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IMMIGRATION AND UNEMPLOYMENT IN EUROPE:

Does the core-periphery dualism matter?

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Abstract

In this paper, we assess the relation between immigration and unemployment for a sample of 15 EU countries between 1997 and 2016. We estimate separate effects for Northern and Southern Countries based on the differences between the two groups in terms of skill intensity and flexibility of labour market adjustments. We use a panel Error Correction Model to assess the direction and persistence of the impact of immigration on domestic unemployment in the short and in the long run. In the long run, immigration is found to reduce unemployment in all peripheral-countries. In core countries, on average there is no long-run impact of immigration on unemployment due to a substantial heterogeneity, but country specific estimates provide evidence that immigration might have reduced unemployment in France, Germany and the UK. As for short-run dynamics, for the EU15 as a whole we find a confirmation of the result that immigration reduces unemployment, while the evidence of a core-periphery dualism is less pronounced.

Keywords: International Migration, Unemployment, European Union, Panel Data

JEL codes: C23, E23, F22, J61

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1. Introduction

The migrant crisis poses new social challenges for policymakers in the EU. Many people seem to fear that native populations will lose out, because public resources are diverted to immigrants, and even more importantly, they fear that immigrants will take away their jobs or make it harder for unemployed persons to find work. According to the European Commission (2015), the majority of EU citizens have negative feelings about immigration, especially from extra-EU countries.

Negative feelings about job loss and welfare tourism might have some ground from the native population's viewpoint, but they also seem to be the result of a misperception of reality (Markaki and Longhi, 2012). Looking at the fiscal contribution of immigrants in Europe, recent analyses find that the native populations' perception is the opposite of what actual data indicate: in countries which show a more negative attitude toward migrants those migrants are net contributors to the welfare system. Spain and UK are two examples (Joxhe and Zanaj 2017).

Our paper assesses the effects of immigration on unemployment, both short and long-run, for a sample of 15 EU countries between 1997 and 2016, by aggregating and splitting them between *core* and *periphery*. The core-periphery dualism is the result of strong imbalances between the two regions in terms of quality of institutions and macroeconomic fundamentals (Giavazzi and Spaventa 2010, Collignon 2013, Cesaroni and De Santis 2017, De Santis and Cesaroni 2016, Celi et al. 2017, Esposito 2017, Esposito and Messori 2019), welfare systems and labour markets (Ferrera 1996, Rhodes, 1996 Magone et al. 2016). In this context, we attempt to answer the following questions: do the migratory flows have different impacts on the labour market in the two *core* and *periphery* models? Is there any difference between the short and long term? Can migratory flows exacerbate this European dualism?

Theoretical models, starting from the Solow-Swan framework, suggest that long-run positive effects of immigration on employment exist if native and foreign workers are imperfect substitutes. With the increase in the degree of substitutability between workers, possible long-run effects will tend to vanish and negative short-run effect might emerge. Yet, in countries with rapidly aging populations, immigration might have a positive effect on employment by compensating the reduction in potential labour supply.

A number of empirical studies have investigated the impact of immigration on domestic employment from a macro-economic point of view (Ottaviano and Peri 2008, Ortega and Peri 2009 and 2012, Peri and Sparber 2009, Peri 2012, Grossmann and Stadelmann 2013, D'Amuri and Peri 2014). Few studies investigated directly the effect of immigration on unemployment in advanced economies (Jean and Jimenez 2007, Boubtane et al. 2013, Damette and Framentin 2013, Latif 2015). The aim of this paper is to provide some new macroeconomic evidence on how immigration affects the European labour market.

We follow a purely macroeconomic approach in line with Damette and Framentin (2013) and Latif (2015), and estimate the short-term and long-term impacts of immigration on unemployment in Western EU countries. We estimate a Panel Error Correction Model (PECM) on a sample of 15 European countries over the 1997-2016 period. The long-run specification is based on the Okun's law (Ho-Chuan, and Yeh, 2013), which relates unemployment to Gross Domestic Product (GDP). This relation is augmented with the net inflow of migrant population and is estimated using the traditional FMOLS and panel DOLS alongside the Common Correlated Effects (CCE), implemented by Pesaran (2006) and extended to the case of endogenous covariates by Neal (2015). The PECM provides short-run impacts as well as the speed of adjustment toward the long-run relation and is estimated through a GMM approach where endogenous covariates, including migration, are instrumented by their lags.

We contribute to the macroeconomic literature on the labour market effects of immigration from three points of view. First, in this strand of economic literature, the evidence on international comparisons based on non-stationary panel data is scant (Damette and Framentin, 2013, Boubtane et al. 2013). Thus, we contribute by employing a PECM to a group of 15 Western EU countries, by also providing new updated evidence and including the seven years following the 2008-09 crisis. The PECM allows us to evaluate both short and long-run causalities.

Second, we look at cross-country differences within the EU starting from the well-known core-periphery dualism, where core countries are broadly represented by Northern Europe and Peripheral Countries are those of Southern Europe, traditionally characterized by a specific Southern European welfare regime (Ferrera 1996, Rhodes 1996). As stated above, the two regions are structurally different but have experienced similar immigration inflows relative to their size. Hence, they represent an optimal group to test for different adjustments due to an immigration shock. Northern countries resemble the standard Solow-Swan case where labour market flexibility allows for a rapid short-run adjustment toward a better long-run equilibrium, where migrant and native workers complement each other due to the higher share of national high-skilled workers. Southern Europe, on the other hand, suffers from low potential growth, high unemployment and shows peculiar characteristics in labour markets, ranging from high (male) employment protection to low participation rates, high inactivity (Ferrera 1996, Rhodes 1996, Faggio and Nickell 2007 Davoine et al., 2008), and strong educational and skill mismatches (International Labour Organization, 2015). This means that immigration could have positive long-run effects as immigrant workers fill shortages in native labour forces, but short-run adjustments could temporarily increase unemployment.

Third, from the methodological point of view, using the CCE estimator allows us to control for unobserved common factors causing cross correlation among residuals. Most previous studies rely on standard OLS estimates or on IV approaches aimed at correcting the endogeneity bias of the migration variable. The issues of non-stationarity and serial correlation are addressed by Damette and

Fromentin (2013), Bubtane et al. (2013) and Latif (2015), but none of the studies takes into account the problem of cross correlation. The use of the CCE estimator allows us to control for this issue by adding cross sectional averages of all variables as additional regressors (Kapetanios et al. 2011).

The structure of the paper is the following: in Section 2 we review the main contributions on the effects of immigration on employment and unemployment, and discuss our approach. In Section 3, we provide some evidence on the evolution of migration inflows in Europe and their role in domestic labour markets. In Section 4, we describe the econometric framework and the results of the empirical analysis. Section 5 discusses the results while Section 6 draws summary conclusions and policy implications.

2. The relation between immigration and unemployment

Starting from the seminal articles of Todaro (1969) and of Harris and Todaro (1970), economic literature has investigated the effects of migration on the levels of (un)employment. From a theoretical point of view, immigration can have both positive and negative effects on unemployment according to, first, the degree of substitution/complementarity between native and migrant workers and, second, the degree of flexibility of labour markets. In a standard Solow-Swan framework, if native and non-native workers are perfect substitutes, there will be only temporary negative effects on unemployment and wages due to the tendency of the capital labour ratio to return to the steady state level. However, with rigid labour markets and no full employment, the short-run negative effects on unemployment could be highly persistent, affecting also the long-run evolution of the variable (Brucker and Jahn 2011). In case of imperfect substitution, a positive effect of immigration on unemployment (i.e. a reduction) is postulated due to the complementarity with native workers (Dadush 2014). Nevertheless, the final outcome will depend on which of the two effects prevails.

Further, amongst theoretical studies, Wooton (1985) in a dynamic general equilibrium model shows that, especially in the long term, labour migration may be mutually beneficial for both the area of immigration and that of emigration. Recently, Lozej (2018) has modelled migration as an

endogenous decision in a search-and-matching framework: results indicate that unemployment increases immediately after the immigration shock, but falls afterwards. From an empirical point of view, studies investigating the impact of immigration on domestic employment may be roughly classified according to the scale of analysis. The first strand uses individual level data (Ottaviano and Peri 2008, Peri and Sparber 2009, Peri 2012, Martins et al. 2018) while the second line adopts macro-data (Ortega and Peri 2009 and 2012, Grossmann and Stadelmann 2013, D'Amuri and Peri 2014, Latif 2015, Jean and Jimenez 2007, Damette and Framentin 2013)[1]. The conclusions of most of these studies are in favour of the complementarity effect.

Micro-level studies focus on single countries and mainly on the US case. Ottaviano and Peri (2008) find that immigration causes small negative effects on employment in the short run, on native workers with no high school degree and on wages, while it has small positive effects on native workers with no high school degree and on native wages in the long run. Peri and Sparber (2009) argue that large inflows of less educated immigrants may cause natives to reallocate their task supply, thus avoiding the substitutability between natives and migrants. More specifically, they provide evidence that the lack of a significant negative employment effect of immigration is due to differences in the task specialization of native and migrant workers. Peri (2012) shows that the main effect of migration on employment in the US operates through total factor productivity, consistent with the theory whereby immigration increases the variety of skills available for production. With respect to other developed countries, a recent study on Portugal by Martins et al. (2018) shows that when using matched employer-employee longitudinal data, there is a strong positive association of immigrants on native hiring. Similarly, Villosio and Venturini (2006) provide evidence of a complementary effect between immigrants and natives in Italy. Conversely, Winter-Ebmer and Zimmermann (1999),

[1] See Dustmann et al. (2008) and Dadush (2014) for surveys of the empirical literature.

D'Amuri et al. (2010) for Germany, Carrasco et al. (2004) for Spain, Dustmann et al (2004) for the UK do not find a significant effect of immigration on employment rates among natives.

Due to the scarcity of micro-data, especially in a panel context, international comparisons are mostly based on macro-data. Ortega and Peri (2009) investigated the impact of immigration on production factors, productivity and factors per worker for a sample of 14 OECD countries. Their findings confirm the positive effect of immigration on employment growth. D'Amuri and Peri (2014) aggregate individual level data collected from the European LFS to build a database including skill and task intensities of native and foreign employed population in 15 Western European countries. They find evidence of complementarity between native and foreign workers due to the specialization in different tasks (Peri and Sparber 2009), which stimulates job creation and a higher job complexity.

Grossmann and Stadelmann (2013) use a purely gravity approach to investigate the impact of migration flows by skill group on relative GDP per capita, Total Factor Productivity (TFP) and wages of the home and host countries. They find a significant positive impact of skilled labour migration on relative TFP differences, in line with the complementarity effect of skilled labour immigration in advanced economies[2].

Within this strand of empirical literature dealing with macro evidence, only a few papers directly focus on the unemployment effect of immigration. Boubtane et al. (2013), using annual data over the 1980–2005 period for 22 OECD countries, employ the panel Granger causality approach to test the relationship between immigration, unemployment and growth of the host country. They find that immigration does not cause unemployment in any country. Latif (2015) uses a panel cointegration approach with provincial level data from Canada and finds that, in the short run, immigration increases unemployment, while in the long run, this effect becomes negative but

[2] The evidence also showed that in evaluating the effect of immigration on the labour market in host economy, the discouraging effect on internal labour mobility should also be taken into account (Brücker et al. 2011).

insignificant. Jean and Jimenez (2007) provide aggregate evidence of the effect of immigration on unemployment for 15 EU countries, the US, Australia and New Zealand over the 1984-2003 period. They find no significant positive long-run effect of immigration on unemployment and only modest short-run negative effects. However, they find that short-run effects are more persistent in countries with strict employment protection legislation and anticompetitive product market regulation. Damette and Framentin (2013) estimate a panel Vector Error Correction model to assess the link between migration, wages, and unemployment in OECD countries, and to address the endogeneity problems among the three variables. They find that in the short run immigration reduces unemployment in the countries belonging to continental Europe but it increases unemployment in the Anglo-Saxon countries.

All in all, the majority of micro and macro level contributions find that immigration has positive effects on the labour market by increasing employment and reducing unemployment. Table A1 in the Appendix summarizes the previous empirical studies.

This article contributes to the macro literature and explicitly estimates the impact of immigration on unemployment. Similarly to Damette and Fromentin (2013) and Latif (2015), we use a purely macroeconomic approach whereby the endogeneity of immigration is dealt with by exogenous lags as instruments. However, we differentiate from previous studies by estimating both the long-run and short-run effects of immigration on unemployment, and by using a single equation approach. We take advantage of the recent development in macro-panel econometrics and apply the Common Correlated Effects estimator with endogenous regressors (CCE-GMM) (Pesaran 2006, Chudick and Pesaran 2015, Neal 2015) to address the endogeneity issue and control for cross correlation among residuals. To the best of our knowledge, this is the first attempt to deal with the issue of cross correlation in the macro-panel estimates of the unemployment/immigration relation. Furthermore, we employ this technique to investigate the core-periphery dualism in Europe, since the existing empirical evidence in this geographical area is still insufficient.

3. Migration flows and domestic unemployment: descriptive statistics

Our database consists of 15 European countries divided into two groups: Austria, Belgium, Denmark, Finland, France, Germany, Luxemburg, Netherlands, Sweden and the UK belong to the "Core" group, while the "Peripheral" group is represented by Greece, Ireland, Italy, Portugal and Spain.

Descriptive statistics for unemployment, GDP and immigration inflows are shown in Table 1. In the periphery, the unemployment rate on average is substantially higher than in the core and shows low growth throughout the period, while in core countries it has slightly decreased. GDP is higher in the core due to the area's larger size and higher level of economic development. However, average GDP growth was rather similar in the two groups throughout the period, although the standard deviations indicate substantial cross-country heterogeneity among peripheral countries. Immigration inflows relative to total population were of similar magnitude in the two groups, with relatively low heterogeneity among countries. The average change in immigration inflows was higher in the periphery on average, but the standard deviation indicates large cross-country differences within groups. In summary, the data in Table 2 indicate that the main difference between the core and peripheral countries lies in the level of unemployment as well as in the magnitude and variability of changes in immigration inflows, both larger in the latter.

As a first indication of the labour market's role in unemployment in the two groups of countries, in Figure 1 we show the average inactivity rate and the OECD Employment Protection Index (EPI).[3] The latter captures a specific aspect of labour market flexibility: the strictness of individual and collective dismissals. Inactivity rates, instead, provide a comprehensive and synthetic indication of labour market differences among countries as they depend on several governments'

[3] Existing labour market indicators measure specific dimensions of labour market flexibility such as the degree of employment protection, union density, collective bargaining coverage and minimum wage laws. The focus on the EPI is due to data availability.

policies in the fields of education, inclusion, income support and so on. Flexible and efficient labour markets are associated with higher employment and activity rates (Di Tella and MacCulloch 2005) and the adjustment costs due to a shock in labour supply should be relatively small, thus negative employment effects might not manifest.

Table 1 Descriptive statistics 1997-2016

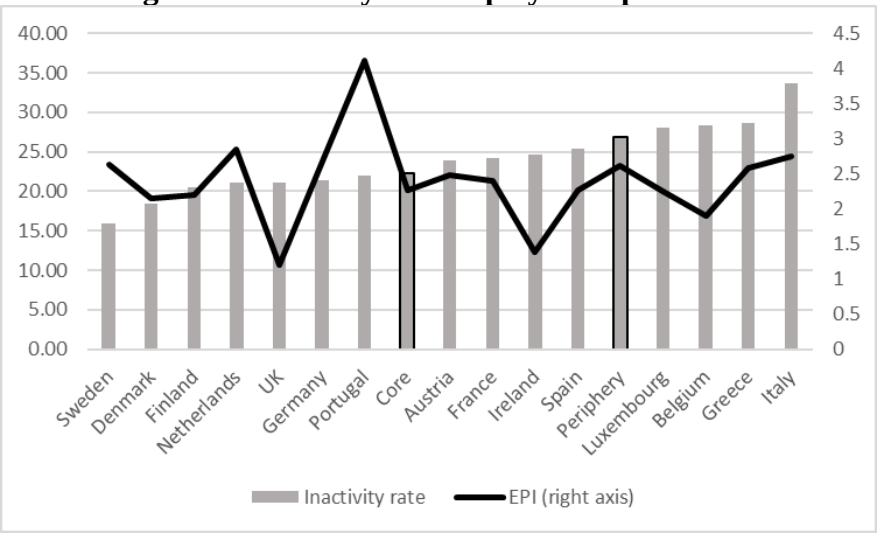
		Average levels			Average growth		
		UR	GDP	Immigration (1000 inhab.)	UR	GDP	Immigration
Total	Mean	7.9	6.32	11.37	0.0	2.0	6.1
	S.D.	4.5	1.28	1.22	1.2	3.0	24.7
	Minimum	1.7	3.21	8.10	-3.4	-9.6	-81.8
	Maximum	27.3	8.33	14.52	6.6	22.8	225.2
Core	Mean	6.3	6.50	11.32	-0.1	2.0	5.3
	S.D.	2.2	1.37	1.27	0.8	2.3	12.0
	Minimum	1.7	3.21	8.98	-2.1	-8.6	-29.1
	Maximum	13.6	8.33	14.52	2.5	8.1	52.1
Periphery	Mean	11.3	5.96	11.47	0.1	1.9	7.6
	S.D.	5.8	0.99	1.13	1.9	4.1	39.4
	Minimum	3.5	4.54	8.10	-3.4	-9.6	-81.8
	Maximum	27.3	7.43	13.73	6.6	22.8	225.2

Source: Eurostat, OECD.

Labour markets in the periphery are characterized by both higher inactivity and higher employment protection. Average inactivity in the periphery is driven up by Italy and Greece, whereas in core countries lower inactivity rates are recoded, especially in the three Scandinavian countries, followed by the Netherlands and the UK. Exceptions to the core-periphery differences are represented by Belgium and Luxembourg, which show high average inactivity, and by Portugal, whose levels are comparable to those of the continental countries such as Germany, Austria and France. In terms of employment protection, core-periphery differences are less pronounced. Portugal and Italy, together with the Netherlands and Sweden, show the highest levels of the index while Ireland, together with the UK, shows the lowest levels of employment protection, a typical feature of Anglo-Saxon labour markets.

In summary, core-periphery differences in the labour markets are not so neat. On average, the higher levels of inactivity might increase adjustment costs due to the inflow of migrants but might also imply that in the long run immigration could replace inactive domestic labour forces. Hence, the immigration-unemployment nexus needs to be estimated empirically.

Figure 1. Inactivity and employment protection



Source: Eurostat, OECD

4. Econometric analysis: long-run and short-run impacts of migration on unemployment

The aim of the econometric analysis is to estimate the long-run and short-run impacts of immigration on domestic unemployment.[4] Following Boubtane et al. (2013) and Latif (2015), we begin by modelling unemployment as a function of domestic GDP and immigration inflows. The relation between unemployment and GDP is based on the long-run version of the Okun Law (Ho-Chuan, and Yeh, 2013) and it is used to relate long-run unemployment to the technological level of a country proxied by GDP. Based on the empirical literature described in Section 2, the long-run effect of immigration on unemployment is expected to be related to the complementarity/substitutability

[4] Variables description and data sources are provided in Table A2 in the Appendix.

effect, to the different task specialization (Peri 2012) and to the incentive for native workers to reallocate their task supply in case of a high task overlap (Peri and Sparber 2009).

In the short run, the degree of complementarity/substitutability will play a higher role in determining the final effect of immigration. In general, high substitutability will cause immigration to temporary increase unemployment, but the outcome will also depend on the degree of flexibility of the labour markets. Based on the evidence of Section 3, we account for the role of labour market flexibility by introducing the inactivity rate and the EPI, both interacted with immigration inflows. In this way, the impact of the latter is made dependent on these two features of the labour markets and the country specific impact can be calculated.

Long-run and short-run relations between unemployment and immigration will be estimated using a Panel Error Correction Model (PECM) of the following form:

$$u_{i,t} = \beta_0 + \beta_1 gdp_{i,t} + \beta_2 imm_{i,t} + \varepsilon_{i,t} \qquad (1)$$

$$\Delta u_{i,t} = \alpha_0 + \alpha_1 \Delta gdp_{i,t} + \alpha_2 \Delta imm_{i,t} - \rho\left(u_{i,t-1} - \beta_0 - \beta_1 gdp_{i,t-1} - \beta_2 imm_{i,t-1}\right) + \\ + \sum_{i=1}^{N} \lambda_i + \sum_{t=1}^{T} \gamma_t + \upsilon_{i,t} \qquad (2)$$

where *gdp* is the log of Gross Domestic Product at constant prices, *imm* is the log of net immigration inflow. Equation (1) represents the long-run relation whereas equation (2) estimates the short-run deviations from the equilibrium relation as well as the speed of adjustment toward the long-run equilibrium (ρ). The short-run relation includes country specific fixed effects and time dummies to control for unobserved heterogeneity and cross sectional dependence.

The estimation of a long-run relation implies that the series are i) non-stationary, ii) that there exists a cointegration relation between the variables. Testing procedures must take into account that in long panels, individual time series are likely to be affected by the same common factors, leading to the presence of cross sectional dependence (CSD) among units. For these reasons, we first test for the presence of CSD by using the Pesaran (2004) test and the test for unit roots using two different

procedures. The first procedure is based on the Maddala and Wu (1999) test, which belongs to the first generation of panel unit root tests and it is not robust in the presence of CSD. The second procedure is the CIPS test developed by Pesaran (2007), which belongs to the second generation of panel unit root tests and it is robust for CSD. Finally, the existence of a cointegration relation is tested by using the procedure developed by Westerlund and Persyn (2007), which is robust for CSD when standard errors are bootstrapped.

In order to estimate the cointegration relation of equation (1) we rely on three different estimators. In choosing the first two estimators, we follow Latif (2015) and apply the group-mean Panel Dynamic OLS (PDOLS) developed by Pedroni (1999) and implemented in STATA by Neal (2015), and the Fully Modified OLS (FMOLS) developed by Pedroni (2001). These two estimators control for potential endogeneity by adding lags and leads of the variables included in equation (1). The PDOLS is only able to control for the simultaneity bias whereas other sources of endogeneity are not addressed. Both estimators do not address the issue of CSD, for this reason we introduce a third estimator given by the Common Correlated Effects Mean Group Estimator (Pesaran, 2006, Pesaran and Chudik 2015), which is one of the best performers when the number of panels is small, as in our case. Neal (2015) developed a GMM version of this estimator (CCE-GMM) which allows us to take into account the endogeneity issues. Endogenous variables are instrumented with their first two lags. The PECM specification of equation (2) is estimated by using a standard fixed effects GMM approach and, in this case too, endogenous regressors are instrumented by their first and second lags. To control for general forms of correlation among residuals we estimate Heteroscedasticity and Autocorrelation Consistent (HAC) standard errors.

Endogeneity problems in the long-run relation affect both GDP and immigration. The former because the Okun-Law does not entail a causal relationship but only a simple correlation. In addition, omitted variables, in particular with respect to technology, can exacerbate the problem. As for immigration, the host country's unemployment may be a typical pull factor as economic migrants

tend to choose low unemployment countries to increase the probability to find a job. In the short run, all these endogeneity issues are mitigated as unemployment is mainly determined by the economic cycle and immigration inflows respond more to long-run features of the destination country. Endogenous regressors for the short-run specification will then be selected according to the VECM-based Granger Causality test.

5. Estimation results

5.1 Time series properties of the variables and Granger Causality

The first panel of Table 2 reports the Pesaran (2004) test for CSD for unemployment (*u*), GDP (*gdp*) and immigration (*imm*). The results indicate that all three series present significant CSD. The middle and lower panels of Table 2 report unit root tests for lag specifications ranging from zero to one. The Maddala and Wu (1999) test indicates that *u* and *gdp* have a unit-root whereas *imm* is stationary. Due to the presence of CSD in the data, the results of the Pesaran (2007) test are more reliable and show that for all series the unit-root assumption is accepted.

Table 2. Unit root and CSD tests

	Pesaran (2004) Test for Cross Sectional Dependence		
	u	gdp	imm
	16.6***	42.9***	24.0***
lags	Maddala and Wu (1999) Panel unit Root Test		
	UR	gdp	imm
0	16.1	13.1	59.9***
1	49.1**	23.5	70.1***
	Pesaran (2007) Panel unit Root Test (CIPS)		
	u	gdp	imm
0	3.3	-0.6	0.8
1	-0.1	-1.3	0.3

*significant at 10% level; **significant at 5% level; ***significant at 1% level. H_0: series has a unit root; u= unemployment rate; imp= log inflow of migrant population; gdp= log of gross domestic product at constant prices; ERFT= ratio of employment rate of foreign-born population relative to total population.

The result of the Westerlund and Persyn (2007) cointegration tests with bootstrapped standard errors are shown in Table 3. Looking at the bivariate relations between unemployment and each of the regressors, the results confirm the existence of a cointegration relation, although for *gdp* only two out of four tests are significant. When including both regressors cointegration is still significant in two out of four tests, confirming the validity of equation (1) as cointegration relation.

Finally, in Table 4 we show the results of the Granger causality test using, alternatively, one or two lags of the differenced variables. We find that *gdp* Granger causes unemployment whereas bidirectional causality is detected between unemployment and immigration. Accordingly, in the PECM specification we will treat immigration as endogenous regressor.

Table 3. Westerlund Cointegration Tests

	imm	gdp	imm, gdp
Gt	-2.6***	-1.9**	-2.2***
Ga	-4.6***	-2.1	-2.3
Pt	-8.1**	-9.8***	-8.7***
Pa	-3.2*	-2.1	-1.8

*significant at 10% level; **significant at 5% level; ***significant at 1% level. Ga and Gt are tests for heterogeneous panels (cointegration for at least 1 panel); Pa and Pt are pooled tests for homogenous panels (cointegration for all panels); imm= log of inflow of migrant population; gdp= log of gross domestic product at constant prices; IR= inactivity rate. H_0: series are not cointegrated. Standard errors bootstrapped using 100 replications.

Table 4 VECM-based Granger causality tests

	$\Delta u_{i,t}$ is not Granger caused by:		
	$\Delta gdp_{i,t}$	$\Delta imm_{i,t}$	ALL
1 lag	2.1	1.1	2.9
2 lags	14.9***	7.2**	20.1***
	$\Delta gdp_{i,t}$ is not Granger caused by:		
	$\Delta u_{i,t}$	$\Delta imm_{i,t}$	ALL
1 lag	0.2	1.1	1.1
2 lags	1.6	1.8	2.6
	$\Delta imm_{i,t}$ is not Granger caused by:		
	$\Delta u_{i,t}$	$\Delta gdp_{i,t}$	ALL
1 lag	4.4**	1.1	19.6***
2 lags	6.8**	2.6	24.4***

*significant at 10% level; **significant at 5% level; ***significant at 1% level.

5.2 Cointegration relation and PECM model

Estimation results for equation (1) are reported in Table 5 for the 15 countries as a whole and separately for core and non-core countries. PDOLS and FMOLS estimates indicate that *gdp* is significant and with the expected negative sign in all three samples, with a larger coefficient for peripheral countries. The impact of immigration varies between the two estimators, with the PDOLS reporting similar and significantly negative impacts in both groups, while the FMOLS reports a larger impact for peripheral countries. For both estimators, the results might be biased due to the presence of CSD among residuals.

The CCE-GMM estimator overcomes the cross correlation problem, as shown by the tests on cointegration residuals at the bottom of Table 5. The impact of *gdp* is still significant but the coefficients in the two groups are identical. The impact of immigration, instead, changes substantially, with no significant impact for the EU15 as a whole and a negative and significant effect for peripheral countries only. This means that, after controlling for CSD, the robust result is that immigration significantly reduces long-run unemployment in peripheral countries whereas it has insignificant impacts in core countries. This result suggests that migrant workers during the last 20 years have complemented native workers in peripheral countries and helped to maintain the unemployment rate low. Country specific coefficients of the CCE-GMM estimates are shown in Table A3 in the appendix and broadly confirm the core-periphery differences. The only exceptions are France, Germany and the UK, which show, similarly to all peripheral countries, negative and significant impacts of immigration on unemployment.

Estimation results of equation (2) are shown in Table 6. For each group (EU15, EU15 Core and EU15 Periphery), we show the results of a fixed effects (FE) model with HAC standard errors (columns 1, 3, 5) and of the GMM model (columns 2, 4 and 6), with immigration treated as endogenous regressors. Fixed effects estimates indicate that short-run disturbances are more persistent in core countries (ρ=0.5) than in the periphery (ρ=0.75). Short-run fluctuations of GDP

affect unemployment in all three samples with a larger effect in the periphery and immigration exerts a similar negative and significant effect in all samples. GMM estimates confirm the different degree of persistence of short-run fluctuations in core and peripheral countries. As for the main regressors, *gdp* turns insignificant in core countries while the impact of immigration retains its significance only in the whole EU15 sample and it increases its impact with respect to the FE estimates.

Table 5. Unemployment determinants: long-run relationship

	PDOLS			FMOLS			CCE-GMM		
	EU15	EU15 Core	EU15 Per	EU15	EU15 Core	EU15 Per.	EU15	EU15 Core	EU15 Per
gdp	-0.221***	-0.113***	-0.436***	-0.373***	-0.222***	-0.322***	-0.423***	-0.367**	-0.367***
	[0.010]	[0.016]	[0.001]	[0.047]	[0.025]	[0.033]	[0.064]	[0.150]	[0.132]
imm	-0.040***	-0.039***	-0.043***	-0.018**	-0.015***	-0.028***	-0.002	-0.004	-0.024**
	[0.001]	[0.001]	[0.002]	[0.007]	[0.005]	[0.005]	[0.007]	[0.009]	[0.011]
Res UR	-7.4***	-5.2***	-6.1***	-2.4***	-3.6***	-1.8**	-7.5***	-6.6***	-6.3***
CSD	5.6***	4.3***	2.6***	18.6***	5.5***	1.9*	0.2	-1.2	-1.6
N	295	197	98	300	200	100	300	200	100

Standard errors in brackets; *significant at 10% level; **significant at 5% level; ***significant at 1% level; imm=log of inflow of migrant population; gdp=log of gross domestic product at constant prices. CSD= Pesaran test for cross sectional dependence among residuals.

Table 6. Unemployment determinants: PECM

	EU15		EU15 Core		EU15 Periphery	
	1	2	3	4	5	6
ρ	-0.743***	-0.522***	-0.747***	-0.821***	-0.592***	-0.840***
	[0.087]	[0.097]	[0.149]	[0.120]	[0.156]	[0.224]
Δgdp	-0.221***	-0.133***	-0.184***	-0.214***	-0.091	-0.187***
	[0.026]	[0.036]	[0.045]	[0.028]	[0.067]	[0.045]
Δimm	-0.013***	-0.010**	-0.012**	-0.022**	-0.051	-0.019
	[0.002]	[0.003]	[0.003]	[0.010]	[0.049]	[0.014]
R^2c	0.623	0.602	0.753	0.596	0.285	0.738
Under id.				10.9***	1.719	4.7*
Weak id.				4.988	0.761	1.793
Hansen J	0	0	0	1.105	0.307	0.843
N	285	190	95	285	190	95

Standard errors in brackets; *significant at 10% level; **significant at 5% level; ***significant at 1% level; ect= error correction term; imm= log inflow of migrant population; gdp= log gross domestic product at constant prices; ERFT= ratio of employment rate of foreign-born population relative to total population. Under id.= Kleibergen-Paap LM underidentification test. Weak id.= Kleibergen-Paap Wald weak identification test. J= Hansen overidentification test.

Looking at the identification tests at the bottom of Table 6, we can see that for the whole sample the instrumentation procedure works well only for the EU15 sample. On the contrary, in the two sub-samples, instruments are weak and the equation is underidentified due probably to the small sample size.

5.3 Cross country heterogeneity and labour market indicators

The results of the previous section for the short-run impacts of immigration are not clear-cut. While FE estimates indicate a rather homogenous impact across countries, GMM estimates suggest larger negative impacts, though insignificant, for core countries. This result would be consistent with the findings of Section 3 as core countries have lower inactivity and slightly lower levels of employment protection. In addition, cross-country heterogeneity beyond the simple core-periphery dichotomy might be the reason behind the insignificance of the average impacts in the two sub-samples.

To provide additional evidence of the cross sectional differences in the short-run impacts of immigration, we estimate an augmented version of equation (2) where log-changes in immigration are interacted with both the activity rate and the OECD Employment Protection Index. Table A4 in the appendix indicates that IR and EPI are non-stationary but their interaction with immigration changes is stationary, hence non-linear terms can be introduced whereas non-interacted terms are excluded[5]. The resulting equation is the following:

$$\Delta u_{i,t} = \alpha_0 + \alpha_1 \Delta gdp_{i,t} + \alpha_2 \Delta imm_{i,t} + \alpha_3 IR_{i,t} \Delta imm_{i,t} + \alpha_4 EPI_{i,t} \Delta imm_{i,t} - \rho\big(u_{i,t-1} - \beta_0 - \beta_1 gdp_{i,t-1} - \beta_2 imm_{i,t-1}\big) + + \sum_{i=1}^{N} \lambda_i + \sum_{t=1}^{T} \gamma_t + \upsilon_{i,t} \qquad (3)$$

[5] Both IR and EPI could enter equation (3) in first differences, however the EPI shows little time variability whereas changes in the inactivity rates are highly correlated with changes in the unemployment rate, causing a strong endogeneity problem. From the statistical point of view, the exclusion of these terms does not affect the interpretation of the impact of immigration: the non-interacted coefficient represent the effect for IR and EPI at their average value whereas the interaction term multiplied by the mean deviation of the two variables measures the degree of non-linearity.

Estimation results for equation (3) are shown in Table 7 and confirm that the impact of immigration is lower (i.e. less negative) the higher the inactivity rates and employment protection (column 4). More specifically, the interaction with inactivity turns significant when controlling for the interaction with the EPI, whereas the latter is significant even when introduced alone. This means that the degree of employment protection is a crucial determinant of the labour market adjustments after an immigration shock and that inactivity does not only reflect this aspect of labour market flexibility.

To better understand the cross-country differences in the impact of immigration, Figure 2 plots the country specific coefficients and their 95% confidence interval calculated by applying the average levels of the two indicators for each country. The resulting picture is similar to the one showed in Figure 1, with the larger negative impacts in the three Scandinavian countries, the UK and Ireland, whereas Greece, Italy, and Portugal show the lowest impact. For most countries, the result is mainly driven by the inactivity rate, but for the UK and Portugal EPI has a substantial effect.

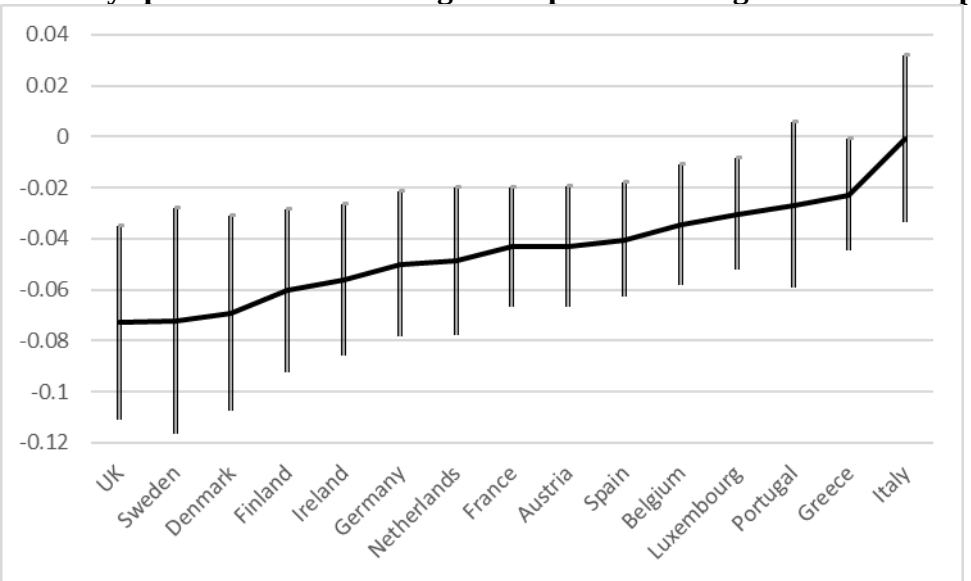
Table 7. Unemployment determinants: PECM specification (2)

	1	2	3	4
ρ	-0.821***	-0.840***	-0.828***	-0.833***
	[0.120]	[0.140]	[0.115]	[0.132]
Δgdp	-0.214***	-0.195***	-0.202***	-0.173***
	[0.028]	[0.033]	[0.027]	[0.032]
Δimm	-0.022**	-0.032**	-0.043**	-0.063***
	[0.010]	[0.013]	[0.014]	[0.017]
Δimm*IR		0.285		0.393**
		[0.190]		[0.184]
Δimm*EPI			0.010*	0.015*
			[0.006]	[0.007]
R^2c	0.596	0.474	0.623	0.512
Under id.	10.908	9.033	8.727	8.228
Weak id.	4.988	2.038	2.059	1.278
Hansen J	1.105	2.125	0.779	1.117
N	285	284	284	284

Standard errors in brackets; *significant at 10% level; **significant at 5% level; ***significant at 1% level; ect= error correction term; imm= log inflow of migrant population; gdp= log gross domestic product at constant prices; ERFT= ratio of employment rate of foreign-born population relative to total population. Under id.= Kleibergen-Paap LM underidentification test. Weak id.= Kleibergen-Paap Wald weak identification test. J= Hansen overidentification test.

To sum up, short-run dynamics confirm only in part the existence of a core-periphery dichotomy. Our estimates divide countries into three groups: Scandinavian and Anglo-Saxon countries, whose short-run effect of immigration on unemployment is largely negative due to high activity rates in the former and low employment protection in the latter; the group of the three worse performing peripheral countries (Italy, Greece and Portugal), which belong to the Southern European welfare system (Ferrera 1996, Rhodes 1996) and show small or insignificant impacts; the remaining countries, including Spain and the old continental countries, which have negative but moderate impacts.

Figure 2. Country specific short-run marginal impacts of immigration on unemployment



Source: own elaboration

6. Conclusions and policy implications

How to integrate the large number of refugees coming to Europe from the Middle East is one of the most challenging tasks the Union has ever faced. This paper looks at the unemployment implication of immigration inflows.

We find significant differences with respect to the effect of immigration on unemployment within the EU, which follow broadly the core-periphery dualism in macroeconomic imbalances and competitiveness. In the long run, immigration is found to reduce unemployment in all peripheral

countries. This confirms that migrant workers are here complementing native workers and mitigate the negative consequences of aging populations and the skill mismatch. Hence, immigration is crucial to improve the long-run growth prospects of these countries. In core countries, on average there is no long-run impact of immigration on unemployment due to substantial heterogeneity, but country specific estimates provide evidence that immigration might have reduced unemployment in France, Germany and the UK.

As for short-run dynamics, for the EU15 as a whole we find a confirmation of the result that immigration reduces unemployment. However, the magnitude of the effect depends on the characteristics of domestic labour markets, with high levels of employment protection and low activity rates causing a reduction in the effectiveness of immigration inflows to reduce unemployment. In this respect, the evidence of a core-periphery dualism is less marked and the emerging cluster of countries is divided into three different groups: Scandinavian and Anglo-Saxon countries, whose short-run effect of immigration on unemployment is largely positive due to high activity rates in the former and low employment protection in the latter; a group consisting of Greece, Italy and Portugal, the three worse performing peripheral countries, which are characterized by low activity, high employment protection and relatively worse economic performance, especially after the crisis (Esposito and Messori 2019), and show small or insignificant short-run impacts of immigration on unemployment; the remaining countries, including Spain and the old continental countries, whose impacts are between those of the other two groups.

Overall, our results provide interesting implications for the current debate on immigration in Europe, especially considering the political choices of some countries. On the one hand, our results show that in the UK immigration has been beneficial for reducing unemployment during a period ending with the year of the Brexit Referendum (2016). Accordingly, the anti-immigration argument which fuelled the Brexit campaign seems unjustified. On a similar token, anti-immigration claims in Italy are not justified in a long-run perspective. Adjustment costs, which have reduced the potential

for immigration to reduce unemployment, were driven by labour market weaknesses due to high inactivity and a rigid labour market. Both features pose a burden on the growth prospects of the country independently of the role of immigration, hence policy efforts should be directed to increase the competitiveness of the country. In this respect, the anti-immigration bias could be defeated with more flexible labour market policies, especially for the more disadvantaged group composed of young individuals who are experiencing high unemployment rates in peripheral countries.

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Appendix

Table A1 - Synoptical analysis of previous empirical studies on the effects of immigration on (un)employment

Level of analysis	Authors	Country and Time-Span	Data	Methodology	Results
Micro	Ottaviano and Peri (2008)	US, 1990-2006	Integrated public use microdata samples (IPUMS) of the U.S. Decennial Census and from the American Community Survey	Elasticity of substitution, 2SLS	Immigration has small negative effects in the short run on native workers with no high school degree and on wages while it causes small positive effects on native workers with no high school degree and on native wages in the long run
	Peri and Sparber (2009)	US, 1960–2000	IPUMS dataset	WLS and 2SLS	The lack of significant negative employment effect of immigration is due to differences in the task specialization of native and migrant workers
	Peri (2012)	US, 1960-2006	IPUMS dataset	2SLS	No evidence that immigrants crowded out employment
	Winter-Ebmer and Zimmermann (1999)	Austria and Germany, 1986-1994	Ministry of Labor (Austria), German statistical office	OLS	Immigration has not a significant effect on total employment
	Carrasco et al. (2004)	Spain, 1993-1999	LFS, Census of Population,	OLS	No significant negative effect of immigration on the employment rates of native workers
	Dustmann et al (2004)	UK, 1983-2000	British Labour Force Survey	OLS, IV	Immigration has no effects on unemployment in UK
	Villosio and Venturini (2006)	Italy, 1993-1997	Labour Force Survey (ISTAT)	Transition matrices, Probit	General complementary effect between immigrants and natives in Italy
	D'amuri et al (2010)	Western German, 1987-2001	IAB Employment Subsample	2SLS	immigration of the 1990's has no adverse effects on native employment levels
	Martins et al. (2018)	Portugal, 2002-2008	Quadros de Pessoal (QP) panel data	Pooled OLS, IV	Strong positive association of immigrants on native hiring
Macro	Jean and Jimenez (2007)	15 EU countries, US, Australia and New Zealand, 1984-2003	LFS	GMM	No permanent effect of immigration upon natives' unemployment.
	Ortega and Peri (2009)	14 OECD countries, 1980-2005	International Migration Dataset (IMD), OECD	Pseudo-gravity empirical specification	Immigration increases employment, with no evidence of crowding-out of natives
	Damette and Framentin (2013)	14 OECD countries, 1970-2008	OECD database	Trivariate VECM	No evidence of adverse effects on unemployment due to immigration in short and long-term except for Anglo-Saxon countries in the short term
	Boubtane te al. (2013)	22 OECD countries, 1980-2005	Annual data, OECD database	Panel Granger causality testing approach	In any country, immigration does not cause unemployment
	D'Amuri and Peri (2014)	5 Western European countries, 1996–2007	ELFS	2SLS	Complementarity between native and foreign workers due to the specialization in different tasks which stimulates job creation and a higher job complexity
	Latif (2015)	Canada, 1983-2010	Provincial level (10 provinces) panel data from the Statistics Canada	FMOLS, DOLS, and panel VECM	In the short run, immigration increases the unemployment, while in the long run, this effect becomes negative but insignificant

Table A2 - Data description

Unemployment rate	*total unemployment/active population for individuals between 20 and 64 years of age*	*Source: Eurostat*
gdp	Log of Gross Domestic Product (euro, 2010 prices)	*Source: Eurostat*
imm	*Log of the net Inflow of Migrant population*	*Source: OECD*
EPI	*Employment Protection Index*	*Source: OECD*
Activity Rate	*Share of inactive individuals in total population aged between 29 and 65 years.*	*Source: own elaboration on Eurostat*

Table A3 Country specific long-run impacts (CCE-GMM estimator)

	EU15 Core	
	gdp	imm
Austria	-0.260***	0.004
Belgium	-0.540***	0.008
Denmark	-1.388***	0.024*
Finland	-0.382***	-0.004
France	-0.334***	-0.038***
Germany	-0.422***	-0.017***
Luxembourg	-0.021	0.002
Netherlands	-1.141***	-0.003
Sweden	0.089	0.031***
UK	-0.307***	-0.058***
	EU15 Periphery	
	gdp	imm
Greece	-0.564***	-0.059***
Ireland	-0.359***	-0.025***
Italy	0.118	-0.017***
Portugal	-0.365***	-0.007**
Spain	-0.274***	-0.051***

Standard errors in brackets; *significant at 10% level; **significant at 5% level; ***significant at 1% level

Table A4 Unit root tests for labour market indicators and their interaction with immigration inflows

	Maddala and Wu (1999) Panel unit Root Test			
lags	IR	EPI	imm*IR	imm*EPI
0	23.7	15.6	242.0***	275.1***
1	31.8	34.6	243.0***	152.5***
	Pesaran (2007) Panel unit Root Test (CIPS)			
lags	IR	EPI	imm*IR	imm*EPI
0	-0.2	2.9	-8.3***	-10.3***
1	-0.2	2.3	-7.5***	-5.3***

Null assumption: series have a unit root. Standard errors in brackets; *significant at 10% level; **significant at 5% level; ***significant at 1% level.