ASECU South Eastern Europe Journal of Economics 2 (2004) 61-79 SEEJE

EU ACCESSION EFFECTS ON TRADE FLOWS: THE CASE OF GREECE

MINOAS KOUKOURITAKIS
Department of Economics, The School of Social Sciences, University of Crete, Greece

Abstract
This paper estimates the effects on the Greek trade balance that were caused by the EU accession. A full trade model was used, since the country relies on imported inputs for export production. The residuals approach was implemented. The gradual liberalization of Greek trade through the abolition of tariffs, quotas, financial stringencies and export subsidies, and the harmonization of the indirect tax system, which took place over the 1981-1992 period, led to a substantial increase in the country's trade deficit. This impact was mainly caused by the large increase in imports, as the effect of accession on exports was quite small.

JEL Classification: C30, F13, F15

Keywords: EU Accession, Trade liberalization, Residuals approach, Anti-monde, Trade balance

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%. This fact led many researchers to argue that Greece's accession to the EU would not have substantial implications on Greek imports (Filactos 1979, Mitsos and Papageorgiou 1979). 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.

Corresponding address: University Campus, 74100 Rethymno, Greece.
e-mail: minoas@econ.soc.uoc.gr

I would like to thank Professors Theodore Georgakopoulos, Michael Michael, and two anonymous referees for their constructive suggestions and helpful comments. All the remaining errors are my own.

On the other hand, Greece had to abolish export subsidies. As Maroulis (1992) indicates, in some manufacturing sectors, such as shoes and garments, 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.

A number of studies have considered the implications of accession on Greek trade, using the analytical or the residuals approach (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 import demand and export supply models or ex-post indices (growth rates, income elasticities, shares in apparent consumption etc.). The former approach treats imports and exports as being independent of each other. For developing countries that face foreign exchange constraints, such as Greece at that period of time, and rely on imported inputs for export production, these single equation trade models are not appropriate. The latter approach 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 Greek trade flows was carried out by using a dynamic full trade model and not single equation models. The single models are not appropriate for countries like Greece, where exports depend heavily on imported materials. This means that imports and exports cannot be independent of each other. In order to estimate the accession effects, the residuals approach has been implemented.

In brief, it appears that if Greece had not entered the EU, the country's trade deficit in 1993 would have been about 65% lower than the actual figure. The cumulative impact of the EU accession amounts to 23% in terms of the Greek GDP in constant prices. This estimation includes both income and substitution effects of the accession. Thus, I can argue that the results yielded by the residuals approach are much closer to the real effects on Greek trade due to EU membership.

The rest of the paper is as follows. Section 2 describes in brief all the trade measures that Greece had implemented in order to protect domestic production and to promote exports. Section 3 outlines the model used in this paper. Section 4 describes the data and analyzes the empirical results, while Section 5 presents the effects on Greek trade flows of EU accession. Section 6 draws some concluding remarks.

2. Trade protection and promotion measures in Greece

Greece had implemented a wide variety of trade measures in order to protect domestic production and to promote exports. Of course, the country had to abolish these

measures after EU accession. In this section I will describe these measures in brief. In the case of imports, the trade barriers that Greece had implemented were the following:

(a) Tariffs. Tariff protection was gradually abolished over the 1981-1986 period, following the schedule that had been determined by the Association Agreement.
(b) Quotas. Greece had implemented quotas for most industrial imports. This measure was gradually abolished over the 1981-1984 period.
(c) Money downpayments. This measure forced importers to deposit without interest in the Central Bank of Greece a percentage of the import value. It was a disincentive for industrial imports. This measure was gradually abolished over the 1981-1984 period.
(d) Restrictions on deferred payments. This measure forced importers to pay import values in cash. It was also gradually abolished over the 1981-1984 period.
(e) Import taxes. Protection was provided via both fictitious increases in the taxable base of imports and nominal rate differentiations. In 1984, this protection was embodied in a special levy, called the regulatory levy, which was gradually phased out between 1984 and 1989.

In the case of exports, Greece subsidized exporters of manufactured goods. These subsidies were estimated by the following formula, which had been determined by the Greek state in 1970:

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

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 expenditure of the exporting enterprise for electricity and fuels 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 to 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.

3. The model

The model used in the present study assumes imperfect substitution and is based on previous works by Goldstein and Khan (1985), Tansel and Togan (1987) and Khan and Knight (1988). Imperfect substitution means that neither imported nor exported goods are perfect substitutes for domestic ones. The structure of the model, which is expressed in a log-linear form, is the following:

$$\ln X_t^S = \alpha_0 + \alpha_1 \ln\left(\frac{PX}{P}\right)_t + \alpha_2 \ln Y_t^* + \alpha_3 \ln S_t + \alpha_4 \ln M_t \tag{1}$$

$$\ln X_t^D = \beta_0 + \beta_1 \ln\left(\frac{PX}{PXW}\right)_t + \beta_2 \ln YW_t \tag{2}$$

$$\ln M_t^D = \gamma_0 + \gamma_1 \ln\left[\frac{PM\left(1+T\right)}{P}\right]_t + \gamma_2 \ln Y_t + \gamma_3 \ln\left(\frac{R}{PM}\right)_t + \gamma_4 L_{1,t} + \gamma_5 L_{2,t} \tag{3}$$

$$TB_t = \left(PX \cdot X\right)_t - \left(PM \cdot M\right)_t \tag{4}$$

$$B_t = \Delta R_t = TB_t + DK_t \tag{5}$$

Equation (1) stands for the export supply function, where X^S is the volume of Greek exports supplied. Greek export supply is a function of (PX/P), where PX is the price of Greek exports and P is the Greek wholesale price index, and of Y^* that is a trend of the Greek productive capacity. I include in this equation the export subsidies (S), since it represented the main measure for Greek export promotion[1]. In equation (1) the volume of imported inputs also determines export supply. To make the model empirically more tractable, it is assumed - due to data limitations - that the price elasticity of the demand for imported inputs is the same as that for total import volume (M). This is a quite plausible assumption, as the share of intermediate and capital goods in total imports has remained quite stable in the period covered, averaging about 75%.

Equation (2) stands for the export demand function, where X^D is the volume of Greek exports demanded. It is a function of (PX/PXW), where PXW is the price of world exports, and of YW, that refers to the real world output.

---

1. Note that the export subsidies are a separate variable in this model and not embodied in export prices. The reason is that we also examine whether the effects on export volume due to subsidy changes are similar to those resulting from export price changes.

Equation (3) stands for the import demand function. M^D is the volume of Greek imports. Greek import demand is a function of (*PM/P*), where *PM* is the price of imports and *P* is the Greek wholesale price index. As shown in equation (3), the price of imports has been adjusted with tariff rate (*T*), in order to capture the distortion from tariff protection. *Y* refers to the real Greek GDP and R is the nominal value of official reserves. The variable (*R/PM*) stands for the stock of real international reserves and is a measure of reserve stringency. Equation (3) also includes two index variables. L_1 represents the gradual abolition of quotas and financial stringencies that had equivalent effects with tariffs, such as money downpayments and restrictions on deferred payments. These trade barriers were totally phased out by 1984. L_2 represents the gradual abolition of the regulatory levy. These two index variables represent the additional protection that Greece provided to domestic production through the complicated institutional framework that is presented in Section 2. It is also assumed that world supply of imports is infinitely elastic, so that an equation does not need to be specified.[2]

The model concludes with two identities. Equation (4) is the trade balance, while equation (5) stands for the balance of payments, which is equal to the change in international reserves. *DK* includes all financial inflows.

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 behavior into the model.

The adjustment mechanism utilized in the export market is similar to the one followed by Goldstein and Khan (1978) and Khan and Knight (1988). Assume that the volume of exports (*X*) adjusts to the optimal supply (X^S) according to a partial adjustment process:

$$\Delta \ln X_t = \lambda_1 \left(\ln X_t^S - \ln X_{t-1} \right), \quad 0 < \lambda_1 < 1 \tag{6}$$

By substituting equation (1) into equation (6) and solving for the volume of exports, one can obtain:

$$\ln X_t = b_0 + b_1 \ln \left(\frac{PX}{P} \right)_t + b_2 \ln Y_t^* + b_3 \ln S_t + b_4 \ln M_t + b_5 \ln X_{t-1} \tag{7}$$

where $b_0 = \lambda_1 \alpha_0$, $b_1 = \lambda_1 \alpha_1$, $b_2 = \lambda_1 \alpha_2$, $b_3 = \lambda_1 \alpha_3$, $b_4 = \lambda_1 \alpha_4$ and $b_5 = 1 - \lambda_1$

2. See also Khan and Knight (1988).

Since the coefficient of adjustment (λ_1) lies between zero and one, b_5 will also lie between zero and one. According to economic theory it is expected that $\alpha_1>0$, $\alpha_2>0$, $\alpha_3>0$, and $\alpha_4>0$. Consequently, it is expected that $b_1>0$, $b_2>0$, $b_3>0$, and $b_4>0$.

If the volume of exports adjusts to excess supply, as specified in equation (6), then the price of exports will adjust according to world demand. 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:

$$\ln X_t^D - \ln X_t = \sum_{k=0}^{T} g_k \ln PX_{t-k} \tag{8}$$

Demand theory imposes the following homogeneity restriction:

$$\sum_{g=0}^{T} g_k = 0 \tag{9}$$

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 (8) becomes:

$$\ln X_t^D - \ln X_t = g_0 \ln PX_t + g_1 \ln PX_{t-1} + g_2 \ln PX_{t-2} \tag{10}$$

and the polynomial has the following form:

$$g_k = q_0 + q_1 k \tag{11}$$

For $k=0$ equation (11) becomes: $g_0=q_0$.

For $k=1$ equation (11) becomes: $g_1=q_0+q_1$.

For $k=2$ equation (11) becomes: $g_2=q_0+2q_1=-2q_0-q_1$ due to the homogeneity restriction in equation (9).

By substituting equation (2) and the above expressions of equation (11) into equation (10) and solving for the price of exports, one can obtain:

$$\ln PX_t = c_0 + c_1 \ln X_t + c_2 \ln YW_t + c_3 \ln PXW_t + c_4 \ln PX_{t-1} + c_5 \ln PX_{t-2} \tag{12}$$

where

$$c_0 = -\frac{\beta_0}{\beta_1 - q_0},\ c_1 = \frac{1}{\beta_1 - q_0},\ c_2 = -\frac{\beta_2}{\beta_1 - q_0},\ c_3 = \frac{\beta_1}{\beta_1 - q_0},\ c_4 = \frac{q_0 + q_1}{\beta_1 - q_0}$$

and $c_5 = -\dfrac{2q_0 + q_1}{\beta_1 - q_0}$.

According to economic theory it is expected that $\beta_1>0$ and $\beta_2<0$. Consequently, it is expected that $c_1<0$, $c_2>0$, $c_3>0$ and $c_4>0$. The sign of the parameter c_5 depends on the size of the parameters c_3 and c_4, due to the homogeneity restriction that requires $c_3+c_4+c_5=1$.

The partial adjustment mechanism is also utilized in the import market. The actual volume of imports is assumed to adjust as follows:

$$\Delta \ln M_t = \lambda_2 \left(\ln M_t^D - \ln M_{t-1} \right), \quad 0 < \lambda_2 < 1 \tag{13}$$

By substituting equation (3) into equation (13) and solving for the volume of imports, one can obtain:

$$\ln M_t = d_0 + d_1 \ln \left[\frac{PM\left(1+T\right)}{P} \right]_t + d_2 \ln Y_t + d_3 \ln \left(\frac{R}{PM} \right)_t + d_4 L_{1,t} + d_5 L_{2,t} + d_6 \ln M_{t-1} \tag{14}$$

where $d_0=\lambda_2\gamma_0$, $d_1=\lambda_2\gamma_1$, $d_2=\lambda_2\gamma_2$, $d_3=\lambda_2\gamma_3$, $d_4=\lambda_2\gamma_4$, $d_5=\lambda_2\gamma_5$ and $d_6=1-\lambda_2$.

Since the coefficient of adjustment (λ_2) lies between zero and one, d_6 will also lie between zero and one. According to economic theory it is expected that $\gamma_1<0$, $\gamma_2>0$, $\gamma_3>0$, $\gamma_4<0$ and $\gamma_5<0$. This means that $d_1<0$, $d_2>0$, $d_3>0$, $d_4<0$ and $d_5<0$.

4. Data and empirical results

4.1 Data

Most of the data for the present study were obtained from the CD-ROM of International Financial Statistics (IFS) of the International Monetary Fund (IMF), 2003. Other sources needed to complete the data set will be indicated below. Due to lack of quarterly data, especially in the case of Greek GDP, tariffs and export subsidies, annual data were used. The time span is 1962 to 1999. All variables are expressed in US dollars. Price of world exports and real world output were obtained from the world tables in the IFS. Unit value indices of Greek imports and exports were taken from lines 75 and 74 of the IFS, respectively.

For the years 1998-1999 the time series were completed from the publication of External Trade Statistics of the National Statistical Service of Greece. Volumes of Greek imports and exports were constructed by deflating the values of Greek imports and exports (lines 71d and 70d in the IFS, respectively) with the corresponding unit values. The real Greek GDP was obtained from the line 99bp of the IFS and the nominal value of official reserves was taken from the line 1ld of the IFS.

For Greek price index I used the wholesale price index, which does not include taxes on consumption, instead of the consumer price index. Since unit values indices of imports and exports also do not include taxes on consumption, such a choice makes more sense. The wholesale price index was obtained from line 63 of the IFS. The tariff rates for Greek imports were taken from the publication of Public Finance Statistics of the National Statistical Service of Greece and the export subsidies were obtained from unpublished data of the Central Bank of Greece.

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

$$Y_t^* = Y_0 e^{gt} \tag{15}$$

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 1980-1999 period. The reason is that the country's growth performance has not been uniform during the overall sample period. Average growth between 1980 and 1999 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)[3].

The two index variables L_1 and L_2, which refer to quotas/financial stringencies and the regulatory levy, respectively, were constructed. Their construction was based on the gradual abolition of the corresponding measures. The initial value of these variables is unity and they were gradually reduced until they become zero. The abolition of quotas/financial stringencies began with the implementation of the Association Agreement in 1/1/1963 and was accelerated after full EU accession on 1/1/1981. The abolition of the "regulatory levy" took place over the 1984-1989 period. The structure of these index variables is presented analytically in Table 1.

The country's trade balance is the difference between the values of Greek exports and Greek imports. The balance of payments is the sum of the country's trade balance and the financial inflows, where financial inflows have been calculated as the residual between the change in official reserves and the trade balance.

---

3. 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 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 on request.

Table 1. The index variables L_1 and L_2

Year	L_1	Year	L_2
1962	1	1962-1983	1
1963-1964	0.98	1984	0.90
1965-1967	0.96	1985	0.80
1968-1969	0.94	1986	0.65
1970	0.92	1987	0.45
1971-1972	0.90	1988	0.25
1973-1975	0.86	1989-1999	0
1976	0.82		
1977	0.80		
1978	0.77		
1979	0.74		
1980	0.72		
1981	0.11		
1982	0.09		
1983	0.04		
1984-1999	0		

4.2 Empirical results

The equations of the model are overidentified. Therefore, they were estimated simultaneously by using 3SLS. The predetermined variables of the model are used as instruments. Empirical results for the structural and the reduced-form parameters are presented in Tables 2 and 3, respectively.

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 0.98.

As shown in Table 2, the estimated coefficients have the expected signs in all cases. In the case of export supply, the coefficient of relative prices is statistically insignificant. On the contrary, the productive capacity of the Greek economy, the imported inputs, the export subsidies and, of course, the volume of exports in the previous period play an important role in the determination of the country's export supply. The significance of the parameter that refers to the imported inputs supports the decision to use a full trade model in this study, as Greece's export promotion is determined by imported materials. These results support the view that the abolition of protection in Greece due to EU accession harmed the country's export perfor-

mance. 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 previous periods.

Table 2. Structural parameters

Explanatory variables	Export supply lnX_t	Export demand $lnPX_t$	Import demand lnM_t
$ln(PX/P)_t$	0.0909(0.41)		
lnY_t^*	0.6672(2.36)**		
lnS_t	0.0303(1.69)*		
lnM_t	0.5793(3.38)***		
lnX_{t-1}	0.2618(2.10)**		
lnX_t		-0.0173(-0.14)	
$lnPXW_t$		0.1566(3.44)***	
$lnYW_t$		0.2788(0.92)	
$lnPX_{t-1}$		1.2309(9.12)***	
$lnPX_{t-2}$		-0.3876(-3.01)***	
$ln[PM(1+T)/P]_t$			-0.4074(-1.73)*
lnY_t			0.5672(2.73)***
$ln(R/PM)_t$			0.1029(1.89)*
$L_{1,t}$			-0.3148(-2.44)**
$L_{2,t}$			-0.1532(-2.21)**
lnM_{t-1}			0.2906 (2.23)**
Intercept	-6.1830 (-4.49)***	-1.0862(-2.38)**	0.5808 (0.45)
R^2	0.991	0.997	0.984
Adjusted R^2	0.989	0.997	0.981
σ	0.070	0.084	0.092
Durbin-Watson	2.29	1.83	1.84
h-statistic (Durbin)	-1.29	-	0.78

t-statistics are shown in parentheses.
**** denotes statistical significance at a 0.01 level.*
*** denotes statistical significance at a 0.05 level.*
** denotes statistical significance at a 0.10 level.*

In the case of import demand, all estimated parameters are statistically significant. The coefficients of quotas/financial stringencies and the regulatory levy are negative and statistically significant at the 5 per cent level. The parameter of tariff adjusted import prices is negative and significant at the 10 per cent level. These results are consistent with the view that the abolition of trade protection through tariffs, quotas,

financial stringencies and the regulatory levy led to a substantial increase of Greek imports. Note also that according to Table 3, the signs of the reduced-form parameters are consistent with economic theory[4].

Table 3. Reduced-form parameters

Exogenous variables	Endogenous variables				
	Export supply lnX_t	Export demand $lnPX_t$	Import demand lnM_t	Trade balance $lnTB_t$	Balance of payments lnR_t
lnP_t	0.1298	-0.0022	0.3813	-0.2538	-0.2538
lnY_t^*	0.7035	-0.0122	0.0645	0.6269	0.6269
lnS_t	0.0319	-0.0006	0.0029	0.0285	0.0285
lnX_{t-1}	0.2760	-0.0048	0.0253	0.2459	0.2459
$lnPXW_t$	0.0239	0.1562	0.0168	0.1634	0.1634
$lnYW_t$	0.0426	0.2781	0.0299	0.2908	0.2908
$lnPX_{t-1}$	0.1881	1.2276	0.1320	1.2837	1.2837
$lnPX_{t-2}$	-0.0592	-0.3865	-0.0416	-0.4042	-0.4042
lnY_t	0.3141	-0.0054	0.5431	-0.2344	-0.2344
$lnPM_t$	-0.3395	0.0059	-0.5870	-0.7466	-0.7466
lnT_t	-0.2256	0.0039	-0.3901	0.1684	0.1684
$L_{1,t}$	-0.1743	0.0030	-0.3014	0.1301	0.1301
$L_{2,t}$	-0.0849	0.0015	-0.1467	0.0633	0.0633
lnM_{t-1}	0.1610	-0.0028	0.2783	-0.1201	-0.1201
$lnDK_t$	0.0570	-0.0010	0.0985	-0.0425	0.9575
lnR_{t-1}	0.0570	-0.0010	0.0985	-0.0425	0.9575
1	-6.3632	-0.9762	-0.1579	-7.1814	-7.1814

From the structural parameters of the model one can determine the long run behavior of Greek trade, by estimating the long run trade functions. The long run equations have the following form:

$$\ln X_t^S = -8.38 + 0.12 \ln\left(\frac{PX}{P}\right)_t + 0.90 Y_t^* + 0.04 \ln S_t + 0.78 \ln M_t, \qquad \lambda_1 = 0.74 \tag{16}$$

$$\ln X_t^D = -62.79 - 9.05 \ln\left(\frac{PX}{PXW}\right)_t + 16.11 \ln YW_t, \qquad q_0 = 48.73,\ q_1 = -119.86 \tag{17}$$

$$\ln M_t^D = 0.82 - 0.57 \ln\left[\frac{PM(1+T)}{P}\right]_t + 0.80 \ln Y_t + 0.14 \ln\left(\frac{R}{PM}\right)_t - 0.44 L_{1,t} - 0.22 L_{2,t}$$
$$\lambda_2 = 0.71 \tag{18}$$

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

The Greek export supply is price inelastic in the long run. As shown in equation (16), 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, the productive capacity of the Greek economy and the imported inputs. There is also a small positive impact on Greek export supply due to changes in export subsidies. The coefficient of adjustment indicates that 74% of the change in 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, equals 1.4 years.

On the other hand, Greek export demand is price elastic in the long run. As shown in equation (17), there is a large impact on export demand due to changes in relative prices, a result that is consistent with previous studies[5]. 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 that Greek export demand will be quite sensitive to relative price changes, since the emergence of lower cost close substitutes leads to substantial market share losses.

The results for 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 in agricultural and labor-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 south eastern Asia and the transition economies or agricultural exports from the Mediterranean countries) to the world markets.

Greek import demand is price inelastic in the long run. The main reason for this result is that inputs not produced domestically constitute a large proportion of Greek imports. Imports of the public sector also contribute to the low sensitivity of import demand to relative price changes[6]. Import demand is also affected in a positive way by domestic income and real international reserves stringency. There are also substantial effects on Greek imports due to changes in all trade barriers. As shown in equation (18), the gradual abolition of all trade barriers led to an increase in Greek imports, which of course replaced much domestic production. As Koukouritakis (2002) indicates, these imports came mainly from the EU, indicating trade creation.

---

5. See for example, Arghyrou and Bazina (2003).

6. See Georgakopoulos (1993).

The coefficient of adjustment indicates that 71% of the change in import volume towards its equilibrium level is taking place in one year. The mean adjustment period of the Greek import demand to a relative price change equals 1.4 years.

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:

$$\ln X_t - 0.0909 \ln PX_t - 0.5793 \ln M_t - 0.2618 \ln X_{t-1} = 0 \tag{19}$$

$$\ln PX_t + 0.0173 \ln X_t - 1.2309 \ln PX_{t-1} + 0.3876 \ln PX_{t-2} = 0 \tag{20}$$

$$\ln M_t - 0.2906 \ln M_{t-1} = 0 \tag{21}$$

The eigenvalues are 0.2616, 0.6144±0.0992*i*, 0.2906 and their moduli are 0.2616, 0.6224, 0.2906. All the calculated moduli are less than unity and consequently, the estimated model is dynamically stable.

An issue that arises from the above analysis is that the variables are not stationary in level but in first difference[7]. 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. The estimated residuals were tested for the existence of a unit root by performing the augmented Dickey-Fuller test, following the Engle-Granger methodology. In order to select the appropriate lag length, the Akaike information criterion has been used. The *ADF statistic* for the export supply function is -6.84, for the export demand function -5.35 and for the import demand function -5.46. The MacKinnon (1991) critical values for the Engle-Granger cointegration test are -4.79 for the export supply and demand functions, and -5.16 for the import demand function, at the 5 percent significance level.

To a large extent, the above 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 led to an increase in imports replacing domestic production, due to trade liberalization. On the other hand, it did not improve the country's export performance, mainly due to the low competitiveness of Greek exports in international markets and additionally due to the abolition of export subsidies.

---

7. For the sake of brevity, the Augmented Dickey-Fuller test results for the variables of the model are not presented here, but are available on request.

5. The effects of EU accession on Greek trade

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 anti-monde (i.e. what would have happened to the corresponding variable if the country had not entered the economic union). In this study, anti-monde begins in 1981 when Greece became a full member of the EU. The main assumption is that if Greece had not entered the EU, the pace of protection abolition would have been the same as that prevailing in Greece before 1981, which had been scheduled in 1962 with the Association Agreement between Greece and the EU.

In the case of tariffs, they were gradually abolished in the 1981-1986 period, following the schedule that had been determined by the Association Agreement. Consequently, there was no effect of EU accession on Greek trade due to the abolition of tariffs. In the case of quotas and financial stringencies, the pace of abolition that had been determined by the Association Agreement was much slower than that which finally prevailed due to full accession. The abolition of these measures, which had an equivalent effect to tariffs, took place between 1981 and 1984.

In the cases of indirect taxes on imports (i.e. the regulatory levy) and export subsidies, there was no provision in the Association Agreement concerning their harmonization with the directives of the Treaty of Rome. The abolition of the regulatory levy took place between 1984 and 1989, while the abolition of export subsidies took place between 1987 and 1992. So, I can argue that if Greece had not entered the EU in 1981, both measures would have remained at the 1980 level. The EU accession effects on Greek trade flows were concentrated solely in the 1981-1993 period[8]. During that period, all trade protection and promotion measures were gradually phased out and the Single European Market was fully implemented.

In this paper, the actual Greek imports, exports and trade balance are the actual variables. The Greek imports, exports and trade balance under the above assumption are the estimated variables. Therefore, the residuals between the two variables (i.e. the actual and the estimated one) are the effects of the accession. Both income and substitution effects are estimated using this approach, which means that the results generated are very close to the actual effects on the Greek trade balance due to EU accession.

---

8. Given the global relaxation in all trade barriers that has occurred since early 1990s, the hypothesis that "if Greece had not entered the EU in 1981, both measures (the "regulatory levy" and the export subsidies) would have remained at the 1980 level" is unrealistic for the post-1993 period and will lead to an overestimation of the EU accession effects. Therefore, the EU accession effects on the Greek trade flows for the 1994-1999 period were not estimated.

The cumulative effects on Greek imports are presented in Table 4 and amount to 21.4% of the Greek GDP at constant prices. Between 1981 and 1984, the positive effects on imports are mainly caused by the abolition of quotas and financial stringencies. Since 1984, the positive effects have been caused by the abolition of the regulatory levy.

Table 4. Cumulative effects on Greek imports of EU accession (as percentages of GDP, at constant prices)

Year	Actual imports M_t	Estimated imports $\hat{M}_t$	Residual $M_t - \hat{M}_t$
1981	24.85	24.26	0.59
1982	27.41	22.63	4.78
1983	29.88	23.43	6.45
1984	29.23	23.10	6.13
1985	32.17	22.68	9.49
1986	32.10	24.80	7.30
1987	39.31	27.80	11.51
1988	28.22	27.87	0.35
1989	36.75	24.81	11.94
1990	41.56	27.67	13.89
1991	45.28	29.95	15.33
1992	51.99	31.71	20.28
1993	57.52	36.14	21.38

The cumulative effects on Greek exports are presented in Table 5 and amount to 1.8% of the country's GDP at constant prices. As seen, EU accession led to an increase in Greek exports until 1987. This is a plausible effect as the country's exports are positively linked to the imported intermediate goods. Since 1988, this effect has become negative due to the abolition of the export subsidies.

The overall effects on Greek trade balance are presented in Table 6 as percentages of GDP, and in Figure 1. As seen, if Greece had not entered the EU, the country's trade deficit in 1993 would have been about 65% lower than the actual figure. The cumulative effect amounts to 23.1% of the Greek GDP at constant prices.

From the above results it is clear that the large increase in imports due to the abolition of all trade barriers contributed more than any other factor to the deterioration of the Greek trade deficit. As seen in Figure 1, a substantial increase in the Greek trade deficit took place after the full abolition of the regulatory levy, which was providing generous protection against imports through the indirect tax system.

On the other hand, the abolition of export subsidies had quite small negative effects on the country's exports and consequently, on the trade balance.

Table 5. Cumulative effects on Greek exports of EU accession (as percentages of GDP, at constant prices)

Year	Actual exports X_t	Estimated exports $\hat{X}_t$	Residual $X_t - \hat{X}_t$
1981	11.80	10.31	1.49
1982	11.79	10.72	1.07
1983	13.40	11.54	1.86
1984	15.83	11.92	3.91
1985	15.33	13.36	1.97
1986	17.63	13.49	4.14
1987	20.01	16.20	3.81
1988	12.88	14.02	-1.14
1989	17.12	14.90	2.22
1990	16.31	17.79	-1.48
1991	18.07	18.54	-0.47
1992	23.03	21.07	1.96
1993	22.62	24.37	-1.75

Table 6. Cumulative effects on Greek trade balance of EU accession (as percentages of GDP, at constant prices)

Year	Actual trade balance TB_t	Estimated trade balance $\hat{TB}_t$	Residual $TB_t - \hat{TB}_t$
1981	-13.05	-13.95	0.90
1982	-15.62	-11.91	-3.71
1983	-16.47	-11.88	-4.59
1984	-13.39	-11.18	-2.21
1985	-16.85	-9.33	-7.52
1986	-14.47	-11.31	-3.16
1987	-19.29	-11.60	-7.69
1988	-16.34	-13.85	-1.49
1989	-19.63	-9.91	-9.72
1990	-25.25	-9.89	-15.36
1991	-27.21	-11.41	-15.80
1992	-28.95	-10.64	-18.31
1993	-34.90	-11.77	-23.13

Figure 1. Cumulative effects on Greek trade balance of EU accession (% of GDP, at constant prices).

The above results are consistent with previous studies (Giannitsis 1988, Plummer 1991 and Arghyrou 2000), but I can argue that they are much closer to the actual figures, since they do not treat import and exports as independent of each other. This is a crucial point, as Greece is not self-sufficient and imports materials that are necessary for production. As I argued above, this is the main reason that a full trade has been used. This study also estimates the effects on volumes of Greek imports and exports and it is not limited to providing only crude estimates of effects of EU accession on Greek trade (e.g., Georgakopoulos, 1993).

6. Concluding Remarks

The purpose of this paper is to analyze the Greek trade functions and to estimate the effects on the country's trade balance of 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. In contrast, export supply is price inelastic and is mainly determined by changes in the productive capacity of the Greek economy and imported inputs. Import demand is also price inelastic in the long run. The reason is that the country is not self-sufficient and imports inputs that are necessary for production. Likewise, a lot of imports are used by the public sector. Thus, import demand has low sensitivity to relative price changes.

The gradual abolition of all protective and promoted measures on trade after the EU accession increased the country's trade deficit. There was a substantial increase in imports, mainly due to the abolition of the regulatory levy, and a quite small decrease in exports. The overall income and substitution effects increased the deficit of the Greek trade balance threefold. The cumulative impact amounts to 23% of the Greek GDP.

The above trade effects are plausible and support the view that EU accession led to a considerable deterioration of the Greek trade balance from the import side. On the other hand, the country did not manage to improve the competitiveness of its products in international markets by developing product differentiation or new production specializations. This fact led to a small decrease in the country's exports after the abolition of the export subsidies. The above developments may explain the troubles that the Greek economy faced, especially in the first post-accession decade, despite the large amount of net resources that the country received from the European budget.

References

Almon, S., 1965, "The Distributed Lag between Capital Appropriations and Expenditures", *Econometrica*, 33, 178-196.

Alogoskoufis, G., 1995, "The Two Faces of Janus: Institutions, Policy Regimes and Macroeconomic Performance in Greece", *Economic Policy*, 20, 149-192.

Arghyrou, M.G., 2000, "EU Participation and the External Trade of Greece: An Appraisal of the Evidence", *Applied Economics*, 32, 151-159.

Arghyrou, M.G., Bazina E., 2003, "Competitiveness and the External Trade of Greece in the 1990s: A Cross-Sectoral Investigation", *Journal of Economic Integration*, 18, 763-793.

Filactos, P., 1979, "Greece In The EEC: The Balance Of Payments Prospects", Paper Presented at the Conference on Medium Term Economic Assessment, Athens.

Georgakopoulos, T., 1993, "Trade and Welfare Effects of Common Market Membership: An Ex-post Evaluation for Greece", *Economia Internazionale*, 46, 360-376.

Giannitsis, T., 1988, *European Community Accession and the Impact on Manufacturing and External Trade*, Foundation of Mediterranean Studies, Athens (in Greek).

Goldstein, M., Khan, M.S., 1985, Income and Price Effects in Foreign Trade, in P.B. Kennen and R.W. Jones (eds.), *Handbook of International Economics*, North Holland, Amsterdam, 1041-1105.

Goldstein, M., Khan, M.S, 1978, "The Supply and Demand for Exports: A Simultaneous Approach", *Review of Economics and Statistics*, 60, 275-286.

Hodrick, R.J., Prescott, E.C., 1997, "Postwar U.S. Business Cycles: An Empirical Investigation", *Journal of Money, Credit and Banking*, 29, 1-16.

International Monetary Fund, 2003, International Financial Statistics (IFS) CD-ROM, International Monetary Fund, Washington DC.

Khan, M.S., Knight, 1988, "Import Compression and Export Performance in Developing Countries", *Review of Economics and Statistics*, 57, 315-321.

Koukouritakis, M., 2002, "Trade Effects in Greece due to the EU Accession", Ph.D. Dissertation, Athens University of Economics and Business, Athens (in Greek).

MacKinnon, J.G., 1991, Critical Values for Co-integration Tests, in R.F. Engle and C.W.J. Granger (eds.), *Long-Run Economic Relationships: Readings in Cointegration*, Oxford University Press, 267-276.

Maroulis, D.K., 1992, *Problems and Perspectives of Greek Exports*: *Conditions of Their Development in the Integrating European market*. Center of Programming and Economic Research, Athens (in Greek).

Mitsos, A., 1983, The Industrial Sector, in J. Sampendro and J. Payno (eds.), *The Enlargement of the European Community: Case Studies of Greece, Portugal and Spain*, McMillan Press.

Mitsos, A., Papageorgiou E., 1979, "Implications For The Balance Of Payments" in L. Tsoukalis (ed.) *Implications For The Balance Of Payments: Greece and the European Community*, Saxon House.

Plummer, M.G., 1991, "Ex-Post Empirical Estimates of the Second Enlargement: The Case of Greece", *Weltwirtschaftliches Archiv*, 127, 171-182.

Tansel, A., Togan, S., 1987, "Price and Income Effects in Turkish Foreign Trade", *Weltwirtschaftliches Archiv*, 123, 521-534.

Tsoukalis, L., 1979, *Greece and The European Community*, Gower.