultural linkages provided that the person immigrated to more democratic countries where immigrants´ integration works and their integration into social and economic activities is highly promoted and practiced. (Lodigiani, 2016). However, it is also true that returnees may face obstacles in the process of transferring the skills they acquired abroad or reintegrating into the domestic labour market (ADBI, 2015; OECD, 2017).

There is also an extensive body of theoretical and empirical studies which try to shed light on how migration and human capital are interrelated – the causality and the association between the two. Dustmann and Glitz (2011) refer to the seminal study of Sjaastad (1962, page 92), which claimed that 'migration decision cannot be viewed in isolation; complementary investments in the human agent are probably as important as or more important than the migration process itself'. Dustmann and Glitz (2011) argue that the decision to migrate and the decision to invest in human capital are intertwined and endogenous. Such decisions have important consequences both for the migrants and for those who stay behind. They also emphasise that selectivity matters: depending on 'who decides to migrate', the skills composition of the country of origin may be changing through the mechanisms of brain drain and brain gain. They point to the critical role that human capital and its deficiency plays in the development processes of less developed countries.

3. Methodology and data sources

3.1. METHODOLOGY

In the context of the WB countries, migration has been one of those mechanisms that has affected features of the labour market which are characterised by high unemployment rates in the region. According to the theoretical and empirical literature – which has been selectively presented above – persisting outward migration has a number of implications for human capital, labour force participation, labour utilisation and wages. A number of studies have followed the work of Blanchard and Katz (1992) on labour market adjustment and migration and adapted it to the specific context. For example, Mitze (2012) used a similar approach to ours to analyse intra-regional mobility in Germany and its effect on labour market adjustment. Similarly, Landesmann and Leitner (2015) implement a similar approach to analyse how the labour market responds to rising intra-EU28 labour mobility and vice versa. In this vein, we also try to investigate how human capital and labour markets adjust to outward mobility from five WB countries to the EU15 countries.

As we already argued above, wage differentials and different employment prospects – e.g. regarding the activity (labour force participation) rate and labour (under)utilisation – are important drivers of mobility.

The hypothesis with respect to wage differential between potential destination and origin country refers to the pull exerted on potential migrants given the size of the wage gap. Labour underutilisation in the source country will act as a push factor for further outward mobility from the origin country to a potential destination country, depending on the size of the labour underutilisation gap. The hypothesis with respect to the labour force participation rate is more complicated as, on the one hand, high activity rates can reflect that there is a relatively dynamic labour market that would mobilise an active labour force and attract migrants; on the other hand, high activity rates in the source country (which shows the proportion of employed and the unemployed in the population) could also reflect an excess labour force in the source country that might look for employment elsewhere. The expected sign on the relative activity rates between destination and source country remains therefore open to empirical investigation.

As to the impact of differences in human capital endowment between country of origin and country of destination, one could think of two different hypotheses: (a) strong differences in skills composition of the available labour forces make migration flows complementary with respect to the available labour force in the potential destination country – we can call this the HOS hypothesis of net migration flows in analogy to the HOS model in international trade theory[8]; (b) there can also be the opposite situation, where particularly skilled workers are attracted by the good employment possibilities in countries which already have a strong skilled labour force and where working and living conditions (e.g. research facilities, good hospitals etc.) are at a higher level than in the source country. We shall call this the 'suitable working conditions' hypothesis – more on this when we discuss the results in section 4 of this paper. Hence, with

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[8] Leamer (1995).

respect human capital endowment, we will again allow the empirical investigation to determine the impact that differences in human capital may have on migration flows.

Taking these considerations into account, we propose to estimate a set of equations in order to account for the effects of migratory movements on human capital and labour market adjustments. Outward mobility will depend on origin and destination country differences in expected levels of earnings, employment prospects (covered by the labour utilisation and activity rate variables), and levels of human capital. Other equations will capture mutual interrelationships of relative levels with respect to earnings, labour force participation, labour underutilisation rates and human capital between country of origin and (potential) country of destination.

Mitze (1992) follows the Harris and Todaro (1970) model, which bases the economic behaviour on the differences in expected income between the origin and potential destination country/region given a certain probability of being employed. In line with this model, the expected level of earnings for staying in a certain region is Y_{ii}^E and is a function of the real wage in country i (Y_i) and the probability of finding employment $\Pr(Emp_i)$, which in turn can be seen as a function of the employment utilisation in region i (e.g. activity rate and labour utilisation) and other economic and non-economic determinants X_i. The same set of variables will be considered for the other (potential destination) country j. The individual will thus weigh the expected levels of earnings in the home (origin) and target (destination) regions against the probability of finding employment. The individual will decide to move from country i to another country j on condition that:

$$Y_{ii}^E < Y_{ij}^E - C_{ij}$$

where C_{ij} stands for the costs that arise from the choice of moving from one country to the other.

The following set of equations will therefore be estimated: the net effect or net migration flows are proxied by the difference in the stock of migrants of country i to country j between time t and t-1. Labour market impacts on migration flows may take place with a time lag, and therefore lag operators have been used to study such joint responses of labour market indicators. Accordingly, interrelationships and adjustments in the labour market to migration from region i to j will be estimated using the system of equations as follows:

$$MNET_{ij,t} = \alpha_{10} + \alpha_{11} * (L)MNET_{ij,t-1} + +\alpha_{12} * (L)W_{ij,t-1} + + \alpha_{13} * (L)LF_{ij,t-1} + \alpha_{14} \\ * (L)LU_{ij,t-1} + \alpha_{15} * (L)H_{ij,t-1} + \varepsilon_{ij,t}$$

where the variables indexed by ij refer to the log difference or the ratio between country i and j for the respective variables, t is the time indicator, L stands for the lag value, W stands for real income, LF is the labour force participation rate, LU is the labour utilisation rate, and H stands for human capital endowment. As the migration and labour market conditions are jointly determined, the system of equations is further extended as follows:

$$W_{ij,t} = \alpha_{20} + \alpha_{21} * (L)MNET_{ij,t-1} + \alpha_{22} * (L)W_{ij,t-1} + \alpha_{23} * (L)LF_{ij,t-1} + \alpha_{24} * (L)LU_{ij,t-1} + \alpha_{25} \\ * (L)H_{ij,t-1} + \varepsilon_{ij,t}$$

$$LF_{ij,t} = \alpha_{40} + \alpha_{41} * (L)MNET_{ij,t-1} + \alpha_{42} * (L)W_{ij,t-1} + \alpha_{43} * (L)LF_{ij,t-1} + \alpha_{44} * (L)LU_{ij,t-1} + \alpha_{45} * (L)H_{ij,t-1} + \varepsilon_{ij,t}$$

$$LU_{ij,t} = \alpha_{30} + \alpha_{31} * (L)MNET_{ij,t-1} + \alpha_{32} * (L)W_{ij,t-1} + \alpha_{33} * (L)LF_{ij,t-1} + \alpha_{34} * (L)LU_{ij,t-1} + \alpha_{35} * (L)H_{ij,t-1} + \varepsilon_{ij,t}$$

$$H_{ij,t} = \alpha_{50} + \alpha_{51} * (L)MNET_{ij,t-1} + \alpha_{52} * (L)W_{ij,t-1} + \alpha_{53} * (L)LF_{ij,t-1} + \alpha_{54} * (L)LU_{ij,t-1} + \alpha_{55} * (L)H_{ij,t-1} + \varepsilon_{ij,t}$$

This set of equations can be tested empirically by means of a Panel Vector Autoregressive Model (PVAR). PVAR models are flexible enough to infer dynamic relationships and changes over time between different covariates which will depend on their own lag values as well as other covariates.

3.2. DATA SOURCES

We will use detailed data for the WB5 (Albania, Bosnia-Herzegovina, Montenegro, North Macedonia, Serbia – Kosovo is not included due to lack of information) and the EU15 as main destination countries, at pair country levels, over the period 2007-2019 or the latest available year.

In a number of cases the statistics on mobility and outward migration suffer from incompleteness or missing observations. We have therefore combined stock data about migration using two different sources: UN statistics and Eurostat population statistics by country of birth. Regarding human capital endowment, we have used as a proxy 'average years of schooling' obtained from international sources such as UNESCO. This indicator has then been used to compute a human capital index following the same approach as suggested in the 2019 PENN World Table[9]. For labour market indicators in the WB5 and EU15 countries we have used international sources such as the International Labour Organisation (ILO), the wiiw database and the South Eastern Europe Jobs Gateway database to compile statistics on labour force participation, wages and labour underutilisation differences. More details about each of the data sources used are provided in the Annex, Table A1.

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[9]　The Penn World Table (PWT) is a database with information on relative levels of income, output, input and productivity, employment and population, covering 182 countries between 1950 and 2017. The current version of the database, version 9.1, thus allows for comparisons of relative GDP per capita, as a measure of standard of living, the productive capacity of economies and their productivity level. Compared to other databases, such as the World Bank's World Development Indicators, the time period covered is longer and there is more data that is useful for comparing productivity across countries and over time. For info, see PWT 9.1 | Penn World Table | Groningen Growth and Development Centre | University of Groningen (rug.nl)

4. Estimation of the PVAR model

The estimation of PVAR models requires first satisfying a number of criteria, such as stationarity and stability of the data necessary for inferring dynamic changes over time and the mechanism behind these. The period taken into consideration, 2005-2019, implies that non-stationarity of the data or breaks in the series are likely to occur – both as concerns net migration flows but also as concerns different labour market indicators – given the international financial crisis of 2008/9 as well as changes to the migration regime applied to Western Balkan countries, such as the free visa regime introduced in 2010-2011 or the 2015 Western Balkan Regulation of Germany. Applying the Fisher type unit root test, which does not require strongly balanced data, we found that the data do not satisfy the stationarity condition. To overcome this limitation, we generated the growth rate in the stock of migrants as a proxy for changes in net migration.

Accordingly, our PVAR model is defined as follows:

$$\Delta \text{MNET}_{ij,t} = \alpha_{10} + \alpha_{11} * (L)\Delta \text{MNET}_{ij,t-1} + +\alpha_{12} * (L)\Delta W_{ij,t-1} + + \alpha_{13} * (L)\Delta LF_{ij,t-1} + \alpha_{14} * (L)\Delta LU_{ij,t-1} + \alpha_{15} * (L)\Delta H_{ij,t-1} + \varepsilon_{ij,t}$$

where the variables indexed by ij imply the ratio between country of destination j and country of origin i for the respective variables, t is the time indicator, and L stands for the lag value. Taking the growth rate of the variables entering the system would be equivalent to the first difference of the log transformation of the variables. Summary statistics of the respective variables are provided in Annex, Table A2.

The rest of the PVAR system of equations is given as follows:

$$\Delta W_{ij,t} = \alpha_{20} + \alpha_{21} * (L)\Delta MNET_{ij,t-1} + \alpha_{22} * (L)\Delta W_{ij,t-1} + \alpha_{23} * (L)\Delta LF_{ij,t-1} + \alpha_{24} * (L)\Delta LU_{ij,t-1} + \alpha_{25} * (L)\Delta H_{ij,t-1} + \varepsilon_{ij,t}$$

$$\Delta LF_{ij,t} = \alpha_{40} + \alpha_{41} * (L)\Delta MNET_{ij,t-1} + \alpha_{42} * (L)\Delta W_{ij,t-1} + \alpha_{43} * (L)\Delta LF_{ij,t-1} + \alpha_{44} * (L)\Delta LU_{ij,t-1} + \alpha_{45} * (L)\Delta H_{ij,t-1} + \varepsilon_{ij,t}$$

$$\Delta LU_{ij,t} = \alpha_{30} + \alpha_{31} * (L)\Delta MNET_{ij,t-1} + \alpha_{32} * (L)\Delta W_{ij,t-1} + \alpha_{33} * (L)\Delta LF_{ij,t-1} + \alpha_{34} * (L)L\Delta U_{ij,t-1} + \alpha_{35} * (L)\Delta H_{ij,t-1} + \varepsilon_{ij,t}$$

$$\Delta H_{ij,t} = \alpha_{50} + \alpha_{51} * (L)\Delta MNET_{ij,t-1} + \alpha_{52} * (L)\Delta W_{ij,t-1} + \alpha_{53} * (L)\Delta LF_{ij,t-1} + \alpha_{54} * (L)\Delta LU_{ij,t-1} + \alpha_{55} * (L)\Delta H_{ij,t-1} + \varepsilon_{ij,t}$$

Following Abrigo and Love (2016), we tried to establish the lag structure of the PVAR model. Running several specifications, the first order PVAR(1) model appeared to satisfy the three criteria of model identification – having the smallest MSC-Bayesian information criterion (MBIC), MMSC-Akaike information criterion (MAIC) and MMSC-Hannan and Quinn information criterion (MQIC). Also, the unit root test of the newly transformed variables confirmed their stationarity (see Tables A3a-b, in the

Annex). The stability of the variables is also confirmed as having eigenvalues lower than one (see Figure A1 in the Annex). Therefore, our preferred model is the PVAR(1) model. It has been estimated following Abrigo and Love (2016) which accounts for the Helmert transformation of the variables. A number of studies propose to use a Helmert transformation of the variables, which allows removing panel fixed effects – in this context pair country fixed effects – present in a dynamic setting with lag dependent variables. The Helmert transformation – by taking the difference between the actual value of an indicator and its future mean values – allows for the orthogonality condition between transformed variables and the lagged dependent variable to be satisfied. Following these transformations, more consistent and efficient GMM estimates can be obtained (Abrigo and Love, 2016). Furthermore, given our large number of country pairs (N) and short time period (T), where N>T, GMM model estimation is suited for maximising the number of observations used for the inference and attainment of consistent estimates.

After estimating the PVAR(1) model (Specification 4, Table A4 in Annex)– the impulse response functions (IRFs) and Cholesky forecast-error variance decomposition (FEVD) have been calculated. The FEVD is useful for showing how much of the variance in the system is explained by changes/shocks of/to respective covariates. Whereas IRFs indicate how the respective variables would respond to a one standard deviation shock of a given variable while other variables of the system are kept constant.

The estimation results and IRFs are respectively presented in Table A4 and in Figure A2 in the Annex. According to Abrigo and Love (2016) and Philips (2020), using forward orthogonal deviation (FOD) or first difference (FD) may provide similar results. Still, with respect to efficiency FOD estimates appear to be preferable. We shall discuss in the following section the results obtained from estimating specification 4 in Table A4 in the Annex.

In particular, we single out three IRFs that are of special interest for this study:

› The impact of shocks ('impulses') of the various labour market and educational gap variables on net migration flows

› The impact of a 'net migration shock' on the other variables

› The impact of shocks ('impulses') of the various variables (including net migration flows) on human capital gaps.

We should remember that all the variables with the exception of net migration flows are specified as 'gaps' (specified as ratios in level terms) between the (potential) country of destination and the country of origin. The chosen PVAR estimation was in growth rate (or delta) terms, so that we analyse e.g. the impact of a change in a (percentage point) growth rate in the wage rate gap (or in the labour underutilisation gap) on a percentage-point change (again in growth rate terms) in net migration flows. Furthermore, the PVAR model is a system of fully interdependent (dynamic) equations, so that all interdependencies among the five variables can be analysed (For a full set of estimates see Annex, Figure A2, which show the IRFs for specification 4, Table A4).

Let us now discuss the three IRFs listed above, starting with the impact of the various labour market and educational gap variables on net migration flows. In this context we will also point to the significance of parameter estimates of specification 4 that can be found in Table A4.

## 4.1.   IRFS- RESPONSE OF MIGRATION TO LABOUR MARKET SHOCKS

As regards migration flows reacting to the various gaps in labour market and education indicators, we obtained – as expected – a high positive and significant parameter estimate for the wage gap on net migration flows that was persistent across specifications (see Table A4). Moreover, the IRF reveals the significant short-run impact of a high wage gap inducing net emigration flows. After further dynamic interactions across the variables are taken into account by the PVAR estimations, there is also a rebound in net migration flows.

The other significant variables on net migration flows estimated by the model refer to a high impact of a human capital gap on net migration. Because we do not include in this analysis a direct measure of the skill composition of migrants, this can be interpreted – as discussed in Section 3(a) – in two competing ways: (a) complementarity (HOS) hypothesis: a high skill endowment in the country of destination compared with the country of origin attracts particularly unskilled workers who are 'scarce' in the destination country and 'plentiful' in the country of origin; and (b) 'suitable working conditions' hypothesis: a high skill endowment in the destination country can lead to a high inflow of skilled workers who are attracted because they expect good employment possibilities in line with their skills. We shall come back to these two competing hypotheses, (potentially) explaining the relationship between human capital endowment gaps and migration flows which is obviously of importance for the discussion of 'brain drain' from the Western Balkans.

The other two variables – labour force participation (LFP) and labour underutilisation (LU) – show positive parameter estimates (only the latter being significant) with respect to net migration flows: a higher relative labour force participation rate in the destination country (or lower relative labour force participation in the source country) can indicate, on the one hand, demand pressure in the labour market of the destination country, which generates a 'pull' factor for inward migrants and, on the other hand, a low participation rate in the source country, which can indicate a low incentive to participate in the home market and could be a reason to look for better work opportunities in another (more attractive) labour market abroad. The IRF figure (Figure 3) captures a significant medium-/longer-run negative impact of the LF gap on net migration flows, i.e., after an initial positive impact the impact of the initial 'impulse' in relative LFP rates turns around and affects net migration flows negatively. One interpretation could simply be an 'overshooting': too many migrants react to a possible tightening of the labour market in the destination country, fail to find jobs or the right conditions and return to their country of origin.

The 'labour underutilisation' variable requires a more complex interpretation: why should there be more migration flows into the destination country when 'labour underutilisation' goes up in the destination country relative to the source country? Here we would refer to the specific phases over which the model was estimated: in some of the main destination countries (e.g. Germany and Austria) there was an improvement in unemployment rates (but also in other components of the composite indicator LU), both in a range of years before the financial crisis and also over the period 2013-2019, after the initial shock of the crisis. However, this applied equally (and even more so) to many of the Balkan countries. Hence, we have a situation whereby although the LU ratio falls, the relative improvement of the labour market situation in the WB source countries does not outweigh the attractiveness of an improved labour market situation in the main countries of destination. We would regard this as the most likely explanation of the IRF shape with respect to the LU variable, which is therefore quite consistent with the shape of the impact of the LF variable discussed above.

Figure 3 / Impulse response functions. Impulse: labour and human capital determinants. Response: migration
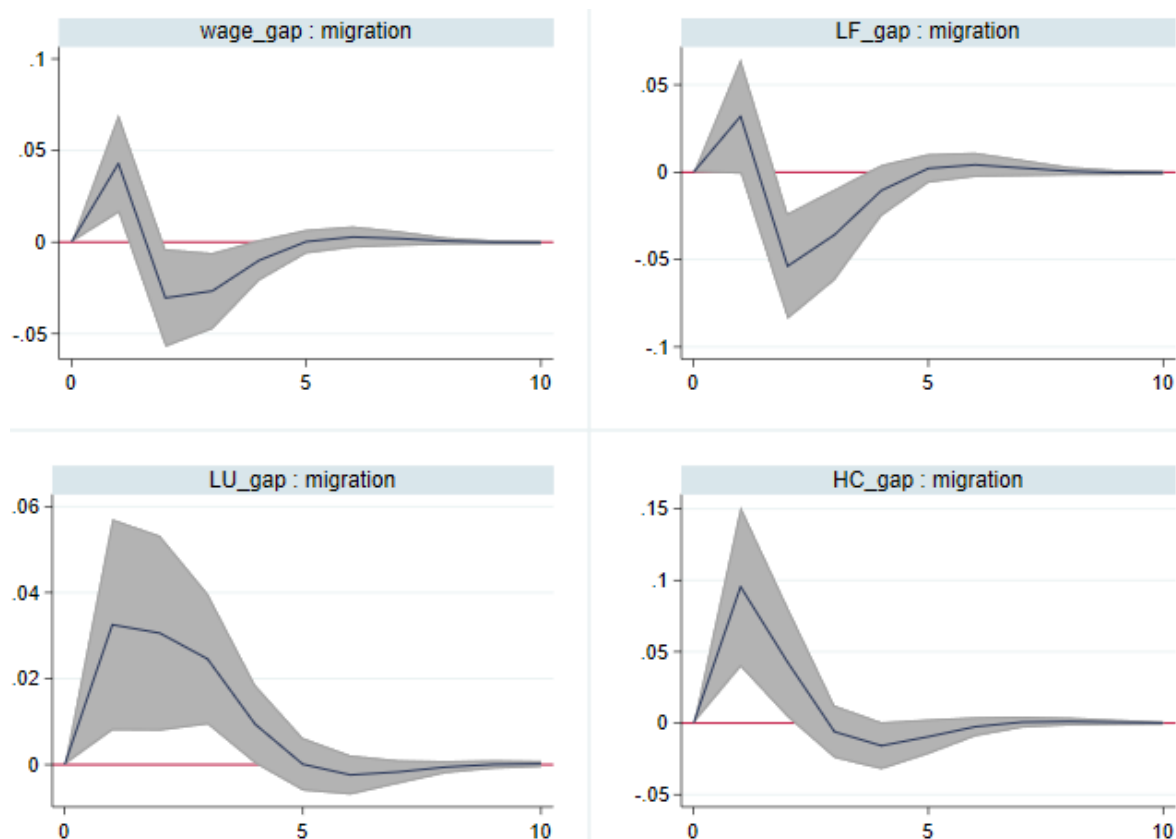
Note: The blue lines are orthogonalised impulse-response functions[10] ('impulse variable: response variable') with a 95% confidence interval of estimates attained with PVAR-GMM (Specification 4, Table A.4) computed using 1,000 Monte Carlo draws over the ten-year period.

We look further at the results of forecast error variance decomposition (FEVD), which helps us to understand how much of that variance is explained by changes in that variable or other variables of the model (see Table A5 in the Annex). We report the results for the first year and the subsequent five- and ten-year periods after the initial shock. The FEVD has been computed following the same Specification 4 as for the IRFs. As expected, most of the forecast error variance FEV is explained by own (one period lagged) changes in the variable. Nevertheless, we find that changes in wage gaps contribute to the variance of migration by 1.2% and the initial shock remains persistent over time (see Table A5). We also find that the human capital gap is important to explain the variance of migration and its impact is at 3.77% after five years, with a slight increase by the end of decade. Changes in LU and LFP gaps explain respectively 1% and 1.8% of the variance in migration. Comparing the FEV of different variables suggests that changes in the human capital gap contribute to the variance of migration much more than labour market changes, e.g. with respect to wage, LFP and LU gaps.

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[10]   Orthogonalised impulse response functions have been obtained via Cholesky decomposition.

4.2. IRFS- RESPONSE OF LABOUR MARKET INDICATORS AND HUMAN CAPITAL TO MIGRATION SHOCKS

Looking first at the econometric results (Table A.4 in the Annex, last column) and the parameter estimates for the migration impact (as explanatory variable) on the various other (relative labour market and human capital endowment) variables, we see a persistent (and significant) impact of migration flows on wage gaps and on relative human capital endowment, with little significance regarding the impacts on the other two variables.

The positive impact of migration on wage gaps may throw some (indirect) light on hypotheses (a) vs. (b) discussed above: if migration flows lead to an increase in the wage gap, it points more towards hypothesis (b), i.e. that relatively more productive workers are leaving the country, thereby widening the wage gaps between destination and source country. In principle, this could be true for both high- and lower-skilled workers, but on average one would expect high-skilled workers contributing more to productivity, and thus to a higher wage level, in the aggregate economy. Hence a relatively large outflow of skilled workers would lead to an increase in the wage gap. An analogous argument applies with respect to the significant positive impact of migration flows widening the gap in human capital endowments (between destination and source countries). This provides again an indirect support for hypothesis (b) above.

As to the impact of migration shocks on the two labour market indicators, the IRFs (Figure 4) show a positive impact of net migration on the relative labour force participation rate in the destination country compared with the source country. This could simply be a compositional shock, as we know that new cohorts of migrants (especially if they come from source countries whose nationals can obtain entry only if they have a valid work permit) have a high rate of labour market participation, and it may therefore positively affect the LFP rate in the destination country relative to that of the source country, where the LFP rate is either not much affected or even negatively affected if those who leave are among the more active ones. The impact of migration flows on the LU gap shows a delayed negative impact of an outward migration 'shock' (i.e. labour utilisation in the country of origin is rising relative to that in the destination country), which indicates the potential impact on unemployment rates and inactivity rates in the source countries following outward migration.

Therefore, migration acts by alleviating differences in labour underutilisation between countries and mobilising resources that would otherwise be lost. The confidence intervals suggest that such a response becomes significant after the first period, suggesting a certain lag between migration and LU response.

With respect to human capital, the impact of migration is found to be non-linear. Initially, migration may be accompanied by a widening of the human capital gap (although the impact is not outside the confidence interval, i.e. it is not significant), which would imply a brain drain effect for the country with the lower level of human capital endowment. Nevertheless, after the second period we find that the effect and the response turn negative and significant. The latter response suggests a reduction in the human capital gap, an outcome which supports a brain gain hypothesis. Nevertheless, the magnitude of

the impact is very small, since a one standard deviation shock of migration would generate a reduction in the human capital gap of just 0,002[11].

Figure 4 / Impulse response functions. Impulse: migration. Response: labour market and human capital determinants
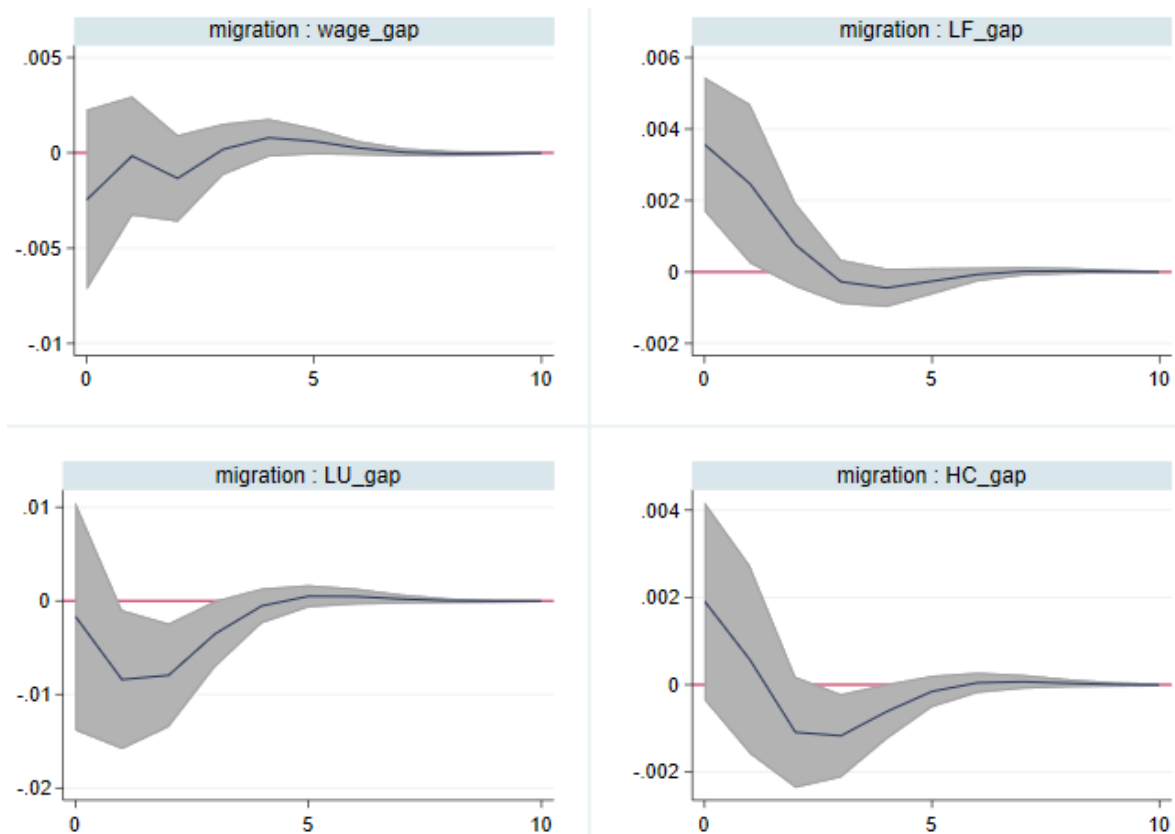
Note: The blue lines are orthogonalised impulse-response functions ('impulse variable: response variable') with a 95% confidence interval of estimates attained with PVAR-GMM (Specification 4, Table A.4) computed using 1,000 Monte Carlo draws over the ten-year period.

The FEVD with respect to migration and labour market indicators suggests that, first, most of the variance is explained by the lagged dependent variable. The FEVD suggest that migration is important for explaining 2.66% of the variation in the LFP gap and the impact is found to be slightly increasing over time – by up to 2.83% over the ten-year period. As concerns other labour market indicators, FEV explained by migration is less significant and below 1% with respect to wage gaps, labour underutilisation gaps and human capital gaps.

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[11] Furthermore, when estimating a reduced model with only four endogenous variables (i.e. dropping the LFP variable), which we undertook to check the robustness of the estimates (see Table A6 and Figure A3 in the Annex), this impact turns out to be no longer significant. All other patterns discussed under (a) to (c) and significance indicators remain robust with this more parsimonious specification.

4.3. IRFS- RESPONSE OF HUMAN CAPITAL TO LABOUR MARKET INDICATORS AND MIGRATION SHOCKS

The IRFs presented in Figure 5 report how human capital responds to shocks in labour market indicators as well as migration.

The econometrically estimated parameters (Table A.4 in the Annex) allow the following interpretation: a reduction in the wage gap reduces the gap in human capital endowment (but the effect is weak and not stable across specifications). An interesting aspect are the strongly significant impacts of the two other labour market variables which take on opposite signs. Higher relative labour force participation in the source country leads to a rise in the human capital endowment gaps between country of destination and country of origin. This could be interpreted as a compositional impact: as more persons get drawn into the labour force, these are more likely to be low-skilled workers (with lower levels of education), as the ones with higher levels of education already have relatively high rates of participation. This difference in participation rates is particularly marked in the WB economies (see wiiw and World Bank, 2018, 2019). The interpretation of the impact of a rise in the LU ratio (between country of destination and country of origin) in conjunction with an increase in the human capital gap is consistent with our interpretation of the LU gap variable under a. (above), where we discuss the determinants of migration flows. In many of the years before and after the financial crisis LU rates improved in both the main destination and the WB source countries, but more so in the latter than in the former. Indirectly, the impact on the human capital (HC) gap therefore supports our theory of a 'skills bias' in the composition of migrants leaving the WBs. Lastly, we have a weak positive impact of migrant flows on the HC gap, and this is again supportive of the skills bias in the migration outflows from the WBs.

As far as the IRF in Figure 5 is concerned, we see that the response of human capital with respect to positive changes in wage differentials is shown to be negative and persisting over time. The implication is that a higher wage gap between the receiving and the sending country may reduce the human capital gap between the two countries. Furthermore, the IRFs suggest that such an impact disappears after a five-year period. One explanation for this may be that better earnings prospects abroad can incentivise further investment in human capital at home. This is a well-known argument which has been originally developed by Stark (1997) – better working and earning prospects abroad drive further investment in human capital and consequently also rising human capital in the sending countries if there is a probability of migration.

The response of human capital to changes in LFP gaps indicate a nonlinear relationship, which is characterised by an initial positive effect of LFP on human capital, and after the first period the impact turns to becoming negative, see Figure 5. This outcome may suggest that an increase in the gap in LFP – e.g. more people leaving the labour market in the sending country relative to the receiving country to go into education or into other forms of inactivity – may be accompanied by a narrowing of the gap in human capital. In terms of size the negative effect also appears to be considerably stronger and longer-lasting than the short-run positive effect, suggesting that the former effect may be more important than the latter.

The IRFs furthermore suggest that the human capital gap responds positively to changes in labour underutilisation gaps. Such response is significant and persistent (over a five-year period). Our interpretation of this result refers again to the particular period in which labour underutilisation declined

in both the countries of destination and the countries of origin, but more so in the latter than in the former. In this period the LU gap was thus declining (see the earlier Figure 2), as was the HC gap.

Figure 5 / Impulse response functions. Impulse: migration and labour market determinants. Response: human capital
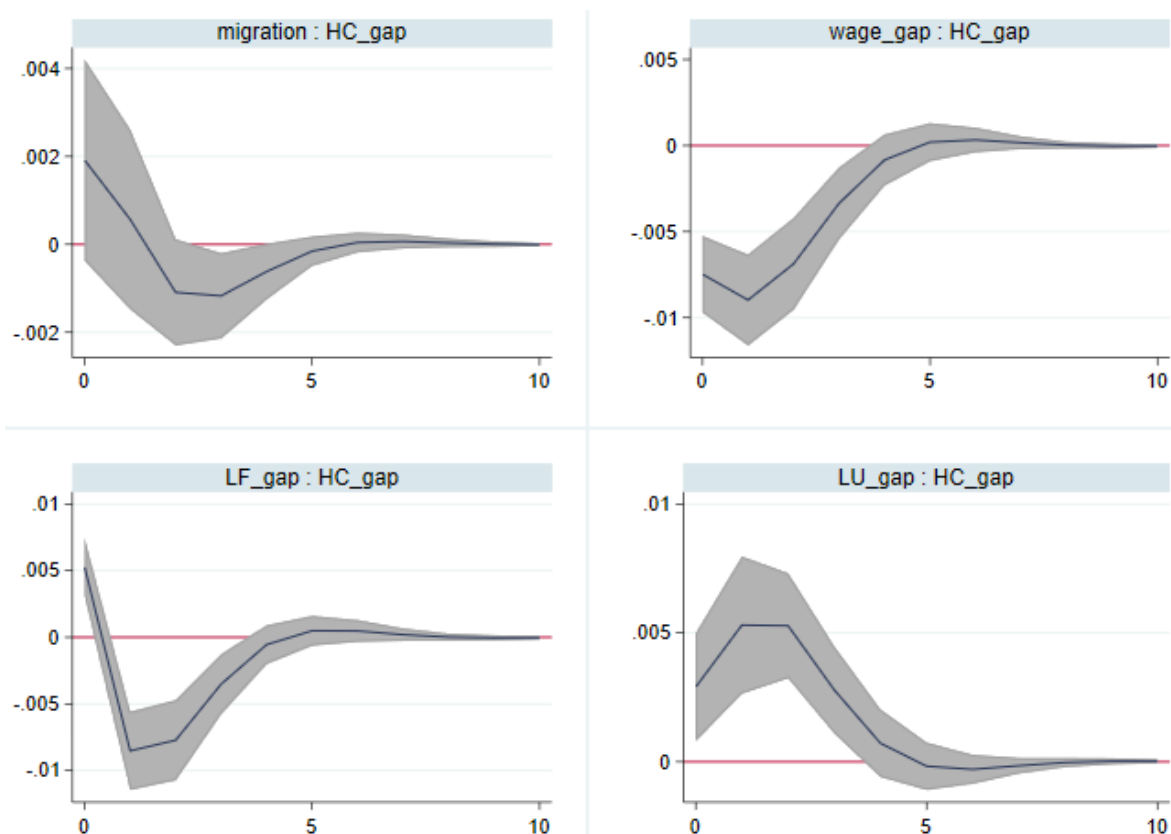
Note: The blue lines are orthogonalised impulse-response functions ('impulse variable: response variable') with a 95% confidence interval of estimates attained with PVAR-GMM (Specification 4, Table A.4) computed using 1,000 Monte Carlo draws over the ten-year period.

Looking now at the FEVD with respect to human capital indicates that changes in the wage gap and in LFP gaps, in particular, help to explain 16% and 14% of the variance in the human capital gap; over time such impact increases significantly between the first and fifth period. Furthermore, LU gap changes on human capital in the first year explain 1.2% of the variance in HC. However, the variance in HC explained by the LU gap changes rises to 5.9 % by the fifth period and remains close to this level up to the tenth year. In contrast, the variance in HC explained by migration has stayed almost insignificant at below 1% – a persistently low level – over the decade. The FEV suggests that gaps in labour market indicators and their fluctuations are much more important for explaining the changes in human capital than the changes related to outward mobility.

Overall, the FEDV results presented in Table A5 in the Annex suggest that:

› Most of the variance in the variables is explained by their own fluctuations.

› With respect to migration, its changes contribute mainly to explaining the variance with respect to LFP, but its changes are less significant when it comes to wage, LU and HC gaps.

› Wage gap changes explain an important part of the variance with respect to labour underutilisation as well as human capital gap changes.

› Labour force participation changes are particularly relevant for explaining the variance with respect to LU and HC as well as wage gaps.

› The impact of LU is demonstrated to be relevant for explaining the HC variance and to a lesser extent for LFP.

› Changes in the human capital gap turn out to be important for explaining changes in wage differentials, LFP gap changes and to a lesser extent changes in migration flows. Even though accounting for a limited amount of the variance in migration flows, changes in the human capital gap seems nonetheless important to explain changes over time of migration, more than changes in the wage and labour force participation gap variables.

5. Main findings and conclusions

The high outward mobility that has characterised the Western Balkan region over the past three decades is often considered as a source of troubles when it comes to labour market imbalances and lower levels of human capital persisting over time in these countries. This paper analyses the relationships between migration, the labour market and human capital and the main implications of mobility for employment, wages, human capital formation and labour utilisation.

To shed light on these issues we have looked at these relationships by employing a system of equations, whereby each equation accounts for the effects of labour market variables and human capital on migration and vice versa. The system of equations allows for determinants to be taken as endogenous. In the past a similar approach has been used to analyse regional mobility and labour market adjustment in Germany (Mitze, 2012) or push and pull factors of mobility in the EU28 (Landesmann and Leitner, 2015).

We have here applied a similar approach for the five WB countries. Our analysis covers the period 2005-2019, and the destination countries are the member countries of the EU-15. The empirical results sustain the argument that wage gaps and their changes have an impact on migration and are an important pull factor for driving outward mobility that can be persistent over time. Nevertheless, it seems that human capital gaps are also a powerful determinant for explaining outward mobility. The main implication of this finding is that gaps in human capital endowments and in the employability (or labour market conditions) of the more highly skilled workers in the home countries may act as a push factor for further outward mobility into countries where returns on human capital may be higher. This is a pattern we are observing in the five WB countries, where high-skilled outward mobility in particular, has been rising, and this mobility is directed towards economies with higher levels of human capital. A good example here is the outward mobility of students, but also of health professionals.

As to the question of whether migration is a source of troubles for the labour market, our analysis actually suggests that when it comes to gaps in labour underutilisation (LU) a positive impact is expected, i.e. a narrowing of the gap in LU. However, migration flows explain only marginally the variations in the LU gaps. With respect to gaps in labour force participation, we find a positive and much stronger effect, suggesting that an increase in the gaps may rise due to migration, an outcome which is likely to be explained by the self-selectivity of migrants – i.e. whether migrants come from the pool of inactive or unemployed workers. Such an outcome would suggest that in the case of the WB economies it may be that migration frequently occurs among those who have a job, and not only among those who are unemployed or inactive.

Regarding the hypothesis whether migration has generated a negative impact on human capital, we find evidence of both a positive and a negative effect of migration on changes with respect to a human capital gap. A narrowing of the human capital gap would sustain the hypothesis that migration may generate a positive response with respect to human capital formation. This outcome is in line with the theoretical work of Oded Stark (see references), according to which migration has a positive effect on

human capital formation over time. Nevertheless, such an impact is almost negligible. Instead, human capital responses are better explained by changes in labour market variables, particularly by changes in wage gaps and labour force participation gaps, pointing to the importance of labour market features being more important than migration in their impact on human capital gaps.

Among the main policy implications highlighted by our analysis is the finding that rather than blaming migration, more efforts should probably be made to introduce policies that would improve labour market conditions within the countries of the region (reduce labour underutilisation and incentivise participation rates). Wage gaps remain a strong pull factor and some adjustments in wage structures might be important to keep well trained persons in the country or exert an incentive for return migration of such persons.

We find that reducing human capital gaps does not necessarily reduce outward migration, as the more skilled/educated part of the work force reacts more strongly to the big gaps in wages and working conditions that exist between destination countries and those in the WB countries. Given their aspirations to become members of the EU and their special pre-accession relations with the EU (including visa-free travel regimes), the WB countries stand in a special position with highly open environment, hence the sensitivity to differences in work and living prospects among the working-age population in these countries is very high. Consequently, strong attention has to be paid to exploit the potential that exists from benefiting from intensive exchanges with the outside world. This relates to improving the attractiveness particularly for young people to return after their studies abroad, but also other groups that received training or accumulated work, managerial and entrepreneurial experiences abroad.

Gaps in labour market, institutional and other conditions between the main destination countries and the countries in the Western Balkans cannot be closed overnight, but are strongly linked to a sustained development strategy that includes the nurturing of areas of economic activity that require well-trained and educated persons (such as happened with the more recent re-industrialisation drives in Serbia and North Macedonia) often with a strong involvement of foreign direct investment, and also making efforts to be included in global value chains (such as has been happening through platform work participation in IT sector). Further, paying much more attention to devote critical resources to improve the working conditions in essential sectors such as health and education and improving the quality of institutions more generally (not explicitly captured in our exercise) would be an essential component of such a development strategy in the region.

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World Bank and wiiw (2020), *Western Balkans Labor Market Trends 2020*, Vienna, March 2020, https://data.wiiw.ac.at/seejobsgateway.html

World Bank (2019), *World Development Report 2019: The Changing Nature of Work*, https://www.worldbank.org/en/publication/wdr2019

World Economic Forum (WEF) (2017), *Global Human Capital Report 2017,* https://weforum.ent.box.com/s/dari4dktg4jt2g9xo2o5pksjpatvawdb

7. Annex

Table A 1 / Data sources

Indicators	Description	Country coverage	Period	Data sources	Link
Stock of migrants	UN statistics Eurostat population statistics Net migration has been generated as the difference between the stocks of migrants at time (t) with (t-1).	France, Germany, Greece, Luxemburg, Portugal, Spain. The UK data are obtained from UN statistics. The other countries' data are obtained from Eurostat.	2015-2019	United Nations, Department of Economic and Social Affairs, Population Division (2019). Eurostat population statistics	https://www.un.org/en/development/desa/population/index.asp https://ec.europa.eu/eurostat/web/population-demography-migration-projections/data
Wages	Mean annual earnings, (EUR, in pps) The wage gap has been generated as the ratio between wages in the receiving country and wages in the sending country	EU15 (Austria, Belgium, Denmark, Finland, Germany, Greece, France, Italy, Ireland, Luxemburg, Netherlands, Portugal, Spain, Sweden, the UK, WB5 (Albania, Bosnia and Herzegovina, Serbia, North Macedonia and Montenegro)	2015-2019	wiiw database	https://www.wiiw.ac.at
Labour force participation rate	ILO estimates, in % The labour force participation gap has been generated as the ratio between the LFP in the receiving country with the LFP in the sending country	EU15, Western Balkan	2015-2019	ILO Statistics on international labour migration	https://ilostat.ilo.org/topics/labour-migration/

contd.

Table A 1 / Contd.

Indicators	Description	Country coverage	Period	Data sources	Link
Labour underutilisation rate	ILO estimates, in %, Composite rate of labour underutilisation (LU4). LU4 = (Unemployed + Potential labour force + Time related underemployment)/(Labour force + Potential labour force). Persons in time-related underemployment are defined as all persons in employment who, during a short reference period, wanted to work additional hours, whose working time in all their jobs was below a specified threshold of hours, and who were available to work additional hours if they had been given the opportunity to do so. The potential labour force consists of people of working age who were actively seeking employment, were not available to start work in the reference week, but would become available within a short subsequent period (unavailable jobseekers), or who were not actively seeking employment but wanted to work and were available in the reference week (available potential jobseekers). https://ilostat.ilo.org/topics/unemployment-and-labour-underutilization/; https://ilostat.ilo.org/resources/methods/forms-of-work/#underutilization. The labour underutilisation gap has been generated as the ratio between the LU rate in the receiving country with the LU rate in the sending country.	EU15, Western Balkan	2015-2019	ILO Statistics on international labour migration	https://ilostat.ilo.org/topics/labour-migration/
Human capital (HC)	Average number of completed years of education of a country's population aged 25 years and above. $$HC = \begin{cases} = 0{,}134 * s \ \ if \ s \leq 4 \\ \\ = 0{,}134 * 4 + \\ 0{,}101 * (s - 4) \\ if \ s4 \leq s \leq 8 \\ \\ = 0{,}134 * 4 + 0{,}101 * 4 \\ + 0{,}068 * (s - 8) \ \ if \ s > 8 \end{cases}$$	EU-5, Western Balkan	2015-2019	UNESCO Education statistics	http://data.uis.unesco.org/

Table A 2 / Summary statistics

Variable	Number of observations	Mean	Std. Dev.	Min	Max
Stock of migrants growth rate, ij	880	0,147	0,856	-1	13
Wage differential, ji, growth rate	915	-0,013	0,056	-0,232	0,161
Labour force participation ratio, ji, growth rate	990	-0,003	0,027	-0,104	0,121
Labour underutilisation ratio, ji, growth rate	900	0,044	0,147	-0,222	1,089
Human capital ratio, ji, growth rate	720	-0,015	0,026	-0,124	0,088

Table A 3a / Lag order choice of the model

Lag	CD (coefficient of determination)	J (Hansen)	J pvalue	MBIC	MAIC	MQIC
1	0,978	276,731	0,000	- 614,295	- 23,269	- 257,791
2	0,974	226,648	0,000	- 515,873	- 23,352	- 218,786
3	0,972	186,696	0,000	- 407,321	- 13,304	- 169,652
4	0,847	164,825	0,000	- 280,688	14,825	- 102,435

Table A 3b / Fisher type unit root test

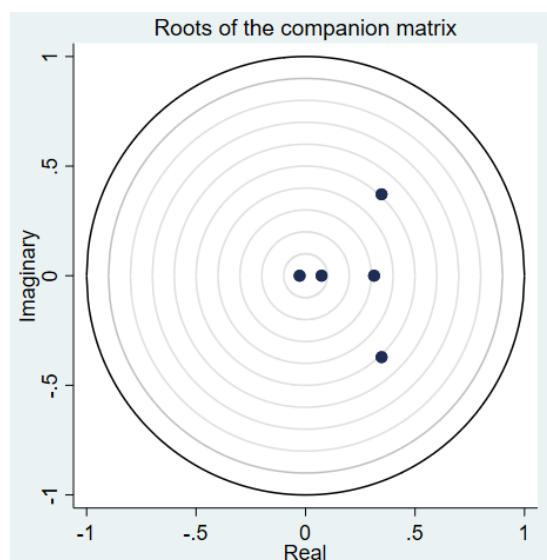| Test statistics	Migration	W	LF	LU	H
Inverse chi-squared(P)	422,69	504,93	353,37	487,83	278,10
p-value	0,00	0,00	0,00	0,00	0,00
Inverse normal (Z)	-11,19	-15,00	-10,61	-15,11	-9,21
p-value	0,00	0,00	0,00	0,00	0,00

Figure A 1 / Eigenvalue stability condition, Specification 4

Table A 4 / PVAR (1) GMM estimation results

	Specification 1 (FD_2_4) Δ_MNET	Specification 2 (FOD_1_3) Δ_MNET	Specification 3 (FD_TD_2_4) Δ_MNET	Specification 4 (FOD_TD_1_3) Δ_MNET
Δ_MNET				
L. Δ_MNET	0.10*	0.068**	0.11**	0.082**
	(0.039)	(0.026)	(0.041)	(0.029)
L. Δ_W	0.75*	1.18***	0.81*	1.41***
	(0.30)	(0.20)	(0.34)	(0.23)
LΔ_LF	-1.63+	0.11	-2.13*	0.66
	(0.87)	(0.56)	(1.03)	(0.75)
L. Δ_LU	0.31**	0.13*	0.42**	0.18*
	(0.11)	(0.060)	(0.13)	(0.082)
L. Δ_H	3.10*	1.99*	4.26**	3.63**
	(1.21)	(0.78)	(1.39)	(1.19)
Δ_W				
L. Δ_MNET	0.0075***	0.0066**	0.0083***	0.0059*
	(0.0015)	(0.0023)	(0.0018)	(0.0023)
L. Δ_W	-0.014	0.051	-0.0051	0.082+
	(0.055)	(0.046)	(0.055)	(0.045)
LΔ_LF	-1.05***	-1.06***	-0.89***	-0.53***
	(0.15)	(0.14)	(0.16)	(0.15)
L. Δ_LU	0.026	0.033*	0.029	0.037*
	(0.024)	(0.016)	(0.024)	(0.017)
L. Δ_H	-0.43***	-0.59***	-0.33**	-0.71***
	(0.13)	(0.15)	(0.12)	(0.16)
Δ_LF				
L. Δ_MNET	0.0035	0.0026	0.0030	0.0030+
	(0.0025)	(0.0017)	(0.0021)	(0.0018)
L. Δ_W	0.043+	0.056***	0.031	0.052**
	(0.022)	(0.017)	(0.020)	(0.017)
LΔ_LF	-0.33***	0.16**	-0.33***	0.077
	(0.090)	(0.060)	(0.082)	(0.063)
L. Δ_LU	0.0051	-0.015+	-0.0017	-0.021*
	(0.013)	(0.0085)	(0.012)	(0.0093)
L. Δ_H	0.47***	0.42***	0.40***	0.42***
	(0.13)	(0.090)	(0.12)	(0.096)
Δ_LU				
L. Δ_MNET	0.012*	0.00094	0.0049	-0.0021
	(0.0052)	(0.0037)	(0.0048)	(0.0029)
L. Δ_W	0.12	-0.33***	0.065	-0.38***
	(0.14)	(0.081)	(0.15)	(0.082)
LΔ_LF	-2.24***	-1.21***	-2.10***	-2.04***
	(0.42)	(0.31)	(0.47)	(0.31)
L. Δ_LU	0.094	0.25***	0.11	0.27***
	(0.072)	(0.056)	(0.077)	(0.058)
L. Δ_H	-0.050	0.21	-0.46	0.078
	(0.46)	(0.28)	(0.49)	(0.27)

<div align="right">contd.</div>

Table A 4 / Contd.

	Specification 1 (FD_2_4) Δ_MNET	Specification 2 (FOD_1_3) Δ_MNET	Specification 3 (FD_TD_2_4) Δ_MNET	Specification 4 (FOD_TD_1_3) Δ_MNET
Δ_H				
L. Δ_MNET	0.00097+	0.0024*	0.0015*	0.0028*
	(0.00053)	(0.0012)	(0.00059)	(0.0012)
L. Δ_W	0.078***	-0.028+	0.10***	-0.029+
	(0.016)	(0.015)	(0.017)	(0.016)
LΔ_LF	-0.49***	-0.32***	-0.57***	-0.46***
	(0.056)	(0.067)	(0.058)	(0.070)
L. Δ_LU	0.030***	0.032***	0.032***	0.030***
	(0.0067)	(0.0081)	(0.0073)	(0.0090)
L. Δ_H	-0.074	0.51***	-0.11	0.55***
	(0.072)	(0.077)	(0.071)	(0.081)
N	550	514	550	514
J	179.1	178.5	182.1	178.9
J_pval[12]	2.0e-16	2.4e-16	6.5e-17	2.2e-16

Standard errors in parentheses: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

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[12] Hansen J p-value attained from the estimating PVAR(1) indicate that there may be an issue of model misspecification. However, the literature argues that this may be the case when the number of instruments is high and Hansen test may be not reliable.

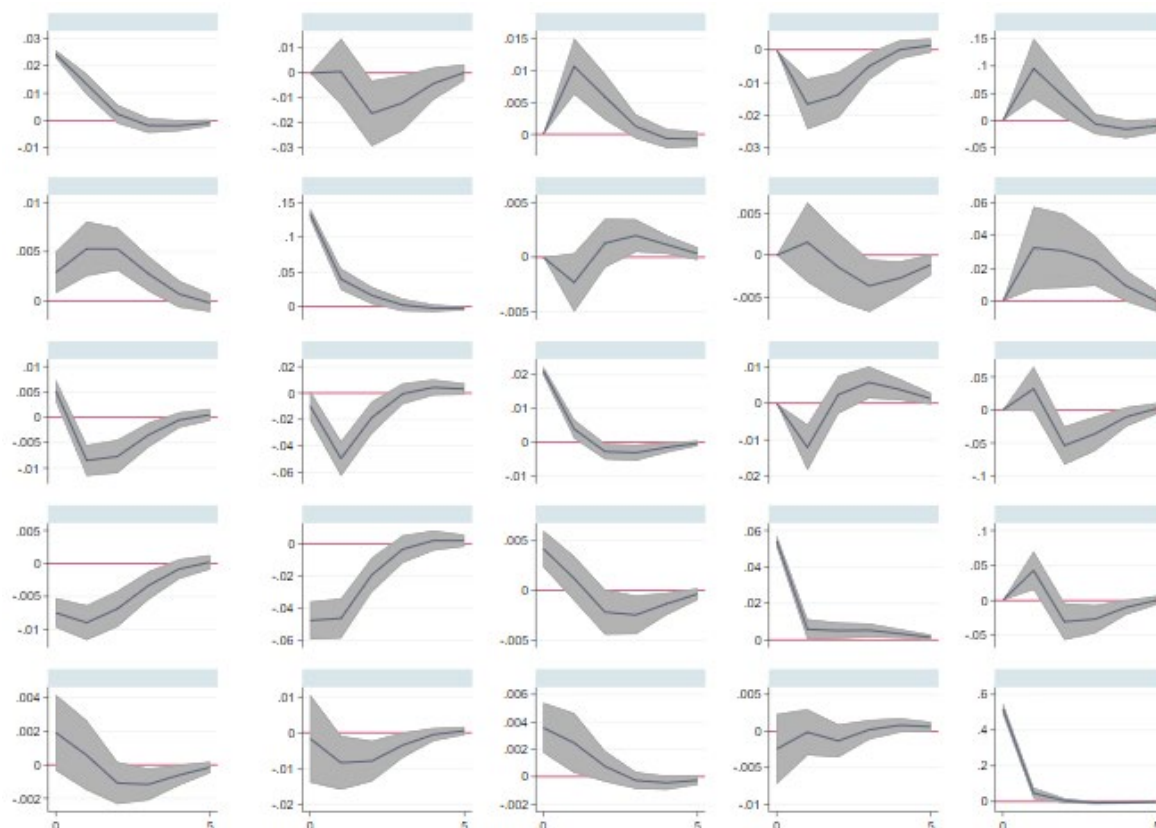**Figure A 2 / Impulse response functions Specification 4 - (FOD_TD_1_3)**

Table A 5 / Forecast error variance decomposition, Specification 4

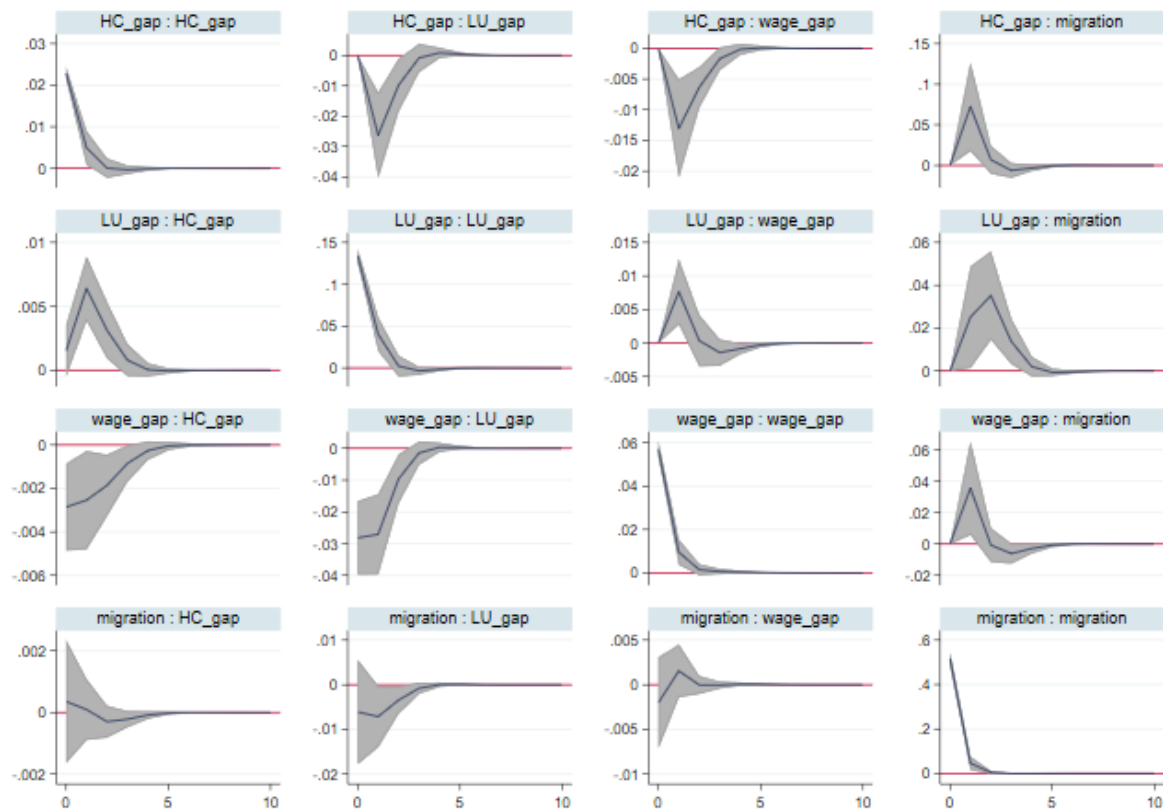| Response variable and Forecast horizon	Impulse variables Δ_MNET	Δ_W	Δ_LFP	Δ_LU	Δ_H
Δ_MNET					
1	1,0000	-	-	-	-
5	0,9235	0,0120	0,0178	0,0090	0,0377
10	0,9230	0,0120	0,0179	0,0090	0,0380
Δ_W					
1	0,0021	0,9979	-	-	-
5	0,0023	0,8076	0,0532	0,0066	0,1303
10	0,0024	0,8064	0,0535	0,0069	0,1308
Δ_LFP					
1	0,0266	0,0369	0,9365	-	-
5	0,0283	0,0456	0,6940	0,0175	0,2145
10	0,0283	0,0458	0,6930	0,0177	0,2152
Δ_LU					
1	0,0001	0,1125	0,0046	0,8827	-
5	0,0053	0,1719	0,1033	0,7044	0,0150
10	0,0054	0,1720	0,1036	0,7040	0,0151
Δ_H					
1	0,0054	0,0819	0,0405	0,0123	0,8599
5	0,0057	0,1600	0,1411	0,0594	0,6337
10	0,0057	0,1600	0,1414	0,0595	0,6335

FEVD standard errors and confidence intervals based on 200 Monte Carlo simulations.

Table A 6 / Reduced form of PVAR(1) GMM estimation results

	Specification 1 (FD_2_4)	Specification 2 (FOD_1_3)	Specification 3 (FD_TD_2_4)	Specification 4 (FOD_TD_1_3)
Δ_MNET				
L. Δ_MNET	0.058	0.058*	0.073+	0.091**
	(0.036)	(0.025)	(0.038)	(0.028)
L. Δ_W	1.18**	0.51*	1.44***	0.86**
	(0.36)	(0.24)	(0.40)	(0.28)
L. Δ_LU	0.20+	0.12+	0.30*	0.15+
	(0.11)	(0.070)	(0.12)	(0.088)
L. Δ_H	1.13	1.11	1.89	3.16**
	(1.20)	(0.77)	(1.37)	(1.21)
Δ_W				
L. Δ_MNET	0.0067***	0.0038	0.0075***	0.0048*
	(0.0015)	(0.0027)	(0.0017)	(0.0023)
L. Δ_W	0.11	0.18**	0.098	0.17**
	(0.068)	(0.056)	(0.065)	(0.052)
L. Δ_LU	0.060*	0.072***	0.066*	0.064***
	(0.026)	(0.019)	(0.026)	(0.018)
L. Δ_H	-0.52**	-0.77***	-0.30*	-0.57**
	(0.17)	(0.23)	(0.15)	(0.17)
Δ_LU				
L. Δ_MNET	0.0031	-0.0039	-0.00015	-0.011*
	(0.0047)	(0.0036)	(0.0050)	(0.0049)
L. Δ_W	0.00097	-0.45***	0.090	-0.38***
	(0.15)	(0.094)	(0.15)	(0.096)
L. Δ_LU	0.10	0.27***	0.084	0.32***
	(0.089)	(0.070)	(0.094)	(0.075)
L. Δ_H	-0.77	-0.74**	-1.32*	-1.15***
	(0.60)	(0.25)	(0.63)	(0.32)
Δ_H				
L. Δ_MNET	0.00015	0.00052	0.00052	0.00053
	(0.00071)	(0.00056)	(0.00073)	(0.00057)
L. Δ_W	0.079***	-0.012	0.11***	-0.011
	(0.021)	(0.018)	(0.022)	(0.018)
L. Δ_LU	0.034***	0.042***	0.035***	0.045***
	(0.0097)	(0.0086)	(0.010)	(0.0088)
L. Δ_H	-0.19+	0.21*	-0.22+	0.21*
	(0.11)	(0.090)	(0.11)	(0.091)
N	550	514	550	514
J	121.3	90.6	135.6	108.2
J_pval[13]	2.5e-12	0.00000016	1.0e-14	3.3e-10

Standard errors in parentheses: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

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[13]   Hansen J p-value attained from the estimating PVAR(1) indicate that there may be an issue of model misspecification. However, in the literature argues that this may be the case when the number of instruments is high and Hansen test may be not reliable.

wiiw Working Paper 196

Figure A 3 / Impulse response functions Specification 4 - (FOD_TD_1_3), reduced form