

How do immigration impact unemployment and economic prosperity? An extensive investigation from the OECD nations

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Abstract. *Acknowledging the fact that immigration crisis is one of the most debated and challenging phenomena, especially in most of the OECD countries, this study involves a utilisation of the panel econometric techniques like Panel Error Correction Model, FMOLS and DOLS to empirically analyse the direction of the effects of immigration on native unemployment, in both the short and the long run, in aggregate. The analysis has been performed on a sample of 33 OECD countries between 1990 and 2017. The results suggest that immigration reduces unemployment in the short as well as the long-run. The impacts of immigration on unemployment are confirmed with a series of robustness tests using different estimation techniques and combination of regressors.*

Keywords: immigration; unemployment; OECD; panel error correction model.

JEL Classification: C1, F2, J6.

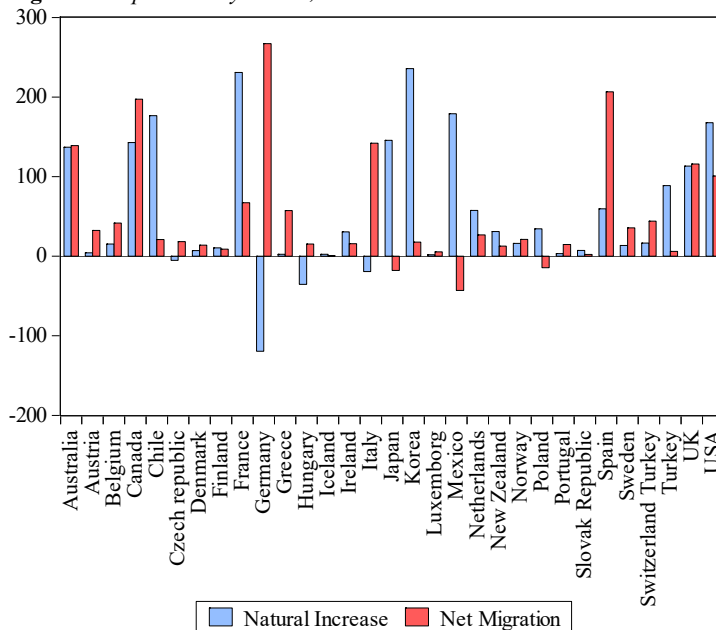
1. Introduction

“Remember, remember always, that all of us, and you and I especially, are descended from immigrants and revolutionists.”

Franklin D. Roosevelt
(Former U.S. President)

The immigration crisis engenders a broad spectrum of social challenges for policymakers throughout the globe. During the past two centuries, the countries of the New World⁽¹⁾ were conventionally known to be the nations that have been lucrative to immigrants from all over the world. From the later part of the 20th century, the situation started evolving significantly with the participation of the Old Europe⁽²⁾ countries in the influx of immigrants. During the last decades, most OECD countries witnessed a surge in the international migration. As a matter of fact, the number of foreign-born in the OECD nations shot up to more than 100 million as compared to just over 75 million a decade earlier (OECD-UNDESA, 2013). Immigrants are the prime constituent of the population in the majority of the OECD countries. They contribute tremendously to the population growth, compared to the natural increase (excess of births over death) in the previous decades (Figure 1). The migration flows are likely to continue at a sustained rate in terms of the aging and the contracting working-age population, in the decades that will follow.

Figure 1. Population dynamics, 1990-2014



Source: Authors' calculation; Demographic and Population Statistics, OECD (2011).

However, there always existed a political and public concern about the repercussions of international migration in context of the economic scenarios in the host countries. Soaring inflows of migrants face strong oppositions on the grounds that continuous addition of international workers to the domestic labour force leads to public resources being diverted

to the immigrants, increases unemployment, depresses wage, makes it harder for unemployed native workers to find jobs and results in declining employment of low-skilled national workers due to enhanced competition in general and especially in times of economic downturns such as the last sub-prime crisis⁽³⁾. Public opinion polls entrench these claims (European Social Survey, 2002; US Bureau of Labor Statistics, 2009).

While public scepticism and political propaganda against immigration seem incessant, the link between immigration and unemployment is not so straightforward, and actually contradicts popular beliefs to a significant extent. The impacts of immigration on the dynamics and equilibrium of the labour market is in fact more complex; it is impossible to understand without taking into account the characteristics of the international migrants and the economic conditions existing in the receiving countries. The labour market role of international worker varies with respect to the stage of the economic cycle. Furthermore, the link between unemployment and immigration also depends on the analysis timescale. Starting from the Solow-Swan framework, theoretical models imply that long-run positive unemployment effects of immigration exist if native and international workers are imperfect substitutes.

An increase in degree of substitutability between workers will lead to the emergence of negative short-run effects and possible long-run effects will tend to disappear (though in the short-run, immigration can contribute towards fixing labour market imbalances and cyclical fluctuations).

Also, in the long-run, immigration can contribute to dampening the impacts of rapidly demographic ageing and to augmenting human capital. Countries, where native and migrant workers complement each other because of the national high-skilled workers, resemble the standard Solow-Swan case where flexibility of the labour market allows for an accelerated short-run adjustment towards a better long-run equilibrium. On the contrary, countries with bizarre characteristics in domestic labour markets like gender bias, higher inactivity, lower participation rates, and intense educational and skill discrepancies, suffer from high levels of unemployment and low potential growth. This is suggestive of the fact that immigration could have positive effects⁽⁴⁾ on unemployment in the long-run since, international workers fill deficiencies in native labour forces, but adjustment in the short-run might temporarily generate unemployment. Nevertheless, definitive conclusions cannot be established resorting to theoretical literature due to the heterogeneity of the features in immigrations, varying specificity of the host countries, migration policies and several other unobservable effects.

For instance, geographical factors can also play a role in affecting the outcomes (geographically smaller areas are likely to be more affected by mobility and spatial interactions). Few empirical works on the causal link between host economic activity and immigration found no evidence of immigration causing unemployment and growth, but surprisingly, the causation running in the opposite direction was concluded (Islam, 2007; Marr and Siklos, 1994; Pope and Withers, 1985). On the other hand, Esposito et al. (2020) found positive impacts of immigration on unemployment in the short-run in all the 15 EU

countries and certain countries in the long-run. However, Chamunorwa and Mlambo (2014) for South Africa, and Angrist and Kugler (2003) in their study containing a panel of 18 European countries for the period 1983-1999, concluded that immigration increased unemployment to a certain degree in the native labour market.

The disparity in the theory and various empirical findings on the subject matter calls for further investigation using sophisticated techniques, different and larger dataset, in order to check the consistency of the previous findings. This paper follows a purely macroeconomic approach in line with Esposito et al. (2020), Latif (2015), and Damette and Fromentin (2013) with an aim to estimate the short and long-run impacts of immigration on unemployment on a sample of 33 OECD countries with the most number of immigrants. A Panel Error Correction Model (PECM) is estimated on the sample over the period between 1990 and 2017. The long-run specification, which relates unemployment to GDP, is based on the Okun's Law (Huang and Yeh, 2013).

This relationship is extended with the net inflow of international migrants and is estimated using the traditional FMOLS and panel DOLS alongside the Common Correlated Effects (CCE), and augmented to the case of endogenous regressors (CCE-GMM). The use of CCE estimator allows to control for cross correlation between the countries by adding cross sectional averages of all variables as additional regressors (Kapetanios et al., 2011).

We contribute to the literature by using the greatest number of OECD countries and a broader time period in the dataset. Estimations obtained from a bigger dataset provided a clearer insight and bolstered the previous findings. Subsequently, we employ a fixed effects model with a unique combination of variables for static analysis of the research question as a mean to check the robustness of the main findings. The study also has a compilation of an extensive literature review to shed light on a broad array of findings over the years.

Rest of the paper is structured as follows: Section 2 reviews the existing literature; Section 3 provides the econometric framework which presents the model specifications, estimation results and robustness check of the empirical model and Section 4 draws the conclusion of the study.

2. Literature review

The immigration-unemployment relationship is not clear-cut, rather the inconsistency between the theoretical literature and empirical findings has always put forth a conundrum. Economic literature has examined the impacts of migration on unemployment (employment) from the outset of seminal articles of Todaro (1969), and of Harris and Todaro (1970). The popular theoretical viewpoint suggests that influx of migrants can have both positive and negative impacts on unemployment depending on the degree of substitution (or, complementarity) between migrant and native workers (Borjas, 1987; Greenwood and Hunt, 1995; Johnson, 1980; Schmidt et al., 1994) and the degree of labour market flexibility.

In a standard Solow-Swan framework, if native and migrant workers are perfect substitutes, there would only be an ephemeral negative impact on unemployment and wages due to the inclination of the capital-labour ratio to go back to the steady state level. But with inflexible labour markets and no full employment, the short-term negative effects on unemployment could be highly resolute, also affecting the long-run evolution of the variable (Brücker and Jahn, 2011). If the labour supply of immigrants and residents are imperfect substitutes, then assuming wage adjustments to clear labour market, an influx of immigrants will reduce wages, resulting in an increase of total employment due to the complementarity. Part of adjustment would take place if labour force participation rates are sensitive to real wage rates. Hence, immigration may cause certain degrees of unemployment among natives who are not willing to work at reduced wages.

Borjas (2009) predicted a decrease of wages in short-run as an outcome of the arrival of immigrants, in line with the neoclassical theory of factor demand. However, if the international and host-country workers are complements in production, the addition of the new international workforce might increase resident productivity, which in turn, raises their wages and their opportunities of employment.

For instance, Berry and Soligo (1969) noted that residents' income increase with increasing immigration; Wooton (1985), in a dynamic general equilibrium model showed that especially in the long-run, labour migration may be mutually favourable for both the aspects of immigration and emigration; Borjas (1995) claimed that an 'immigration surplus' leads to welfare for the host country population, assuming the existence of perfect labour markets, and Ortega (2000) in his paper, introduced immigration in a theoretical model with two countries and concluded that firms, immigrants and natives gain from migration.

On the other hand, Harris and Todaro (1970) asserted that migrants influx should negatively influence the overall level of employment; Greenwood and McDowell (1986) elucidated the adverse effects of immigration on employment and wages for natives and immigrants already present. In a recent research, Lozej (2019) modelled migration as an endogenous decision in a 'search and matching' framework and the results showed that unemployment increases immediately after the immigration shock, but falls subsequently.

There exists diverse empirical literature as well including studies that have summed up the other empirical findings over the years (Kerr and Kerr, 2008; Okkerse, 2008). The popular empirical studies on the subject matter, have presented with assorted conclusions. Ottaviano and Peri (2008) found out that immigration exerts small negative effects on unemployment and wages in the short term on national workers with no high school degrees. However, in the long-run, the effects are positive. Similarly, Gross (2002) carried out an empirical investigation in the immigrant workers flow into the French labour market from the mid-1970s and mid-1990s, and suggested that though the admittance of immigrants led to a minor increase in unemployment in the short-run, the long-run immigration decreased unemployment level.

In another study also based in France, cointegration and Error Correction Model techniques were applied to analyse the relationship between immigration, the labour market and economic development, it was found out that immigration reduced unemployment in both the short and the long-run (Fromentin, 2013).

Jean and Jimenez (2011) made a study on 18 OECD countries for the period of 1984-2003. They found short-run negative effects of immigration on unemployment for a period of five to ten years and no significant effects in the long-run. Their study presented the conclusions that anticompetitive product market regulations increase both the persistence and magnitude of this impact, while more stringent employment protection legislation intensifies its persistence and an increased average replacement rate of unemployment benefits increases its magnitude.

Latif (2015) applied a panel cointegration approach with provincial-level data from Canada and maintained that immigration had negative impact on unemployment in the short-run, but in the long-run, this effect is insignificant.

Also, Gross (2004) in a study involving data from the province of British Columbia in Canada, implied that immigration increased unemployment in short-run and in the long-run, unemployment was lowered permanently by the influx of migrants.

Peri and Sparber (2009) found evidence that due to the disparities in the task specialization of migrant and native workers, there is no significant negative employment effect of immigration.

Peri (2012) claimed that the main employment effect of migration in the US is operational through total factor productivity, validating the theory of immigration increasing the variety of skills available for production.

Martins et al. (2018) used matched employer-employee longitudinal data in their study based on Portugal and discovered that there is a strong positive association of immigrants on native workers hiring. Similarly, Villosio and Venturini (2006) put forth evidence of a complementary effect between natives and immigrants in Italy.

Ortega and Peri (2009) confirmed the positive effect of immigration on the growth of employment after the research on the impact of immigration on productivity, production factors and factors per worker for a sample of 14 OECD countries.

Ghatak and Moore (2007) found out that immigration had a significant positive effect on the unemployment rate in the destination countries after using Granger causality techniques on a panel data from 13 of the original EU countries.

On the contrary, Dustmann et al. (2005) for the UK, Carrasco et al. (2008) for Spain, Winter-Ebmer and Zimmermann (1999) and D'Amuri et al. (2010) for Germany, Strielkowski and Troshchenkov (2013) from the cross-sectional data of 99 municipalities of Denmark, Simon et al. (1993) for the US, and Pischke and Velling (1997) do not find a significant effect of immigration on the (un) employment conditions in the native labour force.

Boubtane et al. (2013) for 22 OECD countries in the period of 1980-2005, and Shan et al. (1999) for Australia and New Zealand, bolstered the findings by providing evidence that immigration does not Granger cause unemployment in any countries. This conclusion is corroborated by the studies based on natural experiments, i.e., immigration caused by political rather than economic factors (Card, 1990 for the Mariel Boatlift⁽⁵⁾ and Hunt, 1992 for the “pieds-noirs” return to France after the independence of Algeria).

Few recent studies provide detailed insights. Grossmann and Stadelman (2013) used a purely gravity approach to analyse the effects of migration flows by skill group on Total Factor Productivity, relative GDP per capita, and wages of the home and host countries. They declared a significant positive impact of skilled labour migration on relative TFP differences, consistent with the complementarity effect of skilled labour immigration in advanced economies⁽⁶⁾.

Damette and Fromentin (2013) used a panel VECM model to assess the connection between migration, wages and unemployment in OECD countries and addressed the endogeneity problems among the three variables. Their results showed that in the short-run, immigration positively affects unemployment in the continental European countries but it negatively affects unemployment in the Anglo-Saxon countries. D’Amuri and Peri (2014) collected aggregate individual level data from the European LFS to construct a dataset including task intensities and skill of foreign employed and native population in 15 Western European countries. The discovered evidence of complementarity between foreign and native workers due to specialization in different tasks, which stimulates higher job complexity and job creations.

To shed light on the impacts of immigration on economic prosperity, few theoretical works (Barro and Sala-i-Martin, 1995; Dolado et al., 1994) employ a Solow growth model extended by human capital to examine the effects of immigrants on growth. They conclude that the impacts of migration on economic growth depend on the composition of skills of the incoming migrants. The more migrants are educated and skilled, the more is the complementarity effect, possibly resulting in enhanced positive effects of immigration on economic growth and subsequently, on employment in the host country. Feridun (2005), using data from Norway, found out that immigration had a positive impact on GDP per capita while it had no effect on unemployment. Quite a few works investigated the fiscal impacts of immigration to evaluate whether receiving country’s social welfare system is burdened by the immigration more than is compensated by the taxes paid by the immigrants (Auerbach and Oreopoulos, 1999; Borjas, 1995, 2001). These studies generally point out that the total economic impact on the host country is relatively small.

In a related study, Beine et al. (2014) investigated whether immigration could alleviate the Dutch disease effects associated with booms in natural resource sectors. The study used a panel data for the 10 Canadian provinces and discovered that workers’ immigration into the booming provinces exerted a mitigating impact on the Dutch disease. The mitigation effect was more intense with inter-provincial migration flows immigration flows connected with temporary foreign workers program. However, any evidence of such mitigation effect

for permanent international immigration was not found. In another study, Gross and Schmitt (2012) used panel data from the 10 Canadian provinces and found that availability of ephemeral international labours contributed to the persistence of regional discrepancies in the rate of unemployment.

The diversified empirical conclusions in the immigration-unemployment relationship literature pool, provide the rationale for further empirical investigations to be carried out in the following sections.

3. Empirical analysis

This section intends to present the overall empirical findings and sheds further light on the immigration-unemployment debate. The entire framework has been constructed with reference to Esposito et al. (2020).

3.1. Model specifications and methodologies

Following Latif (2015), Esposito et al. (2020), and Boubtane et al. (2013), we initiate by modelling unemployment rate as a function of domestic GDP and immigrant inflows (check Appendix III for variable descriptions). Mathematically,

$$U_{it} = f(IM_{it}, GDP_{it})$$

where U represents the unemployment rate; IM is the immigrants inflow; GDP is the gross domestic product of a nation, and the subscripts i ($i = 1, \dots, N$) and t ($t = 1, \dots, T$) indicate the individual country and time period, respectively.

The relationship between unemployment and GDP is established with respect to the long-run version of the Okun's Law (Huang and Yeh, 2013). Taking into account the ample of empirical and theoretical evidences provided in the literature review section, the long-run effect of immigration on unemployment is expected to be positive by the virtue of the complementarity/substitutability effect. In the short-run, the degree of complementarity or substitutability will play a more crucial role in determining the ultimate immigration effects. Though, in a broader perspective, a higher degree of substitutability is expected increase unemployment due to immigration, but the outcome might also vary depending on certain other factors like the flexibility of labour markets and other prevailing economic conditions. The GDP variable is anticipated to have a negative coefficient since, economic growth creates job opportunities and reduces unemployment.

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

$$unem_{i,t} = \beta_0 + \beta_1 limm_{i,t} + \beta_2 lgdp_{i,t} + \varepsilon_{i,t} \quad (i)$$

$$\begin{aligned} \Delta unem_{i,t} = & \alpha_0 + \alpha_1 \Delta limm_{i,t} + \alpha_2 \Delta lgdp_{i,t} - \rho (unem_{i,t-1} - \beta_0 - \beta_1 limm_{i,t-1} - \beta_2 lgdp_{i,t-1}) + \\ & + \sum_{i=1}^N \lambda_i + \sum_{t=1}^T \gamma_t + v_{i,t} \end{aligned} \quad (ii)$$

where $unem$ is the unemployment rate variable, $lgdp$ is the log of GDP at constant 2010 USD and $limm$ represents the log of inflow of immigrants. Equation (i) denotes the long-

run equation whereas equation (ii) is used for estimating the short-run deviations the equilibrium relation as well as the adjustment speed toward the long run equilibrium (ρ). Higher adjustment speed implies lower persistence of short-run disturbances. λ_i symbolises country specific fixed effects and γ_t represents time fixed effects and they are employed in order to take into account the unobserved heterogeneity and Cross Sectional Dependence (CSD).

The long-run relationship estimation implies that there exists a cointegrating relationship between the variables and that the series are non-stationarity. It is also to be taken into account that in longer panels, individual time series are probably affected by the same common factors, resulting in the presence of CSD. Hence, a couple of testing procedures are to be carried out preliminarily. We begin by testing for the presence of CSD following Pesaran (2004) and subsequently, test for the presence of unit roots using two different methods.

The first step involves the application of Maddala and Wu (1999) test, which is a panel unit root test of the first generation and is not robust when CSD is existent. In the second step, the CIPS test developed by Pesaran (2007) is used. The CIPS test belongs to the second-generation panel unit root tests and is robust in presence of CSD. In the end, the presence of a cointegration relation is examined by utilising the procedure constructed by Persyn and Westerlund (2008), which is robust in presence of CSD when standard errors are bootstrapped.

The cointegration relation of equation (i) is estimated using three different estimators. The first two estimators are the group-mean Panel Dynamic OLS (PDOLS) and the Fully Modified OLS (FMOLS) developed by Pedroni (2001). By adding lags and leads of the variables in equation (i), these two estimators control for potential endogeneity. The PDOLS does not control for other sources of endogeneity apart from the simultaneity bias. Both the estimators do not control for the CSD issues, and therefore, the Common Correlated Effects Mean Group estimator (Chudik and Pesaran, 2015; Pesaran, 2006) is introduced.

The advantages of this estimator are enhanced performance in presence of a small panel and it takes into account the CSD issue. By introducing cross sectional averages of all the variables as well as additional common factors, the CCE estimator controls for CSD. In this case, the additional factor is a year dummy equal to 1 to control for the time shocks of the European sovereign debt crisis and the Global Financial Crisis. A GMM version of this estimator (CCE-GMM) was developed by Neal (2015), which permits to take into account the endogeneity issues. The first two lags of the endogenous variables are used as the instruments. The paper estimates the PECM specification of equation (ii) by using a standard fixed effects estimator alongside a GMM approach, where the first and second lags of the endogenous regressors are used as the instruments. Heteroscedasticity and Autocorrelation Consistent (HAC) standard errors are estimated to control for general forms of correlation among residuals.

Since the Okun's Law entails a simple correlation rather than a causal relationship, endogeneity problems in the long-run relation affect both GDP and immigration. Additionally, omitted variables, particularly with regards to technological developments, can aggravate the situation. As far as immigration is concerned, the unemployment in the host country could be a potential pull factor since job-searching migrants are more likely to choose countries with lower unemployment to increase the probability of landing into a job. All these endogeneity issues are attenuated in the short-run since unemployment conditions are mainly determined by the economic cycle and migrant inflows respond more to the long-run economic features of the destination country. We will use VECM-based Granger Causality test to determine the endogenous regressor(s) in this study.

3.2. Data type and source

We use a panel data of 33 OECD countries with the time frame 1990-2017. The dataset has been compiled by collecting data from the World Bank World Development Indicators (February 2019), OECD database, IMF database and FRED database.

3.3. Estimation and analysis

At first, the reports of Pesaran (2004) test for CSD is interpreted for all the variables. From the first panel of Table 2, the outputs show that all the three series display significant CSD. The remaining two panels of Table 2 provide the outcomes of the unit root tests for the lag specifications of zero and one.

Table 1. CSD and Unit Root Tests

Pesaran (2004) Test for Cross Sectional Dependence			
	<i>unem</i>	<i>limm</i>	<i>lgdp</i>
	11.99***	48.33***	114.66***
lags	Maddala and Wu (1999) Panel Unit Root Test		
	<i>unem</i>	<i>limm</i>	<i>lgdp</i>
0	97.31***	71.75	48.39
1	147.89***	125.348***	54.31
	Pesaran (2007) Panel Unit Root Test (CIPS)		
	<i>unem</i>	<i>limm</i>	<i>lgdp</i>
0	2.34	-0.84	1.29
1	-0.3	-1.53	1.86

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively.

The Maddala and Wu (1999) test shows that *limm* and *lgdp* have a unit-root whereas *unem* is a stationary series. However, due to the existence of CSD in the data, the Pesaran (2007) test results are more dependable and the results indicate that the assumption of I(1) process for all the series is accepted.

The outcomes of the Persyn and Westerlund (2008) cointegration tests with bootstrapped standard errors are displayed in Table 2. Skimming through the bivariate relations between each of the regressors and unemployment, we can confirm from the results that there exists a cointegration relation.

Table 2. Westerlund Cointegration Tests

	<i>limm</i>	<i>lgdp</i>	<i>limm, lgdp</i>
Gt	-2.65**	-3.2***	-3.35***
Ga	-10.69	-13.78*	-13.79*
Pt	-15.46***	-10.09	-14.62***
Pa	-13.74***	-6.69	-11.9***

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively. Ga and Gt are tests for heterogenous panels (cointegration for at least 1 panel); Pa and Pt are pooled tests for homogenous panels (cointegration for all panels). H_0 : series are not cointegrated. Standard errors are bootstrapped using 100 replications.

For *limm*, three out of four tests are highly significant; two out of four tests are significant for *lgdp*. While both the regressors are tested, all the four tests for cointegration are significant. Henceforth, the existence of a cointegration relationship for equation (i) can be confirmed.

Table 3. VECM based Granger Causality Tests

$\Delta unem_{i,t}$ is not Granger caused by:			
	$\Delta limm_{i,t}$	$\Delta lgdp_{i,t}$	All
1 lag	0.001	17.8***	18.09***
2 lags	10.91***	36.68***	51.25***
$\Delta limm_{i,t}$ is not Granger caused by:			
	$\Delta unem_{i,t}$	$\Delta lgdp_{i,t}$	All
1 lag	15.2***	7.61***	50.59***
2 lags	14.58***	7.13**	44.3***
$\Delta lgdp_{i,t}$ is not Granger caused by:			
	$\Delta unem_{i,t}$	$\Delta limm_{i,t}$	All
1 lag	0.29	0.1	0.36
2 lags	0.62	0.99	1.43

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively.

Lastly in Table 3, we show the results of the Granger causality test using alternatively one or two lags of the differenced variables. We find that *lgdp* Granger causes *unem* whereas evidences of bidirectional causality between *limm* and *unem* has been found. As per the results, *limm* is treated as the endogenous regressor in the PECM specification.

Estimation outcomes for equation (i) are shown in Table 4. The FMOLS model estimates a negative coefficient for *lgdp* as expected and for *limm* as well. The results show that both *lgdp* and *limm* are significant at 1% and 5% level, respectively. In the PDOLS model, the lags and leads are chosen as per Schwartz criterion. The model predicts negative coefficients for both *limm* and *lgdp*.

However, we find that *limm* is insignificant in this model. For both the estimators, the outputs can be potentially biased due to the possible presence of CSD.

Table 4. Unemployment Determinants: The Long-Run Relationship

	FMOLS	PDOLS	CCE-GMM
<i>limm</i>	-0.492** [0.25]	-0.445 [0.371]	-1.611* [0.881]
<i>lgdp</i>	-22.864*** [1.652]	-24.097*** [2.261]	-26.419*** [5.52]
Resid UR	-1.70**	-2.8***	-12.85***
N	791	758	759

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively. Standard Errors are shown in []. Resid UR = unit root test of estimation residuals.

The CCE-GMM estimator, on the other hand, takes the cross correlation into account. $lgdp$ is still found to be negative and significant. The immigration impact is found to be changed substantially and is significant at 10% level. It can be concluded that the native workers have been complemented by the international workers during the last 27 years and thus, maintaining the unemployment at a lower level.

In Table 5, the estimation results of equation (ii) are shown. The results of a Fixed Effects (FE) model with HAC standard errors, and a GMM model with immigration treated as the endogenous regressor, are plotted.

Table 5. Unemployment Determinants: PECM

	FE	GMM
ρ	-0.272*** [0.029]	-0.38*** [0.037]
$\Delta limm$	-0.399*** [0.127]	-0.96*** [0.356]
$\Delta lgdp$	-25.979*** [1.596]	-25.776*** [1.828]
R ²	0.552	0.551
Hansen J		6.795
N	784	759

Note: ***, ** and * represent significance at 1%, 5% and 10% levels respectively. Standard Errors are shown in []. Hansen J = Hansen overidentification test.

From the results of both the estimators, we can interpret that immigration significantly reduces unemployment in the short-run. $lgdp$ has significant negative coefficients. The significantly negative values of ρ (-0.27 and -0.38) indicate that the short-run disturbances are persistent and that there is long-run convergence towards the equilibrium.

3.4. Robustness check

To check the soundness of the results obtained, a series of steps has been followed. First of all, to come up with further evidence on the cross-sectional diversities in the short-run impacts of immigration, an augmented version of equation (ii) is estimated where the log changes in immigration is interacted with both the OECD Employment Protection Index (epi) and the labour force participation rate (lfp). epi is used as employment protection is a crucial determinant of the adjustments of labour market after an immigration shock, and lfp controls for labour market flexibility (Esposito et al., 2020). The new equation is as follows:

$$\Delta unem_{i,t} = \alpha_0 + \alpha_1 \Delta limm_{i,t} + \alpha_2 \Delta lgdp_{i,t} + \alpha_3 (lfp_{i,t} \Delta limm_{i,t}) + \alpha_4 (epi_{i,t} \Delta limm_{i,t}) - \rho (unem_{i,t-1} - \beta_0 - \beta_1 limm_{i,t-1} - \beta_2 lgdp_{i,t-1}) + \sum_{i=1}^N \lambda_i + \sum_{t=1}^T \gamma_t + v_{i,t}$$

Both lfp and epi variables are non-stationary. However, the interactions with the immigration variable are stationary. Hence, the non-linear terms are included and the non-interacted variables are left out. The estimation results of negative coefficient of immigration from the main analysis does not alter.

In the next step, we carry out a static estimation of the immigration-unemployment relationship using a fixed effects model. Two new variables, secondary school enrolment ratio (sse) and inflation (inf) are introduced as control variables along with the pre-existing variables. The reason for choosing these variables are the established relationship between

them and unemployment. The *sse* variable controls for the human skill-set and increased education likely reduces unemployment. As for as inflation is concerned, the Philips Curve popularised the inflation-unemployment trade-off theory. The resulting equation is:

$$unem_{i,t} = \alpha + \beta_1 limm_{i,t} + \beta_2 lgdp_{i,t} + \beta_3 lfp_{i,t} + \beta_4 epi_{i,t} + \beta_5 inf_{i,t} + \beta_6 sse_{i,t} + \sum_{i=1}^N \lambda_i + \sum_{t=1}^T \gamma_t + \delta_{i,t}$$

Initially, the main regressors, *limm* and *lgdp* are introduced and then, one by one, the other control variables are used. The results display that the coefficient of immigration is negative throughout and is significant at 1% level.

Hence, the results of the empirical investigation that influx of international workers reduced unemployment rate in the OECD nation, stands.

4. Conclusion

The upward trend in economic growth observed across the last decade in the majority of the OECD member countries has fuelled the debate on immigration, the primary focus of which remains the flow control, to the contributions that immigration might play in decreasing sectoral labour shortages, and dampening the effects of population ageing. Nevertheless, events like the Brexit campaign fuelled by the anti-immigration arguments, prove that the scepticism related to allowing foreign population in the native country, persists. In light of these, the paper empirically analyses the unemployment impacts of immigration. The results suggest that immigration reduces unemployment in both the short and the long-run in the economically developed OECD countries in line with Ortega and Peri (2009), and (Esposito et al. (2020)). The explanation for this is that the migrant workers are complementing the national workers, and that they mitigate the negative impacts of skill mismatches and the aging population. Damette and Fromentin (2013) link the result obtained to the high-speed adaptation of migrant workers and the labour market's absorptive capacity, and mentions the rationale for this result that migration creates jobs as well as fill them. Thus, it is a bit unfair to condemn the migrant workers on grounds of taking away employment opportunities from the natives.

However, this paper suffers from the limitation of lack of data availability. More data points would provide clearer insights on the topic of discussion. Provided the fact that immigration is a matter of concern in many other nations apart from the OECD, recommendations would be to collect sufficient data for those countries inclusive, so that answers could be sought not limited to the OECD countries.

Notes

- (1) Australia, Canada, New Zealand, USA.
- (2) Western Europe.
- (3) During the recession, a debate ensued in Europe on whether immigrants were stealing jobs from the native workers (Rohac, 2014).

- (4) Throughout the paper, the study defines positive (negative) effect of immigration on unemployment as decrease (increase) of unemployment rate. However, empirically, a positive (negative) means a negative (positive) coefficient in the estimations provided later on.
- (5) In 1980, Fidel Castro granted free access to depart from the Mariel port, to any persons who wished to leave Cuba. Approximately, 125,000 Cubans, comprising of mostly unskilled workers, migrated to Miami, increasing Miami's labour force by 7 percent.
- (6) In evaluating the labour market effect of immigration in the host economy, the discouraging effect on internal labour mobility has to be taken in account (Brücker et al., 2011).

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Appendix I. List of countries

Australia	Czech Republic	Greece	Italy	Netherlands	Slovak Republic	Turkey
Austria	Denmark	Hungary	Japan	New Zealand	Slovenia	UK
Belgium	Finland	Iceland	Korea	Norway	Spain	USA
Canada	France	Ireland	Luxembourg	Poland	Sweden	
Chile	Germany	Israel	Mexico	Portugal	Switzerland	

Appendix II. Variable statistics

Variables	Observations	Mean	Std. Dev.	Min	Max
<i>unem</i>	910	7.586	4.063	0.7	27.466
<i>limm</i>	825	11.045	1.451	7.21	14.517
<i>lgdp</i>	921	26.763	1.473	22.792	30.485
<i>lfp</i>	917	60.407	6.637	45.09	83.847
<i>epi</i>	836	2.205	0.872	0.093	4.833
<i>inf</i>	911	5.016	12.372	-5.214	208.178
<i>sse</i>	656	89.537	8.764	44.260	105.699

Appendix III. Variable descriptions

Variables	Descriptions	Source
<i>unem</i>	<i>Unemployment, total (% of total labour force)</i> . The share of the labour force that is without work but available for and seeking employment.	The World Bank
<i>limm</i>	<i>Log of total inflows of foreign population by nationality</i> . OECD countries seldom have tools specifically designed to measure the inflows and outflows of the foreign population, and national estimates are generally based either on population registers or residence permit data.	OECD
<i>lgdp</i>	<i>Log of Gross Domestic Product (constant 2010 US\$)</i> . Sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.	The World Bank
<i>lfp</i>	<i>Labour force participation rate, total (% of total population ages 15+)</i> . Labour force participation rate is the proportion of the population ages 15 and older that is economically active: all people who supply labour for the production of goods and services during a specified period.	The World Bank
<i>epi</i>	<i>Strictness of employment protection</i> . The OECD indicators of employment protection are synthetic indicators of the strictness of regulation on dismissals and the use of temporary contracts. They are compiled from 21 items covering three different aspects of employment protection regulations: (i) protection of regular workers against individual dismissals; (ii) regulation of temporary forms of employment; (iii) additional, specific requirements for collective dismissal	OECD
<i>inf</i>	<i>Inflation, GDP Deflator (annual %)</i> . It shows the rate of price change in the economy as a whole	The World Bank
<i>sse</i>	<i>School enrolment, secondary (% gross)</i> . Ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.	The World Bank