

**Professor Marta-Christina SUCIU, PhD**

**Faculty of Theoretical and Applied Economics**

**The Bucharest University of Economic Studies**

**E-mail: Christina.suciu@economie.ase.ro**

**Professor Mirela CRISTEA, PhD\* (Corresponding author)**

**University of Craiova, Faculty of Economics and Business**

**Administration, Department of Finance, Banking and**

**Economic Analysis**

**Center for Banking and Financial Research**

**E-mail: mirelas.cristea@gmail.com**

**Associate Professor Grațîela Georgiana NOJA, PhD**

**West University of Timișoara, Faculty of Economics and**

**Business Administration, Department of Marketing and**

**International Economic Relations, East European Center for**

**Research in Economics and Business**

**E-mail: gratiela.noja@e-uvt.ro**

## **IMMIGRATION EFFECTS WITHIN THE EU-BREXIT FRAMEWORK: AN EMPIRICAL ANALYSIS**

***Abstract.** This research aims to assess the Brexit spillovers upon ten EU economies (EU-10), through labour mobility, as a core pillar of regional integration. In this regard, we have developed two scenarios on the outputs obtained by EU-10 related to GDP growth and labour market main results both for natives and the foreign population under the effects of labour and humanitarian immigration flows framed within the Brexit context (2000-2019). We have built up a panel consisting of representative indicators that have been standardised in order to ensure accurate results for the specific macro-econometric and structural equations models (SEM) applied. The results highlight that the EU-10 will be positively influenced by immigration considering the labour market outcomes, as revealed by important employment levels increases, even though the impact largely differs across countries, under a compelling spatial presence.*

***Keywords:** immigration flows, Brexit, European integration, economic growth, labour market, econometric modelling.*

**JEL Classification: F15, F22, F63.**

### **1. INTRODUCTION**

European economic integration resides on granting the four basic freedoms of movement, with labour mobility as one of the most controversial pillar that weighted heavily also in the Brexit decision.

The Brexit vote in 2016 was influenced in a great manner by natives' reluctance towards migrants that has increased during the latest years, especially in the background of the refugee crisis in Europe (Clarke and Whittaker, 2016; Parker, 2017), and highlights the risk of hardening barriers for labour movement within the EU. This situation regards mostly the low-skilled workers that might also bring an unfavourable spillover impact on the high-skilled workforce mobility and correspondingly on the potential impact for long-run economic development in migrants' countries (both for the sending and hosting states).

Within the Brexit framework, several studies had highlighted the potential impact upon European economies through multiple channels, like foreign direct investment (FDI), trade, financial services, industrial policies, settlements, fiscal involvement, living standard (expressed mostly in terms of income), while migration has been often comprised as a fundamental influential factor (e.g. Booth et al., 2015; Beggand Mushövel, 2016;Portes, 2016; Jafari and Britz, 2017; Simionescu et al., 2017).

Although there are several studies considering migration implications after Brexit, these have mostly investigated the impact for the UK economy(e.g. Kierzenkowski et al., 2016; Jafari and Britz, 2017; Parker, 2017; Portesand Forte, 2017), and fewer for the otherEU-27 Member States (MS)and the UK (Irwin, 2015; Beggand Mushövel, 2016;Simionescu et al., 2017).

Based on various implications of migration within the Brexit outlook and few researches which analysed these credentials for all or correspondingly for a group of EU MS, *the main objective of our paper is to examine the Brexit spillovers upon ten EU MS (EU-10) most targeted by migrants (including the UK) through the free movement of persons (labour mobility), as a core pillar of regional integration.* Different from other similar researches, we have built up a complex panel of EU-10 MS, considered for the 2000-2019 time span(2019 representing the time limit for Brexit negotiations, which have started in 2017). Furthermore, we have analysed based on *Stata program* a complex set of indicators (200 observations per each) that have been next extrapolated and standardised in order to obtain accurate results from the appropriate *macro-econometric models* and *structural equations modelling (SEM)*.

The paper is structured on three main parts: after a brief introduction on the research topic's importance, the first part presents a brief review of the specialised literature; in the second part we have detailed the data used for the empirical analysis and the methodological endeavour, while the last part comprises the main research results, discussions and final remarks.

## **2. BRIEF LITERATURE REVIEW**

Numerous scenarios regarding the implications of the UK's decision to leave the UE were investigated by researchers, both forwards, and after the Brexit decision vote (June 2016).

The effects of migration after Brexit would highly depend on the new partnerships stated and conditions negotiated by the UK.

In this regard, Booth et al. (2015) investigated the implications of regulation, trade and labour migration for the UK's economy.

They took into account four potential alternatives of what kind of partnerships UK might select after Brexit, as follows: (1) there is no new partnership with the remaining EU MS; (2) a Free Trade Agreement (FTA) negotiated with the EU-27; (3) a combination of the FTA stated with the EU, and another one with the rest of the world; (4) it drops out any participation to the EU budget. For the first two scenarios, all the variables investigated would generate a loss for the UK's GDP (estimated to be greater for the first scenario), while for the last two scenarios we might anticipate these would result in a gain of GDP (predicted to be higher for the 4<sup>th</sup> scenario).

The research performed by Irwin (2015) represents one of the most extensive studies dedicated to this particular topic, focusing on the Brexit implications upon the UK and the other EU-27. Irwin measured the impact intensity (impact scale) of 10 variables (channels) by applying the multiple metrics score. The variables considered were: immigration, FDI, regulation, industrial policies, budget, financial services, trade, international influence, uncertainty. The results obtained revealed high and unfavourable effects for the UK's economy. The impact intensity of Brexit upon the remaining EU-27 countries was grouped into four categories, corresponding to a very high, high, medium and low impact. As regards migration, the expected effects are on a *medium scale* (on the niche), especially for Poland.

Begg and Mushövel (2016) analysed the GDP effects of migration, employment opportunities, and public finances, also for the EU-27 and the UK. They focus their debate on the main scenarios (short and long-term) accounted by a group of economists. Their results revealed that, there might be expected negative implications both for the UK, and for the EU-27, concerning mostly *the short-term*; it is anticipated a GDP variation ranging between a 10% loss to a 4% growth, according to different economists, *for the long run*. As regards migration, positive effects might happen, since EU migrants "are significantly more likely to be in employment than their indigenous counterparts and make a positive contribution to the UK's public finances" (Begg and Mushövel, 2016: 4).

The effects for the UK's economy determined by immigration, alongside with trade, skills, confidence, FDI and deregulation were studied by Kierzenkowski et al. (2016). These authors consider that GDP would be over 3% lower by 2020 (near term), and over 5% until 2030 (longer term), since "... structural impacts would take hold through the channels of capital, immigration and lower technical progress" (Kierzenkowski et al. 2016: 5).

The combined implications of trade, reduced EU labour immigration, and FDI might generate a total GDP decrease of over 3% for the UK, as outlined by Jafari and Britz (2017). Parker (2017) examined the political implications for migrants after Brexit. The author started from the presumption of an "*obviously impact adversely on national labour markets*" of migration (Parker, 2017: 11).

Parker revealed that it is expected to register “*a net economic positive impact*” of migration from EU MS in the case of the UK, according to “*a progressive politics*”. Implication of flows and migration policies upon the UK would determine the raising in regulatory burdens with anticipated effects on decreasing the output of unskilled and skilled labour “... *and an increase in illegal working*” (Portes, 2016: 20).

Portes and Forte (2017) have studied the effects for the UK’s economy of migration, employment, salaries, and development. They highlighted that the decreases in migration “*are likely to have a significant negative impact on the UK GDP per capita (and GDP), with marginal positive impacts on wages in the low-skill service sector*” (Portes and Forte, 2017: S31). Sampson (2017), attempting to explain better the main findings of Portes and Forte (2017), supposed these impacts would be significant, “*particularly for sectors such as finance that rely on access to highly skilled workers from across the EU*” (Sampson, 2017: 173).

Various researches (Boubtaneet al., 2015; Comes et al., 2018) proved that migration leads to significant higher economic impacts than FDI or trade, expressed especially in terms of productivity and real GDP growth. These results are justified, on one hand, by pointing out the relevance of intellectual capital and high-skilled migrants (skill composition of migration), also highlighted by Roman and Popescu (2015), and Boboc et al. (2015). On the other hand, Parker (2017) outlined, in the Brexit context, that “*even in the UK case where the issue has been most controversial and politicised, the evidence suggests a net economic positive impact of EU migration*” (Parker, 2017: 23). Boswell (2016) and Booth et al. (2015) underlined the necessity for better training and education policies (ALMPs) for natives (e.g. British labour force) since a significant reduction of labour might generate damaging effects. Marcu and Dobrotă (2017), as well as Netoiu et al. (2014), underlined the need for innovation, encouraging investments in lifelong learning & education, flexible and adaptable labour market policies, in order to reduce the poverty rate, to support economic and social developments and to decrease the inequalities among MS.

Based on the literature review, we can conclude that there are many studies that investigated the Brexit impacts through migration, both on the UK (as a focus point for most of the researches) and on the EU MS (fewer studies), but, as far as we know, none of these applies an extensive methodology and various models to ensure proper results and interpretations. Nevertheless, in addition to being designed as a comprehensive study focusing on the immigration effects in EU-10 countries most targeted by migrants under the Brexit perspective, this research broadens the foresight of performances achieved by these countries expressed in terms of GDP growth and labour market outcomes, revealed both in the case of own and outside population.

### 3. DATA AND METHODOLOGY

By investigating the main findings of the literature, lined up to our general main research objective, we have designed our analysis such as to include in the panel the **following data (variables)**:

*i) international migration variables:* immigrants' flows (IMIG); asylum seekers inflows (number of applications) (ASYL);

*ii) economic development, labour market and related representative variables:* GDP growth rate (GDP\_growth) (%); employment rate (ER, ER\_F) and unemployment rate (UR, UR\_F) (%) of total and foreign population (F); at-risk-of-poverty rate (POV\_R); annual net earnings of a two-earner married couple with two children (EARN) (euro); educational level reflected through the educational attainment for tertiary education (EDU\_tert), and the participation rate in education and training (EDU\_part); the active labour market policies (ALMPs), and the passive labour market policies (PLMPs); life expectancy at birth (LE); business enterprise R&D expenditures for the business enterprise sector as a percentage of the GDP (BERD); Gini coefficients (index) (GINI);

*iii) globalization variables:* KOF Index of Globalization – overall (total) and economic dimensions (KOF\_T, KOF\_E).

The general panel covers the EU-10MS most targeted by migrants for 2000-2019 time period, based on the statistical data for 2000-2015. We have proceeded to use extrapolation as a mathematical method, for the 2016-2019 series, to forecast a sample of the statistical data expected evolution. The databases used for collecting our variables (200 observations per each group of variables) are: ETH Zurich, Eurostat (European Commission); Organisation for Economic Co-operation and Development (OECD); Un Refugee Agency (UNHCR); World Development Indicators (World Bank).

Regarding *the international migration situation*, in 2015, the total number of migrants in Europe (over 76 million people) has increased with almost 4 million people compared to 2014, representing 31.25% from the total stock of migrants at the worldwide level (over 243 million persons) (UN DESA, 2015). In 2015, *the most targeted EU-10 MS by migrants* were: "Germany (12 million migrants stock), the United Kingdom (8.5 million), France (7.8 million), Spain (5.9 million), Italy (5.8 million), Sweden (1.6 million), Austria (1.5 million), Belgium (1.4 million), Denmark (572 thousands), Finland (315 thousands)" (Noja et al., 2018: 6). Bilaterally, the main migrant sending economies are in fact developing countries, looking for cross-border jobs (e.g. Poland, with 3.6 million of migrants, Romania, almost 3 million). As a result of the Brexit vote, the flow of immigrants in the UK declined slightly in 2016 compared with the previous year, while emigration rose due to the insecurities brought by the Brexit vote (Eurostat, 2017).

*The refugees' statistics*, at the level of 2016 year, counted 22.5 million moved away people, being considered "*the highest on record, although the annual rate of growth has slowed since 2012*" (OECD, 2017).

Large shares of *asylum seekers* in Europe were registered by Germany and Italy, “Germany remained the top recipient, with over 720,000 applications, followed by the United States (262,000) and Italy (123,000)” (OECD, 2017: 32).

Hence, Europe is confronting nowadays with double flows of international migration: (1) the labour migration flows, especially coming from European emergent developing countries (*labour or economic migration*); (2) growing flows of refugees and asylum seekers, forced by political incertitude or poverty to leave their countries and to look for international security (*humanitarian migration*). These two types of specific migration flows induce direct or indirect connections to the expected outcomes in different economic fields, mainly on the labour market. All of these flows bring major economic transformation and are therefore considered to be very significant and relevant for our analyse from an empirical point of view.

In the *methodological endeavour*, we have firstly applied *the standardisation procedure* for the indicators used in the empirical analysis and we have suggested the use of a composite indicator determined according to the equation (1) (OECD, 2005):

$$y_i = \frac{x_i - \text{mean}}{sd}, \quad (1)$$

where:  $x_i$  represents the crude value of the indicator; and  $sd$  is the standard deviation. Thus, the standardisation method allowed us to convert all indicators to a common scale (standard deviation of the indicator across countries is the scaling factor) to provide a suitable comparability and statistical representativeness of data among countries in order to avoid aggregation distortions.

Furthermore, the impact of economic(labour) immigration upon labour market outcomes and economic growth of the receiving economies under the implications of Brexit spillovers was investigated based on *distinctive macro-econometric models* and associated next methods specific to Stata program. Thus, we have configured and processed a general model through random and fixed effects (FE or RE - *model 1*, with results reported according to the Hausman test), spatial analysis (spatial lag – *model 2*, and lag bootstrap – *model 3*, respectively spatial error – *model 4*, and error bootstrap – *model 5*), robust regression (REG, general–*model 6*, and bootstrap – *model 7*), and panel corrected standard errors (PCSE –*model 8*).

The macro–econometric model for the migration-GDP\_growth impact is designed as a baseline panel regression model (2a), but reshaped through the spatial procedures (lag,2b, and error, 2c), according to equations (2a), (2b) and (2c).

$$GDP\_growth_{it} = \beta_0 + \beta_1 IMIG_{it} + \beta_2 ER_{it} + \beta_3 EDU\_tert_{it} + \beta_4 EDU\_part_{it} + \beta_5 BERD_{it} + \beta_6 ALMPs_{it} + \beta_7 PLMPs_{it} + \beta_8 GINI_{it} + \beta_9 EARN_{it} + \beta_{10} KOF\_E_{it} + u_{it} \quad (2a)$$

$$GDP\_growth_{it} = \lambda WGDP\_gr_{it} + \beta_0 + \beta_1 IMIG_{it} + \beta_2 ER_{it} + \beta_3 EDU\_tert_{it} + \beta_4 EDU\_part_{it} + \beta_5 BERD_{it} + \beta_6 ALMPs_{it} + \beta_7 PLMPs_{it} + \beta_8 GINI_{it} + \beta_9 EARN_{it} + \beta_{10} KOF\_E_{it} + u_{it} \quad (2b)$$

$$GDP\_growth_{it} = \beta_0 + \beta_1 IMIG_{it} + \beta_2 ER_{it} + \beta_3 EDU\_tert_{it} + \beta_4 EDU\_part_{it} + \beta_5 BERD_{it} + \beta_6 ALMPs_{it} + \beta_7 PLMPs_{it} + \beta_8 GINI_{it} + \beta_9 EARN_{it} + \beta_{10} KOF\_E_{it} + \rho Wu_{it} + v_{it} \quad (2c)$$

The general model developed for assessing the impacts of immigration (labour) upon the employment rate (as the main labour market indicator), both for own and the outside (foreign) population, has the following configuration (equation 2d):

$$ER_{it} = \beta_0 + \beta_1 IMIG_{it} + \beta_2 EDU\_tert_{it} + \beta_3 EDU\_part_{it} + \beta_4 BERD_{it} + \beta_5 ALMPs_{it} + \beta_6 PLMPs_{it} + \beta_7 GINI_{it} + \beta_8 EARN_{it} + \beta_9 KOF\_E_{it} + u_{it} \quad (2d)$$

The spatial autocorrelation presence (or absence) is validated through *Patrick Moran (Moran's I) test* by equation (3) (Viton, 2010).

$$I = \frac{R}{\sum_i \sum_j \omega_{ij}} \frac{\sum_i \sum_j \omega_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_i (x_i - \bar{x})^2} \quad (3)$$

In order to provide substantial estimates of our analysis, we have also determined *bootstrap sampling, estimation on spatial models and robust regression*. These methods „allow assigning measures of accuracy (defined in terms of bias, variance, confidence intervals, prediction error or some other such measure) to sample estimates” (Efron and Tibshirani, 1993: 10).

Moreover, in order to enclose and highlight the connections (direct, indirect and total) among immigration, the labour market results and GDP growth we have applied *structural equations modelling (SEM)*. SEM is a multivariate data analysis, which tests and forecasts causal links among selected variables, being an inclusive and high modelling technique. SEM is configured through the following system of equations: (4).

$$\begin{cases} b_{11}y_{2t} + \dots + b_{1m}y_{mt} + c_{11}x_{1t} + \dots + c_{1n}x_{nt} = \varepsilon_{1t} \\ b_{21}y_{2t} + \dots + b_{2m}y_{mt} + c_{21}x_{1t} + \dots + c_{2n}x_{nt} = \varepsilon_{2t} \\ \dots\dots\dots \\ b_{m1}y_{1t} + \dots + b_{mm}y_{mt} + c_{m1}x_{1t} + \dots + c_{mn}x_{nt} = \varepsilon_{mt} \end{cases} \quad (4)$$

where:  $t$  is the observed time periods (number);  $b_{ij}$  represents the parameters of  $y_{ij}$  endogenous variables;  $c_{ij}$  are the parameters,  $i=1, \dots, m$ , of the  $x_{ij}$  exogenous variable;  $j=1, \dots, n$ .

## 4. MAIN RESULTS AND DISCUSSIONS

### 4.1. Macro-econometric modelling: migration impact models

In line with our main research objective and following the methodological endeavour, we have designed the macro-econometric models such as to estimate the labour immigration effects on host countries' economic growth and correspondingly the employment performances of natives and foreign population according to the Brexit framework. We applied *eight procedures*, namely: *fixed effects (model 1 – the FE were stored after running also the random effects and performed the Hausman test which was in favour of the FE models:  $\chi^2(10)=73.90$ ;  $p=0.000$ ); spatial analysis (spatial lag – model 2 and lag bootstrap – model 3; spatial error – model 4 and error bootstrap – model 5); robust regression (general–model 6 and robust bootstrap–model 7; robust regression was performed even to discard variations among host countries since the panel could be*

entirely driven by larger economies, such as, for example, Germany, France); and *panel corrected standard errors* (PCSE – model 8).

A description of the statistics variables considered for the analysis is presented in Appendix, Table A1. Panel unit-root tests applied (Levin-Lin-Chu, Im-Pesaran-Shin, Harris Tzavalis and Fisher-type based on Augmented Dickey-Fuller presented in the Appendix, Table A2) reveal that this problem is discarded in favour of stationarity. Although the estimated coefficients are slightly different in size, they are consequent in sign throughout all the applied econometric procedures, the results being robust and thus properly interpreted.

In the case of spatial analysis, both spatial lag and spatial error models have been applied, taking into account the fact that by ignoring a spatial lag leads to biased and inconsistent estimation of the parameters, while ignoring a spatial error leads to inefficient estimation of the parameters and to a biased residual variance. Therefore, the spatial lag model is built up such as to contain the spatial lag of the dependent variable in enclosed locations used as an extra explanatory variable.

The Moran's I tests reveal a positive global spatial autocorrelation ( $I_{GDP\_growth}=0.198$ ,  $p=0.000$ ;  $I_{ER}=0.084$ ,  $p=0.000$ ;  $I_{ER\_F}=0.060$ ,  $p=0.000$ ). Therefore, the results obtained by the neighbouring locations are also conclusive for assessing the impact upon economic growth and labour market outcomes of considered host economies under the compelling effects of immigration.

If we consider the immigration impact upon GDP growth rates (Table 1), the results reveal that in the Brexit framework this is expected to have a negative effect since the estimated coefficients associated with IMIG variable are negative, but with a small degree of statistical significance (below the 10% level). On the other hand, when we have accounted for the immigration impact on labour market outcomes for natives and for the foreign population residing in the EU-10 migrant receiving economies considered, the results are positive and extremely significant (at 0.1% level) (Table 2), thus highlighting a major contribution of economic migrants to the overall employment performances of host countries.

Thus, the results further reveal a strong positive impact induced by additional immigration inflows upon the labour market outcomes of EU-10. This is reflected by a significant increase in employment levels, both total, on the aggregate level, but especially for the foreign people (positive coefficients associated with the IMIG variable as shown in Table 2 and Table A3 in the Appendix).

In this regard, another positive credential is represented by the educational background, highly skilled tertiary educated labour (EDU\_tert) having a major contribution both for economic growth (GDP\_growth) and for the employment outcomes, under the compelling effects of spatial spillovers. Moreover, an additional effort made to support research and development (revealed by the upward of BERD) positively reflects on labour market results expressed by an increase in total employment rate.



Immigration Effects within the EU-Brexit Framework: An Empirical Analysis

**Table 1. Results of *GDP\_growth-migration* macro-econometric impact models**

<b>Dependent Variable : GDP_growth_st</b>								
<i>Variables</i>	(1) <i>FE</i>	(2) <i>Spatial lag</i>	(3) <i>Spatial lag bootstrap</i>	(4) <i>Spatial error</i>	(5) <i>Spatial error bootstrap</i>	(6) <i>Robust REG</i>	(7) <i>Robust REG bootstrap</i>	(8) <i>PCSE</i>
IMIG_st	-0.0779 (0.133)	-0.0736 (0.0951)	-0.0736 (0.117)	-0.0616 (0.105)	-0.0616 (0.116)	-0.0305 (0.0815)	-0.0305 (0.106)	-0.0781 (0.0945)
ER_st	0.361 (0.307)	0.163 (0.117)	0.163 (0.150)	0.137 (0.126)	0.137 (0.167)	0.228 (0.122)	0.228* (0.114)	0.226 (0.124)
EDU_tert_st	0.199* (0.0911)	0.250** (0.0658)	0.250** (0.0776)	0.225*** (0.0675)	0.225** (0.0745)	0.213*** (0.0564)	0.213** (0.0748)	0.320*** (0.0560)
EDU_part_st	0.0491 (0.145)	-0.00899 (0.0867)	-0.00899 (0.143)	-0.0303 (0.0915)	-0.0303 (0.118)	0.0407 (0.0886)	0.0407 (0.119)	0.0182 (0.100)
BERD_e_st	-0.445 (0.244)	0.00477 (0.127)	0.00477 (0.151)	-0.00416 (0.135)	-0.00416 (0.131)	0.00909 (0.0984)	0.00909 (0.0886)	-0.00988 (0.0836)
ALMPs_st	0.119 (0.167)	0.0586 (0.0651)	0.0586 (0.0958)	0.0823 (0.0723)	0.0823 (0.0927)	-0.114 (0.0718)	-0.114 (0.0872)	0.0142 (0.0659)
PLMPs_st	-0.568*** (0.132)	-0.352*** (0.0891)	-0.352*** (0.101)	-0.327*** (0.0984)	-0.327*** (0.119)	-0.300*** (0.0801)	-0.300* (0.125)	-0.430*** (0.0961)
GINI_st	0.0643 (0.170)	-0.0120 (0.126)	-0.0120 (0.180)	0.0344 (0.129)	0.0344 (0.166)	-0.194 (0.106)	-0.194 (0.157)	-0.0803 (0.0999)
EARN_st	-0.966*** (0.159)	-0.419*** (0.0825)	-0.419*** (0.111)	-0.384*** (0.0973)	-0.384*** (0.0967)	-0.459*** (0.0852)	-0.459*** (0.110)	-0.557*** (0.134)
KOF_E_st	-0.981*** (0.196)	-0.145 (0.0862)	-0.145 (0.101)	-0.172 (0.0991)	-0.172 (0.126)	-0.149 (0.0793)	-0.149 (0.129)	-0.199 (0.115)
_cons	0.0614 (0.0733)	-0.0409 (0.0574)	-0.0409 (0.122)	-1.411 (2.978)	-1.411*** (0.0793)	0.240*** (0.0586)	0.240*** (0.0588)	0.145 (0.179)
Rho _cons		0.976*** (0.0242)	0.976 (0.520)					
Sigma _cons		0.817*** (0.0788)	0.817*** (0.0910)	0.836*** (0.0778)	0.836*** (0.0736)			
Lambda _cons				0.974*** (0.0256)	0.974* (0.424)			
$R^2$	200 0.261	200	200	200	200	200 0.191	200 0.191	200 0.186

Note: standard errors in parentheses; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . Source: authors' research.

**Table 2. Results of ER-migration macro-econometric impact models**

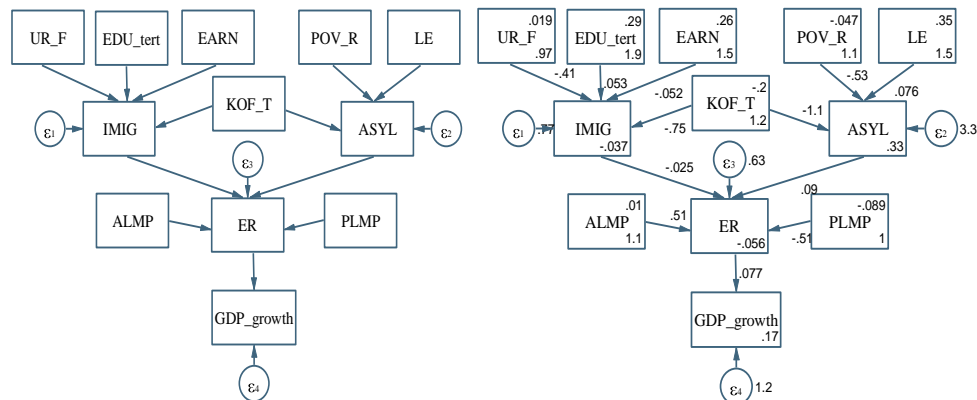
<b>Dependent Variable: Employment rate – total (ER_st)</b>								
<i>Variables</i>	(1) <i>FE</i>	(2) <i>Spatial lag</i>	(3) <i>Spatial lag bootstrap</i>	(4) <i>Spatial error</i>	(5) <i>Spatial error bootstrap</i>	(6) <i>Robust REG</i>	(7) <i>Robust REG bootstrap</i>	(8) <i>PCSE</i>
IMIG_st	0.197*** (0.0288)	0.307*** (0.0371)	0.307*** (0.0373)	0.296*** (0.0378)	0.296*** (0.0444)	0.287*** (0.0413)	0.287*** (0.0668)	0.324*** (0.0421)
EDU_tert_st	0.0222 (0.0220)	0.0150 (0.0229)	0.0150 (0.0257)	0.00288 (0.0224)	0.00288 (0.0231)	0.00717 (0.0327)	0.00717 (0.0471)	0.00353 (0.0201)
EDU_part_st	0.0749* (0.0347)	0.233*** (0.0613)	0.233*** (0.0612)	0.218** (0.0579)	0.218** (0.0805)	0.240*** (0.0482)	0.240* (0.119)	0.253*** (0.0333)
BERD_e_st	0.0576 (0.0590)	0.186*** (0.0555)	0.186** (0.0643)	0.207*** (0.0573)	0.207** (0.0749)	0.254*** (0.0555)	0.254** (0.0923)	0.187*** (0.0534)
ALMPs_st	-0.197*** (0.0377)	0.100* (0.0475)	0.100* (0.0445)	0.0966 (0.0497)	0.0966 (0.0543)	0.0358 (0.0410)	0.0358 (0.0976)	0.107* (0.0509)
PLMPs_st	-0.159*** (0.0298)	-0.227*** (0.0404)	-0.227*** (0.0420)	-0.208*** (0.0419)	-0.208*** (0.0425)	-0.248*** (0.0440)	-0.248*** (0.0648)	-0.213*** (0.0274)
GINI_st	-0.0619 (0.0409)	-0.225*** (0.0548)	-0.225*** (0.0648)	-0.215*** (0.0558)	-0.215** (0.0747)	-0.188** (0.0591)	-0.188** (0.0612)	-0.237*** (0.0574)
EARN_st	0.0793* (0.0381)	0.350*** (0.0420)	0.350*** (0.0410)	0.399*** (0.0443)	0.399*** (0.0445)	0.356*** (0.0416)	0.356*** (0.0671)	0.376*** (0.0420)
KOF_E_st	0.0433 (0.0473)	0.219*** (0.0365)	0.219*** (0.0312)	0.256*** (0.0385)	0.256*** (0.0316)	0.235*** (0.0425)	0.235*** (0.0562)	0.249*** (0.0384)
_cons	-0.00162 (0.0178)	-0.0506 (0.0359)	-0.0506 (0.0466)	0.0348 (0.202)	0.0348 (0.0387)	-0.0640 (0.0340)	-0.0640 (0.0607)	-0.0309 (0.0241)
Rho		0.439*	0.439					
_cons		(0.222)	(0.310)					
Sigma		0.450***	0.450***	0.442***	0.442***			
_cons		(0.0214)	(0.0233)	(0.0213)	(0.0202)			
Lambda				0.806***	0.806*			
_cons				(0.189)	(0.404)			
<i>N</i>	200	200	200	200	200	200	200	200
<i>R</i> <sup>2</sup>	0.505					0.807	0.807	0.803

Standard errors in parentheses; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . Source: authors' research.

However, the impact on foreign population’s employment opportunities (ER\_F) and on the economic growth is uncertain (due to the lack of statistical significance of the estimated coefficients associated with BERD variable) and quite contradictory (since these coefficients are negative for the GDP\_growth and ER\_F impact models). Nevertheless, the passive labour market policies, PLMPs (e.g. the early retirement schemes and unemployment benefits) hinder the active labour market participation, thus leading to a major reduction of the employment rate (both on the total level of population and more severely for the foreign population).

**4.2. SEM developed to assess the impact of international labour mobility upon the economic activity in EU-10 during 2000-2019**

Aligned to our main research objective, we have evaluated the immigration effects on host countries’ economic growth (measured through the real GDP growth rate) and on the labour market outcomes (measured through the employment rate) through an integrated frame of reference (SEM) to better capture the amplitude of the migration process and its multi-stage effects. Thus, from a three-fold approach, SEM captures the main implications of immigration process (both for labour/economic and the humanitarian component) in a globalization era, the labour market performances and the set of adopted policies, their inter-linkages, as well as final effects upon economic growth of the receiving countries (Figure 1).



**Figure 1. SEM results for the immigration impact (IMIG and ASYL) upon the economic growth and labour market in EU-10 during 2000-2019**

Source: designed by the authors based on our research results

Goodness-of-fit tests (Appendix, Table A4) and Cronbach’s alpha results for each element and total scale (Appendix, Table A5) highlight the reliability of the SEM model and robustness of Maximum Likelihood Estimations (MLE). Results obtained based on SEM model reveal that, when the inter-linkages between migration determinants-economic credentials-policies-final output are taken into account, the overall impact of international migration flows, both economic/labour

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(IMIG) and humanitarian (ASYL), tend to positively reverberate on host countries' economies.

Migrants tend to positively select at destination according to their educational background (especially for the high-skilled tertiary educated migrants), being attracted by higher earnings, employment opportunities and increased living standards (welfare), as shown by our results (Figure 1). Thus, additional labour immigrants and asylum seekers are drawn by improved living standards (reflected by reducing  $POV\_R$ , the estimated coefficient being  $-0.53$ ), and public health policies (reflected by an increase in life expectancy,  $LE$ , the estimated coefficient being  $0.076$ ).

Nevertheless, persistent high unemployment rates for the foreign population ( $UR\_F$ ) already residing in host economies and increased poverty risk act as a disincentive for immigrants targeting particular destinations (the estimated coefficient is  $-0.41$ ). Moreover, active labour market policies (ALMP) oriented towards job creation and educational programmes have important positive effects leading to an increase in employment levels (the coefficient is  $0.51$ ), while passive policies (PLMP, especially the unemployment benefits) tend to deteriorate labour market participation rate (the estimated coefficient is  $-0.51$ ). All these positive and negative dimensions reverberate on final economic growth of host economies (the estimated coefficient is  $0.077$ ), and therefore are considered to be extremely important by policy makers across Europe, especially in the context of Brexit.

## 5. CONCLUDING REMARKS

This research aimed to examine the immigration effects upon economic growth and labour market outcomes (both for own and for the foreign people) for EU-10 MS in the context of Brexit framework. Labour mobility is one of the four fundamental manifestation of freedom for the European integration process and a major thematic invoked by the UK in motivating its decision to exit from the EU. According to this broader framework, we have designed two scenarios of the expected outcomes accomplished by the EU-10 MS (including the UK) expressed in terms of GDP growth rates and correspondingly of employment anticipated levels under the impact of the trends of the international migratory flows considered within the Brexit context, respectively during 2000-2019 (2019 being the deadline for Brexit negotiations).

Our main research results reveal a strong positive immigration impact upon host countries' labour markets reflected through important increases in employment rates (both overall and mainly for the foreign population), on the one side. On the other side, the impacts on GDP growth rates could not be properly captured, since the estimated coefficients have a reduced degree of statistical significance throughout the eight econometric methods processed. Though, when we have applied the integrated framework for the analysis of labour immigration impacts in this regard (SEM models), we could notice that, if the inter-linkages between migration determinants - economic credentials - policies - final output are taken

into account, the overall impacts of immigration flows, both labour (economic) and humanitarian, tend to have positive expected effects reflected on the host countries' economies.

Our main research results obtained are in line with previous similar studies (Chu, 2016) and show that a possible slowdown of economic growth after the Brexit shock could be mitigated through continuous support of labour mobility and not by reinforcing barriers in this respect.

Our results support positive credentials of migration, consistent with Booth et al. (2015), which reveal that policies supporting the free movement of people will significantly contribute to the raise of the total GDP by 2030. Labour mobility after Brexit in Europe will certainly influence both migrant sending and hosting economies, since it will be reconfigured under new migration policies and regulations adopted by EU-27 and by the UK.

In order to enhance the results of our study, we aim to include in our future research a bilateral matrix approach by extending the panel so as to comprise migrant sending economies as well.

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**Appendix**

**Table A1. Descriptive statistics of the variables, 2000-2019 sample**

<i>Variables</i>	<i>N</i>	<i>Mean</i>	<i>sd</i>	<i>min</i>	<i>max</i>
IMIG	200	305259.6	308797.9	16895	1845793
ASYL	200	48116.55	67278.9	1405	490520
ER	200	67.1235	6.344435	53.7	77.9
ER_F	200	61.071	5.591304	45.2	74.4
UR	200	7.401	2.238156	2.100001	15.7
UR_F	200	13.6625	5.508645	3.600001	35.4
EARN	200	54223.53	13303.79	28412	113749
ALMPs	200	0.663075	0.3801446	0.035	1.973
PLMPs	200	1.342235	0.6662019	-.0039999	3.053
EDU_tert	200	26.62	8.937471	8.1	75.89999
EDU_part	200	18.4625	11.81902	-6.7	95.3
POV_R	200	20.49	4.646142	9.1	30.30001
LE	200	80.8375	2.011485	76.2	87.39998
BERD	200	1.28585	.5970249	0.38	2.985
GINI	200	28.85	3.588049	20.6	39.7
KOF_T	200	84.6848	4.524084	74.94002	92.63
KOF_E	200	76.4758	10.08743	49.08002	94.8

Source: own process in Stata

**Table A2. Unit Root Tests of the Residuals, Models for Immigration-GDP\_growth Impact, 2000-2019**

<b>Residuals</b>		
LLC (Levin-Lin-Chu)	p-value	0.0159
	t-statistic	-2.1473
	ADF regressions: 1 lag	
	LR variance: Bartlett kernel, 8.00 lags average	
Im-Pesaran-Shin	p-value	0.0001
	t-statistic	-2.9054
	Test critical values:	1%
		5%
		10%
ADF regressions: No lags included		
AR (Autoregressive) parameter: Panel-specific		
Harris-Tzavalis	p-value	0.0000
	Statistic	0.4315
	Z	-9.0995
Fisher-type Based on Augmented Dickey- Fuller (ADF) tests	p-value	0.0000
	Inverse chi-squared (56)	78.5494
	Modified inv. chi-squared	9.2575

Ho: (All/ Some) Panels contain unit roots

Ha: Panels are stationary/ At least one panel is stationary

Source: authors' research in Stata



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**Table A3. Results of ER\_F-migration macro-econometric impact models**

**Var. Dep: Employment rate of the foreign population (ER\_F\_st)**

Variables	(1) FE	(4) Spatial lag	(5) Spatial lag bootstrap	(6) Spatial error	(7) Spatial error bootstrap	(8) Robust REG	(9) Robust REG bootstrap	(10) PCSE
IMIG_st	0.347*** (0.0541)	0.278*** (0.0786)	0.278*** (0.0631)	0.281*** (0.0706)	0.281*** (0.0637)	0.322*** (0.0675)	0.322*** (0.0747)	0.308*** (0.0528)
EDU_tert_st	0.0325 (0.0413)	-0.0213 (0.0555)	-0.0213 (0.0568)	-0.00965 (0.0575)	-0.00965 (0.0584)	-0.0172 (0.0534)	-0.0172 (0.0790)	-0.0204 (0.0514)
EDU_part_st	-0.0505 (0.0652)	0.160 (0.134)	0.160 (0.143)	0.149 (0.139)	0.149 (0.151)	0.332*** (0.0787)	0.332* (0.168)	0.171** (0.0616)
BERD_e_st	0.196 (0.111)	-0.127 (0.0906)	-0.127 (0.0996)	-0.142 (0.0902)	-0.142 (0.104)	-0.107 (0.0907)	-0.107 (0.0995)	-0.132 (0.0733)
ALMPs_st	-0.302*** (0.0707)	0.0401 (0.0587)	0.0401 (0.0601)	0.0342 (0.0610)	0.0342 (0.0623)	0.0402 (0.0669)	0.0402 (0.0631)	0.0403 (0.0619)
PLMPs_st	-0.594*** (0.0559)	-0.555*** (0.0563)	-0.555*** (0.0588)	-0.581*** (0.0652)	-0.581*** (0.0566)	-0.526*** (0.0718)	-0.526*** (0.0706)	-0.554*** (0.0634)
GINI_st	-0.371*** (0.0768)	-0.0726 (0.0906)	-0.0726 (0.0971)	-0.0730 (0.0899)	-0.0730 (0.0952)	-0.0106 (0.0966)	-0.0106 (0.1000)	-0.0787 (0.109)
EARN_st	0.197** (0.0715)	0.0914 (0.0708)	0.0914 (0.0653)	0.0784 (0.0720)	0.0784 (0.0739)	0.0398 (0.0680)	0.0398 (0.119)	0.0926 (0.0582)
KOF_E_st	0.182* (0.0888)	0.144 (0.0781)	0.144* (0.0638)	0.133 (0.0784)	0.133 (0.0913)	0.172* (0.0694)	0.172 (0.116)	0.148** (0.0504)
_cons	-0.0284 (0.0334)	0.00215 (0.0681)	0.00215 (0.0658)	0.0182 (0.135)	0.0182 (0.0695)	0.0262 (0.0554)	0.0262 (0.0866)	-0.0150 (0.0508)
Rho _cons		0.248 (0.396)	0.248 (0.401)					
Sigma _cons		0.714*** (0.0375)	0.714*** (0.0385)	0.711*** (0.0373)	0.711*** (0.0328)			
Lambda _cons				0.486 (0.528)	0.486 (0.442)			
N	200	200	200	200	200	200	200	200
R <sup>2</sup>	0.612					0.520	0.520	0.515

Standard errors in parentheses; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . Source: authors' research in Stata.

**Table A4. Goodness-of-fit tests for SEM, 2000-2019**

Fit statistic	Value	Description
Likelihood ratio (LR)		
chi2_ms(26)	366.200	model vs. saturated
p > chi2	0.000	
chi2_bs(38)	683.845	baseline vs. saturated
p > chi2	0.000	
Information criteria		
AIC	6785.422	Akaike's information criterion
BIC	6851.389	Bayesian information criterion
Baseline comparison		
CFI	0.473	Comparative fit index
TLI	0.230	Tucker-Lewis index
Size of residuals		
SRMR	0.097	Standardized root mean squared residual
CD	0.764	Coefficient of determination

Source: authors' research in Stata.

**Table A5. Results for Cronbach's alpha, SEM, 2000-2019**

Test scale = mean (standardized items)						
Average						
Item	Obs	Sign	Item-test correlation	Item-rest correlation	Inter-item correlation	alpha
GDP_growth	200	+	0.3137	0.1389	0.1564	0.6710
IMIG	200	+	0.5662	0.4238	0.1310	0.6238
ASYL	200	+	0.6381	0.5108	0.1238	0.6084
EARN	200	+	0.7014	0.5900	0.1174	0.5940
EDU_tert	200	+	0.3287	0.1550	0.1549	0.6685
UR_F	200	-	0.4641	0.3049	0.1413	0.6441
KOF_T	200	-	0.4829	0.3264	0.1394	0.6405
POV_R	200	-	0.2199	0.0403	0.1659	0.6863
LE	200	+	0.3451	0.1727	0.1533	0.6657
ER	200	+	0.5125	0.3606	0.1364	0.6347
ALMPs	200	-	0.2628	0.0849	0.1616	0.6794
PLMPs	200	-	0.7040	0.5933	0.1171	0.5934
Total scale					0.1415	0.6643

Source: authors' research in Stata.