"Dimitrie Cantemir" Christian University
Knowledge Horizons - Economics
Volume 9 , No. 2, pp. 31-46
P-ISSN: 2069-0932, E-ISSN: 2066-1061
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www.orizonturi.ucdc.ro

THE IMPACT OF IMMIGRANTS ON THE UK ECONOMY

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Abstract *Starting from the recent debates on Brexit, the main aim of this paper is to evaluate the impact of immigrants on the UK economy. In this context, we made a comparison between EU and non-EU immigrants in the period 1991-2015. According to estimations based on vector error correction models, there is not a long-run relationship between number of EU immigrants and employment rate, respectively real economic growth in the UK in the period 1991-2015. On the other hand, the number of non-EU employees is higher and they had a significant impact on the UK labour market. A significant causal relationship from employment rate to number of non-EU immigrants was identified in the period 1991-2015. The Brexit's argument related to the negative impact of EU immigrants on the UK economy is not supported by the empirical findings.*

Key words:
immigrants, vector error correction model, Brexit, GDP, employment

JEL Codes:
C51, C53, J61

1. INTRODUCTION

In the context of recent debates regarding Brexit, an empirical evaluation of the impact of immigrants on the UK economy is necessary. A dissociation have to be made between EU and non-EU immigrants to check if the EU immigrants represented a real problem for the UK economy. Contrary to the popular opinion regarding the EU migrants, Petroff (2016) proved that the UK's immigrants contribute to the country's budget and accelerated the economic growth. Most of the EU immigrants came in the UK to work and they paid taxes. The academic environment showed that the Brexit will bring a lower economic growth (Boubtane et al., 2015; Boronska-Hryniewiecka, 2016; Dhingra et al., 2016).

The main aim of this paper is to assess the impact of EU and non-EU immigrants on the UK economy using as macroeconomic variables the real GDP and the employment rate. The relationship between the number of immigrants from the two regions and the macroeconomic indicators are studied on long, but also on short-run. This type of analysis is based on vector error correction models and the results indicated that there is not a long-run and short-run relationship between EU migrants and the real economic growth, respectively employment rate. So, the argument regarding the migrants' issue for Brexit is contradicted by the empirical finings.

After this introduction, the paper focuses on the literature review. Next section is dedicated to the methodological framework, being followed by the empirical analysis. The last part of the paper concludes.

2. THE UK AND THE IMMIGRANTS IN THE ECONOMIC LITERATURE

According to the free movement principle, any non-British EU citizen has the right to work in the UK (Boswell, 2016). Moreover, the UK has the right to completely control the borders. It is exempt from common standards in immigration and some asylum regulations (Staiger, 2016).

In the context of the economic integration, four freedoms specific to Internal Market are affected: free movement of persons, capital, services and merchandise trade. Ebell and Warren (2016) explained that EU membership had a positive effect on the UK immigrants, because of free capital movement and because of free goods and services trade, including labour mobility and passporting. In the opinion of Robinson (2015), the most important effect of Brexit would be on the capital movement that will affect businesses by increasing the uncertainty. Therefore, investment will fall mostly because of the multinationals that will find the UK a less attractive location.

Considering the endogenous growth theory, a liberal trade brings benefits to the industries with a clear competitive advantage (Rebelo, 1991;

Romer 1994; Stefaniak-Kopoboru & Kuczewska, 2016). In this approach, faster economic growth can be realized through specialisation and through reduction of product unit costs. Duczynski (2000) showed that the countries with higher trade openness have more opportunities to exploit technological innovations, with direct implications on a faster economic growth. The product life cycle theory shows that in case of standardized product technologies, companies relocate their production to the states with lower capital intensity (Hirsch, 2009; Farmer & Schelnast, 2012). Greater innovation rate and more technology absorptions promote the improvement of human resources skills and abilities (Balcerzak, 2016) that brings economic growth on the long run (Pilinkiene, 2016).

An important argument for Brexit was the control of immigration from the other EU countries to the UK. The level of net inward migration achieved record levels in recent years. The British media and population perception is that uncontrolled immigration will negatively influence the Britons' salaries, jobs and the life quality. The immigration reduction is required by a consistent part of the British population (44% of the population according to Ipsos-Mori and 71% of the Britons according to 5 News and YouGov). The reasons are related to burden on public services, wages, unemployment and cultural issues (Boswell, 2016). 58% of the UK citizens considered that the EU migrants should have a definite job before their arrival in the UK (Daily Express, 2016).

The perception of the economists regarding the migration issue is different. Most of the empirical findings encourage the EU immigrants. A profile of EU migrants show that they are younger, available to work, more educated and ask for fewer benefits compared to the UK-born. Even if there are concerns about the jobs competition, the services and goods used by immigrants increase demand and create more jobs opportunities. Moreover, the immigrants might have complementary skills. There are some researches in the economic literature that analyse the impact of immigration on jobs and wages of the UK-born workers (Portes, 2016; Wadsworth, 2015; Dustmann et al, 2005). All these studies proved that the increase in the number of immigrants did not significantly influence the jobs and wages of UK-born workers in a negative way). According to Wadsworth et al. (2016), the regions with high increase in the number of EU immigrants did not meet high fall in the jobs and salaries paid to UK-born people. The real cause of the salaries decrease after 2008 is the global financial crisis and not the immigration increase. There is a little evidence related to the less jobs and wages for low skilled UK-born workers, because of the more educated EU immigrants.

The immigrants come with extra resources that could be utilized to increase the spending on local health and education of the UK-born people. There is not any consensus regarding the consequences of immigration on the productivity in the UK. Previous studies showed strong evidence for positive effects in case of high educated immigrants (Ortega and Peri, 2014; Ottaviano et al., 2016). According to Felbermayr et al (2010), an increase in the immigrant stock by 10% determined the gain of 2.2% in income per capita income after 2000. Boronska-Hryniewiecka (2016) concluded that the GDP will decrease by more than 1% by 2020 if the number of immigrants will decrease by 100,000 people each year.

The EU immigrants reduced the budget deficit, because they pay more taxes with respect to the money for welfare and the public services use. The immigrants do not negatively influence the local services on problems regarding education, health, crime or social housing.

Considering the impact of immigrants on the UK public finances, Dustmann and Frattini (2014) brought evidence that EU immigrants had a positive fiscal contribution, because they paid more taxes than benefits in terms of welfare. Milaszewicz et al. (2015) showed that only 0.8 per cent of the EU immigrants had unemployment benefits one year after their arrival in the UK. Most of the EU immigrants came to the UK only to get a job and not for high welfare.

If the EU immigrants will decrease by 80 000 people per year, Boubtane et al (2015) indicated that the labour productivity could decrease by 0.16%. Ten years after Brexit, the GDP per capita will be 1.6% lower compared to the situation when UK would be EU member state.

In case the UK will follow the Norway model, free movement will be accepted (Staiger, 2016). In case of Switzerland model, the immigration will remain uncontrolled. After Brexit, Boswell (2016) and Booth (2015) suggested new policies for higher wages and better training and education of the UK labour force, especially in building sector. The high decrease of the labour work in sectors like health, food processing, cleaning, manufacturing, and tourism will generate negative effects on the UK economy (Boswell, 2016).

In case of a significant reduction of the number of immigrants, even the advantages for highly-skilled sectors are doubtful (Boronska-Hryniewiecka, 2016; Boswell, 2016). Chu (2016) explained that only a low reduction in immigration will avoid a high deterioration of the economic performance after Brexit. In case of a liberal policy on migration GDP will increase till 2030, according to Booth (2015). The UK

should continue to receive the EU immigrants for covering the necessity of low-skilled jobs.

3. METHODOLOGY

In this study, the relationship between immigrants and other macroeconomic variables (employment rate, GDP rate) will be assessed considering vector error correction models.

If the time series of two variables Xt and Yt are co-integrated, then an Error Correction Model representation exists. Co-integration represents a necessary condition for Error Correction Model and viceversa.

If the time series of two variables Xt and Yt are integrated of the same order (they have the same number of unit roots), they are co-integrated if there is a linear combination of them that is stationary (no unit roots).

Engle and Granger (1987) proposed a procedure for checking for co-integration:

- The following regression model is estimated starting from the data in level:

$Y_t = a + bX_t + Z_t$, where $X_t, Y_t \to I(1)$

X_t- explanatory variable

Y_t- dependent variable

a,b- parameters

Z_t- error term

- The Augmented Dickey-Fuller test is performed on residuals (estimated errors $\hat{Z}_t$)

$$\Delta\hat{Z}_t = \varphi\hat{Z}_{t-1} + \sum_{i=1}^{p} \tau_i \hat{Z}_{t-i} + e_t$$

- Considering the previous regression model, we have to test if φ is 0 or not from statistical point of view.
- In the end, the final decision is taken. If the residuals are integrated of order 0 (stationary), then the Xt and Yt are co-integrated.

However, in this research, we will use Johansen co-integration test of Johansen and Juselius (1990) that has two major advantages compared to Engle-Granger procedure:

a. Checking for the number of co-integrating vectors

b. Joint procedure: it allows for testing and providing a maximum likelihood estimation of the VECM and long term equilibrium relationships.

In the case a bivariate vector-autoregressive model (VAR), if Xt and Yt are co-integrated of order 1, then:

$$\Delta X_t = c_1 + \rho_1 Z_{t-1} + \beta_1 \Delta X_{t-1} + \cdots + \alpha_1 \Delta Y_{t-1} + \cdots + \varepsilon_{xt}$$
$$\Delta Y_t = c_2 + \rho_2 Z_{t-1} + \gamma_1 \Delta X_{t-1} + \cdots + \delta_1 \Delta Y_{t-1} + \cdots + \varepsilon_{yt}$$

$(\varepsilon_{xt}, \varepsilon_{yt})'$- bivariate white noise,

$Z_t = X_t - AY_t \to I(0)$ and at least one $\rho_i \neq 0$

If Xt and Yt are not co-integrated, then Zt is integrated of order 1.

Several steps are followed when a vector error correction model is estimated:

(1) Check if the time series Xt and Yt are integrated of the same order, applying an unit root test for each data series (for example, Augmented Dickey-Fuller (ADF) test);

(2) Check if the time series Xt and Yt are co-integrated. The co-integration relation is identified. We check if the residuals of the regression model between Y and X are stationary.

(3) Short-run dynamics:

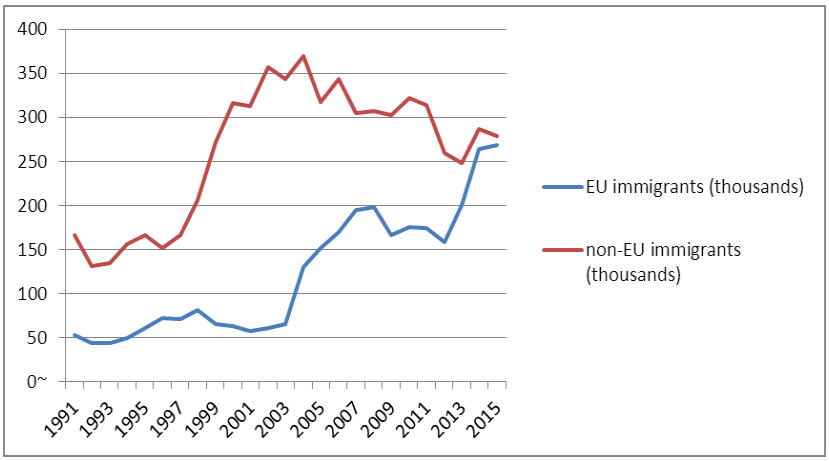
$$\Delta X_t = c_1 + \rho_1(Y_{t-1} - \hat{\alpha}X_{t-1}) + \beta_{x1}\Delta X_{t-1} + \cdots + \beta_{y1}\Delta Y_{t-1} + \cdots + \varepsilon_{xt}$$
$$\Delta X_t = c_2 + \rho_2(Y_{t-1} - \hat{\alpha}X_{t-1}) + \gamma_{x1}\Delta X_{t-1} + \cdots + \gamma_{y1}\Delta Y_{t-1} + \cdots + \varepsilon_{yt}$$

The main advantage of VECM is that it allows for interpretations of long-run and short-run relationships between variables in the model.

4. THE IMPACT OF EU AND NON-EU IMMIGRANTS IN THE UK ON LABOUR MARKET AND ECONOMIC GROWTH

Considering that our main objective is to assess the impact of EU and non-EU immigrants on labour market and economic growth of the UK for designing the best policies regarding migration after Brexit, we considered an empirical research based on the following variables with annual data series: number of EU immigrants, number of non-EU immigrants, employment rate (data for these variables were provided by Office for National Statistics of the UK) and real GDP rate (2010=100) provided by Eurostat. The period of analysis refers to 1991-2015.

Figure 1.
The evolution of the number of EU and non-EU immigrants in the UK (1991-2015)



Source: own graph

As the Figure 1 suggests, most of the immigrants from the UK are not from the EU. The gap between the two variables reduced very much starting from 2013, arriving to a difference of only 10 thousand immigrants in 2015. There are two main reasons for the EU migration to the UK: economic problems of the countries in the South Europe, mainly because of the recent crisis, and the expansion of the EU. Most of the migrants came from the western Europe (Spain, Italy, France) considering that Britain is the " jobs factory of Europe". Moreover, the statistics indicated a small increase in the number of immigrants from Bulgaria and Romania that came in the UK for jobs. The Romanian and Bulgarian migrants were encouraged to come in the UK by the removal of restrictions regarding their acceptance on the UK labour market. In 2016, the high increase in the number of EU migrants is due to the referendum debate and to the anticipated restrictions on EU immigration after Brexit. Only in the last few years, the employment rapidly grew because of the EU immigrants, while the number of UK employees outside the EU remained at a stable value. However, the immigrants represent around 10% of the UK workforce with an increase of only 3.5% in March 2016 compared to 1997.

According to ONS Migration Statistics Quarterly Report from December 2016, 41% of the EU immigrants had a definite job before coming to the UK and 31% were looking for job. 9% of these immigrants accompanied their family or other people and only 13% of the EU migrants came in the UK to study. Most of the non-EU immigrants (47% of them) chose the UK for studying and only 21% had a definite job.

It is more than likely that immigrants might have a significant impact on the UK employment and, possibly, on the economic growth of this country. We will test the relationship between immigrants and employment rate and then between immigrants and real GDP rate considering separately the two categories of migrants.

The data series for the number of EU immigrants is stationary in the first difference at 10% level of significance, according to ADF test. For the rest of the variables, the data series are stationary in the second difference at 10% level of significance, according to ADF test (see Appendix 1). Therefore, we can conclude that the variables number of EU immigrants (data series in level) and the variation in number of non-EU immigrants, unemployment rate and GDP rate (data series in first difference) are co-integrated of order 1. Number of non-EU immigrants, unemployment rate and GDP rate are co-integrated of order 2 (see Appendix 2). Johansen co-integration test is applied to check the existence of a long-run relationship between immigrants and the rest of the variables (employment rate, GDP rate).

The results of Johansen co-integration test indicated that there is no co-integration relationship between number of EU immigrants and employment rate variation and, respectively, between number of EU immigrants and GDP rate variation from one year to another. So, we can state that there is no relationship on long-run between EU immigration and variation in employment rate and GDP rate. On the other hand, Johansen test identified 2 co-integration relationships between the number of non-EU immigrants and employment rate at 5% level of significance. However, there is not a long-run connection between the number of non-EU immigrants and real GDP rate.

A vector error correction model was built using as variables the number of non-EU immigrants and employment rate (see Appendix 3). If the coefficients C(1) and C(7) are negative, then we can conclude that

there is a long-run relationship between the number of non-EU immigrants and employment rate.

D(NON_EU_IMMIGRANTS) = C(1)*(NON_EU_IMMIGRANTS(-1) - 51.83474237*EMPLOYMENT_RATE(-1) + 3435.039376) + C(2)*D(NON_EU_IMMIGRANTS(-1)) + C(3)*D(NON_EU_IMMIGRANTS(-2)) + C(4)*D(EMPLOYMENT_RATE(-1)) + C(5)*D(EMPLOYMENT_RATE(-2)) + C(6)

D(EMPLOYMENT_RATE) = C(7)*(NON_EU_IMMIGRANTS(-1) - 51.83474237*EMPLOYMENT_RATE(-1) + 3435.039376) + C(8)*D(NON_EU_IMMIGRANTS(-1)) + C(9)*D(NON_EU_IMMIGRANTS(-2)) + C(10)*D(EMPLOYMENT_RATE(-1)) + C(11)*D(EMPLOYMENT_RATE(-2)) + C(12)

The estimations showed that only C(1) is negative and there was only one long-run relationship from employment rate to number of non-EU immigrants. Wald test is applied to check the short-run relationship between these variables. In this approach, we have to test if the coefficients C(4) and C(5) are zero or not. According to Wald test, C(4) and C(5) were 0 from statistical point of view and a short-run relationship was not identified. All in all, we can conclude that there is only a long-run causality from employment rate to number of non-EU immigrants. From economic point of view, this results indicated that non-EU immigrants are attracted by the possibilities of employment on the UK labour market.

D(NON_EU_IMMIGRANTS) = - 0.6472663644*(NON_EU_IMMIGRANTS(-1) - 51.83474237*EMPLOYMENT_RATE(-1) + 3435.039376) + 0.04559647976*D(NON_EU_IMMIGRANTS(-1)) + 0.2692140948*D(NON_EU_IMMIGRANTS(-2)) - 21.07181008*D(EMPLOYMENT_RATE(-1)) - 11.19291113*D(EMPLOYMENT_RATE(-2)) + 9.373408896

D(EMPLOYMENT_RATE) = 0.004616144207*(NON_EU_IMMIGRANTS(-1) - 51.83474237*EMPLOYMENT_RATE(-1) + 3435.039376) - 0.001863048124*D(NON_EU_IMMIGRANTS(-1)) - 0.001099852312*D(NON_EU_IMMIGRANTS(-2)) + 0.6848996147*D(EMPLOYMENT_RATE(-1)) + 0.1198506281*D(EMPLOYMENT_RATE(-2)) + 0.1323970248

C(8) and C(9) are not statistically significant which implies the lack of a short-run relationship from number of non-EU immigrants to employment rate. This means that the non-EU immigrants received the available jobs and new jobs were not created especially for them after they came in the UK. On the other hand, for EU immigrants a connection with the shocks in employment and GDP was not identified. In terms of policies after Brexit, special regulations regarding the EU immigrants should not be considered. The same policies like those for non-EU immigrants should be taken into account in the future. So, the EU immigrants did not represent a ”danger” for the UK labour market as Brexit supporters claimed.

According to variance decomposition, in the first period after a shock, the entire variation in the number of non-EU immigrants is due to shocks in this variable and not to changes in the employment rate. Starting with the second period, the variation in the number of non-EU immigrants (4.49% of this variation in the second period) is explained by chances in employment rate.

The impact of employment rate suddenly increases till the 6th period and then begins to decrease slowly, remaining around 55%. One year after the shock, 22.74% of the variation in employment rate is explained by the changes in the number of non-EU immigrants and 77.25% by the shocks in employment rate. The impact of immigrants on employment rate is higher since the second lag and it increases till the 9th lag arriving to a stable value of around 41%. So, the non-EU immigrants are absorbed by the labour market and the employment rate increased due to these immigrants.

Table 1.
Variance decomposition of the variables

Response of non-EU immigrants			Response of employment rate	
Period	Non-EU immigrants	Employment rate	Non-EU immigrants	Employment rate
1	100.0000	0.000000	22.74435	77.25565
2	95.50135	4.498649	27.09713	72.90287
3	79.59387	20.40613	30.76890	69.23110
4	55.76119	44.23881	34.75837	65.24163
5	45.37582	54.62418	37.90377	62.09623
6	41.65420	58.34580	40.13137	59.86863
7	42.15798	57.84202	41.37855	58.62145
8	43.34010	56.65990	41.89459	58.10541
9	44.55384	55.44616	41.94525	58.05475
10	45.18024	54.81976	41.87820	58.12180

Source: own calculations

Even if the expectations given by official statistics (ONS Migration Statistics Quarterly Report from December 2016) showed that the main reason of the EU immigrants for coming to the UK was related to jobs, the econometric estimations did not identify a long-run relationship between number of EU immigrants and employment rate over the period 1991-2015. This might be explained by the fact that only in the last few years the number of EU immigrants increased in a high proportion. On the other hand, the number of non-EU employees is higher and they had a significant impact on the UK labour market. We only detected a causal relationship from employment rate to number of non-EU immigrants. This means that non-EU migrants came because they had definite jobs in the UK.

5. CONCLUSIONS

In this empirical study, we proved that there was not a significant relationship between immigrants and the UK economic growth in the period 1991-2015. However, a causal relationship from employment rate to number of non-EU immigrants was identified. In case of EU migrants, we did not detect a significant influence on the employment rate. So, the argument for Brexit related to the EU migrants issue is not justified. On long-run, only the non-EU migrants might represent a danger for the UK labour market. Contrary to previous studies in literature, we showed that the non-EU migrants might cause problems to UK and not the EU migrants, as British media claimed.

Our empirical findings could be useful for designing new migration policies in case of UK. New policies should not focus on the reduction of the number of EU migrants, mainly because they cover the necessities in low-skilled sectors. The research is limited by the fact that the overall EU migrants were considered. In a future study, we should divide the migrants in EU-12 migrants and other EU migrants.

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Appendix 1
Unit root tests
Number of EU immigrants in level
Trend and intercept in the test equation

ADF Test Statistic	-2.479182	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

Intercept in the test equation

ADF Test Statistic	-0.250618	1% Critical Value*	-3.7497
		5% Critical Value	-2.9969
		10% Critical Value	-2.6381

No trend and no intercept in the test equation

ADF Test Statistic	1.162102	1% Critical Value*	-2.6700
		5% Critical Value	-1.9566
		10% Critical Value	-1.6235

Number of EU immigrants in the first difference

ADF Test Statistic	-3.253722	1% Critical Value*	-4.4415
		5% Critical Value	-3.6330
		10% Critical Value	-3.2535

ADF Test Statistic	-3.197059	1% Critical Value*	-3.7667
		5% Critical Value	-3.0038
		10% Critical Value	-2.6417

ADF Test Statistic	-2.665524	1% Critical Value*	-2.6756
		5% Critical Value	-1.9574
		10% Critical Value	-1.6238

Number of non-EU immigrants in level

ADF Test Statistic	-1.027898	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

ADF Test Statistic	-1.832684	1% Critical Value*	-3.7497
		5% Critical	-2.9969

		Value	
		10% Critical Value	-2.6381
ADF Test Statistic	0.430668	1% Critical Value*	-2.6700
		5% Critical Value	-1.9566
		10% Critical Value	-1.6235

Number of non-EU immigrants in the second difference

ADF Test Statistic	-4.377768	1% Critical Value*	-3.7856
		5% Critical Value	-3.0114
		10% Critical Value	-2.6457
ADF Test Statistic	-4.240726	1% Critical Value*	-4.4691
		5% Critical Value	-3.6454
		10% Critical Value	-3.2602
ADF Test Statistic	-4.509988	1% Critical Value*	-2.6819
		5% Critical Value	-1.9583
		10% Critical Value	-1.6242

Employment rate in level

ADF Test Statistic	-2.776516	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474
ADF Test Statistic	-2.705350	1% Critical Value*	-3.7497
		5% Critical Value	-2.9969
		10% Critical Value	-2.6381

ADF Test Statistic	1.372038	1% Critical Value*	-2.6700
		5% Critical Value	-1.9566
		10% Critical Value	-1.6235

Employment rate in the second difference

ADF Test Statistic	-3.616793	1% Critical Value*	-4.4691
		5% Critical Value	-3.6454
		10% Critical Value	-3.2602

ADF Test Statistic	-3.737495	1% Critical Value*	-3.7856
		5% Critical Value	-3.0114
		10% Critical Value	-2.6457

ADF Test Statistic	-3.896351	1% Critical Value*	-2.6819
		5% Critical Value	-1.9583
		10% Critical Value	-1.6242

GDP rate in level

ADF Test Statistic	-1.910742	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

ADF Test Statistic	-1.152750	1% Critical Value*	-3.7497
		5% Critical Value	-2.9969
		10% Critical Value	-2.6381

ADF Test Statistic	2.309502	1% Critical Value*	-2.6700
		5% Critical Value	-1.9566
		10% Critical Value	-1.6235

GDP rate in the second difference

ADF Test Statistic	-5.171558	1% Critical Value*	-2.6819
		5% Critical Value	-1.9583
		10% Critical	-1.6242

		Value	
ADF Test Statistic	-5.030725	1% Critical Value*	-3.7856
		5% Critical Value	-3.0114
		10% Critical Value	-2.6457
ADF Test Statistic	-4.897962	1% Critical Value*	-4.4691
		5% Critical Value	-3.6454
		10% Critical Value	-3.2602

Appendix 2
Johansen co-integration test summary

Series: EU_IMMIGRANTS D_EMPLOYMENT
Lags interval: 1 to 1

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Selected (5% level) Number of Cointegrating Relations by Model (columns)					
Trace	0	0	0	0	0
Max-Eig	0	0	0	0	0

Series: EU_IMMIGRANTS D_GDP_RATE
Lags interval: 1 to 1

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Selected (5% level) Number of Cointegrating Relations by Model (columns)					
Trace	0	0	0	0	2
Max-Eig	0	0	0	0	0

Series: NON_EU_IMMIGRANTS EMPLOYMENT_RATE
Lags interval: 1 to 2

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or	No Intercept	Intercept	Intercept	Intercept	Intercept

No. of CEs	No Trend	No Trend	No Trend	Trend	Trend
Selected (5% level) Number of Cointegrating Relations by Model (columns)					
Trace	0	2	2	1	2
Max-Eig	1	2	2	1	2

Series: NON_EU_IMMIGRANTS EMPLOYMENT_RATE
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.566434	27.43334	15.41	20.04
At most 1 **	0.337184	9.047673	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 2 cointegrating equation(s) at both 5% and 1% levels

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.566434	18.38567	14.07	18.63
At most 1 **	0.337184	9.047673	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates 2 cointegrating equation(s) at the 5% level
Max-eigenvalue test indicates no cointegration at the 1% level

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

NON_EU_ IMMIGRANTS	EMPLOYMENT _RATE
-0.034694	1.798339
0.002189	0.722802

Unrestricted Adjustment Coefficients (alpha):

D(NON_EU_ IMMIGRANTS)	18.65660	-8.574291
D(EMPLOYMENT_ RATE)	-0.133054	-0.278337

1 Cointegrating Equation(s): Log likelihood -112.0606

	Normalized cointegrating coefficients (std.err. in parentheses)
NON_EU_ IMMIGRANTS	EMPLOYMENT _RATE
1.000000	-51.83474
	(5.26170)
	Adjustment coefficients (std.err. in parentheses)
D(NON_EU_ IMMIGRANTS)	-0.647266
	(0.19091)
D(EMPLOYMENT_ RATE)	0.004616
	(0.00428)

Series: NON_EU_IMMIGRANTS GDP_RATE
Lags interval: 1 to 1

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Selected (5% level) Number of Cointegrating Relations by Model (columns)					
Trace	0	0	0	0	0
Max-Eig	0	0	0	0	0

Appendix 3
Vector Error Correction Model (VECM)

Vector Error Correction Estimates
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	
NON_EU_IMMIGRANTS (-1)	1.000000	
EMPLOYMENT_RATE(-1)	-51.83474	
	(5.26170)	
	[-9.85134]	
C	3435.039	
Error Correction:	D(NON_EU_ IMMIGRANTS)	D(EMPLOYMENT _RATE)
CointEq1	-0.647266	0.004616
	(0.19091)	(0.00428)
	[-3.39050]	[1.07897]
D(NON_EU_ IMMIGRANTS(-1))	0.045596	-0.001863
	(0.18599)	(0.00417)

	[0.24516]	[-0.44698]
D(NON_EU_ IMMIGRANTS(-2))	0.269214	-0.001100
	(0.18898)	(0.00424)
	[1.42458]	[-0.25970]
D(EMPLOYMENT_ RATE(-1))	-21.07181	0.684900
	(12.0778)	(0.27067)
	[-1.74467]	[2.53038]
D(EMPLOYMENT_ RATE(-2))	-11.19291	0.119851
	(12.6658)	(0.28385)
	[-0.88371]	[0.42224]
C	9.373409	0.132397
	(5.96643)	(0.13371)
	[1.57102]	[0.99017]
R-squared	0.486145	0.323552
Adj. R-squared	0.325566	0.112162
Sum sq. resids	10658.09	5.352854
S.E. equation	25.80951	0.578406
F-statistic	3.027443	1.530595
Log likelihood	-99.23000	-15.66911
Akaike AIC	9.566364	1.969919
Schwarz SC	9.863921	2.267476
Mean dependent	6.545455	0.240909
S.D. dependent	31.42751	0.613855
Determinant Residual Covariance		172.1691
Log Likelihood		-112.0606
Log Likelihood (d.f. adjusted)		-119.0665
Akaike Information Criteria		12.09696
Schwarz Criteria		12.79126

Total system (balanced) observations 44

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.647266	0.190906	-3.390503	0.0019
C(2)	0.045596	0.185988	0.245158	0.8079
C(3)	0.269214	0.188977	1.424584	0.1640
C(4)	-21.07181	12.07781	-1.744671	0.0906
C(5)	-11.19291	12.66581	-0.883711	0.3834
C(6)	9.373409	5.966433	1.571024	0.1260
C(7)	0.004616	0.004278	1.078965	0.2887
C(8)	-0.001863	0.004168	-0.446978	0.6579
C(9)	-0.001100	0.004235	-0.259700	0.7968
C(10)	0.684900	0.270671	2.530380	0.0165
C(11)	0.119851	0.283848	0.422235	0.6757
C(12)	0.132397	0.133711	0.990172	0.3295
Determinant residual covariance		91.06462		

Equation: D(NON_EU_IMMIGRANTS) = C(1)*(NON_EU_IMMIGRANTS (-1) - 51.83474237*EMPLOYMENT_RATE(-1) + 3435.039376) + C(2)*D(NON_EU_IMMIGRANTS(-1)) + C(3)*D(NON_EU_IMMIGRANTS(-2)) + C(4)*D(EMPLOYMENT_RATE(-1)) + C(5) *D(EMPLOYMENT_RATE(-2)) + C(6)

Observations: 22

R-squared	0.486145	Mean dependent var	6.545455
Adjusted R-squared	0.325566	S.D. dependent var	31.42751
S.E. of regression	25.80951	Sum squared resid	10658.09
Durbin-Watson stat	1.834116		

Equation: D(EMPLOYMENT_RATE) = C(7)*(NON_EU_IMMIGRANTS(-1) - 51.83474237*EMPLOYMENT_RATE(-1) + 3435.039376) + C(8)*D(NON_EU_IMMIGRANTS(-1)) + C(9)*D(NON_EU_IMMIGRANTS(-2)) + C(10)*D(EMPLOYMENT_RATE(-1)) + C(11) *D(EMPLOYMENT_RATE(-2)) + C(12)

Observations: 22

R-squared	0.323552	Mean dependent var	0.240909
Adjusted R-squared	0.112162	S.D. dependent var	0.613855
S.E. of regression	0.578406	Sum squared resid	5.352854
Durbin-Watson stat	2.033793		

Wald Test:
System: Untitled

Null Hypothesis:	C(4)=0 C(5)=0		
Chi-square	4.256090	Probability	0.119070

Wald Test:
System: Untitled

Null Hypothesis:	C(8)=0 C(9)=0		
Chi-square	0.262291	Probability	0.877090

Response of NON_EU_IMMIGRANTS:

Period	NON_EU_IMMIGRANTS	EMPLOYMENT_RATE
1	25.80951	0.000000
2	13.72303	6.344249
3	19.82585	16.72084
4	18.99449	30.92142
5	27.21987	39.39634
6	30.20058	41.71483
7	33.32960	37.82296
8	31.84512	32.29412
9	30.03007	27.99484
10	27.56375	26.94781

Response of EMPLOYMENT_RATE:

Period	NON_EU_IMMIGRANTS	EMPLOYMENT_RATE
1	0.275848	0.508391
2	0.469828	0.734942
3	0.580805	0.792649
4	0.634531	0.720539
5	0.615319	0.610527
6	0.572608	0.530904
7	0.528852	0.515074
8	0.511969	0.550740
9	0.518985	0.605147
10	0.541224	0.645206

Variance Decomposition of NON_EU_IMMIGRANTS:

Period	S.E.	NON_EU_IMMIGRANTS	EMPLOYMENT_RATE
1	25.80951	100.0000	0.000000
2	29.91157	95.50135	4.498649
3	39.58980	79.59387	20.40613
4	53.70547	55.76119	44.23881
5	71.95325	45.37582	54.62418
6	88.48430	41.65420	58.34580
7	101.8377	42.15798	57.84202
8	111.4806	43.34010	56.65990
9	118.8000	44.55384	55.44616
10	124.8975	45.18024	54.81976

Variance Decomposition of EMPLOYMENT_RATE:

Period	S.E.	NON_EU_IMMIGRANTS	EMPLOYMENT_RATE
1	0.578406	22.74435	77.25565
2	1.046628	27.09713	72.90287
3	1.435638	30.76890	69.23110
4	1.727097	34.75837	65.24163
5	1.932414	37.90377	62.09623
6	2.084218	40.13137	59.86863
7	2.211097	41.37855	58.62145
8	2.335461	41.89459	58.10541
9	2.467777	41.94525	58.05475
10	2.607516	41.87820	58.12180