EU Accession Effects on Export Performance: The Case of Greece

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Abstract

This paper estimates the effects on the Greek export performance that caused by the EU accession. A simultaneous equations model of export demand and export supply has been used in order to avoid the simultaneity problem. Comparative static analysis and the residuals approach have been implemented. The results indicate that the EU accession and the consequent abolition of the export subsidies had a negative effect on the country's export performance, instead of improving it. The main reason for this effect is that the export subsidies, during the time period that were valid, were just improved the exporters' revenues and not used for creating new comparative advantages for the Greek products.

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1. INTRODUCTION

Greece entered the EU as a full member in 1981. Being an associate member since 1962, the country had gradually reduced tariff protection, so that by 1981, imports of manufactures not produced domestically were totally liberalized, while tariffs on imports of products produced domestically had fallen by 60%. Yet, protection by other means (quotas, financial stringencies, import taxes, etc.) was very large and its abolition has harmed the country's trade balance from the import side considerably. As Koukouritakis (2005) shows, the abolition of the overall trade protection had negative effects on the country's domestic production. Especially in the case of manufactures, it was found that the cumulative reduction in the domestic sales of manufactures (i.e. domestic production minus total exports) for the first post accession decade amounts to about 10% of the total expenditure and to about 6% of GDP. EU imports substituted for the major part of the above reduction, while imports from the rest of the world (ROW) substituted for a smaller part.

On the other hand, Greece had to abolish the export subsidies. As Maroulis (1992) indicates, in some manufacturing sectors, such as shoes and garments, the export subsidies were up to 24% of the fob value of exports. Note also that since 1968, all barriers that were imposed by the six EC members on Greek imports were totally abolished. The present analysis shows that the gradual abolition of the export subsidies had a negative effect on the country's export performance. This implies that the provision of this export promotion measure did not lead to an improvement of quality and competitiveness of the Greek exports. This fact is obvious especially in the categories 6 and 8 of the Standard International Trade Classification – Revision 3 (SITC3), which include the leading sectors of the Greek exports, such as textiles, shoes and garments.

A number of studies have considered the implications of accession on the Greek export performance (see for example Tsoukalis 1979, Mitsos 1983, Giannitsis 1988, Plummer 1991, Georgakopoulos 1993 and Arghyrou 2000). These studies have however used either elasticity estimates coming out of single equation export supply models or ex-post indices (growth rates, income elasticities, shares in apparent consumption etc.). These approaches can provide only crude estimates of the accession effects.

The present study contributes in the following way: The estimation of the EU accession effects on the Greek export performance was carried out by using a simultaneous two-equation model and not single equation models. Then, comparative static analysis and the residuals approach have been implemented. The simultaneous estimation of the export

demand and supply functions allows me to avoid the simultaneity problem that may arise by the dual relationship between the volume of exports and the price of exports.

In the next section of the present paper, I present the institutional framework of the Greek export subsidies, as well as the course of export penetration of the Greek products during the last decades. Section 3 describes the theoretical specification of the model, while Section 4 presents the data used and analyses the estimation method and the results. In Section 5, I use comparative static analysis in order to estimate the short run and long run multipliers of the variables of the model, while in Section 6 I use the residuals approach in order to determine the effects that caused by the EU accession and the consequent abolition of the export subsidies on the country's export performance. Section 7 draws some concluding remarks.

2. EXPORT SUBSIDIES AND EXPORT PENETRATION

Greece subsidized exporters of manufactures using the following formula, which had been determined by the Greek government in 1970:

$$S = E\left(0.12 + \frac{A-30}{30}0.12\right), \quad A \le 60 \tag{1}$$

where S is the subsidy, E is the fob value of exports and A is the so-called "export value added". Export value added is calculated by deducting the cif value of imported inputs, half of the electricity and fuels expenditure of the exporting enterprise and the value of domestic inputs from the fob value of exports. From the above formula it is clear that the larger the "export value added" was, the larger were the subsidies.

In 1982, a constant export subsidy for shoes and garments was set up, which was 24% of the fob value of exports. Other measures with equivalent effect with export subsidies were the stamp-duty returns and the low interest rates on loans, in order to finance export activity. The abolition of all forms of export subsidies took place between 1987 and 1992. Table 1 presents the time schedule of the gradual abolition of the export subsidies.

As mentioned in the previous section, the export subsidies were not used for the improvement of the quality and competitiveness of the Greek exports. The above argument is indicated by the results of Tables 2 and 3, which present the Greek export penetration index for the overall products and for the industrial products, respectively. The export penetration index of a country i to a country (or group of countries) j is defined as the ratio of the country i's exports to the country (or group of countries) j, divided by the country (or group of countries) j's total imports.

As Table 2 indicates, the Greek export penetration to all destinations increased in the 1970s. This is mainly due to the fact that the export subsidies and the low interest rates in financing investments in the agricultural and industrial sector, led a large number of domestic and foreign enterprises to start their operation in the country. The first years after the EU accession the Greek export penetration to the EU increased, while the one to the rest of the OECD countries decreased. But, the gradual abolition of the export subsidies that began in 1986 led to a continuous decrease of the country's export penetration. This decrease is mainly focused on the exports to the EU markets.

Table 3 presents the Greek export penetration index for the industrial products. I mainly focus on categories 6 and 8 of SITC3, which include the leading sectors of the Greek exports, such as textiles, shoes and garments. Until the mid-1980s this index is almost constant for all destinations. It is also obvious that in the last years of the 1980s, where the abolition of export subsidies began, there is a continuous decrease of the specific index, especially for the exports to the EU markets. The export penetration index remains in low levels in the 1990s, which reflects the low competitiveness and the structural problems of the Greek economy.

The analysis in the present section indicates that there is a downward trend in the Greek export penetration after the mid-1980s, where the abolition of the export subsidies began[1]. During the long time period that these subsidies were valid, they did not manage to improve the competitiveness of the Greek products in international markets by developing product differentiation or new production specializations. Thus, the reduction of the country's export penetration to international markets after the abolition of the subsidies was inevitable.

3. THE MODEL

The model used in the present study assumes imperfect substitution and is based on previous works by Goldstein and Khan (1978, 1985) and Tansel and Togan (1987). Imperfect substitution means that the exported goods are not perfect substitutes with the domestic ones. The structure of the model, which is expressed in a log-linear form, is the following:

$$\ln X_t^D = \alpha_0 + \alpha_1 \ln\left(PX/PXW\right)_t + \alpha_2 \ln YW_t \tag{2}$$

$$\ln X^S = \beta_0 + \beta_1 \ln\left(PX/P\right)_t + \beta_2 \ln Y_t^* + \beta_3 \ln S_t + \beta_4 \ln S_{t-1} \tag{3}$$

In equation (2), X^D is the volume of Greek exports demanded, PX is the price of the Greek

[1] For a more detailed analysis of the institutional framework of the Greek export subsidies and the penetration of the country's exports to international markets, see also Koukouritakis (2002).

exports, *PXW* is the price of the world exports and *YW* refers to the real world output. In equation (3), *P* is the domestic price index, *Y** is a trend of the domestic productive capacity and *S* refers to the rate of export subsidies on the fob value of exports[2].

Note that the variable *S* has the form of the following polynomial:

$$S = (a + bL)S_t \tag{4}$$

since it enters the model with a lag (*L* is the lag operator). The reason that I use this assumption is that the preparation expenditures of the Greek exports were pre-financed with special low interest rates. These low interest rates were, of course, a measure of export promotion (Koukouritakis, 2002).

Since trade flows need some time to adjust to their long-run levels, the estimation of a static form of the model is problematic. Therefore, a dynamic form has been developed in order to introduce the disequilibrium behaviour into the model.

The adjustment mechanism utilized in the export market is partly based to the one followed by Goldstein and Khan (1978) and Browne (1982). Assume that the price of exports adjusts according to world demand for exports. The adjustment mechanism employed in this case is based on the polynomial distributed lag (PDL) scheme developed by Almon (1965). In this case it takes the following form:

$$\ln X_t^D - \ln X_t = \sum_{k=0}^{T} g_k \ln PX_{t-k} \tag{5}$$

Demand theory imposes the following homogeneity restriction:

$$\sum_{g=0}^{T} g_k = 0 \tag{6}$$

Almon assumes that g_k can be approximated by a suitable-degree polynomial in *k*, where *k* denotes the length of the lag. Generally, it is assumed that the degree of the polynomial (*m*) is less than *k* (the maximum length of the lag). In order to choose the appropriate lag length, the Akaike information criterion has been used. It is found that *k=2* and, consequently, *m=1*.

Therefore, equation (5) becomes:

$$\ln X_t^D - \ln X_t = g_0 \ln PX_t + g_1 \ln PX_{t-1} + g_2 \ln PX_{t-2} \tag{7}$$

and the polynomial has the following form:

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[2] Note that the export subsidies are a separate variable in this model and not embodied in export prices. The reason is that it is also examined if the effects on the export volume due to the subsidies' changes are similar with the ones that come out of the export price changes.

$$g_k = q_0 + q_1 k \tag{8}$$

For *k=0* equation (8) becomes: $g_0=q_0$.

For *k=1* equation (8) becomes: $g_1=q_0+q_1$.

For *k=2* equation (8) becomes: $g_2=q_0+2q_1=-2q_0-q_1$ due to the homogeneity restriction in equation (6).

By substituting equation (2) and the above expressions of equation (8) into equation (7) and solving for the price of exports, one can obtain:

$$\ln PX_t = c_0 + c_1 \ln X_t + c_2 \ln YW_t + c_3 \ln PXW_t + c_4 \ln PX_{t-1} + c_5 \ln PX_{t-2} \tag{9}$$

where $c_0 = -\frac{\alpha_0}{\alpha_1 - q_0},\ c_1 = \frac{1}{\alpha_1 - q_0},\ c_2 = -\frac{\alpha_2}{\alpha_1 - q_0},\ c_3 = \frac{\alpha_1}{\alpha_1 - q_0},\ c_4 = \frac{q_0 + q_1}{\alpha_1 - q_0}$ and $c_5 = -\frac{2q_0 + q_1}{\beta_1 - q_0}$.

According to economic theory it is expected that $\alpha_1 < 0$ and $\alpha_2 > 0$. Consequently, it is expected that $c_1 < 0,\ c_2 > 0,\ c_3 > 0$ and $c_4 > 0$. Due to the homogeneity restriction that requires $c_3 + c_4 + c_5 = 1$, the sign of the parameter c_5 depends on the size of the parameters c_3 and c_4.

If the price of exports adjusts to world demand, as specified in equation (5), then the volume of exports will adjust according to excess supply. Assume that the volume of exports (X) adjusts to the optimal supply (X^S) according to a partial adjustment process:

$$\Delta \ln X_t = \lambda \left(\ln X_t^S - \ln X_{t-1} \right), \quad 0 < \lambda < 1 \tag{10}$$

By substituting equation (3) into equation (10) and solving for the volume of exports, one can obtain:

$$\ln X_t = b_0 + b_1 \ln \left(\frac{PX}{P} \right)_t + b_2 \ln Y_t^* + b_3 \ln S_t + b_4 \ln S_{t-1} + b_5 \ln X_{t-1} \tag{11}$$

where $b_0 = \lambda\beta_0,\ b_1 = \lambda\beta_1,\ b_2 = \lambda\beta_2,\ b_3 = \lambda\beta_3,\ b_4 = \lambda\beta_4$ and $b_5 = 1 - \lambda$.

Since the coefficient of adjustment (λ) lies between zero and one, b_5 will also lie between zero and one. According to economic theory it is expected that $\beta_1 > 0,\ \beta_2 > 0,\ \beta_3 > 0$ and $\beta_4 > 0$. Consequently, it is expected that $b_1 > 0,\ b_2 > 0,\ b_3 > 0$ and $b_4 > 0$.

4. DATA AND EMPIRICAL RESULTS

Due to lack of quarterly data especially in the case of the Greek GDP and export subsidies, annual data were used. The time span is 1962 to 1997. I did not used data that cover the after-1997 period, since the change of the Greek monetary policy in order to start preparations for the Greek currency to join the Eurozone, had a considerable effect on the exchange rate of the drachma that was reflected on the country's trade flows. Thus, the inclusion of data that cover the after-1997 period in the present analysis may bias the results[3].

Data for the volume and unit value index of the Greek exports were obtained by the External Trade Statistics of the National Statistical Service of Greece. As domestic price index, I used the wholesale price index of goods produced and consumed domestically, which was obtained by the Statistical Yearbook of the National Statistical Service of Greece. For the export subsidies, I used primary and unpublished data that were obtained by the Central Bank of Greece. Price of world exports and real world output were obtained from the world tables of the CD-ROM of International Financial Statistics of the International Monetary Fund.

In order to construct the trend of the Greek productive capacity, the following formula has been used:

$$Y_t^* = Y_0 e^{gt} \tag{12}$$

where Y_0 is the initial value of the volume of domestic production and g is the average growth rate for the corresponding period. Constructing this index I used two separate average growth rates. The first covers the 1962-1979 period and the second covers the 1980-1997 period. The reason is that the country's growth performance has not been uniform during the overall sample period. Average growth rate between 1980 and 1997 has been considerably lower compared to the 1962-1979 average growth rate. A similar distinction between the two periods average growth rates in Greece is also performed by Alogoskoufis (1995)[4]. Data for the Greek GDP were obtained by the Statistical Yearbook of the National Statistical Service of Greece. All data are expressed in US dollars and the base year is 1982.

The equations (9) and (11) of the model are overidentified. Therefore, they were estimated simultaneously by using 3-stage least squares method. The predetermined variables

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[3] For the same reason, the calculation of the export penetration index in the previous section stops in 1997.

[4] An alternative approach to calculate Y_t^* is by fitting a Hodrick-Prescott filter (Hodrick and Prescott 1997) in the series of the volume of the domestic production. The results obtained by estimating the model using this alternative approach remain robust. These results are not presented in the paper but are available under request.

of the model are used as instruments. The estimates for the structural and the reduced-form parameters are presented in Tables 4 and 5, respectively.

As shown in Table 4, the signs of the structural parameters are consistent with economic theory and most of them are statistically significant. The Durbin-Watson statistic and the *h-statistic*, which is used in partial adjustment models, indicate no presence of serial correlation. The multiple coefficients of determination and the adjusted ones are also above 0.97.

The estimated coefficients have the expected signs in all cases. In the case of export demand, the export price is mainly determined by changes in the price of world exports and in the domestic price of exports in the previous period. In the case of export supply, the coefficient of relative prices is statistical insignificant. On the contrary, the productive capacity of the Greek economy, the export subsidies and, of course, the volume of exports in the previous period has an important role on the determination of the country's export supply. The coefficient of the export subsidies with one period lag is statistically insignificant at the 5 percent level of significance. According to Table 3, the signs of the reduced-form parameters are consistent with economic theory[5].

The estimated model has also been tested for dynamic stability by calculating its respective eigenvalues. They were calculated from the endogenous part of the structural model:

$$\ln PX_t + 0.1398 \ln X_t - 1.2077 \ln PX_{t-1} + 0.3755 \ln PX_{t-2} = 0 \qquad (13)$$

$$\ln X_t - 0.4635 \ln PX_t - 0.5723 \ln X_{t-1} = 0 \qquad (14)$$

The eigenvalues are 0.4356 and 0.6180±0.2852*i* and their moduli are 0.4356 and 0.6807, respectively. All the calculated moduli are less than unity and consequently, the estimated model is dynamically stable.

An important issue that comes into light is that the variables are not stationary in level but in first difference[6]. Based on the cointegration theory, this problem can be faced if the estimated residuals are integrated of order zero, i.e. *I(0)*. This means that the difference between dependent and independent variables is stationary and thus, the parameter estimates are not spurious. In order to test for cointegration, the estimated residuals of equations (9) and

[5] The matrix of the reduced-form parameters $(\mathbf{\Pi})$ is given by the following formula: $\mathbf{\Pi} = -\mathbf{B}^{-1}\mathbf{\Gamma}$, where $\mathbf{B}$ is the matrix of the parameters of the endogenous variables and $\mathbf{\Gamma}$ is the matrix of the parameters of the predetermined variables of the system.

[6] For the sake of brevity, the Augmented Dickey-Fuller test results for the variables of the model are not presented here, but are available under request.

(11) were tested for a unit root using the ADF test, following the Engle-Granger methodology (Engle and Granger, 1987). In order to select the appropriate lag length, the Akaike information criterion was used. As Enders (2004, pp. 336-337) points out, it is not possible to use the Dickey-Fuller tables in order to obtain critical values in this case. The reason is that the estimated residuals ($\hat{e}_{i,t}$) are generated from regression equations and we do not know the actual errors ($e_{i,t}$) but only the estimated ones ($\hat{e}_{i,t}$). MacKinnon (1991) developed the critical values for the Engle-Granger cointegration test using the response surface methodology. They are calculated by the following formula:

$$C(p) = \varphi_\infty + \varphi_1 T^{-1} + \varphi_2 T^{-2} \tag{15}$$

where $C(p)$ is the p percent critical value, T is the number of observations φ_∞ is the estimated asymptotic critical value and φ_1, φ_2 are coefficients in the response surface regression. In the present study $T = 36$ and consequently, the critical values for the export demand and supply functions (with 5 variables as regressors and a constant in the cointegrating vector) are $C(1) = -5.60$, $C(5) = -4.81$ and $C(10) = -4.43$. The *ADF statistic* for the export demand function is -4.88 and for the export supply function is -6.60. Therefore, the null hypothesis for the existence of a unit root is rejected. This means that the estimated residuals of equations (9) and (11) are stationary. In other words, the variables of the structural model are moving together in the long run.

Since the estimated structural model is dynamically stable and the parameter estimates are not spurious, one can use these estimates for estimating the long run export functions in order to determine the long run behaviour of the Greek exports. The long run equations have the following form:

$$\ln X_t^d = -14.62 - 1.20 \ln\left(PX/PXW\right)_t + 4.27 \ln YW_t, \quad q_0 = -0.41, \;\; q_1 = -0.53 \tag{16}$$

$$\ln X_t^s = 2.07 + 1.08 \ln\left(PX/P\right)_t + 0.09 \ln Y_t^* + 0.03 \ln S_t, \;\; \lambda_1 = 0.43 \tag{17}$$

The coefficient of the export subsidies in the long run export supply function results by setting L=1 in the term $S=(\alpha+bL)S_t$ and dividing with the adjustment coefficient. It is the sum of the structural coefficients of the export subsidies.

The Greek export demand is price elastic in the long run. As shown in equation (16), there is a large response on export demand due to changes in relative prices, a result that is consistent with previous studies (see for example, Arghyrou and Bazina (2003)). It is an expected result for Greece, since the country is a small open economy with no market power

in world trade and its production remains concentrated in low technology and high competition sectors. Thus, it is inevitable for the Greek export demand to be quite sensitive in relative price changes, since the emergence of lower cost close substitutes leads to substantial market share losses.

The results for the country's export demand also indicate a high income elasticity, which implies that Greek products abroad are treated as "luxury" goods. These results are consistent with those obtained by Arghyrou and Bazina (2003), which indicate that due to this high income elasticity Greek exports are vulnerable to downwards cyclical fluctuations abroad. Yet it is well known that Greek exports are mainly concentrated on agricultural and labour-intensive products, such as textiles, which cannot be considered as "luxury" items. The explanation is that Greek exports are treated as "luxury" goods only compared with similar exports (textile exports from the South-eastern Asia and the transition economies or agricultural exports from the Mediterranean countries) to the world markets.

On the other hand, the Greek export supply is price elastic in the long run. As shown in equation (17), the volume of exports supplied is mainly affected in a positive way by changes in the ratio of domestic export prices over world export prices and the productive capacity of the Greek economy. There is also a small positive response on Greek export supply due to changes in export subsidies. The coefficient of adjustment indicates that 43% of the change of export volume towards its equilibrium level is taking place in one year. The mean adjustment period of Greek export supply to a relative price change is quite long and equals $(\lambda)^{-1}$=2.3 years, which, of course, reflects the structural problems of the Greek economy.

5. COMPARATIVE STATIC ANALYSIS

In this section I use comparative static analysis in order to estimate the effects of the EU accession on the volume of the Greek exports, on their prices and on the exporters' revenues (R). Following Moran (1988), the use of the reduced-form parameters of Table 5 allows me to estimate the short run and long run effects on X, PX and R that come up by a unit change of the exogenous variables of the model (S, Y*, PXW and YW). The reduced-form equations have the following form:

$$\ln PX_t = \pi_{13} \ln S_t + \pi_{16} L \ln S_t + \pi_{17} L \ln X_t + \pi_{18} L \ln PX_t + \pi_{19} L^2 \ln PX_t + \pi_1 Z_{1t} \quad (18)$$

$$\ln X_t = \pi_{23} \ln S_t + \pi_{26} L \ln S_t + \pi_{27} L \ln X_t + \pi_{28} L \ln PX_t + \pi_{29} L^2 \ln PX_t + \pi_2 Z_{1t} \quad (19)$$

where L is lag operator and Z_t=(1, $\ln P_t$, $\ln Y_t^*$, PXW_t, YW_t). Equivalently:

$$\left(1-\pi_{18}L-\pi_{19}L^2\right)\ln PX_t=\left(\pi_{13}+\pi_{16}L\right)S_t+\pi_{17}L\ln X_t+\pi_1 Z_t \tag{20}$$

$$\left(1-\pi_{27}L\right)\ln X_t=\left(\pi_{23}+\pi_{26}L\right)S_t+\left(\pi_{28}L+\pi_{29}L^2\right)\ln PX_t+\pi_2 Z_t \tag{21}$$

5.1 Supply Side

In the supply side I examine the effects on X, PX and R by a unit change in the exports subsidies and the productive capacity of the Greek economy. For the export subsidies, I differentiate equations (20) and (21) with respect to S and having constant the vector of the exogenous variables (i.e. $dZ_t=0$), I have the following system of equations:

$$\left(1-\pi_{18}L-\pi_{19}L^2\right)\frac{d\ln PX_t}{d\ln S_t}=\left(\pi_{13}+\pi_{16}L\right)+\pi_{17}L\frac{d\ln X_t}{d\ln S_t} \tag{22}$$

$$\left(1-\pi_{27}L\right)\frac{d\ln X_t}{d\ln S_t}=\left(\pi_{23}+\pi_{26}L\right)+\left(\pi_{28}L+\pi_{29}L^2\right)\frac{d\ln PX_t}{d\ln S_t} \tag{23}$$

The following short run multipliers arise by setting L=0:

$$m_{PX,S}^{S.R.}=\left[\frac{d\ln PX_t}{d\ln S_t}\right]^{S.R.}=\pi_{13} \tag{24}$$

$$m_{X,S}^{S.R.}=\left[\frac{d\ln X_t}{d\ln S_t}\right]^{S.R.}=\pi_{23} \tag{25}$$

The following long run multipliers arise by setting L=1:

$$\left(1-\pi_{18}-\pi_{19}\right)m_{PX,S}^{L.R.}=\left(\pi_{13}+\pi_{16}\right)+\pi_{17}m_{X,S}^{L.R.} \tag{26}$$

$$\left(1-\pi_{27}\right)m_{X,S}^{L.R.}=\left(\pi_{23}+\pi_{26}\right)+\left(\pi_{28}+\pi_{29}\right)m_{PX,S}^{L.R.} \tag{27}$$

Solving equations (26) and (27), I have:

$$m_{PX,S}^{L.R.}=\left[\frac{d\ln X_t}{d\ln S_t}\right]^{L.R.}=\frac{\left(\pi_{13}+\pi_{16}\right)\left(1-\pi_{27}\right)+\pi_{17}\left(\pi_{23}+\pi_{26}\right)}{\left(1-\pi_{18}-\pi_{19}\right)\left(1-\pi_{27}\right)+\pi_{17}\left(-\pi_{28}-\pi_{29}\right)} \tag{28}$$

$$m_{X,S}^{L.R.}=\left[\frac{d\ln PX_t}{d\ln S_t}\right]^{L.R.}=\frac{\left(1-\pi_{18}-\pi_{19}\right)\left(\pi_{23}+\pi_{26}\right)+\left(\pi_{13}+\pi_{16}\right)\left(\pi_{28}+\pi_{29}\right)}{\left(1-\pi_{18}-\pi_{19}\right)\left(1-\pi_{27}\right)+\pi_{17}\left(-\pi_{28}-\pi_{29}\right)} \tag{29}$$

Finally, the short run and long run effects on the exporters' revenues by a unit change of the export subsidies are determined by the following formula:

$$R=X*PX\Rightarrow\ln R=\ln X+\ln PX \tag{30}$$

Thus:
$$m_{R,S}=\frac{d\ln R_t}{d\ln S_t}=\frac{d\ln X_t+d\ln PX_t}{d\ln S_t}=m_{X,S}+m_{PX,S} \tag{31}$$

The short run and long run effects on X, PX and R by a unit change of the productive capacity

of the Greek economy are estimated with similar way, by differentiating equations (20) and (21) with respect to Y* and having $dZ_t=0$[7]. The results are presented in Table 6.

As shown in Table 6, the short run effect on the volume of exports by a unit change of the export subsidies is quite high, while the long run effect is smaller. On the contrary, the effect by a unit change of the productive capacity of the Greek economy is higher in the long run than in the short run. The impact on export prices is very small, except the long run effect that caused by a unit change of the productive capacity of the Greek economy. This last result reflects the interdependence between the structure of the country's economy and the competitiveness of the exported goods. Finally, the results indicate important and positive short run effect on the exporters' revenues, especially by a unit change of the export subsidies, while the long run effect is close to zero.

5.2 Demand Side

Following the same methodology as in the Section 5.1, I estimated the short run and long run multipliers that refer to the effects on X, PX and R by a unit change of the price of world exports. The multipliers for the world income have not been estimated, since the structural parameter of the world income is statistical insignificant at the 5 percent level of significance (Table 4). The results are presented in Table 7.

As Table 7 indicates, there are strong short run and long run impacts on X, PX and R that caused by a unit change of the world price of exports. These results are expected for Greece, since the country is a small open economy with no market power in world trade, which implies that the country is a price-taker in international markets. Additionally, its production remains concentrated in low technology and high competition sectors. Thus, it is inevitable for the Greek export volume to be quite sensitive in relative price changes, since the emergence of lower cost close substitutes leads to substantial world market share losses. Note that since Greece uses imported inputs for its production, a change of world export prices will affect the domestic export prices. This is also reflected on the short run and long run impacts on the exporters' revenues.

[7] In that case the vector of the exogenous variables dZ_t is different, since it includes the variable $\ln S_t$ and does not include the variable $\ln Y_t^*$.

6. THE EU ACCESSION EFFECTS

In order to estimate the effects on the Greek export performance that caused by the EU accession and the consequent abolition of the export subsidies, the residuals approach has been used. In general, the residuals approach, which can be implemented only ex-post, estimates the effects of an economic union as the residual between an actual and an estimated variable. The estimated variable represents the "anti-monde" (i.e. what would have happened to the corresponding variable if the country had not entered the economic union). The main assumption in the present analysis is that if Greece had not entered the EU, the export subsidies would have remained at their 1986 level. Consequently, in the present study the "anti-monde" begins in 1987.

In this paper, the actual export volume and the actual export prices are the actual variables. The export volume and the export prices under the above assumption are the estimated variables. Therefore, the residual between the two variables (i.e. the actual and the estimated one) represents the effects of the accession. Using the reduced-form equations (18) and (19) I estimate the short run and long run effects of the EU accession on the Greek export volume and the export prices. Since the abolition of the export subsidies began in 1987, the estimated variables in 1986 are the same as the actual ones.

Tables 8 and 9 present the long run annual and cumulative effects of the EU accession on the export volume and the export prices respectively[8,9]. The results indicate that the effects of the EU accession were quite small for both variables[10]. To a large extent, these findings for Greece are consistent with those obtained by previous studies (see for example Giannitsis 1988, Plummer 1991, Georgakopoulos 1993 and Arghyrou 2000). They all point out that the EU accession did not improve the country's export performance, but had a small negative effect instead. This effect was mainly due to the low competitiveness of Greek exports in international markets and additionally due to the abolition of the export subsidies.

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[8] For the sake of brevity, the short run annual and cumulative effects of the EU accession are not presented here but are available under request.

[9] Since the reduced-form equations (18) and (19) are expressed in log-linear form, the implementation of the residuals approach gave results in logarithmic form. The EU accession effects that presented in Tables 8 and 9 come up by using the exponential function on the results of the residuals approach.

[10] Given the global relaxation in all trade barriers that has occurred since early 1990s, the hypothesis that "if Greece had not entered the EU, the export subsidies would have remained at their 1986 level" is unrealistic for the post-1992 period and will lead to an overestimation of the EU accession effects. Therefore, the EU accession effects on the Greek export volume and export prices for the 1993-1997 period were not estimated.

7. CONCLUDING REMARKS

The purpose of this paper is to analyze the Greek export functions and to estimate the effects on the country's export performance that caused by the EU accession. As a small open economy with production concentrated in low technology and high competition sectors, the country faces a price elastic export demand in the long run. Export supply is also price elastic and is mainly determined by changes in the productive capacity of the Greek economy and the export subsidies.

The EU accession did not lead to an improvement of the country's export performance. Instead, it had a small negative effect on the Greek exports. This argument is indicated by the country's export penetration index and verified from both the comparative static analysis and the residuals approach. The latter estimates the above negative effect to 2.32% of the total Greek export volume and to 0.30% of the Greek GDP.

The main reason for the deterioration of the Greek export performance after the EU accession is that the export subsidies, during the time period that were valid, were not used for developing product differentiation or new production specializations. These would help the country to create new comparative advantages for its products and to gain market power in international trade. Instead, the export subsidies were just used for increasing the exporters' revenues. The above developments may explain the troubles that the Greek economy faced, especially after the mid-1980s, despite the large amount of net resources that the country received from the European budget.

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Table 1
Reduction percentages of the export subsidies that were valid since 31/12/1986

Date	Exports to the EU countries	Exports to the ROW countries
1/1/1987	55%	40%
1/1/1988	15%	12%
1/1/1989	15%	12%
1/1/1990	15%	12%
1/1/1991	-	12%
1/1/1992	-	12%

Source: Koukouritakis (2002).

Table 2
Greek export penetration index: Total products

Year	Total exports excluding fuels			Total exports		
	Intra EU	Total EU	Rest OECD	Intra EU	Total EU	Rest OECD
1970	0.61	0.32	0.17	0.58	0.28	0.15
1975	0.74	0.41	0.25	0.79	0.38	0.19
1980	0.66	0.39	0.25	0.72	0.36	0.17
1981	0.68	0.40	0.22	0.63	0.32	0.21
1982	0.73	0.44	0.18	0.69	0.36	0.17
1983	0.80	0.47	0.06	0.73	0.38	0.06
1984	0.86	0.50	0.08	0.82	0.42	0.08
1985	0.71	0.43	0.08	0.71	0.38	0.08
1986	0.82	0.50	0.09	0.81	0.46	0.09
1987	0.79	0.48	0.10	0.79	0.46	0.10
1988	0.56	0.34	0.07	0.55	0.32	0.07
1989	0.75	0.45	0.09	0.75	0.43	0.08
1990	0.63	0.38	0.09	0.63	0.37	0.09
1991	0.67	0.40	0.08	0.66	0.38	0.08
1992	0.78	0.47	0.07	0.77	0.44	0.07
1993	0.61	0.38	0.07	0.60	0.35	0.07
1994	0.54	0.34	0.06	0.54	0.33	0.06
1995	0.57	0.36	0.06	0.56	0.35	0.05
1996	0.48	0.31	0.07	0.48	0.29	0.06
1997	0.42	0.26	0.10	0.42	0.25	0.09

Source: OECD – Foreign Trade by Commodities (Series C), Various Issues.

Table 3
Greek export penetration index: Industrial products

	Chemical products (Category 5 of SITC3)			Industrial products classified by raw material (Category 6 of SITC3)			Machinery and other transportation material (Category 7 of SITC3)			Miscellaneous industrial products (Category 8 of SITC3)		
Year	Intra EU	Total EU	Rest OECD	Intra EU	Total EU	Rest OECD	Intra EU	Total EU	Rest OECD	Intra EU	Total EU	Rest OECD
1970	0.42	0.27	0.02	0.75	0.42	0.12	0.03	0.02	0.06	0.18	0.10	0.26
1975	0.38	0.27	0.09	0.89	0.53	0.26	0.06	0.04	0.10	0.92	0.54	0.84
1980	0.22	0.16	0.11	0.99	0.57	0.17	0.04	0.03	0.02	1.10	1.01	1.04
1981	0.11	0.08	0.07	1.04	0.63	0.23	0.05	0.03	0.02	1.27	1.16	0.76
1982	0.18	0.13	0.04	1.01	0.60	0.18	0.06	0.04	0.03	1.44	1.32	0.57
1983	0.22	0.16	0.03	1.01	0.63	0.08	0.05	0.03	0.00	1.53	0.86	0.08
1984	0.17	0.12	0.04	1.11	0.69	0.18	0.06	0.04	0.00	1.75	0.96	0.11
1985	0.12	0.09	0.04	0.96	0.61	0.18	0.05	0.03	0.00	1.54	0.87	0.14
1986	0.12	0.08	0.03	1.02	0.65	0.17	0.06	0.04	0.00	1.83	1.05	0.18
1987	0.10	0.08	0.05	1.01	0.65	0.18	0.06	0.03	0.00	1.87	1.04	0.20
1988	0.08	0.06	0.03	0.74	0.47	0.13	0.04	0.03	0.00	1.41	0.76	0.16
1989	0.14	0.10	0.04	0.90	0.56	0.13	0.06	0.04	0.00	1.51	0.81	0.22
1990	0.12	0.09	0.05	0.75	0.48	0.11	0.06	0.04	0.01	1.37	0.74	0.20
1991	0.13	0.09	0.05	0.83	0.52	0.10	0.06	0.04	0.01	1.44	0.75	0.17
1992	0.15	0.11	0.05	0.88	0.56	0.09	0.08	0.05	0.01	1.84	0.95	0.08
1993	0.14	0.11	0.06	0.61	0.43	0.12	0.08	0.05	0.01	1.68	0.85	0.08
1994	0.12	0.09	0.04	0.58	0.41	0.10	0.07	0.04	0.01	1.39	0.71	0.06
1995	0.15	0.11	0.04	0.60	0.41	0.10	0.10	0.06	0.01	1.37	0.71	0.07
1996	0.12	0.09	0.05	0.48	0.34	0.12	0.07	0.04	0.01	1.22	0.62	0.07
1997	0.11	0.08	0.07	0.45	0.31	0.13	0.07	0.05	0.01	1.10	0.54	0.19

Source: OECD – Foreign Trade by Commodities (Series C), Various Issues.

Table 4
Structural parameters

Explanatory variables	Export demand $lnPX_t$	Export supply lnX_t
lnX_t	-0.1398 (-0.68)	
$lnPXW_t$	0.1678 (3.09)**	
$lnYW_t$	0.5976 (1.15)	
$lnPX_{t-1}$	1.2077 (8.19)**	
$lnPX_{t-2}$	-0.3755 (-0.95)	
$ln(PX/P)_t$		0.4635 (0.56)
lnY_t^*		0.0402 (2.36)*
lnS_t		0.1090 (2.23)*
lnS_{t-1}		-0.0956 (-1.73)
lnX_{t-1}		0.5723 (4.01)**
Intercept	-2.0445 (-1.40)	0.8834 (1.77)
R^2	0.997	0.981
Adjusted R^2	0.997	0.978
Σ	0.06	0.12
Durbin-Watson	1.73	2.27
h-statistic (Durbin)	-	-1.42

t-statistics are shown in parentheses. ** denotes statistical significance at a 0.01 level. * denotes statistical significance at a 0.05 level.

Table 5
Reduced-form parameters

Exogenous variables	Endogenous variables	
	Export demand $lnPX_t$	Export supply lnX_t
$lnPXW_t$	0.1576	0.0730
$lnYW_t$	0.5612	0.2601
$lnPX_{t-1}$	1.1342	0.5257
$lnPX_{t-2}$	-0.3526	-0.1634
lnP_t	0.0608	-0.4353
lnY_t^*	-0.0053	0.0377
lnS_t	-0.0143	0.1024
lnS_{t-1}	0.0125	-0.0898
lnX_{t-1}	-0.0751	0.5375
1	-2.0361	-0.0603

Table 6
Effects by unit changes of S and Y*

	Export volume		Export prices		Exporters' revenues	
	Short run $\left(m_{X,i}^{S.R.}\right)$[a]	Long run $\left(m_{X,i}^{L.R.}\right)$	Short run $\left(m_{PX,i}^{S.R.}\right)$	Long run $\left(m_{PX,i}^{L.R.}\right)$	Short run $\left(m_{R,i}^{S.R.}\right)$	Long run $\left(m_{R,i}^{L.R.}\right)$
dS[b]	0.1024	0.0164	-0.0143	-0.0133	0.0881	0.0031
dY^{*}[c]	0.0377	0.0491	-0.0053	-0.0406	0.0324	0.0085

[a] i refers to the respective variable, whose effects are examined. [b] dS refers to a unit change of S. [c] dY^{*} refers to a unit change of Y^{*}.

Table 7
Effects by unit changes of PXW

	Export volume		Export prices		Exporters' revenues	
	Short run $\left(m_{X,i}^{S.R.}\right)$[a]	Long run $\left(m_{X,i}^{L.R.}\right)$	Short run $\left(m_{PX,i}^{S.R.}\right)$	Long run $\left(m_{PX,i}^{L.R.}\right)$	Short run $\left(m_{R,i}^{S.R.}\right)$	Long run $\left(m_{R,i}^{L.R.}\right)$
dPXW[b]	0.0730	0.5694	0.1576	0.5211	0.2306	1.095

[a] i refers to the respective variable, whose effects are examined. [b] dPXW refers to a unit change of PXW.

Table 8
Long run effects on the Greek export volume, due to the EU accession (in 1982 prices)

As percentages of the total Greek export volume						
	Annual effects			Cumulative effects		
Year	Actual variable X	Estimated variable $\hat{X}$	Residual $X - \hat{X}$	Actual variable X	Estimated variable $\hat{X}$	Residual $X - \hat{X}$
1986	100	100.00	0.00	100	100.00	0.00
1987	100	101.12	-1.12	100	101.12	-1.12
1988	100	100.36	-0.36	100	101.48	-1.48
1989	100	100.32	-0.32	100	101.80	-1.80
1990	100	100.32	-0.32	100	102.12	-2.12
1991	100	100.10	-0.10	100	102.22	-2.22
1992	100	100.10	-0.10	100	102.32	-2.32
As percentages of the Greek GDP						
	Annual effects			Cumulative effects		
Year	Actual variable X	Estimated variable $\hat{X}$	Residual $X - \hat{X}$	Actual variable X	Estimated variable $\hat{X}$	Residual $X - \hat{X}$
1986	18.09	18.09	0.00	18.09	18.09	0.00
1987	20.45	20.59	-0.14	20.45	20.59	-0.14
1988	13.73	13.78	-0.05	13.73	13.92	-0.19
1989	18.92	18.96	-0.04	18.92	19.15	-0.23
1990	17.92	17.96	-0.04	17.92	18.19	-0.27
1991	20.52	20.54	-0.02	20.52	20.81	-0.29
1992	22.69	22.70	-0.01	22.69	22.99	-0.30

Table 9
Long run effects on the Greek export prices, due to the EU accession (1982=100)

Year	Annual effects (1)	Cumulative effects (2)	Actual export price index PX (3)	Predicted export price index $P\hat{X}$ (4)=(3)-(2)
1986	0.00	0.00	170.50	170.50
1987	1.09	1.09	182.30	181.21
1988	0.35	1.44	220.70	219.26
1989	0.32	1.76	254.00	252.24
1990	0.31	2.07	276.10	274.03
1991	0.10	2.17	300.50	298.33
1992	0.10	2.27	323.60	321.33