
Pavlos Stamatiou and Nikolaos Dritsakis

Department of Applied Informatics, University of Macedonia, Economics and Social Sciences, 156 Egnatia Street, 540 06 Thessaloniki, Greece

e-mail: drits@uom.gr

Abstract. Foreign direct investments (FDI) and exports play an important role in economic development worldwide. However, there is a widespread belief among economists that economic growth cannot be enhanced if unemployment rates are very high. This paper applies panel unit root tests, panel cointegration and panel causality test to investigate the relationship between exports, FDI, unemployment and economic growth in thirteen new European Union (EU) members (Bulgaria, Czech Republic, Estonia, Croatia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia, and Slovakia) using annual data for the period 1995-2013. The FMOLS and DOLS are used to estimate the long run relationship between the examined variables. The results of the study indicate that, in the long run, there is bidirectional causality between exports and economic development and a unidirectional causality between economic development and unemployment with direction from economic development to unemployment. Also, the results show that there is a short run unidirectional causality between exports and FDI running from exports to FDI. Findings suggest that exports are a vital force for increasing economic development and attracting foreign direct investments. Moreover, the results reveal that economic growth is an important determinant for increasing exports and reducing unemployment.

Keywords: Economic development, Foreign direct investments, Exports, Unemployment, Panel cointegration, FMOLS and DOLS methods, Causality.

JEL Classification: C22, E31, E50

1. Introduction

Since 2004, thirteen new countries (Bulgaria, Czech Republic, Estonia, Croatia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia, and Slovakia), mainly of Central and Eastern Europe, have acceded to the European Union (EU) and other six (Albania, Iceland, Montenegro, Serbia, The former Yugoslav Republic of Macedonia and Turkey) are on the road to EU membership. With the accession of these countries, in 2013 the real Gross Domestic Product (real GDP) in the EU reached approximately 13000 billion euro (AMECO 2015). The total GDP of the thirteen new members does not exceed 7% of European Union’s GDP.
EU membership is the strongest guarantee for these countries to achieve higher growth rates, a stable business environment and generally a stable growth path. It constitutes the trigger for direct investments and new capital inflows since investors gain more confidence for these economies. The accession in EU symbolizes their return to the European family and establishes a balanced economic environment.

Among the thirteen new members, there are countries such as Poland, Czech Republic, Slovakia, Hungary with significant industrial base, which hope to attract foreign direct investments from the rest EU members (EU-15). Many companies located in the developed EU countries decide to create new production units in the new neighboring EU members due to the low-cost labor supply. The increase in investments and in domestic products in the new European Union countries will increase the flows of foreign trade and will promote their exports.

The economic crisis which started in 2008 has created serious concerns about high unemployment rates and negative growth rates in many EU countries. In 2013, unemployment rates in Bulgaria, Croatia, Cyprus, Latvia, Lithuania and Slovakia reached 13.0%, 17.3%, 15.9%, 12.0%, 11.8% and 14.2 respectively (AMECO 2015). Many economists believe that foreign direct investments (FDI) and international trade are the key factors for enhancing economic development and reducing unemployment. FDI can play a vital role due to the fact that enhances private investments, encourages the creation of new jobs and transfers knowledge and technological skills in the workforce.

Today, we cannot say that there is a universal agreement concerning the impact of FDI in host countries economies. The impact of FDI on economic performance remains a popular subject among policy makers especially for some developing countries. The purpose of this paper is to examine the links between FDI, exports, unemployment and economic growth in the thirteen new EU members (countries that joined the EU after May 1st, 2004 such as Bulgaria, Czech Republic, Estonia, Croatia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia, and Slovakia) over the period 1995-2013.

The contribution of this paper is shown in the following paragraphs:

It is used a VAR model to examine the relations among foreign direct investments, exports of goods and services, unemployment and economic growth for the thirteen new EU members, viewed as group. Most of these countries were under communist regimes until 1989 and the last 20 years are trying to convert their economies to market economies within the institutional framework of EU. For these countries, EU membership is the strongest guarantee for the establishment of market economies with high growth rates similar to EU-15.

To our knowledge very few studies have taken into consideration these four variables together and have used the causality analysis. Also, there are even fewer studies that carried out their analysis in the panel framework.

The structure of the paper is as follows: Section 2 briefly reviews the literature. Section 3 presents data and methodology and section 4 presents the empirical results. Concluding remarks are given in the final section.

2. Literature Review

The great recession of 2008 proved the interdependence that exists between the economies of European countries. Under adverse conditions, capital flows and international financial interconnections between them can cause destabilization of their real economies (Thalassinos 2008). However, economic crisis did not have the
same impact in all countries. This depended on the infrastructure and the level of the
domestic economy of each country.

The effect of FDI on domestic economy, trade, and unemployment has been a key
subject of intense research during the last years. There is a widespread belief among
policy makers that foreign direct investments inflows in combination with exports are
the most important factors in the process of economic development of a country.
Denisia (2010) believed that FDI affects economic growth both directly and indirectly
through exports. The positive effect of FDI on economic performance appears to be
greater in developed economies, since they can absorb more easily new technologies
(Blomstrom, Lipsey and Zejan 1992). De Mello (1997) supported that FDI enhances
the production process, increases capital adequacy and transfers knowledge and
technology both in terms of labor training and skill acquisition. Also, in an open
economy, technology and knowledge can be transferred through exports and imports
and consequently the economic growth can be promoted (Grossman and Helpman
1997). However, the fact that the positive effect of FDI appears greater in developed
economies was criticized by Rodrik. Rodrik (1999) supported that developed
economies attract more FDI because they have higher growth rates, are more
productive and more profitable economies.

On the other hand, the benefits of FDI have been disputed, especially in the past,
(Reuber, Crookell, Emerson and Gallais-Hammonno 1973, Lall, 1974) because of the
short-term unemployment it often causes and the high adjustment cost of domestic
companies in order to cope the new competitive conditions. Lee and Vivarelli (2005)
supported that even FDI and trade are expected to have positive effect on employment
level, the creation of new lobs cannot be automatically assured, since the employment
effect can be very diverse in different areas of the world.

In previous year, studies on the relationship between foreign direct investments,
exports, unemployment and economic growth, using either time series or panel data,
reveal different results which depend on econometric methods and the period the
analysis were carried out.

Chang (2005) examined the dynamic interactions between FDI, economic growth,
exports and unemployment for Taiwan using time series data over the period 1981-
2003. This study found that both economic growth and exports have a positive impact
on FDI inflows. On the other hand exports have a negative impact on FDI outflows.
Also the results show that FDI inflows have a positive impact on exports and
economic development. In addition, there is a positive relationship between economic
growth and exports and a negative relationship between economic growth and
unemployment. In conclusion, exports not only attract FDI inflows and reduce FDI
outflows but also enhance economic growth.

Aktar and Ozturk (2009) investigated the relationship between FDI, exports,
unemployment and GDP for Turkey using time series data over the period 2000-2007.
They found that FDI does not create new job for this period. However, exports attract
more FDI to the country. Also, the results show that economic growth does not reduce
unemployment rate either. Findings suggest that Turkey should attract more and better
FDI, in order to boost economic performance through technology transfer.

Ozughalu and Ogwumike (2013) studied the relationship among unemployment,
economic growth, exports and foreign direct investments in Nigeria over the period
1984-2010. The results show that foreign direct investments, exports and economic
growth cannot solve the problem of unemployment in the country. The Nigerian
government should immediately implement policies which will help the country to
break the yoke of underdevelopment.
Regarding studies that examine the interactions between these variables in a group of countries, Hsiao and Hsiao (2006) investigated the relationship among FDI, exports and GDP for eight rapidly East and Southeast Asian economies using panel data over the period 1986-2004. The panel data causality results revealed that FDI influences GDP both directly and indirectly through exports. Also, they found that there is bidirectional causality between exports and GDP for the group. The results suggest that growth in domestic products and the large amount of inward FDI are the two vital forces in promoting exports for these eight economies as a group. Also, the findings support the export-led growth and FDI-led growth model.

Dritsakis and Stamatiou (2014) investigated the relationship between FDI, exports and GDP in five Eurozone countries using panel data for the period 1970-2011. They found that there is bidirectional causality between exports and economic development, while there is no causality between economic growth and FDI nor between FDI and exports. The results of this study show that an increase in domestic products of these countries will cause a dynamic impulse in exports and economic growth.

A similar study (see also Mahmoodi and Mahmoodi 2014) investigated the casual links among GDP, exports and FDI in two panels of Asian countries (three developed and eight developing countries) during the period 1986-2010. The results from developed panel show unidirectional causality from GDP to exports, FDI to exports and from GDP to FDI. Findings suggest that GDP and FDI are vital forces for increasing exports and that economic growth is an important determinant for attracting FDI. Results of developing countries indicate a unidirectional causality from GDP to FDI and bidirectional causality between GDP and exports which means that economic growth is an important determinant for promoting exports and attracting FDI in this group of countries.

3. Data and Methodology

3.1 Data

The variables that are used in this study are gross domestic product (GDP), exports of goods and services (EXP) and foreign direct investments inflows (FDI inflows) measured in constant 2005 US dollars, expressed in million and unemployment (UN) expressed as a percentage of civilian labor force. The data are annual covering the period 1995-2013. Data are gathered from economic databases Annual Macro-Economic (AMECO 2014), World Development Indicator (WDI 2014) and United Nations Conference on Trade and Development (UNCTAD 2014).

3.2 Methodology

In order to examine the relationships between foreign direct investments, exports of goods and services, unemployment rate and economic growth we specify a vector autoregressive model (VAR), as implemented by Sims (1980). The general form of the VAR model is expressed in equation (1):

\[ U = f(GDP, EXP, FDI, UN) \]  

(1)

where: GDP is the economic development, EXP are the exports of goods and services, FDI are the foreign direct investments inflows and UN are the unemployment rates.
After the specification of the VAR model, we continue analyzing panel unit root tests, panel cointegration and panel causality test. The FMOLS (Fully Modified Ordinary Least Square) and DOLS (Dynamic Ordinary Least Square) methods are used to estimate the long run relationship between the examined variables. The panel VECM (Vector Error Correction Model) is used in order to find the causality between foreign direct investments, exports of goods and services, unemployment rate and economic growth.

3.2.1 Panel Unit Root Tests

In the first step we should examine if the four variables (GDP, EXP, FDI, UN) are stationary. In econometric literature, there are several approaches for unit root tests in panel data. Considering that these methods may give different results, we apply the tests suggested by Breitung (2000), Levin, Lin and Chu (2002) (LLC), Im, Pesaran and Shin (2003) W-test (IPS), ADF-Fisher Chi-square test (ADF-Fisher), PP Fisher Chi-Square test (PP-Fisher), Maddala and Wu (1999), and Hadri (2000). In all these cases except Hadri, the null hypothesis is that the variable contains a unit root (i.e., it is not stationary) (For details on the description of the above methods see Dritsakis and Stamatiou 2014).

3.2.2 Johansen-Fisher Panel Cointegration Test

Since panel unit root tests have been applied, our next step is to use the Johansen-Fisher panel cointegration test, developed by Maddala and Wu (1999), in order to examine the long run relationship between the variables. This test is based on the cointegration trace and maximum eigenvalue tests by Johansen (1988). Johansen’s methodology takes as starting point a vector autoregression (VAR) of order of $p$:

\[
Y_t = \sum_{i=1}^{p} A_i Y_{t-i} + e_t
\]

This model can also be written as shown below:

\[
\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p} \Gamma_i \Delta Y_{t-i} + \mu_t
\]

where: $\Pi = -(I - \sum_{j=1}^{p} A_j)$ and $\Gamma_i = - \sum_{j=i+1}^{p} A_j$, with $i = 1...p$

Both trace and maximum eigenvalue tests are related to the rank $r$ of matrix $\Pi$. For the trace test, the null hypothesis is that there are at most $r$ cointegration vectors against the alternative of full rank $r = k$ cointegration vectors (where $k$ is the number of variables included in the model). The null hypothesis of maximum eigenvalue test remains the same as before, however the alternative is that there are exactly $r + 1$ cointegration vectors.

Maddala and Wu (1999), using Fisher’s test (1932), proposed an alternative method for testing cointegration in panel data. This test (Johansen-Fisher) combines the individual cross-section tests, giving a statistic concerning the whole panel. Let
$p_i$ be the $p$-value obtained from the individual cointegration test of cross section $i$. Then, under the null hypothesis for the panel:

$$-2 \sum_{i=1}^{N} \log(p_i) \rightarrow \chi^2_{2N} \quad (4)$$

where $N$ is the number of cross-sections (Hamori and Hamori 2010).

### 3.2.3 Panel FMOLS and DOLS estimates

Since our variables are cointegrated the next step is the estimation of the long-run equilibrium relationship. The ordinary least square (OLS) method leads to a biased and inconsistent estimator when applied to cointegrated panels (Kao and Chiang 2000). Therefore, we estimate the long-run relationship using the fully modified OLS (FMOLS) estimator proposed by Pedroni (1999, 2001) and the dynamic OLS (DOLS) estimator suggested by (Kao and Chiang 2000) and Mark and Sul (2002). These estimators allow for greater flexibility in the existence of heterogeneity of the cointegrating vectors (Pedroni 1999, 2000, 2001, 2004).

Consider the following fixed effects panel regression:

$$y_{it} = \alpha_i + \beta x_{it} + u_{it} \quad \text{for } i = 1 \ldots N \text{ members and } t = 1 \ldots T \quad (5)$$

where $y_{it}$ is a matrix $(1,1)$, $\beta$ is a vector of slopes $(k,1)$ dimension, $\alpha_i$ is the individual fixed effect, $u_{it}$ are the stationary disturbance terms. $x_{it}$ $(k,1)$ vector assumed to be an integrated process of order one for all $i$, where $x_{it} = x_{it-1} + e_{it}$.

FMOLS and DOLS estimators are constructed making corrections for endogeneity and serial correlation to the OLS estimator (Phillips 1995). The equation given below presents the estimated coefficient of FMOLS:

$$\beta_{FM} = \left[ \sum_{i=1}^{N} \sum_{t=1}^{T} (x_{it} - \bar{x}_i)(x_{it} - \bar{x}_t)' \right]^{-1} \left[ \sum_{i=1}^{N} \left( \sum_{t=1}^{T} (x_{it} - \bar{x}_i)y_{it}^* + T\Delta_{EM} \right) \right] \quad (6)$$

where $y_{it}^*$ is the transformed variable of $y_{it}$ in order to achieve the endogeneity correction and $\Delta_{EM}$ is the serial correlation error correction term.

The DOLS is an extension of Stock and Watson (1993) estimator. Following equation is used to obtain the DOLS estimator:

$$y_{it} = \alpha_i + \beta x_{it} + \sum_{j=-q}^{q} c_j \Delta x_{i,t-j} + v_{it} \quad (7)$$

Where $c_j$ represents the lead or lag coefficient of explanatory variables at first differences. The DOLS estimator is obtained as following:
\[
\beta_{\text{DOLS}} = \left[ \sum_{i=1}^{N} \sum_{t=1}^{T} z_{it} z_{it}^* \right]^{-1} \left[ \sum_{i=1}^{N} \sum_{t=1}^{T} z_{it} y_{it}^* \right]
\]

where \( z_{it} = [x_{it} - \bar{x}_i, \Delta x_{i,t-q}, \ldots, \Delta x_{i,t-q}] \) is \((q+1) \times 1\) vector of regressors. Kao and Chiang (2000) supported that the DOLS estimator is less biased and has superior small sample properties compared with FMOLS estimator.

### 3.2.4 Panel Causality Analysis

The existence of cointegration between the examined variables implies that there is causality relation among them in at least one direction (Granger 1969, Engle and Granger 1987, Granger 1988). In order to determine the direction of causality the Vector Error Correction Model (VECM) is estimated. The equations that are used to test Granger causality are the following:

\[
\Delta \text{GDP}_{i,t} = a_{i1} + \sum_{k=1}^{p} \beta_{1,i,k} \Delta \text{GDP}_{i,t-k} + \sum_{k=1}^{p} \beta_{2,i,k} \Delta \text{FDI}_{i,t-k} + \sum_{k=1}^{p} \beta_{3,i,k} \Delta \text{EXP}_{i,t-k} + \sum_{k=1}^{p} \beta_{4,i,k} \Delta \text{UN}_{i,t-k} + \lambda_{i,1} \text{ECT}_{i,t-1} + u_{i,1,t} \tag{9}
\]

\[
\Delta \text{FDI}_{i,t} = a_{i2} + \sum_{k=1}^{p} \beta_{2,i,k} \Delta \text{GDP}_{i,t-k} + \sum_{k=1}^{p} \beta_{2,i,k} \Delta \text{FDI}_{i,t-k} + \sum_{k=1}^{p} \beta_{3,i,k} \Delta \text{EXP}_{i,t-k} + \sum_{k=1}^{p} \beta_{4,i,k} \Delta \text{UN}_{i,t-k} + \lambda_{i,2} \text{ECT}_{i,t-1} + u_{i,2,t} \tag{10}
\]

\[
\Delta \text{EXP}_{i,t} = a_{i3} + \sum_{k=1}^{p} \beta_{3,i,k} \Delta \text{GDP}_{i,t-k} + \sum_{k=1}^{p} \beta_{2,i,k} \Delta \text{FDI}_{i,t-k} + \sum_{k=1}^{p} \beta_{3,i,k} \Delta \text{EXP}_{i,t-k} + \sum_{k=1}^{p} \beta_{4,i,k} \Delta \text{UN}_{i,t-k} + \lambda_{i,3} \text{ECT}_{i,t-1} + u_{i,3,t} \tag{11}
\]

\[
\Delta \text{UN}_{i,t} = a_{i4} + \sum_{k=1}^{p} \beta_{4,i,k} \Delta \text{GDP}_{i,t-k} + \sum_{k=1}^{p} \beta_{2,i,k} \Delta \text{FDI}_{i,t-k} + \sum_{k=1}^{p} \beta_{3,i,k} \Delta \text{EXP}_{i,t-k} + \sum_{k=1}^{p} \beta_{4,i,k} \Delta \text{UN}_{i,t-k} + \lambda_{i,4} \text{ECT}_{i,t-1} + u_{i,4,t} \tag{12}
\]

where \( \Delta \) is the first difference operator, \( k=1, \ldots, p \) is the optimal lag selected by the Schwarz, \( \text{ECT}_{i,t-1} \) is the estimated lagged error correction term derived from the long run cointegration equation, \( \lambda_{i,j} \) is the adjustment coefficient \((j = 1, 2, 3, 4)\) and \( u_{i,j,t} \) is the disturbance term assumed to be uncorrelated with zero means.

### 4. Empirical Results

The multivariate panel framework comprises annual data concerning exports of goods and services, foreign direct investments inflows, unemployment rate and gross domestic product for thirteen new European Union members. We begin by testing the stationarity of these variables.
### 4.1 Panel Unit Root Tests Results

Applying the unit root tests of LLC, Breitung, IPS, ADF-Fisher, PP-Fisher and Hadri we present the results in table 1. We have performed each test for the level and first difference of the variables. All tests were performed for both cases of including individual effects and individual effects and trend.

**Table 1: Panel Data Unit Root Tests Results**

<table>
<thead>
<tr>
<th>Panel Level Series</th>
<th>GDP</th>
<th>FDI</th>
<th>EXP</th>
<th>UN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level Unit Root Test Results</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LLC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual intercept</td>
<td>-1.026</td>
<td>-3.198***</td>
<td>0.682</td>
<td>-3.370***</td>
</tr>
<tr>
<td></td>
<td>(0.152)</td>
<td>(0.000)</td>
<td>(0.752)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Individual intercept and trend</td>
<td>1.822</td>
<td>-2.197**</td>
<td>-2.824***</td>
<td>-1.853**</td>
</tr>
<tr>
<td></td>
<td>(0.965)</td>
<td>(0.014)</td>
<td>(0.002)</td>
<td>(0.031)</td>
</tr>
<tr>
<td>Breitung</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual intercept</td>
<td>2.583***</td>
<td>0.179</td>
<td>1.370</td>
<td>0.106</td>
</tr>
<tr>
<td></td>
<td>(0.995)</td>
<td>(0.571)</td>
<td>(0.914)</td>
<td>(0.542)</td>
</tr>
<tr>
<td>Individual intercept and trend</td>
<td>2.348***</td>
<td>2.966***</td>
<td>4.744</td>
<td>-3.268***</td>
</tr>
<tr>
<td></td>
<td>(0.990)</td>
<td>(0.001)</td>
<td>(1.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>IPS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual intercept</td>
<td>-1.040</td>
<td>-3.558***</td>
<td>-1.200</td>
<td>-0.870</td>
</tr>
<tr>
<td></td>
<td>(0.149)</td>
<td>(0.000)</td>
<td>(0.115)</td>
<td>(0.192)</td>
</tr>
<tr>
<td>Individual intercept and trend</td>
<td>3.408</td>
<td>1.261</td>
<td>1.842</td>
<td>0.708</td>
</tr>
<tr>
<td></td>
<td>(0.190)</td>
<td>(0.001)</td>
<td>(0.149)</td>
<td>(0.095)</td>
</tr>
<tr>
<td>ADF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual intercept</td>
<td>10.607</td>
<td>49.116***</td>
<td>6.838</td>
<td>62.882***</td>
</tr>
<tr>
<td></td>
<td>(0.996)</td>
<td>(0.004)</td>
<td>(0.999)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Individual intercept and trend</td>
<td>32.095**</td>
<td>53.561***</td>
<td>36.442</td>
<td>35.811</td>
</tr>
<tr>
<td></td>
<td>(0.190)</td>
<td>(0.001)</td>
<td>(0.083)</td>
<td>(0.095)</td>
</tr>
<tr>
<td>PP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual intercept</td>
<td>10.817</td>
<td>54.673***</td>
<td>7.064</td>
<td>26.271</td>
</tr>
<tr>
<td></td>
<td>(0.996)</td>
<td>(0.000)</td>
<td>(0.999)</td>
<td>(0.448)</td>
</tr>
<tr>
<td>Individual intercept and trend</td>
<td>8.696***</td>
<td>47.821***</td>
<td>28.136</td>
<td>12.178</td>
</tr>
<tr>
<td></td>
<td>(0.999)</td>
<td>(0.005)</td>
<td>(0.351)</td>
<td>(0.999)</td>
</tr>
<tr>
<td>Hadri</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual intercept</td>
<td>9.315***</td>
<td>5.461</td>
<td>9.484</td>
<td>0.324</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.372)</td>
</tr>
<tr>
<td>Individual intercept and trend</td>
<td>5.396***</td>
<td>2.918</td>
<td>4.502***</td>
<td>4.024***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.001)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td><strong>First Difference Unit Root Test Results</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LLC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual intercept</td>
<td>-7.894***</td>
<td>-17.253***</td>
<td>-12.211***</td>
<td>-7.728***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
</tbody>
</table>
As can be seen for table 1 the results showed that GDP and EXP contain a unit root (non-stationary) in levels, while the results for the other two variables (FDI and UN) are inconclusive. Evidently, the results indicated that all variables are stationary in their first differences (i.e. $I(1)$).

### 4.2 Panel Cointegration Test Results

It is commonly accepted, according to the existing literature, that two series with different integration order cannot form a cointegrated series. However, it is not as well known that more than two series, with different integration order, it is possible to form a cointegrated series of lower order of integration. For example, suppose the series $x_t$ and $y_t$ where $x_t \sim I(0)$ and $y_t \sim I(1)$. In this case we say that $x_t$ and $y_t$ are not cointegrated. But in the case we have more than two series, suppose $x_t$, $y_t$, $z_t$ where $x_t \sim I(1)$, $y_t \sim I(2)$ and $z_t \sim I(2)$, then $y_t$ and $z_t$ can form a cointegrated series of order one $I(1)$, which then can cointegrate with $x_t$ to give a $I(0)$ series (Pagan and Wickens 1989) (see also Ramirez and Sharma 2008, Alexiou, Tsaliki, Tsoulfidis 2014). Following Harris (1995), with $n$ variables there can be at most $n-1$...
linearly independent cointegrating relations. Considering all the above, we continue applying Johansen’s Fisher panel cointegration test in order to examine the long run relationship between FDI, EXP, GDP and UN. Table 2 presents the results of Johansen’s Fisher test.

**Table 2: Johansen-Fisher Panel Cointegration Test Results**

<table>
<thead>
<tr>
<th></th>
<th>Individual intercept</th>
<th>Individual intercept and trend</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fisher Statistic (trace test)</strong></td>
<td><strong>Probability</strong></td>
<td><strong>Fisher Statistic (max eigen test)</strong></td>
</tr>
<tr>
<td>None</td>
<td>352.0</td>
<td>0.0000***</td>
</tr>
<tr>
<td>At most 1</td>
<td>154.7</td>
<td>0.0000***</td>
</tr>
<tr>
<td>At most 2</td>
<td>68.35</td>
<td>0.0000***</td>
</tr>
<tr>
<td>At most 3</td>
<td>37.40</td>
<td>0.0688</td>
</tr>
</tbody>
</table>

Notes:
The null hypothesis is that the variables are not cointegrated. Under the null tests, all variables are distributed normal, N(0, 1). *** and ** significant at the 1%, 5% levels, respectively. Fisher’s test (1932) applied regardless of the dependent variable. Lag intervals for test: 1 1. Asymptotic p-values are computed using X² distribution.

The results of table 2 (trace test statistics and maximum eigenvalue statistics) support the presence of three cointegration vectors at 1% level of significance. We conclude that there is a strong evidence of cointegration among the examined variables.

**4.3 Panel Cointegration Estimation Results**

Since our variables are cointegrated, we proceed by estimating the parameters of the long-run equilibrium relationship. The results of Fully Modified OLS (FMOLS) and Dynamic OLS (DOLS) estimations are provided in table 3.

**Table 3: Panel FMOLS and DOLS Estimations Results for the Group of Countries (GDP as dependent variable)**

<table>
<thead>
<tr>
<th></th>
<th>FMOLS Independent Variables</th>
<th>DOLS Independent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coeff.</strong></td>
<td>EXP</td>
<td>FDI</td>
</tr>
<tr>
<td>1.083</td>
<td>(43.44)***</td>
<td>0.570</td>
</tr>
<tr>
<td>-751.34</td>
<td>(-8.73)***</td>
<td>-857.09</td>
</tr>
<tr>
<td>-857.09</td>
<td>(-8.21)***</td>
<td>0.865</td>
</tr>
<tr>
<td>R²</td>
<td>0.900</td>
<td>0.892</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.988</td>
<td>0.865</td>
</tr>
</tbody>
</table>

Notes:
The numbers in parentheses denotes t-statistic. Asymptotic distribution of t-statistic is standard normal as T and N go to infinity. *** significant at 1% level. Lag and lead method selected by Akaike in DOLS.

Table 3 presents the estimated parameters from the long-run equation where GDP is the dependent variable. In the other cases the signs do not agree with the economic theory and the coefficients are not statistically significant.
The estimation results show that exports as well as foreign direct investments have a positive effect on economic growth in 1% level of significance. Also, unemployment has a negative impact on economic growth in 1% level of significance.

4.4 Panel VECM Causality Tests Results

The results on panel data for short and long run causality relationships are reported in Table 4.

Table 4: Panel Causality Tests Results

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Source of Causation (independent variables)</th>
<th>F-statistic</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Short-run</td>
<td></td>
</tr>
<tr>
<td>DGDP</td>
<td>DEXP</td>
<td>2.915*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DFDI</td>
<td>0.047</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DUN</td>
<td>0.349</td>
<td></td>
</tr>
<tr>
<td>DEXP</td>
<td></td>
<td></td>
<td>4.750***</td>
</tr>
<tr>
<td></td>
<td>DFDI</td>
<td>0.394</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DUN</td>
<td>1.117</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6.675***</td>
</tr>
<tr>
<td>DFDI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DUN</td>
<td>0.088</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-1.447</td>
<td></td>
</tr>
<tr>
<td>DUN</td>
<td></td>
<td></td>
<td>2.026**</td>
</tr>
</tbody>
</table>

Notes:
\( \Delta \) denoted the first difference operator, ***, ** and * significant at the 1%, 5% and 10% levels, respectively. Short-run causality is determined by the statistical significance of the partial F-statistics associated with the right hand side variables. Long-run causality is revealed by the statistical significance of the respective error correction terms using a t-test.

From the results of Table 4 we see that the estimated coefficients of ECT in equations of DGDP, DEXP and DUN are statistically significant at 1% and 5% level, implying that gross domestic product, exports of goods and services and unemployment could play an important adjustment role in the long run equilibrium.

In particular, from the results of Table 4 for the thirteen countries viewed as a group we see that there is a long run bidirectional causality relation between exports and economic development and a long run unidirectional causality between economic development and unemployment running from economic development to unemployment. Also the results show that, in the short run, there is a unidirectional causality between exports and FDI with direction from exports to FDI (see Figure 1). The knowledge about the direction of causality helps policy maker to develop a proper economic policy.

Figure 1: Panel Data Granger Causality Relations for Thirteen Countries
5. Conclusion and Policy Implications

The European Union (EU) will continue growing. The last few years we see that more and more countries are interested in joining the EU. The accession in European Union symbolizes their return to European family and establishes a stable growth path. EU membership is the strongest guarantee for these countries to achieve recovery of their economies, higher growth rates and a stable business environment.

This study investigates the causal relationships among foreign direct investments, exports of goods and services, unemployment and economic growth in thirteen new European Union (EU) members (Bulgaria, Czech Republic, Estonia, Croatia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia, and Slovakia) using annual data for the period 1995-2013. We apply panel unit root tests, panel cointegration test and dynamic panel causality test with error correction model. Findings suggest that there is a strong evidence of cointegration among the examined variables, which indicates that the there is long run equilibrium relationship.

The FMOLS and DOLS methods are used to estimate the long run relationship between the examined variables. The estimation results, for the group of countries, show that exports as well as foreign direct investments have a positive effect on economic growth in 1% level of significance. Also, unemployment has a negative impact on economic growth in 1% level of significance.

Then, an error correction model was used to capture the short run and long run dynamic relationships. The obtained results indicate that in the long run, there is bidirectional causality between exports and economic development and a unidirectional causality between economic development and unemployment with direction from economic development to unemployment. Also, the results showed that there is a short run unidirectional causality between exports and FDI running from exports to FDI. Findings suggest that exports are a vital force for increasing economic development and attracting foreign direct investments. Moreover, the results reveal that economic growth is an important determinant for increasing exports and reducing unemployment. An increase in domestic products of these countries will promote exports and will help in reducing unemployment. Moreover, long run dynamics show that exports have an indirect effect on unemployment through economic growth. Therefore, the governments of these countries should implements policies to stimulate their exports. Exports not only not only attract FDI and enhance economic development but also help in reducing unemployment (through GDP).

References


