A Causal Relationship between Exports, Foreign Direct Investment and Economic Growth for five European countries. A panel data approach.

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

This study investigates the relationship between exports, foreign direct investments (FDI) and economic growth in five Eurozone countries (Greece, Portugal, Ireland, Spain, and Italy) using panel data for the period 1970 to 2011. The panel data causality results revealed 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.

Key Words: economic development, foreign direct investments, exports, causality, panel analysis.

JEL Classification: C22, E31, E50
1. Introduction

The relationship between foreign direct investments (FDI), exports and economic growth has been the focus of a considerable number of academic studies. Recent literature has highlighted the role of both exports and FDI in the context of economic growth. As proposed and supported by Hsiao and Hsiao (2006) there exists a triangular relationship among FDI, exports and economic growth. This means that FDI has both direct and indirect effects on economic growth through exports.

FDI inflows can play a vital role in host countries due to the fact that it increases the supply of funds for domestic investments. Furthermore, FDI inflows not only can increase the export capacity of the host country but also encourage the creation of new jobs.

The world FDI inflows increased significantly from 207 billion US dollars in 1990 to 1,975 billion US dollars in 2007 (UNCTAD, 2013). This led to a number of surveys which studied the impact of FDI on the host country’s economy. Most studies found positive effects between FDI and economic growth.

However, we cannot say that the relationships linking FDI, exports and economic growth are clear. Studies focusing on the long-term relationships among these three variables have produced contradictory results. The purpose of this paper is to examine the links between FDI, exports and economic growth in five Eurozone countries (Greece, Portugal, Spain, Ireland, Italy) over the period 1970-2011.

The structure of the paper is as follows: Section 2 briefly reviews the theoretical literature. Section 3 presents the recent empirical literature. Section 4 presents the analytical framework, the econometric methodology and the empirical results. Concluding remarks are given in the final section.
2. Review of Theoretical Literature

In the neoclassical growth model, technological progress and labor are exogenous factors of foreign direct investments that simply increase the rate of investments and afterwards lead to an increase to per capita income, without having any effect on long-term growth. The new model in the theory of growth that was developed in the 1980s considers technological progress as an endogenous factor and foreign direct investments to have a permanent effect on the development through technology transfer.

Since FDI has increased worldwide the last few decades, there are ongoing discussions related to the impact of foreign direct investments in a host country economy. Most of the studies found positive effects of foreign direct investments in transitional and long term economic growth through capital accumulation and transfer of knowledge (Basu, et al. 2003). In an open economy, technology and knowledge can also be transferred through exports and imports and consequently the economic growth can be promoted (Grossman and Helpman, 1997).

Furthermore, some studies have shown that these positive results may be insignificant or even negative due to the concentration of domestic capital (Carkovic and Levine 2005).

It is also pointed out that multinational companies try to find out the most productive countries, with fast growth, so as to invest in these developing economies. In other words we would say that the causality of foreign direct investments and economic growth can run in both directions.

The issue of exports and economic growth has been discussed thoroughly since 1960, in many studies. The results have showed that there is no obvious agreement on whether economic growth has led exports or exports have led economic
growth. However, the relationship among foreign direct investments, exports and economic growth has received less attention in academic community. The relationship between trade and foreign direct investments are positively related (complementary) between asymmetric countries and negative (substitutes) between symmetric countries (Markusen and Venables, 1998). Thus, the relationship can be positive or negative. On the other hand, when exports increase foreign direct investments will pave the way for new investments, reducing the transaction cost of investors with the knowledge of the structure of the market in the host country.

To our knowledge very few studies have taken into consideration these three variables together and have used the causality analysis of panel data. In terms of econometric methods, this study investigates the causality relations among foreign direct investments, exports, and GDP (a proxy for economic growth) for the five weakest economies of the Eurozone.

3. Review of Recent Empirical Literature

In current literature, most of the published studies examine the bivariate relationships, either theoretically or empirically, between the pairs of economic growth and exports, economic growth and foreign direct investments or exports and foreign direct investments. Despite the relationships between them, there are very few studies that have examined empirically the causality relations among these three variables in a group of countries. Also, there are even fewer studies that carried out their analysis in the panel framework.

There are several studies that examine the Granger causality with these three variables in a country. Liu, et al. (2002) found bidirectional causality between each
pair of real GDP, real exports, and real FDI for China using seasonally adjusted quarterly data during the period 1981–1997.

Dritsaki, et al. (2004) investigated the relationship between exports, FDI and GDP of Greece over the period of 1960-2002. This study found that there is a long run relation and a causality relation between the examined variables.

Ahmad, et al. (2004), found unidirectional causalities from exports to GDP and FDI to GDP for Pakistan using annual data for the period 1972-2001.

Mehmet Eryigit (2012) examined the relationship between FDI, exports, and GDP for Turkey through cointegration tests for the period of 2000-2010. The results of the study showed that there is a long-term relationship between FDI and export volume, FDI and GDP, and export volume and GDP.

Syed Imran Ali Meerza (2012) investigated the casual relationship between FDI, trade and economic growth for Bangladesh over the period 1973-2008. This study found that there is a long run relationship between the examined variables. In addition, there is a unidirectional a causality relation between FDI and exports with direction from exports to FDI.

There are also studies that examine the Granger causality with these three variables in a group of countries. Wang, et al. (2004) used a large panel data set encompassing 79 countries over the period 1970-1998. Their study revealed that FDI are more beneficial for high-income countries, while the international trade is more important for low-income countries. The stationarity of the variables was not examined and the panel causality analysis was not implemented in this study.

Hsiao, Hsiao, (2006) examined the relationship among FDI, exports, and GDP for eight East and Southeast Asian economies through Granger causality test and panel data analysis for the period of 1986-2004. Their study 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.

A similar study (Yao, 2006) investigated the effect of exports and FDI on economic performance, using a large panel data set encompassing 28 Chinese provinces over the period 1978-2000. The results of the study showed that both exports and FDI have a strong and positive effect on economic growth.

Yongkul, Won and Frank, Hsiao (2008) examined the causality relations among GDP, exports and FDI in first generation Asian industrializing economies (Korea, Taiwan, Singapore) and in second generation industrializing economies (Malaysia, Philippines, Thailand, China) using panel data over the period 1981-2005. The results of the study showed that there are bidirectional causality relations among all variables for the first generation countries. Also, there is a unidirectional causality relation between exports and GDP for the second generation countries.

Nishiyama and Yamaguchi (2010) investigated FDI inflows from developed countries to developing countries. They found that FDI leads to an increase in GDP of developing countries.

A similar study (Acaravci Ali, Ozturk, Ilhan, 2012) investigated the causal relationship among economic growth, exports and FDI for ten European countries over the period 1994-2008. Their study revealed that there is causality relation among FDI, exports and economic growth in four out of ten countries.

In general, the empirical literature suggests that the causality relations depend on econometrics methods and the period the studies were carried out. The results can be unidirectional causality, bidirectional causality or no causality relation. In any case, the results seem to indicate a positive relation among exports, economic growth and FDI.
Table 1: Causality relations among EXP, FDI and GDP for a group of countries using panel data

<table>
<thead>
<tr>
<th>Authors</th>
<th>Period</th>
<th>Country</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hsiao and Hsiao (2006)</td>
<td>1968-2004</td>
<td>Eight rapidly developing East and Southeast Asian economies (China, Korea, Taiwan, Hong Kong, Singapore, Malaysia, Philippines, Thailand)</td>
<td>EXP↔GDP, FDI→GDP, FDI→EXP</td>
</tr>
<tr>
<td>Yongkul, Won and Frank, Hsiao (2008)</td>
<td>1981-2005</td>
<td>Seven ANIEs (Asian Newly Industrializing Economies)</td>
<td>EXP↔GDP, EXP↔FDI, FDI→GDP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>First generation ANIEs (Korea, Taiwan, Singapore)</td>
<td>EXP↔GDP, GDP↔FDI, FDI↔EXP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Second generation ANIEs (Malaysia, Philippines, Thailand, China)</td>
<td>EXP↔GDP</td>
</tr>
</tbody>
</table>

Source: Authors, based on data combined from bibliography
4. Analytical Framework

In order to test the causality relations among the examined variables, we specify a vector autoregressive model (VAR), as implemented by Sims (1980). The VAR model is expressed in equation (1).

\[ U = (\text{GDP, FDI, EXP}) \quad (1) \]

where:

- GDP is the economic development
- FDI are the foreign direct investments
- EXP are the exports

The main advantage of the VAR model is that it treats each variable of the system as endogenous and relates each variable to its own past values and to past values of all other variables included in the model.

The following equation shows the form of VAR model in panel data.

\[ y_{it} = \alpha_i + x_{it} \beta + u_{it} \quad (2) \]

where \( y_{it} \) is one of the three endogenous examined variables, \( i \) is the number of sections (countries) and \( t \) are the observations. The constant \( \alpha_i \) takes into consideration the heterogeneity of each variable, which may differ between sections (countries). \( x_{it} \) is a vector that contains the lags of the endogenous variables. \( \beta \) is a column vector of slope coefficients for the group of countries. The error term \( u_{it} \) follows asymptotically the normal distribution \( u_{it} \rightarrow N(0, \sigma^2_{u}) \).

Panel data analysis has the advantage of using information about cross-section units and time series. Also, panel data analysis can examine the heterogeneity of individual cross-section units, which give more variability, less collinearity among the variables, more degrees of freedom and more efficiency (Baltagi, 2001). In addition,
the repeated cross-section units of observations are better adapted for studying the dynamics of changes of variables such as foreign direct investments, exports and development.

The five Eurozone economies under consideration have similar problems the last few years. Considering the interdependence of these economies, we proposed to integrate their data over the 42 years (1970-2011) in a panel data set and then use a table of regressions to examine Granger causality relations. Data are gathered from economic databases Annual macro-economic database (AMECO) and United Nations Conference on Trade and Development (UNCTAD). The current prices of exports, GDP and foreign direct investments are expressed in euro, deflated by the GDP deflator of each country (2000=1) in order to be converted in constant prices.

4.1 Panel Data Unit Root Tests

We begin by testing the stationarity of three variables (real FDI, real EXP and real GDP). The recent literature proposes several methods for unit root tests in panel data. Since these methods may give different results, we selected Breitung (2000), Levin, Lin and Chu (2002) (LLC), Im, Perasan 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) to perform panel data unit root tests. In all these tests except Hadri, the null hypothesis is that the variable contains a unit root (i.e., it is not stationary).

The results of level and first difference unit root tests for the three variables are provided in Table 2.
Table 2: Panel Data Unit Root Tests

<table>
<thead>
<tr>
<th>Panel Level Series</th>
<th>GDP</th>
<th>FDI</th>
<th>EXP</th>
</tr>
</thead>
<tbody>
<tr>
<td>LLC</td>
<td>Individual intercept</td>
<td>-0.64343 (0.2600)</td>
<td>-0.13051 (0.4481)</td>
</tr>
<tr>
<td></td>
<td>Individual intercept and trend</td>
<td>-1.85992** (0.0314)</td>
<td>0.49143 (0.6884)</td>
</tr>
<tr>
<td>Breitung</td>
<td>Individual intercept</td>
<td>3.51568 (0.9998)</td>
<td>1.70438 (0.9558)</td>
</tr>
<tr>
<td></td>
<td>Individual intercept and trend</td>
<td>2.79602 (0.9974)</td>
<td>-3.3470*** (0.0004)</td>
</tr>
<tr>
<td>IPS</td>
<td>Individual intercept</td>
<td>9.73209 (0.4643)</td>
<td>43.2279*** (0.0000)</td>
</tr>
<tr>
<td></td>
<td>Individual intercept and trend</td>
<td>16.2923* (0.0916)</td>
<td>44.8807*** (0.0000)</td>
</tr>
<tr>
<td>ADF</td>
<td>Individual intercept</td>
<td>0.11587 (1.0000)</td>
<td>52.3633*** (0.0000)</td>
</tr>
<tr>
<td></td>
<td>Individual intercept and trend</td>
<td>9.01543 (0.5306)</td>
<td>56.2391*** (0.0000)</td>
</tr>
<tr>
<td>PP</td>
<td>Individual intercept</td>
<td>9.26438*** (0.0000)</td>
<td>2.13076** (0.0166)</td>
</tr>
<tr>
<td></td>
<td>Individual intercept and trend</td>
<td>6.24177*** (0.0000)</td>
<td>-0.58559 (0.7209)</td>
</tr>
<tr>
<td>Hadri</td>
<td>Individual intercept</td>
<td>9.26438*** (0.0000)</td>
<td>2.13076** (0.0166)</td>
</tr>
<tr>
<td></td>
<td>Individual intercept and trend</td>
<td>6.24177*** (0.0000)</td>
<td>-0.58559 (0.7209)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>GDP</th>
<th>FDI</th>
<th>EXP</th>
</tr>
</thead>
<tbody>
<tr>
<td>LLC</td>
<td>Individual intercept</td>
<td>-1.83262** (0.0334)</td>
<td>-5.7895*** (0.0000)</td>
</tr>
<tr>
<td></td>
<td>Individual intercept and trend</td>
<td>1.19804 (0.8845)</td>
<td>-3.9342*** (0.0000)</td>
</tr>
<tr>
<td>Breitung</td>
<td>Individual intercept</td>
<td>3.71610 (0.9999)</td>
<td>1.54987 (0.9394)</td>
</tr>
</tbody>
</table>
As can be seen from Table 2, most of the test results showed that FDI is stationary in levels, while the other two variables contain a unit root. Most of the test results indicated that all variables are stationary in their first differences. Therefore, we use first differences to analyze the causality in VAR model.
4.2 Panel Data VAR and Granger Causality Test

When we estimate panel data regression models, we consider various assumptions about the intercept, the slope coefficients, and the error term. This procedure requires selecting either the fixed effects model or the random effects model.

Since the random effects model requires a number of sections (units) greater than the number of coefficients, having five sections (units-countries) in our study, we can estimate a model VAR(p) with lags \( p = 1 \) or \( 2 \). In case we have two lags, we lose some certain information when the data are related to a period of 42 years. The optimal lag length selected by the minimum value of Akaike criterion.

We also apply the Hausman test (1978) to help in choosing between FEM and REM estimations before implementing the Wald test of coefficients to determine the Granger causality directions.

<table>
<thead>
<tr>
<th>Table 3: Hausman Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>( X^2(2) )</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>( 16.504 ) (0.000)</td>
</tr>
</tbody>
</table>

The Hausman test results indicate that we should use the FEM to estimate the first equation \( \Delta \text{GDP} \) and the third equation \( \Delta \text{EXP} \) and use the REM to estimate the second equation \( \Delta \text{FDI} \).
4.2.1. Granger Causality Test

Table 4 presents the estimated panel data VAR(2) for the five countries under investigation, in two FEM and in one REM. The Wald test of coefficients indicates the Granger causality directions.

Table 4: Panel Data Granger Causality Tests

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>DGDP</th>
<th>DFDI</th>
<th>DEXP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fixed Effects</td>
<td>Random Effects</td>
<td>Fixed Effects</td>
</tr>
<tr>
<td>Model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant (c1)</td>
<td>4.116 (0.000)</td>
<td>0.291 (0.474)</td>
<td>3.606 (0.001)</td>
</tr>
<tr>
<td>DGDP(-1) (c2)</td>
<td>0.984 (0.000)</td>
<td>-0.018 (0.659)</td>
<td>0.067 (0.622)</td>
</tr>
<tr>
<td>DGDP(-2) (c3)</td>
<td>0.051 (0.684)</td>
<td>-0.015 (0.701)</td>
<td>0.198 (0.127)</td>
</tr>
<tr>
<td>DFDI(-1) (c4)</td>
<td>0.126 (0.591)</td>
<td>-0.291 (0.000)</td>
<td>0.263 (0.279)</td>
</tr>
<tr>
<td>DFDI(-2) (c5)</td>
<td>-0.101 (0.670)</td>
<td>-0.304 (0.000)</td>
<td>0.082 (0.737)</td>
</tr>
<tr>
<td>DEXP(-1) (c6)</td>
<td>-0.434 (0.001)</td>
<td>0.025 (0.529)</td>
<td>0.021 (0.875)</td>
</tr>
<tr>
<td>DEXP(-2) (c7)</td>
<td>-0.336 (0.003)</td>
<td>0.045 (0.210)</td>
<td>-0.521 (0.000)</td>
</tr>
<tr>
<td>Dummy</td>
<td>-9.896 (0.000)</td>
<td>0.215 (0.805)</td>
<td>-3.055 (0.300)</td>
</tr>
</tbody>
</table>

Wald test of Coefficients Causality Direction (1)

<table>
<thead>
<tr>
<th>Ho F-statistic</th>
<th>B (F(2,187)=0.305 (0.737))</th>
<th>A (F(2,183)=0.815 (0.444))</th>
<th>A (F(2,187)=9.770 (0.000))</th>
</tr>
</thead>
</table>

Wald test of Coefficients Causality Direction (2)

<table>
<thead>
<tr>
<th>Ho F-statistic</th>
<th>C (F(2,187)=13.83 (0.000))</th>
<th>C (F(2,183)=1.226 (0.295))</th>
<th>B (F(2,187)=0.591 (0.554))</th>
</tr>
</thead>
</table>

Notes:

a) The numbers in parentheses denote p-values.
b) *** (**, *, +) denotes rejection of null hypothesis at the 1% (5%, 10%, 15%) level of significance, respectively.
c) Ho=null hypothesis, F-stat=F-statistic.
d) In Wald test of coefficients, the null hypothesis A is c2=c3=0, B is c4=c5=0, C is c6=c7=0, respectively.
e) Hausman test is used in the selection of fixed effects or random effects model.

From the results of table 4 for the five countries viewed as a group, we see that:

The coefficients of dummies variables are negative in the first and third function. This means that the economic crisis had significant negative impacts on these five Eurozone countries, as group.
From the first equation (DGDP) of Table 4 we see that there is a strong unidirectional causality relation between exports and economic development with direction from exports to economic development, while there is no causality relation between foreign direct investments and economic development. This result indicates that exports are a vital force for increasing economic development.

The second equation (DFDI), indicated that there is no causality relation between economic development and foreign direct investments nor between exports and foreign direct investments. Obviously, it seems that the increase in exports for the group of five Eurozone countries is not the only factor in attracting foreign direct investments. Factors, such as low wages, tax breaks, human capital, bureaucracy, proper administration etc, are the ones that can attract foreign direct investments.

From the third equation (DEXP) of Table 4 we find that there is a strong unidirectional causality relation between exports and economic development with direction from economic development to exports. This relation shows the increase in domestic products of the five examined countries as group, which is a dynamic in the promotion of exports. On the contrary, there is no causality relation between foreign direct investments and exports. This means that investors are reluctant to invest in this group of countries where there is an economic recession. Summarizing the results for the three equations we can say that there is only a strong bidirectional causality relation between exports and economic development (see Figure 1).
In this paper we employed a Keynesian demand model in an open economy to examine the relations among foreign direct investments, exports and economic development in a VAR model. For the empirical analysis in this study we used panel data causality analysis for five Eurozone countries that are in recession during the last few years. There are many theoretical and empirical studies on the bivariate causality between exports and economic development, exports and imports, trade and foreign direct investments. However, there are few studies that deal with the causality relations among exports, economic development and foreign direct investments. The
selection of these five Eurozone countries was motivated by the fact that there are few studies that using panel data VAR to examine the heterogeneous economic characteristics in the stages of recession.

In this paper, the most significant econometric finding is that foreign direct investments influence neither exports nor development. On the contrary, there is a strong bidirectional causality relation between exports and economic development. This causal relation indicates that an increase in domestic products of the five countries will cause a dynamic impulse both in exports and development. The results of this study differ from those in Hsiao and Hsiao (2006) where it is argued that exports and foreign direct investments together are the most important indicator of economic development, in a group of developed countries.
References


