HELLENIC OBSERVATORY
European Institute

The Relationship Between Greek Exports and Foreign Regional Income

Konstantinos Chisiridis and Theodore Panagiotidis

GreeSE Paper No.111
Hellenic Observatory Papers on Greece and Southeast Europe

JUNE 2017

All views expressed in this paper are those of the authors and do not necessarily represent the views of the Hellenic Observatory or the LSE
© Konstantinos CHISIRIDIS and Theodore PANAGIOTIDIS

LSE THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

TABLE OF CONTENTS

ABSTRACT _____ **iii**

1. Introduction _____ **1**

2. The Composition of Greek Export Goods per Region _____ **5**

3. Methodology _____ **8**

   3.1 The Vector Autoregressive Model _____ 10

4. Empirical Results _____ **11**

   4.1 Data and Unit Root Tests _____ 11

   4.2 Cointegration Analysis _____ 13

   4.3 Income and Price Elasticities for Greek Exports _____ 15

   4.4 Dynamic Analysis _____ 18

5. Conclusion _____ **20**

References _____ **22**

The Relationship between Greek Exports and Foreign Regional Income

Konstantinos Chisiridis* Theodore Panagiotidis**

ABSTRACT

This paper assesses the effect of foreign economic activity on Greek exports based on both static and dynamic analysis. We employ data from 1990:I to 2016:IV and quantify the long-run foreign income elasticity of Greek exports. We establish a cointegration relationship and find that the aggregate foreign income elasticity of Greek exports is 1.72 and the price elasticity is negative. We reveal that economic growth in Germany, Italy and Turkey has the greatest impact on Greek exports and the corresponding elasticities are found to be 0.75, 0.72 and 0.65. The rest of the European countries are also found to be significant for the growth of the Greek exports. Finally, the dynamic analysis shows a positive interaction between real income growth in Germany, Italy, the rest of Europe and Greek export growth in the short-run horizon.

* Department of Economics, University of Macedonia, email: *k.chisiridis@gmail.com*
** Department of Economics, University of Macedonia, email: *tpanag@uom.gr*

The Relationship Between Greek Exports and Foreign Regional Income

"It is your concern when your neighbor's wall is on fire."
Horace

1. Introduction

The cumulative deficits of the current account of Greece have been cited as one of the factors that contributed to the recent debt crisis that occurred. After joining the euro zone, the Greek economy could not use the devaluation as a tool of consolidation of the current account anymore. Despite the sluggish adjustment, the current account of Greece recorded surplus during the third quarter of 2012 for the first time in 18 years. A critical question is whether exports or imports of goods and services were the driving force of this adjustment. A report of the National Bank of Greece in July 2013, argues that this adjustment in current account stems from imports that contracted (the period 2009-2012) by 33% in value terms. Exports have increased by 20%.

It has been argued that trade openness and export expansion can act as a catalyst to stimulate growth recovery (Riedel 1984). Promotion of exports is linked with a positive effect on productivity and positive externalities, the so-called export-led-growth-hypothesis (ELGH; Emery 1967, Balassa 1978, Feder 1982). Also, an export-oriented economy can benefit from economies of scale (Helpman and Krugman 1985), increased aggregate demand and better allocation of the total

investments. Export growth ensures a strong balance of payments which provides support to imports of intermediate and capital goods.

Another strand of the literature focuses on the impact of trade openness and imports on economic growth. Grossman and Helpman (1991) point out that the adoption of trade expansion policies can strengthen knowledge and innovation spillovers in a small open economy frame. Macnab and Moore (1998) reiterate the latter for developing countries as they relate strongly outward oriented policies with a 1.5% annual increase of GDP growth. In this context, imports of intermediate goods exhibit growth inducing effects as well, known as the import-led-growth hypothesis (ILGH). The studies of Awokuse (2007, 2008) and Thangavelu and Rajaguru (2004) provide evidence for the importance of imports in the growth process.

Empirical modeling of the mechanisms that define international trade relations among countries helps to understand the evolution of trade deficits (Crane et al. 2007). Economic theory points to three factors that can determine the foreign demand for domestic goods and services: (i) foreign income, (ii) prices of domestic export goods and services and (iii) prices of goods and services that compete with the domestic ones in the global markets.

It is important though, to grasp how changes in foreign demand can affect export growth. For this purpose, some studies focus on the computation of the foreign income and price elasticity of exports for developed and developing countries (Marquez and McNeilly 1988, Marquez 1990, Senhadji and Montenegro 1999). These foreign income elasticities of exports, quantify the simultaneous relationship between

foreign economic growth and domestic exports. Higher GDP growth in the trade partners of Greece may lead to higher demand for the Greek exports of goods and services. Thus, economic prosperity in foreign regions can be associated with higher Greek export growth.

This paper estimates the long-run aggregated foreign income elasticity of Greek export goods and the long-run disaggregated income elasticity of Greek export goods per trading partner together with the price elasticity. The adopted approach allows us to quantify the impact of a change in the foreign real income on Greek exports separately for each trading partner. Nie and Taylor (2013) follow the same procedure to study the region-specific income effects for the U.S. exports. We employ a Vector Autoregressive (VAR) model to gauge the dynamic inter-linkages among Greek exports, regional foreign growth and the real effective exchange rate of Greece. The main questions that we address are:

1. What was the evolution of shares and destinations of Greek export goods per region over the last twenty years (1996-2016)?
2. How changes in real GDP per region affect Greek exports?
3. Which is the dynamic response of Greek exports in positive shocks on foreign disaggregated income and the exchange rate in the short-run and long-run?

The model includes real income activity in the main trading partners of Greece over the last five years: Germany, Italy, Turkey and the rest of the Europe. These regions account, on average, for the 75% of the Greek export goods. We employ quarterly data from 1990:I to 2016:IV. To investigate the long-run properties of our variables, we conduct a

cointegration test (static analysis). The estimations of the foreign real income and price elasticities of Greek exports are based on OLS and Fully Modified OLS (FMOLS).

We find that economic growth in Germany, Italy and Turkey are important for the growth of Greek exports. A 1% increase in the real income activity of these three countries is associated with a contemporaneous increase of real Greek exports of 0.75%, 0.72% and 0.65% respectively. The price elasticity of Greek exports is found to be negative (in line with expectations) and significant. The real income in the rest of Europe has the greatest impact on Greek exports (income elasticity of 1.16).

In the dynamic analysis, we examine the effect of a positive 1% shock in the foreign real income growth on Greek export growth. The results indicate the importance of the German and Italian markets for Greek exports. Also, a real depreciation of the Greek economy can boost export growth in the short-run.

The outline of the paper is structured as follows: part 2 provides an overview of the trade partners of Greece for the last twenty years and part 3 discusses the methodology. The empirical evidence provided in part 4 and the last one concludes.

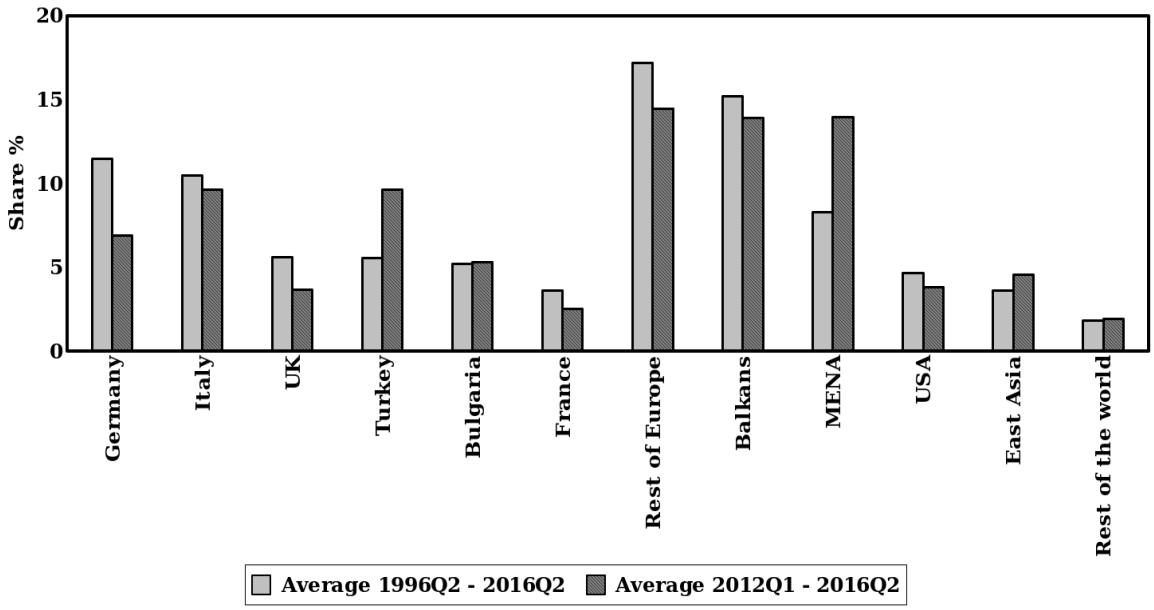
2. The Composition of Greek Export Goods per Region

An open economy benefits from trade with both developed and fast growing economies (Arora and Vamvakidis 2005). The Greek economy is influenced by economic conditions abroad with global shocks transmitted into the domestic economy through the trading partners' channel. An investigation of the recent evolution of the Greek trade partners can offer useful implications for economic policy analysis. The Greek economy is one of the closest economies in the EU in terms of trade openness. Bower *et al.* (2014) attribute the latter to weak institutional quality.

Over the last twenty years, 75% of the Greek exports were absorbed by European markets. The Middle East and North Africa (MENA) holds an average, 8% of the Greek export goods followed by the USA with 5% and East Asia with 4%. Growth in these regions affects the growth rate of Greek exports of goods and services. Figure 1 presents the region and country destination of Greek export goods from 1996:02 till 2016:02. The most important trade partners for Greece were Germany with 11% of Greek export goods and Italy with 10%; UK, Turkey, Bulgaria and the USA follow.

For the period 2012-2016 Germany, Italy and Turkey emerge the most important markets for Greece. These countries absorbed, on average, 26% of Greek export goods.

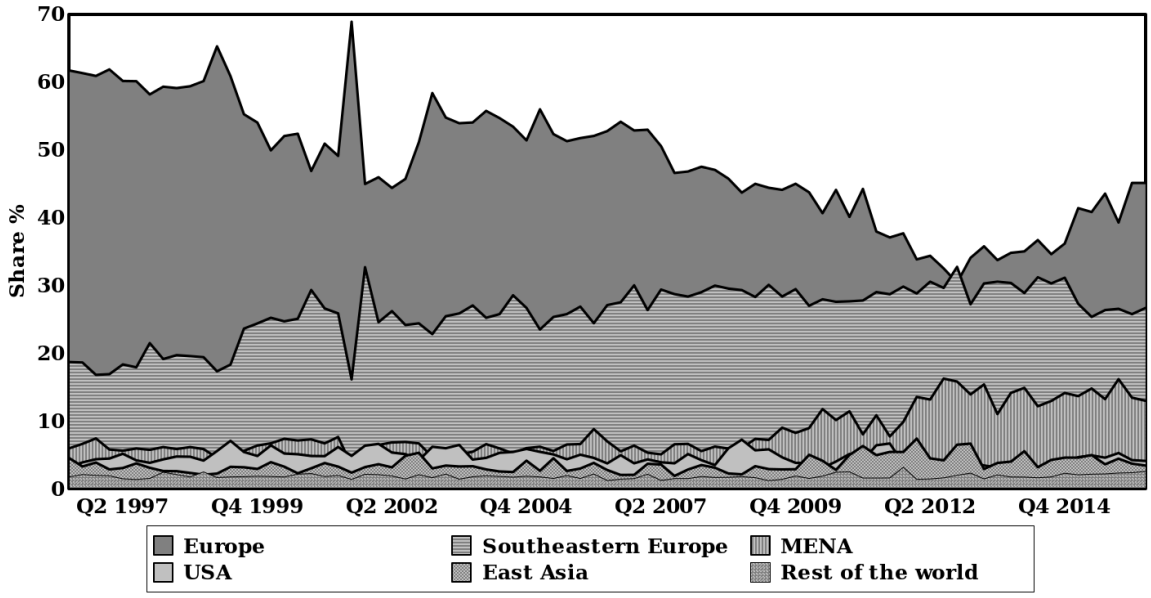
Figure 1. Greek Export Goods Share per Region



Notes: Rest of Europe includes Austria, Belarus, Belgium, Czech Republic, Denmark, Estonia, Finland, Hungary, Iceland, Ireland, Latvia, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Russia, Slovak Republic, Spain, Sweden, Switzerland and Ukraine. Balkans includes Albania, Cyprus, FYROM, Romania, Serbia and Slovenia. MENA includes Algeria, Kingdom of Bahrain, Egypt, Islamic Republic of Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Morocco, Saudi Arabia, Tunisia and United Arab Emirates. East Asia includes China, Hong Kong, Indonesia, Japan, Korea and Singapore. Rest of the World includes Argentina, Australia, Brazil, Canada, Colombia, Mexico and South Africa. Source: IMF Direction of Trade Statistics and authors' calculations.

The ranking of Greece's trade partners has changed during the last seven years of economic crisis. Important destinations such as Europe and the region of Balkans lost part of their share and more distant areas such as the USA and East Asia have emerged. Also, a notable rise is in the region of the Middle East and North Africa that nearly doubled its share to 14% in the period 2012-2016. Figure 2 summarizes the evolution of the geographical destination of Greek export goods.

Figure 2. Time Varying Share of Greek Export Goods per Region 1996:II-2016:II



Notes: Europe includes Austria, Belarus, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Russia, Slovak Republic, Spain, Sweden, Switzerland, UK and Ukraine. Southeastern Europe includes Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, FYROM, Republic of Kosovo, Romania, Serbia, Slovenia and Turkey. MENA includes Algeria, Kingdom of Bahrain, Egypt, Islamic Republic of Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Morocco, Saudi Arabia, Tunisia and United Arab Emirates. East Asia includes China, Hong Kong, Indonesia, Japan, Korea and Singapore. Rest of the World includes Argentina, Australia, Brazil, Canada, Colombia, Mexico and South Africa. Source: IMF Direction of Trade Statistics and authors' calculations.

This geographical reorientation of the Greek exports can be attributed to the weak economic growth of the western and the southeastern Europe during the last six years. From 2008 to 2016, the Euro area had an anemic GDP growth rate of 0.6% as a result of the economic instability in the area. Southeastern Europe failed to recover to the pre-crisis level. This has direct implications for the structure of Greek export goods. The weak demand from these countries forced Greek exporters to find other markets. Turkey showed a GDP growth rate of 3.4%, the USA grew on average 1.5% and East Asia recorded a high GDP growth rate of 8%. Traditional trade with Italy and Germany sustained although that exports to the German market were reduced.

3. Methodology

This section examines the way economic growth in foreign economies affects Greek exports. We employ both static and dynamic analysis. We provide a framework to gauge both the short run and long run relationship between the foreign real GDP growth and real Greek export growth (see Goldstein and Khan 1985 for a detailed description about specification issues of trade equations). The first model examines the contemporaneous relationship between the real Greek exports, real foreign income and real effective exchange rate. Assuming that domestic and foreign tradable goods are imperfect substitutes, this specification is close to the standard export demand function and can be written as:

$$log(ex_t) = \alpha_0 + \beta\, log(y_t) + \gamma\, log(reer_t) + \alpha_1\, log(ex_{t-1}) + \alpha_2 d_t + u_t \quad (1)$$

where ex_t is real export goods of Greece; y_t is the foreign income variable approximated by the difference between real GDP and real exports of goods and services of the Greek trading partners; $reer_t$ is the real effective exchange rate of Greece and represents the relative price between Greek export goods and those that compete with them in the global markets. Parameter β can be interpreted as the foreign income elasticity of Greek exports and γ captures the competitiveness of the Greek economy. Sehandji and Montenegro (1999), employ the same specification with the variable y_t to account for the proper activity variable of trading partners' income. Also, we incorporate in model (1)

the first lag of the dependent variable ex_{t-1} and a dummy variable d_t to capture shifts in the constant term due to structural breaks[1].

Previous studies have employed cointegration for equation (1) (see for instance Caporale and Chui 1999, Hooper *et al.* 2000). If all variables are I(1) and there is a cointegration relationship among them, model (1) represents the long-run relationship and can be estimated using FMOLS (Phillips and Hansen 1990).

The linkage between foreign income and Greek exports through the aggregate income elasticity is of importance. Nevertheless, it would also be interesting to examine how Greek exports react to income changes in specific regions. Therefore we estimate the region disaggregated foreign income elasticities for the Greek exports. We include in our analysis the three most important trade partners of Greece over the last five years as defined in section 2; Germany, Italy and Turkey. We quantify income in the remaining trading partners through the variable *RoE* which encapsulates income in the rest of the Europe. Thus, the augmented model can be written as:

$$log(ex_t) = \alpha_0 + \beta_i log(y_{i,t}) + \gamma log(reer_t) + \alpha_1 log(ex_{t-1}) + \alpha_2 d_t + u_t \quad (2)$$

where $i = 1, 2, 3\ or\ 4$ for the case of the real income activity (real GDP minus real exports) in Germany, Italy, Turkey and *RoE* respectively. Parameters β_i represent the region-specific real income elasticities of the Greek exports. This approach gauges the effect of a change in the

1Dummy variable d_t takes the value 0 before 1996:II and 1 afterwards. The break date was indicated by the Zivot-Andrews procedure.

foreign income on Greek export goods separately for each region. If all variables are I(1) and there is a cointegration equation among them, equation (2) can be estimated using FMOLS [2].

3.1 The Vector Autoregressive Model

A VAR model can capture linear interdependencies between real Greek export goods growth, Greek trade partners' real income activity growth and exchange rate growth. To quantify short-run dynamics we utilize a reduced form VAR(*p*) model represented by:

$$x_t = v + A_1 x_{t-1} + \dots + A_p x_{t-p} + u_t, \; t = 1, 2, \dots, p$$

where $x_t = (x_{1t}, \dots, x_{kt})'$ is a $(k \times 1)$ vector of the variables, A_i is a $k \times k$ coefficient matrices for $i = (1, \dots, p)$, $v = (v1, \dots, vk)'$ is an intercept term matrix and $u_t = (u_{1t}, \dots, u_{kt})$ is a *k*-dimensional zero mean white noise process with covariance matrix $E(u_t u_t{}') = \Sigma_u$. Under standard assumptions, if all the roots of x_t are outside the unit circle, a stable process x_t has means, variances and covariances that are time invariant.

Our model consists of six endogenous variables with vector x_t be of 6×1 dimension, formed as:

$$x_t = \begin{bmatrix} Greek\ export\ goods\ growth_t \\ German\ real\ income\ growth_t \\ Italian\ real\ income\ growth_t \\ Turkish\ real\ income\ growth_t \\ RoE\ real\ income\ growth_t \\ reer\ growth_t \end{bmatrix}$$

2OLS estimators of models (1) and (2) are also provided.

We will investigate the dynamic properties of the VAR(p) model using the Generalized Impulse Response Functions (GIRFs) developed by Pesaran and Shin (1998). GIRFs are invariant of the ordering of the variables. The shock will gauge the total effect of a 1% positive shock on foreign real GDP to Greek exports. Note that GIRFs refer to a one standard deviation shock to the variable of choice, so we normalize the response of Greek exports with the standard deviation of each variable in order to obtain the 1% response.

The Local Projections (LPs) of the GIRFs as proposed by Jordà (2005, 2009) are also provided. The main advantage of this procedure is that LPs rely on their own IRF regression instead of previous iterations of the model leading to be less vulnerable to misspecification. Also, LPs benefit from the simplicity of their estimation (they rely on OLS with robust standard errors) and they are better to capture non-linearities.

4. Empirical Results

4.1 Data and Unit Root Tests

We employ quarterly seasonally adjusted data for the period 1990:I-2016:IV (108 observations). The variable y_t is proxied by the real GDP of the European OECD countries minus their real exports of goods and services. This variable was chosen as 75% of the Greek export goods were absorbed by European markets over the last twenty years. Also, real income activity for Germany, Italy and Turkey and *RoE* was created using data for real GDP and real exports of goods and services. Region

RoE consists of all the European OECD countries except Germany, Italy and Turkey which are already incorporated into the analysis. All the above data series were retrieved from the OECD database. The value of Greek export goods series was deflated using the unit value of Greek export goods. Both series, along with the real effective exchange rate for Greece were retrieved from the IMF database.

The Augmented Dickey-Fuller (ADF) test is used for all the variables of models (1) and (2). The unit root test conducted both in the levels and first differences of the variables. The lag length of the test was based on AIC. Table 1 summarizes the results.

The results indicate the presence of a unit root in the levels of all the variables (except Germany in the case with constant and trend). Furthermore, all variables reject the null hypothesis of the ADF test in the case of the first differences. This leads to the conclusion that all series in models (1) and (2) are I(1) and can be used in the subsequent cointegration analysis.

Table 1: Unit Root Tests Table (ADF)

		At Level						
		ex	*y*	*Germany*	*Italy*	*Turkey*	*RoE*	*reer*
With Constant	*t-*	− 0.33	− 2.58	− 1.58	− 0.81	0.34	− 1.76	− 2.37
	Prob.	0.91	0.10	0.49	0.81	0.98	0.40	0.15
With Constant & Trend	*t-*	− 2.63	− 0.81	− 4.25	0.01	− 1.93	0.12	− 1.57
	Prob.	0.28	0.96	0.00	0.99	0.63	0.99	0.79
		At First Difference						
		d(ex)	*d(y)*	*d(Germany)*	*d(Italy)*	*d(Turkey)*	*d(RoE)*	*d(reer)*
With Constant	*t-*	− 4.55	− 10.53	− 3.32	− 4.38	− 10.58	− 9.40	− 7.50
	Prob.	0.00	0.00	0.02	0.00	0.00	0.00	0.00
With Constant & Trend	*t-*	− 4.54	− 11.15	− 4.28	− 6.37	− 10.60	− 9.92	− 7.76
	Prob.	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: Variable *ex* refers to real Greek export goods. Variable *y* refers to aggregate foreign real income of the Greek trading partners. Variables *Germany, Italy, Turkey and RoE* refer to the real income in the respective regions and variable *reer* is the real effective exchange rate of Greece. All the above variables are in logarithms of the level values. The lag length of the test was based on AIC.

4.2 Cointegration Analysis

To define whether there is a cointegration relationship among the variables in models (1) and (2), we adopt the single-equation cointegration test proposed by Engle and Granger (EG; 1987)[3]. This procedure implies a test for the presence of a unit root in the residuals of the cointegrating equation. A cointegration relationship suggest that there is a long-run "equilibria'' relationship among Greek exports (ex_t),

[3]One could also employ the Johansen cointegration test. In this case, we are interested in estimating single equation cointegration relationships (1) and (2) and as a result multivariate approaches are not useful.

foreign income (total y_t and region disaggregated $y_{i,t}$) and the relative price of Greek exports ($reer_t$). Therefore, we employ the test between variables of model (1); ex_t, y_t and $reer_t$ and model (2); ex_t, $y_{i,t}$ (real income in Germany, Italy, Turkey and *RoE*) and $reer_t$. Maximum lags of the test were 8 quarters and the test lag length was based on AIC. Table 2 summarizes the EG test results.

Table 2. Engle-Granger Cointegration Test

Model (1) EG Cointegration test (Sample: 1990:I-2016:IV)		
Cointegration Equation Deterministics: Constant & Trend		
Dependent Variable	*z − statistic*	*Prob.*
ex_t	− 33.61	0.02
Independent Variables: y_t, $reer_t$		
Model (2) EG Cointegration test (Sample: 1990:I-2016:IV)		
Cointegration Equation Deterministics: Constant		
Dependent Variable	*z − statistic*	*Prob.*
ex_t	− 139.98	0.00
Independent Variables: *German real income*$_t$, *Italian real income*$_t$, *Turkish real income*$_t$, *RoE real income*$_t$, *reer*$_t$		

Note: *p*-values from MacKinnon (1996).

Table 2 EG test results indicate that there is a cointegration relationship both among the variables of model (1) and model (2) as the null hypothesis of the test is rejected at the 5% level (*z − statistic* is − 33.61 and − 139.98 respectively). Thus, it is possible to quantify the long-run foreign income elasticities of the Greek exports represented in equations (1) and (2) using FMOLS.

4.3 Income and Price Elasticities for Greek Exports

Estimation of equations (1) and (2) quantify the foreign income (aggregated and disaggregated) and the price elasticity of Greek exports. If the connection between the growth of Greek exports and economic growth in its trade partners is significant, this will be depicted by a high level of foreign income elasticity. It is straightforward that the expected relationship between foreign income and Greek exports is positive. Also, a real depreciation of the Greek economy can enhance the domestic productivity leading to more competitive export goods in the global market. Therefore, the literature suggests that the price elasticity of Greek exports should be negative (see Stern 1976 for a thorough analysis on price elasticities of exports).

The FMOLS estimation results of equation (1) (Table 3, Column 2) indicate that the long-run aggregate foreign income elasticity of Greek exports is about 1.72 and statistically significant at the 1% level. This reveals that Greek exports are very sensitive to changes in foreign income conditions. A 1% increase in the real income of the Greek trading partners is associated with an approximately 1.70% simultaneous increase in the Greek exports. The long-run price elasticity of Greek exports is found to have the expected negative sign (-0.31) but does not have the required statistical properties.

The region disaggregated approach in the model (2) (Table 3, Column 4) highlights that different regions affect in a different way the Greek export growth. Economic growth in all four regions (rest of the Europe, Germany, Italy and Turkey) has a positive and statistically significant, at

the 1% level, effect on Greek exports. Rest of the Europe has the greatest impact on Greek exports as a 1% increase in the region's real income is associated with a 1.16% increase of real Greek exports. This can be attributed to the fact that *RoE* is the largest block relative to the other countries of our model. The Greek export elasticity with respect to the German real income is found to be 0.75. The respective elasticities for the case of the Italian and the Turkish real income are 0.72 and 0.65. For example, a 1% rise in the level of the Italian real income increases by 0.72% increase in Greek exports. Note that these four region-specific elasticities do not need to sum up to the aggregate foreign income elasticity of the Greek exports.

Table 3. The Long-Run Elasticities between Greek Exports and Foreign Regional Real Income

Dependent Variable: Greek real export goods ex_t	Model (1)		Model (2)	
	OLS	**FMOLS**	**OLS**	**FMOLS**
y_t	1.97**	1.72***		
	[2.01]	[3.55]		
$reer_t$	− 0.22	− 0.31	− 0.63***	− 0.62***
	[− 0.77]	[− 1.54]	[− 2.72]	[− 10.29]
α_0	− 29.32**	− 24.93***	− 42.31***	− 41.64***
	[− 2.00]	[− 3.42]	[− 3.13]	[− 14.19]
German real income$_t$			0.76*	0.75***
			[1.84]	[6.68]
Italian real income$_t$			0.73**	0.72***
			[2.31]	[3.67]
Turkish real income$_t$			0.66***	0.65***
			[19.06]	[17.14]
RoE real income$_t$			1.16	1.16***
			[1.44]	[5.62]
d_t	− 0.10	− 0.09**	− 0.21***	− 0.20***
	[− 1.45]	[− 2.44]	[− 4.91]	[− 15.35]
ex_{t-1}	0.86***	0.85***	0.67***	0.63***
	[15.49]	[24.85]	[13.32]	[45.09]
Observations:	108	108	108	108
R-squared:	0.91	0.90	0.92	0.92
Time Period	1990:I - 2016IV	1990:I - 2016IV	1990:I - 2016IV	1990:I - 2016IV

Notes: *t*-statistics given in brackets. (*, **, ***) indicate significant at the 10%, 5% and 1% level respectively. RoE refers to all European OECD countries except Germany, Italy and Turkey. This table refers to the estimation of models (1) and (2) using OLS and FMOLS. In the case of the FMOLS estimation the deterministic variables in the cointegrating equation are: a_0, d_t, ex_{t-1}.

The results of the FMOLS estimation in Table 3 indicate that most of the value added for Greek export goods the last twenty-five years can be attributed to economic conditions in these four regions. Also, price export elasticity of Greece (Table 3, Column 4) found negative (-0.62) and

statistically significant at a 1% level. This means that a real devaluation in the Greek economy can increase Greek exports by 0.62%.

Table 3 (Columns 1 & 3) presents also the OLS estimators of models (1) and (2) in order to enhance our analysis. The results confirm the FMOLS estimations of the aggregated and region disaggregated foreign income elasticities.

4.4 Dynamic Analysis

We employ a VAR(1) model to study the dynamic relationship between Greek exports and real income growth in the trading partners. The number of lags structure was decided based on the AIC and the likelihood ratio test. The coefficient matrix A_1 is a 6×6 matrix. Table 5 summarizes the effect of a positive 1% regional real income shock and exchange rate shock on Greek export goods growth. We take into account both the short-run (first four quarters) and the long-run (second four quarters) effect of the shock.

Table 4. Response of Greek Export Growth to a Positive 1% Shock on Foreign GDP Growth

A positive 1% shock to the growth rate of each variable	The Response of real Greek export growth			
	In the First 4 Quarters		In the Second 4 Quarters	
	GIRF	LPs of the GIRF	GIRF	LPs of the GIRF
German real income growth	1.12	1.12	-0.01	-0.82
Italian real income growth	1.85	3.77	0.01	-1.24
Turkish real income growth	-0.23	-0.08	-0.01	-0.25
Rest of Europe real income growth	0.59	2.14	-0.03	3.01
Real effective exchange rate growth	-1.40	4.45	0.00	-0.99

Notes: This table is based on the GIRFs and the LPs of the GIRFs as proposed by Jordà (2005, 2009). The GIRFs and the LPs of the GIRFs were standardized to obtain the 1% response of Greek exports.

The results from the total effect of the shock (Table 4, Column 1) indicate that the response of Greek export growth to a positive 1% shock on Greek trade partners growth is positive in all cases, except Turkey, for the first four quarters of the initial shock (see also figure 3). Greek export growth is more sensitive, in the short-run, to real income growth in Italy and Germany followed by growth in the rest of the Europe. A 1% increase in the growth rate of Italy yields a 1.85% increase in the Greek exports over the first four quarters. In the same way, the sensitivity of Greek export growth to a 1% increase in the growth of Germany, Turkey and the rest of

the Europe is 1.12%, -0.23% and 0.59% respectively. The negative growth rate of Greek exports in the case of a real income increase in Turkey means that Greek exports may still grow in volume terms, but at a slower pace than previous. Also, a 1% real appreciation of the Greek economy leads to a decreased growth rate for the Greek exports due to the fact that Greek export goods lose competitiveness in the global markets.

Table 4 (Column 2) summarizes the LPs results (see also Figure 4) and confirms the dynamic sensitivity of Greek exports to economic growth in Germany, Italy and the RoE in the short run. In general, the sign of the response of Greek export growth is similar in both approaches although, the impact of the shock is higher in the LPs case.

These results provide a framework to study the dynamic response of Greek exports relative to shocks in the trading partners' real income, although that we cannot obtain statistical significant inferences. Concerning the results for the long run (second four quarters; Table 4, Columns 3 & 4) effect of the shock the decreased growth rate of Greek exports is anticipated. This is due to the correction in the growth rate of the Greek trade partners after the initial increase.

5. Conclusion

The relationship between foreign income and exports growth is well established in the literature. This paper examines the relation between Greek exports and the real income in the major trading partners of

Greece. We offer a quantification of the static and dynamic relationship between Greek exports and real income in various regions of interest. The recent current account adjustment in Greece and the evolvement of the Greek trade partners as a share of the total Greek exports goods were examined.

Greek exports have shifted over the last seven years from the European markets to more distant oriented markets such as the USA and East Asia. Nevertheless, higher income in traditional markets such as Germany, Italy and Turkey is essential for the expansion of Greek exports. Also, the markets of the rest of the Europe are very important for the Greek exporting goods as the region has the greatest real income elasticity. These four regions account for the bulk of the relationship between Greek real exports and foreign real income.

Furthermore, implications from the dynamic analysis tend to confirm the importance of economic growth in these regions for the Greek exports. Moreover, the higher than unity (1.72) aggregate foreign real income elasticity of the Greek exports can signal that an outward-oriented policy can be beneficial in the economic recovery of the country.

References

Arora, V. and Vamvakidis, A. (2005): “How much do trading partners matter for economic growth?” IMF Staff Papers 52, 24-40.

Awokuse, T. O. (2008): “Trade openness and economic growth: is growth export-led or import-led?” Applied Economics 40, 161-173.

Awokuse, T. O. (2007): “Causality between exports, imports, and economic growth: Evidence from transition economies” Economics Letters 94, 389-395.

Balassa, B. (1978): “Exports and economic growth: further evidence” Journal of Development Economics 5, 181-189.

Böwer, U., Michou, V. and Ungerer, C. (2014): “The puzzle of the missing Greek exports” Directorate General Economic and Financial Affairs (DG ECFIN), European Commission.

Caporale, G. M. and Chui, M. K. (1999): “Estimating income and price elasticities of trade in a cointegration framework” Review of International Economics 7, 254-264.

Crane, L., Crowley, M. A. and Quayyum, S. (2007): “Understanding the evolution of trade deficits: Trade elasticities of industrialized countries” Economic Perspectives-Federal Reserve Bank of Chicago.

Emery, R. (1967): “The relation of exports and economic growth” Kyklos 20, 470-486.

Engle, R. F. and Granger, C. W. (1987): “Co-integration and error correction: representation, estimation, and testing” Econometrica 55, 251-276.

Feder, G. (1982): “On exports and economic growth” Journal of Development Economics 12, 59-73.

Goldstein, M. and Khan, M. S. (1985): “Income and price effects in foreign trade” Handbook of International Economics 2, 1041-1105.

Grossman, G. M. and Helpman, E. (1991): “Trade, knowledge spillovers, and growth” European Economic Review 35, 517-52.

Helpman, E. and Krugman, P. R. (1985): “Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy” MIT press.

Hooper, P.; Johnson, K. and Marquez, J. (2000): “Trade elasticities for the G7 countries” Princeton Studies in International Economics 87.

Jordà, Ò. (2005): “Estimation and inference of impulse responses by local projections” The American Economic Review 95, 161-182.

Jordà, Ò. (2009): “Simultaneous confidence regions for impulse responses” The Review of Economics and Statistics 91, 629-647.

MacKinnon, J. G. (1996): “Numerical distribution functions for unit root and cointegration tests” Journal of Applied Econometrics 11, 601-618.

Marquez, J. (1990): “Bilateral trade elasticities” The Review of Economics and Statistics 72, 70-77.

Marquez, J. and McNeilly, C. (1988): “Income and Price Elasticities for Exports of Developing Countries” The Review of Economics and Statistics 70, 306-314.

McNab, R. M. and Moore, R. E. (1998): “Trade policy, export expansion, human capital and growth” The Journal of International Trade & Economic Development 7, 237-256.

Nie, J. and Taylor, L. (2013): “Economic growth in foreign regions and US export growth” Economic Review Federal Reserve Bank of Kansas City 31.

Pesaran, H. and Shin, Y. (1998): “Generalized impulse response analysis in linear multivariate models” Economics Letters 58, 17-29.

Phillips, P. C. and Hansen, B. E. (1990): “Statistical inference in instrumental variables regression with I(1) processes” The Review of Economic Studies 57, 99-125.

Riedel, J. (1984): “Trade as the Engine of Growth in Developing Countries” Revisited, The Economic Journal 94, 56-73.

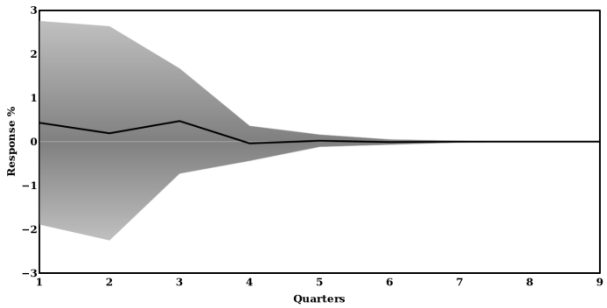
Senhadji, A. S. and Montenegro, C. E. (1999): “Time series analysis of export demand equations: a cross-country analysis” IMF Economic Review 46, 259-273.

Stern, R. M. (1976): “Price elasticities in international trade: An annotated bibliography” Springer.

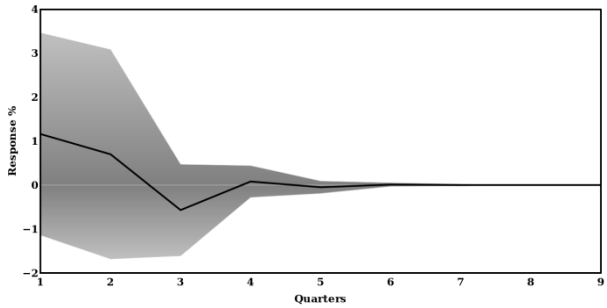
Thangavelu, S. M. and Rajaguru, G. (2004): “Is there an export or import-led productivity growth in rapidly developing Asian countries? A multivariate VAR analysis” Applied Economics 36, 1083-1093.

Appendix

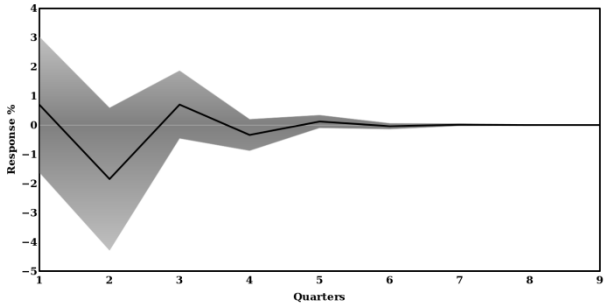
Figure 3. Generalized Response of Greek Export Growth to a one s.d. Shock on Foreign Real Income Growth



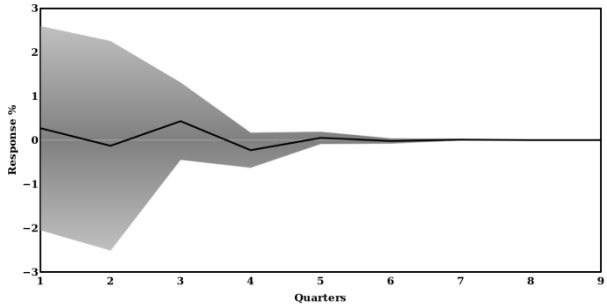
(a) Generalized response of Greek exports to a one s.d. shock on German real income growth.



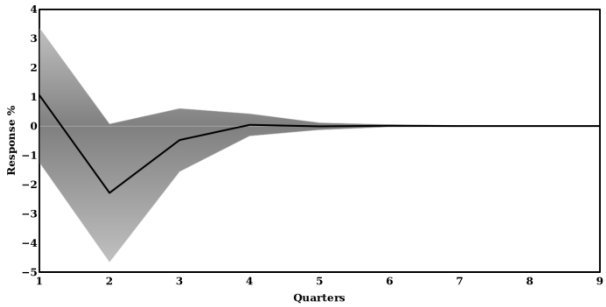
(b) Generalized response of Greek exports to a one s.d. shock on Italian real income growth.



(c) Generalized response of Greek exports to a one s.d. shock on Turkish real income growth.



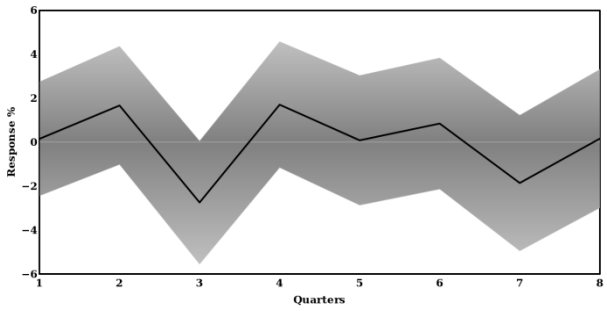
(d) Generalized response of Greek exports to a one s.d. shock on the RoE real income growth.



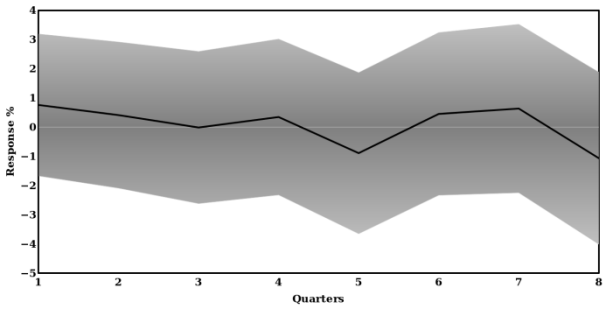
(e) Generalized response of Greek exports to a one s.d. shock on reer growth.

Note: Shaded areas represent the ±2 s.e. confidence bands.

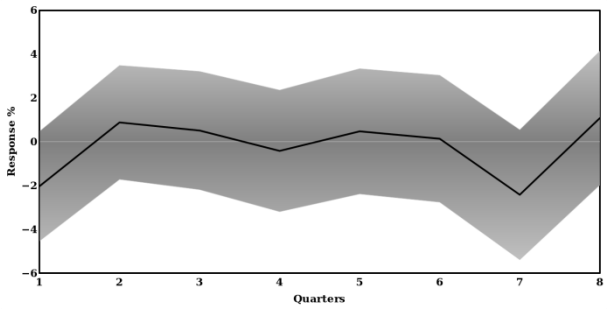
Figure 4. Local Projections of the Generalized Response of Greek Export Growth to a one s.d. Shock on Foreign Real Income Growth



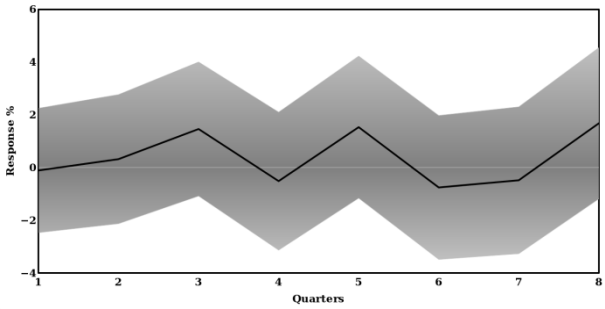
(a) LP of the generalized response of Greek exports to a one s.d. shock on German real income growth.



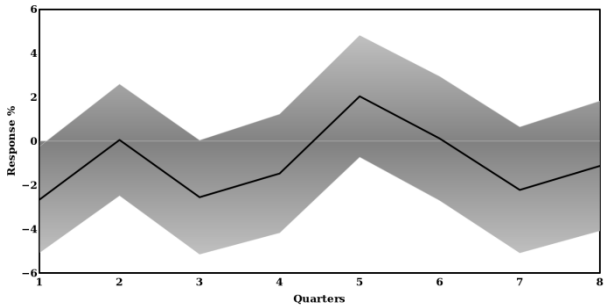
(b) LP of the generalized response of Greek exports to a one s.d. shock on Italian real income growth.



(c) LP of the generalized response of Greek exports to a one s.d. shock on Turkish real income growth.



(d) LP of the generalized response of Greek exports to a one s.d. shock on the RoE real income growth.



(e) LP of the generalized response of Greek exports to a one s.d. shock on reer growth.

Note: Shaded areas represent the 95% confidence bands.

Previous Papers in this Series

110. Magioglou, Thalia, Representations of Democracy for Young Adults in Greece before and during the Crisis: cultural dualism revisited through an over-time qualitative study**, June 2017**

109. Kammas, Pantelis and Sarantides, Vassilis, Democratisation and tax structure: Greece versus Europe from a historical perspective**, May 2017**

108. Tsekeris, Charalambos, Ntali, Evdokia, Koutrias,Apostolos and Chatzoulis, Athena, Boomerang Kids in Contemporary Greece: Young People's Experience of Coming Home Again, **March 2017**

107. Theologos Dergiades, Eleni Mavragani, Bing Pan**,** Arrivals of Tourists in Cyprus Mind the Web Search Intensity, **February 2017**

106. Kougias, Konstantinos**,** 'Real' Flexicurity Worlds in action: Evidence from Denmark and Greece**, January 2017**

105. Jordaan, Jacob A. and Monastiriotis, Vassilis**,** The domestic productivity effects of FDI in Greece: loca(lisa)tion matters!**, December 2016**

104. Monokroussos, Platon; Thomakos, Dimitrios D.; Alexopoulos, Thomas A.**,** The Determinants of Loan Loss Provisions: An Analysis of the Greek Banking System in Light of the Sovereign Debt Crisis**, November 2016**

103. Halikiopoulou, Daphne, Nanou Kyriaki, Vasilopoulou Sofia**,** Changing the policy agenda? The impact of the Golden Dawn on Greek party politics**, October 2016**

Online papers from the Hellenic Observatory

All GreeSE Papers are freely available for download at:
http://www.lse.ac.uk/europeanInstitute/research/hellenicObservatory/pubs/greese.aspx