Immigration and Economic Growth: Further Evidence for Greece

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Abstract

The present paper examines the relationship between immigration and economic growth for Greece. In the empirical analysis of this paper, Johansen cointegration and Gregory and Hansen tests are applied to examine the long-run relationships and structural change of variables respectively. A vector error correction model VAR is used in order to test the relationship between the number of immigrants and economic growth. The results of Granger causality tests indicate a bidirectional relationship between economic growth and immigration.

Keywords: Immigration, Economic Growth, Cointegration, Causality, Structural-Break

JEL. Classification: E20, F10

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1. **Introduction**

The increase in international migration flows has been primarily observed since the 90’s and has continued into the early 21st century. This trend is partly attributed to the developing countries’ labor market inability to absorb the total workforce, as a result of the rapid increase of the number of immigrants from the developing towards the developed countries, and also to the constant needs of economic and production systems within OECD countries for hiring migrant employees.

Taking intensified ageing trends and the demographic slide which characterize developed countries for granted (as a result of the rise average life), the role of migration for the population increase in these countries is of vital importance. Specifically, according to the annual report of European Union for migration, the preservation in steady levels of the active population (15 until 64 years of age) presupposes the influx of 1,5 million immigrants to the European countries annually. This number is being rising rapidly provided the preservation of current ratio between active population and those above 65 years of age.

The active population shrinkage is a serious obstacle in order to achieve the “potential growth rate” for European economy. This means the maximum rate where production can increase in the long run without any imbalances. At the same time, the lack of labor force threats the viability of retirement system for European countries.

In Greece, based on the 2001 census, 762.191 immigrants have been recorded (7% of total population). 80% of immigrants are in the productive age while 17% are between 0 -14 years old. Immigrants participate by 9,5% in the total employment of the country, while 90% of the immigrants are wage workers.
It is well known that public discussion made, as far as the immigrants are concerned, is focused on the short run consequences of labor market and public economics. In this way, all the theoretical and empirical research concerning the immigration phenomenon in systematic conditions and in the long run are ignored. Such an action is referred to macroeconomic discussions in national and international level. The empirical and theoretical research framing this category, agree within the potential benefits for economic prosperity internationally. The notion which governs the particular research is simple: a worker’s mobility from an economy with low marginal productivity (low wages) towards a country with a high marginal productivity (high wages) produces a surplus which benefits both the employee and society. At the same time, immigration contributes to economic growth in a national level.

Despite its importance the relation between immigration and economic growth has not attracted much research attention, with some exceptions. O Jones (1998) shows that rising population growth rate (including immigration) reduce transitional per capita economic growth. This may be due to adverse effect of rising population on capital labour ratio.

Robertson (2002) examined the causality between these two series (immigration and economic growth) using Urzawa – Lucas approach in which unskilled and skilled labour perform distinct services. He found that an unanticipated increase in unskilled workers due to population boom, or inflow of immigrants results in a transitional growth with a slow growth of human capital relative to the balanced path.

Morley’s (2006) findings offer a relevant starting point. He used autoregressive distributed lag (ARDL) approach to cointegration and found evidence
of long – run causality coming from per-capita economic growth to immigration, but failed to establish the reverse causality.

Finally, Islam (2007) examined Canadian data within vector error correction model. He found a long-run positive relationship among per-capita GDP, immigration rate and real wages. The results indicate that, in the short run, more immigration is possibly associated with attractive Canadian immigration policies, and in long run, as the labour market adjusts, Canadian- born workers are likely to benefit from increased migration.

This paper examines the long run relationship between immigration increase and economic growth for Greece. The remainder of this paper is organized as follows: Section 1 reports the role of immigrants from economically developing to developed countries and its benefits to economic prosperity worldwide. Section 2 describes the data that have been used in this paper, as well as the specification model. Section 3 applies unit root tests and investigates the stationarity of the used data. The cointegration analysis between the used variables is provided in Section 4. Section 5 presents Granger causality tests through error correction model and finally section 6 provides the summary and conclusions.

2. Data specification of the model

For the causality analysis between immigrants and economic growth the following function has been used:

$$\text{IMM} = f(\text{GDP}) \quad (1)$$
where IMM expresses the number of immigrants and GDP the economic growth. The causality types that should be analyzed are the following:

- A unidirectional causality running from the number of immigrants (IMM) to economic growth (GDP).
- A unidirectional causality running from economic growth (GDP) to the number of immigrants (IMM)
- A bidirectional causality between the number of immigrants (IMM) and economic growth (GDP).
- No causality between the number of immigrants (IMM) and economic growth (GDP).

The hypotheses of model (1) assume that the variables are stationary and since the stationarity has been ascertained, the cointegration and causality tests are applied.

All variables are expressed by logarithms in order to include the proliferative effect of time series and are symbolized with the letter L preceding each variable name, covering the period 1975-2006 deriving from the Greek National Statistical Service database.

The list of variables that have been used in the analysis are:

LIMM = Logarithm of number of immigrants.
LGDP = Logarithm of economic growth.

3. **Unit root tests**

Many macroeconomic time series contain unit roots dominated by stochastic trends as developed by Nelson and Plosser (1982). Unit roots are important in
examining the stationarity of a time series because a non-stationary regressor invalidates many standard empirical results. The presence of a stochastic trend is determined by testing the presence of unit roots in time series data. In this study a unit root test is examined using Augmented Dickey-Fuller (ADF), Phillips-Perron (1988) and Zivot – Andrews (1992).

Table 1 reports the results of unit root tests for the examined variables using the Dickey-Fuller (DF), Phillips and Perron (PP) and Zivot and Andrew (ZA) tests. From table 1 we observe that all variables are integrated of order one, I(1) according to DF, PP and ZA tests.

Table 1

4. Cointegration test

If the time series (variables) are non-stationary in their levels, they can be integrated with integration of order 1, when their first differences are stationary. These variables can be cointegrated as well, if there are one or more linear combinations among the variables that are stationary. If these variables are being cointegrated, then there is a constant long-run linear relationship among them.

Since it has been determined that the variables under examination are integrated of order 1, then the cointegration test is performed. The testing hypothesis is the null of non-cointegration against the alternative that is the existence of cointegration.
Following the maximum likelihood procedure of Johansen (1988, 1991) and Johansen and Juselious (1990,1992) we create a vector VAR model. The FPE Akaike criterion (1969) is used to choose the number of time lags that are required in the cointegration test.

Table 2

Table 2 confirms the presence of a cointegration vector in the 5% significance level.

Because the data consist of structural breaks, we also use the Gregory Hansen (1996) test to adjust the structural data in cointegration analysis. Table 3 presents the results of cointegration tests for the structural variations of the data.

Table 3

Based on the results of the above table, we accept a cointegrated vector where coefficients vary due to a possible variation in 1992.

5. VAR model with an error correction mechanism

After determining that the logarithms of the model variables are cointegrated, we must then estimate a VAR model in which we shall include a mechanism of error correction model (MEC). The error correction model derived from the long run cointegrating relationship which is as follows:
\[ \Delta \text{LIMM}_t = \text{lagged}(\Delta \text{LIMM}_t, \Delta \text{LGDP}_t) + \lambda u_{t-1} + \nu_t \quad (2) \]

where \( \Delta \) is referred to the first differences of all variables.

\( u_{t-1} \) are the estimated residuals from the cointegrating regression (long run relationship) and represents the divergence from the equilibrium in a time period \( t \).

\(-1 < \lambda < 0\) is the short run coefficient which represents the response of the dependent variable in every period starting at the equilibrium position.

\( V_t \) is a 2X1 vector of white noise errors.

Granger (1988) claimed that there are two channels of causality, the first one is through lagged values (\( \Delta \text{LIMM}, \Delta \text{LGDP} \)) when variable coefficients’ are statistically significant (F – distribution) and the other channel if \( \lambda \) coefficient of \( u_{t-1} \) variable is statistically significant (t- distribution). If \( \lambda \) is statistically significant in equation (2), then economic growth also influences migration.

**Table 4**

The error correction model (equation 2) is used to examine the causality relationships between variables. This analysis provides the short run dynamic adjustment towards long run equilibrium. The levels of significance of F distribution tests for Granger causality, while with t distribution we check the \( u_{t-1} \) coefficient. The numbers in parentheses show the number of time lags determined by the use of FPE Akaike criterion. As it was mentioned before, there are two channels of causality. These are called channel 1 and channel 2. If lagged values of a
variable (except the lagged value of the dependent variable) on the right hand side are jointly significant then this is channel 1. On the other hand, if the lagged value of the error correction term is significant, then this is channel 2. For convenience, let us call the relationships a “strong causal relation” if it is through both channel 1 and channel 2 and simply a “causal relation” if it is through either channel 1 or channel 2. The results of table 4 show that there is a bilateral and “strong” causal relation.

6. Conclusions

In the present paper, we have tried to explore the role of immigration in the economic development of Greece by making use of the causality based on a vector autoregressive model. In the empirical analysis of this paper, Johansen cointegration and Gregory and Hansen tests were applied to examine the long-run relationships and structural change of variables respectively. Our findings support long-run bidirectional causality between GDP and immigration.

We argue that immigration is not exogenous, but is determined by the growth of an economy. Economic growth raises input prices, makes jobs attractive, and attracts immigrants from all over the world. Immigration does not instantaneously help economic growth in the host nation. It takes time for the immigrants to adapt to a new culture and learn a new language. However, as the immigrants become part of the labor force they contribute to economic growth.
Reference


<table>
<thead>
<tr>
<th>Variables</th>
<th>DF</th>
<th>PP</th>
<th>ZA</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIMM</td>
<td>-1.23</td>
<td>-2.34</td>
<td>-3.48 (1991)</td>
</tr>
<tr>
<td>LGDP</td>
<td>-2.41</td>
<td>-1.97</td>
<td>-3.02(2000)</td>
</tr>
<tr>
<td>∆LGDP</td>
<td>-7.65**</td>
<td>-6.19**</td>
<td>-5.03*(2002)</td>
</tr>
</tbody>
</table>

Notes:
LIMM and LGDP denotes the number of immigrants and gross national product in real prices in logarithms.
∆ denotes the first differences.
DF=Dickey-Fuller PP=Philips and Perron (unit root test).
ZA=Zivot and Andrews (unit root test with structural break).
The numbers in parentheses are the dates of structural break.
Critical values for 1% and 5% levels of significance are -3.95 and -3.08, for DF and PP, and -5.34 and -4.80 respectively for Zivot and Andrews example.
* and ** denotes 5% and 1% levels of significance respectively

<table>
<thead>
<tr>
<th>Trace test</th>
<th>5% critical value</th>
<th>10% critical value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H0: r = 0</td>
<td>42.1185</td>
<td>24.0500</td>
</tr>
<tr>
<td>H0: r ≤ 1</td>
<td>4.3561</td>
<td>12.3600</td>
</tr>
<tr>
<td>H0: r ≤ 2</td>
<td>1.6837</td>
<td>4.1600</td>
</tr>
</tbody>
</table>

Notes:
Critical values are taken from Osterwald – Lenum (1992).
r denote the number of cointegrated vectors.
Akaike Criteria (FPE) was used to select the number of lags required in the cointegration test.

<table>
<thead>
<tr>
<th>Minimum T- Statistics</th>
<th>-5.68</th>
</tr>
</thead>
<tbody>
<tr>
<td>Break - Year</td>
<td>1992</td>
</tr>
</tbody>
</table>

Notes:
The 1% , 5% critical value is -5.47 and -4.95.
For Immigration we assume break in trend
Gregory-Hansen test reports null hypothesis of no-cointegration.
Table 4. Causality test results based on vector error – correction modeling

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>F – significance level</th>
<th>t – statistic $u_{t-1}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\Delta LIMM$</td>
<td>$\Delta LGDP$</td>
</tr>
<tr>
<td>$\Delta LIMM$</td>
<td>[0.023]**(1)</td>
<td>[0.000]***(1)</td>
</tr>
<tr>
<td>$\Delta LGDP$</td>
<td>[0.000]***(1)</td>
<td>[0.067]**(1)</td>
</tr>
</tbody>
</table>

Notes:

*, **, and *** indicate 10%, 5%, and 1% levels of significance.

Number in parentheses are lag lengths.

Numbers in brackets are levels of significance.