Acta Oeconomica, Vol. 52 (4) pp. 473–496 (2002)

THE TRADE AND WELFARE EFFECTS OF GREEK MEMBERSHIP IN THE EU

A Yardstick for the Associated Countries

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(Received: 17 September 2001; revision received: 29 April 2002; accepted: 24 September 2002)

This paper presents quantitative estimates of the trade and welfare effects of the entry of Greece into the EU and presents a tool for assessing the impact of the Central and Eastern European Countries' accession to the EU. Both the static and the dynamic effects of the entry of Greece into the EU are examined. When looking at the static effects, it is shown that there was a "net" trade creation of about USD 1.6 billion, which accounted for approximately 4.4% of the GDP of the year before accession. It has also been found that 86% of the total trade creation was internal trade, while 84% of the entire trade diversion was external trade diversion, these being results that accord with the theory of the customs union. When we make an assessment of the dynamic effects, we can see that Greece's EU entry had mixed reactions in different sectors: for about two-thirds of the examined sectors we find that Greece's integration into the EU was desirable – in general, however, the integration indices found are close to being the same, thereby showing that the dynamic effects of the country's EU entry have been minimal.

Keywords: Greece, CEECs, accession, static integration effects, dynamic integration effects

JEL classification index: F02, F15

1. INTRODUCTION

The accession of Greece to the EU in 1981 was, from an economic perspective, a historical event. It was the first time that a customs union was formed between high-income developed economies and a middle-income developing economy such as Greece.[1]

Some attempts have been made in literature to qualitatively and quantitatively estimate the economic implications of the Greek accession. Plummer (1991) investigated the static effects of the accession using an *ex-post* import-growth model

[1] For an analysis of the development prospects of Greece into the EU see Polychronopoulos (1994).

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(Verdoorn – van Bochove 1972) for an estimation of the trade creation and trade diversion resulting from the accession. He found that, in the Greek market, positive trade creation came with most agricultural goods – while trade diversion was present when it came to most manufactured and semi-manufactured products. Giannitsis (1988), using the "shares in apparent consumption" approach, found that the Greek accession caused a considerable amount of trade diversion from third countries to the EU as regards agricultural products while, at the same time, it considerably increased the amount of imports in agricultural and manufactured products from the EU. These effects have been attributed by the author to the Common Agricultural Policy (CAP) of the EU and to a decrease in protection with regard to consumer products. Katos (1982) on the other hand analysed – with an *ex ante* model based on the data of years 1970 and 1973 – the possible effects of the EU economic integration of Portugal, Spain and Greece on the region's welfare regarding dynamic effects connected with relative efficiency changes brought about by the increase in foreign competition. He concluded that the dynamic effects of the integration of these three countries into the EU are "marginal" while the accession of Greece to the EU would have no effect on the EU's overall GDP. He found that the accession of Greece would have increased EU's agricultural GDP by 3.1%, though it would reduce manufactures' GDP by 0.41%. More recently, Mattas and Tzouvelekas (1999) concluded that Greece's accession to the EU had both positive and negative effects on its economy. They found that the most important benefits came from budgetary transfers, mainly due to the CAP, which improved the income of farmers. On the other hand, however, it was found that the balance of trade was negatively affected owing to trade liberalisation, to significant imported agricultural product price increases and to domestic inflationary pressures.

This paper's purpose is thus to give quantitative estimates of the trade and welfare effects of Greece's entry into the EU and to produce a tool by which to assess the same effects of the Central and Eastern European Countries' (CEECs) EU accession. Greece's course towards integration with the EU could highlight the path for the successful accession of new applicants with similar economies to that of Greece.[2] Both static and dynamic effects will be assessed. The static effects of entry will be looked at via an *ex-post* model – a "shares in apparent consumption" model – which was first introduced by Truman (1969, 1975). While

[2] For an extensive analysis of the trade effects of integration on three CEECs, Hungary, Bulgaria and the Czech Republic, see Tsounis (1998b). The methodology presented in the paper can be used for analysing integration effects in connection with other areas of preferential trading and/or regional association, like the Black Sea Economic Co-operation countries (BSEC) (for a detailed analysis of the effects of the BSEC on its member countries see Siskos 1998).

possible dynamic effects (changes in relative efficiency caused by increased competition and exploitation of economies of scale) on Community output with regard to Greek entry into the EU are examined with the help of an *ex-ante* model.

The paper's structure is therefore as follows: in Section 2 a methodology for analysing the static effects of integration and a quantification of the trade creation/trade diversion caused by the Greek accession is given; Section 3 makes an estimate of the dynamic effects of Greece's EU accession; and Section 4 concludes. *Tables* are given in the *Appendix* to the paper.

2. THE STATIC EFFECTS OF THE ENTRY OF GREECE INTO THE EU

The first method, one introduced in customs union theory for an empirical assessment of the effects of preferential trading areas, was the "income elasticity of import demand" method of Balassa (1963, 1967, 1975). This is a ratio of the average annual rate of import change as set alongside GNP. However, this method does not provide any exact estimates of trade creation or trade diversion, giving instead only a crude indication of the static effects of integration (i.e. the major changes in prices caused by the entry of a country into a preferential trading area).[3]

The "shares in apparent consumption" method utilised in the present analysis to measure the static effects of integration is a modification, one first introduced by Truman (1969, 1975). This way of assessment gives us quantitative estimates of trade creation and diversion; for this reason, it has been extensively used in studies pertaining to empirical assessment of the static effects of preferential trading areas.[4] The merits and deficiencies of the method are presented below.

2.1. Description of the method

Customs unions theory – given a small country, perfect competition, full employment, perfect factor mobility, as well as upwardly sloping supply curve and downwardly sloping demand curve assumptions – predicts that a reduction in internal tariffs going with the formation of a customs union leads to a decline in domestic prices. This is then followed by an expansion in consumption (consumption effect) and a reduction in product quantities supplied by domestic re-

[3] Criticisms as regards use of the method can be found in Kreinin (1969), Clavaux (1969), Sellekaerts (1973), Tsounis (1992).

[4] See for example Giannitsis (1988), Allen et al. (1996), Tsounis (1999) and the references therein.

sources (production effect). The decline in domestic production will be met with an increase in imports from the partner countries and a decrease in imports from non-member countries (that is, given all the usual assumptions associated with perfectly price-elastic supply curves for partner and non-partner countries). One then expects that the price reduction in the domestic market will be accompanied by a decline of the share of domestically produced products in total consumption, an increase in the share of imports from the partner countries and a decrease in the share of non-partner countries.

Given the above, it is suggested that by measuring domestic supply shares, the shares of imports from non-member countries and the share of partner-country imports in apparent consumption, inferences can be made regarding trade creation and trade diversion by looking at differences between the pre-integration and post-integration time periods. This holds both before and after customs union formation and with an assumption that the pre-integration shares would have remained unchanged without such integration.

The shares for each case are calculated in the following way:

Demand satisfied out of domestic production	$D^{d} = Q - X$
Demand satisfied out of imports from partners	$D^{EU} = M^{EU}$
Demand satisfied via imports from non-members	$D^{TC} = M^{TC}$
"Apparent" consumption	$C = Q - X + M^{EU} + M^{TC}$
Share of "apparent" consumption satisfied by domestic production	$DS = D^{d} / C$
Share of "apparent" consumption satisfied by partners' imports	$ECS = M^{EU} / C$
Share of "apparent" consumption satisfied by imports from non-members	$TCS = M^{TC} / C$

Q is the gross domestic production, X denotes exports, while M^{EU} and M^{TC} denote imports from partners and from non-members respectively. In each year the shares come to one, and their changes between any two years come to zero.

There are six possible patterns going with the three shares that are attributable to the economic integration, which are given in *Table 1*.

The term "trade creation" is given where there is a domestic share decline. Both partner countries and non-members can absorb the decline. This is a case of double (internal and external) trade creation. A decline in domestic share accompanied by a decline in the share of non-members, while there is a rise in partner country shares, points to case 2. This is where the pattern of movement of shares accords with what is predicted by the traditional customs union theory.

A decline of domestic and partner shares accompanied by a rise in the share of non-members makes up case 3.

The term "trade erosion" marks cases where the domestic share increases at the expense of both member and non-member countries, this being accompanied by an increase in the country's share (case 4); or at the expense of the partner countries (case 5); or at the expense of the non-members alone (case 6).

Under the static partial equilibrium analysis of customs unions, a reduction in internal tariffs will lead to a lessening of domestic production only if the domestic price goes down. Without a decline in the domestic price, there may be no trade creation but there can be external trade diversion (cases 2 and 6). The amount of trade creation / diversion for a particular commodity depends on the level of the tariff and the relevant supply and demand elasticities. The lower the initial level of imports from third countries, the smaller the amount of trade diversion. If domestic and partners' supply curves were perfectly price inelastic, there could be no trade creation or diversion. Additionally, if non-members' excess supply curves were perfectly price elastic, there could be no trade creation.

If, in addition to a reduction of internal tariffs, there were a lowering of the tariff on non-members' imports, this would *ceteris paribus* lead to an increase in trade creation and reduce trade diversion, and it could also lead to an increase in the non-members' share (cases 1 and 3). On the other hand, an increase in the tariff on imports from non-members might increase the domestic price and domestic production (cases 4 to 6). While case 6 can be considered plausible, cases 4 and 5 are seldom observed. A change in the level of effective protection for a commodity might lead to case 4 (Truman 1975, pp. 6–7).

By using the idea of shares, the approach abstracts from the effects of the economy's growth. However, the assumption needed is that growth has a neutral effect with regard to the three shares – that is, the elasticity of each share regarding increases in income is equal to zero.

The method directly shows the amount of trade creation, and the substitutions caused in production and consumption by economic integration can be looked at together. Deficiencies are the usual problems connected with a period chosen for an *anti-monde* construction. Also, it has been argued that systematic shifts in the domestic share caused by home pressure of demand and structural change – and apart from that caused by the integration itself – tend to cause unreliability in any conclusions regarding trade creation (Verdoorn – van Bochove 1972, p. 346).

To overcome this problem, a measure of domestic demand pressure is included as one of the explanatory variables in the regressions to explain the change in shares (while other independent variables include variables for the measurement of the cyclical movement of shares and for time trends).

2.2. Results

A direct application of the method is to make a computation of the shares between a base pre-integration year and a "representative" post-integration year, and to examine changes in them according to the analysis given above. However, this approach requires the very strong assumption that, in the absence of integration, nothing would have happened to systematically alter the pattern of shares in the base year.

Three factors that influence the three shares should be taken into account:

- the cyclical changes of the shares over time;
- general trends exhibited in the shares of some sectors; and
- the level of domestic demand pressure.

The effects of cyclical changes in the shares can be neutralised by taking the average value of the shares over a pre-integration period and over a post-integration period, rather than for single years. The method of averaging has a disadvantage here, however, for it does not take into account the shares' general tendencies before and after integration. If, for example, before the integration period the domestic share had a tendency to increase at the expense of partners' and non-partners' shares, and in the post-integration period this pattern were reversed, by taking averages over consecutive pre-integration and post-integration years one would find that the shares had remained unchanged.

The second factor that might create errors in conclusions drawn via an observation of changes in shares concerns the supposition that, given no integration, the three basic shares would, as regards their pattern in the base year, remain unchanged. In the absence of integration, the domestic shares of expenditure on apparent consumption might have been going down while partner/non-member shares might have been increasing. Thus, taking on board the assumption that there is no trend with the shares (if such a thing actually exists) would lead to an overestimation of the amount of trade creation.

Finally, it has been assumed that the level of the domestic demand pressure of the economy will not change. Yet if a change in the productive capacity of the economy takes place or there is a change in domestic demand, there will be a change in the relative shares, which cannot be attributed to the fact of integration.

To see whether tendencies exist, the statistical significance of the shares' average changes over the two periods has been examined (Tsounis 1999). If the difference between the average rates of change of these shares over the two time periods is statistically different from zero, a *no-trend* or *a change-in-the-trend*

hypothesis can be adopted (and it will be explained later how the two cases can be distinguished from each other).

Regarding the third assumption, domestic demand pressure should not exhibit any structural modifications leading to an alteration in the domestic, partner and non-partner shares in apparent consumption.

To see whether domestic demand pressure has remained constant in the pre-integration and post-integration periods, the following procedure was resorted for each sector. Fluctuations in domestic demand pressure might come either from the supply side or the demand side, or both, so measures representing both sides should be included in the test. To measure the domestic demand pressure, it was decided to use the ratio of the total apparent consumption ($C = Q - X + M$) and the GNP. Demand-side changes would be reflected in apparent consumption and supply-side alterations would be taken up within a measurement of the GNP.

To test for a structural change in domestic demand pressure, the domestic shares of each sector were regressed on a ratio of (C/GNP)[5] for the periods 1976–1980 and 1981–1986, and a Chow-test was undertaken to look at the structural stability of the coefficients with the F-statistic (see also Tsounis 1999).[6]

It was concluded that no structural change had taken place in any of the sectors and that the domestic demand pressure remained constant over the period 1976–1986.

As has been said, to eliminate cyclical fluctuation of the shares, averages are taken from the pre-integration and post-integration periods, and the statistical significance of the two means was looked at with the t-test.

Use of the means method (above) will not produce correct results in a case where there are just general tendencies in sector share movements. Yet (as already noted) there are two cases in which trends might be exhibited:

- there might be a generalised (increasing or decreasing) pattern with shares in both the pre-integration and post-integration periods; and
- there might be a trend (increasing or decreasing) of the shares in the pre-integration period, and a reverse trend in the post-integration period.

[5] Other ways of measurement of domestic demand pressure have been tried: the ratio of the industry's "apparent" consumption to that of GNP, and the semi-logarithmic form of both ratios (C_t/GNP$_t$) and (C_{it}/GNP$_t$), allowing for possible non-linearities. The ratio (C/GNP) was chosen based on the coefficient of determination and the t-statistic. However, in the 100, 323, 342 and 353 sectors the ratio of a sector's "apparent" consumption to that of the GNP gave a better performance compared to the ratio of the total "apparent" consumption to that of the GNP; the Chow test for these sectors was done using the former.

[6] The results from the Chow-test can be obtained upon request from the author.

In neither situation will the averaging of shares lead to reliable results because in the first case it will show a structural break in the post-integration period, i.e. one which has not happened; and in the second case it will not show a structural break that *has* taken place, since the averages of the two periods would be almost equal.

To overcome this share tendency problem, therefore, the average rate of change in share over the two periods has been calculated, too, and the *t*-statistic has been used to test the statistical significance of the two means from the two periods.

If the *first* case applies to a sector, one can assume that a structural break has happened only if the difference in the average rates of change of the shares over the two periods is statistically different from zero – and the average rates of share change would have the same sign.

If the *second* case applies to a sector, we may assume that, although the share means for the two periods might be the same (their difference not being statistically much different from zero), the signs pertaining to the average rate of share change in the two periods will be different, and their difference will be statistically different from zero.

Finally, in a case where no general movement is seen in a sector, and where a structural break happens *after* integration, we can assume that the difference in the share means from the pre-integration and post-integration periods will be statistically different from zero, and the difference in the average rate of alteration in share over the two periods will not, in a statistical sense, be notably different from zero.

This case can be mistaken for the first one, however, i.e. where no structural break has taken place and where the difference in means is an effect of a generalised movement of the shares. Thus, for these two cases one needs to examine the shares of that sector over the whole pre-integration and post-integration periods.

The minus sign in *Table 2* shows a decrease in the share, the plus sign an increase, and zero shows a constant share over the pre-integration and the post-integration periods.

Sectors 323 (leather products), 353 (petroleum refineries), 354 (miscellaneous petroleum and coal products), 355 (rubber products), 372 (non-ferrous metals) and 384 (transport equipment) belong to the second category described above; there was a tendency for the domestic shares to increase in the pre-integration period but it reversed in the post-integration period. Obtaining share averages for these time periods would therefore not be a representation of the effects of integration (if a break is to be attributed to integration). In these sectors the last year of the pre-integration period (1980) was taken as the representative year for

the construction of the *anti-monde* method, and this was compared with the last available year of the post-integration period (1986).

Trade creation occurs in 26 sectors (i.e. pointing to a decrease in the domestic share), while trade erosion occurs in 3 (an increase in the domestic share). In 9 sectors case 2 of *Table 1* happened, with internal trade creation and external trade diversion (which is what the traditional customs union theory predicts to happen after a customs union formation). The sectors of food products (311), rubber products (355), iron and steel (371), non-ferrous metals (372), fabricated metal products (381), machinery – except electrical (382), machinery – electrical (383), professional and scientific equipment (385) and agricultural products (100) belong to this category. In 12 sectors double (internal and external) trade creation took place (case 1 of *Table 1*). This concerns the beverages (313), textiles (321), wearing apparel (322), footwear (324), wood products (331), furniture (332), paper and products (341), petroleum refineries (353), plastic products (356), pottery and china (361), glass and products (362) and miscellaneous non-metallic mineral products (369) sectors.

In four sectors there was external trade creation and internal trade diversion (case 3 of *Table 1*). These were the leather products (323), industrial chemicals (351), other chemicals (352) and miscellaneous petroleum and coal products (354) sectors.

Of the three cases of trade erosion, two (printing and publishing (342) and transport equipment (384)) – where domestic and partner shares increased at the expense of non-partners (case 6 of *Table 1*) – are plausible (see above). The third occurrence might have been caused by a change in the level of effective protection (which happened in sector 390 of "other manufactured products"). Nonetheless, such a result could have come out simply owing to the sector's nature, i.e. a residual and therefore heterogeneous sector.

Finally, there was the case of sector 314 (tobacco) where the non-members' share remained the same while the partners' increased at the expense of that of domestic production.

From the figures pertaining to the changes in the three shares and from the level of apparent consumption in the post-integration period, the total amount of (internal and external) trade creation, the quantity of (internal and external) trade diversion and the entire amount of (internal and external) trade erosion can be calculated with definitions in accordance with *Table 1*.

Table 3 shows the substitution effects existing between the three sources of supply – domestic, imports from members and imports from non-members – on apparent consumption, expressed in USD (in 1980 prices and 1980 exchange rates).

The substitution effect shows the magnitude of such effects attributable to integration in value terms, under the assumption that the only cause of share change is the customs union formation. It has been calculated by multiplying apparent consumption in the post-integration period by the degree of change in the appropriate shares over the pre- and post-integration periods: $C^{81-86}(S^{81-86}-S^{76-80})$.

Trade creation in its entirety was found to be about USD 2.4 billion, total trade diversion about USD 400 million, and the full amount of trade erosion about USD 300 million – this giving a "net" trade creation (substitution effect) of USD 1.6 billion (i.e. 4.427% of the GDP for 1980, which was USD 36,766,498,000, or about 20.789% of the average total trade flows for that year:

$$\text{total average trade flows} = \frac{\text{total export} + \text{total imports}}{2}.$$

Most of this trade creation was internal (86% of the trade creation as a whole) while the majority of trade diversion was external (84% of the full amount of trade diversion), which is a "normal" result being in accordance with customs union theory.

3. THE DYNAMIC EFFECTS OF GREECE'S ENTRY INTO THE EU

In Section 2, static effects – i.e. changes in prices that took place after integration – were examined. In this section an attempt will be made to ascertain the dynamic impact of Greek entry into the EU. Dynamic effects come from changes in the degree of competition and the amount of monopoly power, exploitation of economies of scale, usage of outside economies, improvements in the rate of technological change, increases in investment and possible reductions in investment risk and uncertainty.

Other results (ones cannot be so readily classified within these two categories) are the elimination of supply bottlenecks, and the abandonment of national policies of small-firm protection as well as stepped up technological contacts (see Tsounis 1999, pp. 246–249 for a review of the impact of economic integration).

An attempt will be made here to study one aspect of these dynamic effects: the changes in relative efficiency caused by increased competition and the ability to exploit economies of scale. For this purpose an *ex-ante* model will be used, based on data for the year before integration.

3.1. The model

To examine the dynamic effects of economic integration on each sector of a region that is about to integrate, the "normal" products of the sectors of a region now integrated are compared with the "normal" products emanating from the sectors of an individual country with *no* economic integration (Sakamoto 1969, p. 284). These "normal" products are functions of regional income, the market size and the level of efficiency of a sector in terms of the economy's overall efficiency (Chenery 1960, p. 630; UN 1963, pp. 3–6). The "normal" products for the economy as a whole and for various sectors individually of a country are given by:[7]

$$V_{Tj} = A_T Y_j^{a_T} P_j^{b_T} ; \quad j = 1,...,m \tag{1}$$

$$V_{ij} = A_i Y_j^{a_i} P_j^{b_i} D_{ij}^{c_i} ; \quad j = 1,...,m, \; i = 1,...,n \tag{2}$$

where the subscripts T, j and i denote all sectors of economy j taken together, country j and sector i, respectively. Variables V, Y, P and D denote gross value added, per capita income, population, and the relative rate of efficiency. The relative rate of efficiency is defined as the efficiency of a sector in terms of the overall efficiency of the economy (a full description of the variables and the method of calculation of the relative efficiency variable is given in Section 3.2). A is a constant term, while a, b and c are elasticities. Thus, a_i is the income elasticity of the value added of sector i, b is the population elasticity of the value added of sector i, and c is the elasticity of the value added of sector i with regard to the sector's relative degree of efficiency. The value added variable was made use of as it was seen as a more appropriate measure than gross output for summing up an industry's relative importance (both compared with other industries and in the context of the national economy as a whole). However, experimentation has been made with the use of gross output as dependent variable, and it was found that the (adj R^2) and the statistical significance of the independent variables were lower.

Let us assume now that a region R is made up of two blocks: the nine EU countries and Greece, with per capita incomes $Y_{EU} = (\Sigma_j Y_j P_j)/(\Sigma_j P_j)$; $j = 1,\ldots,9$ and Y_{GR}, and population $P_{EU} = \Sigma_j P_j$; $j = 1,\ldots,9$ and P_{GR} respectively.

Equations (1) and (2) express relationships – given income, population and relative efficiency – with which it is possible to determine the "normal" product

[7] The model used here was developed by the UN (1963) and Sakamoto (1969) and refined by Katos (1982). A full description and explanation of equations 1–6 is given in Katos (1982, pp. 88–89).

of the different sectors. So we are able to refer to the two regions' integration as beneficial according to a Pareto criterion, i.e. as being a "situation … in which the regional product of at least one of the branches is larger than the sum of the respective products of the two countries [regions], and where the regional product of the remaining branches is not smaller than the sum of the two countries' [regions'] products" (Sakamoto 1969, p. 285). Consequently, if we observe that integration for some sectors yields a larger amount of product but at the same time the products of the remaining branches become smaller, then no judgement can be made about the *complete* effects of the integration on *all* sectors.

To formalise the above, the "normal" equations pertaining to each block, in our case of the EU-9 and Greece, corresponding to sector i of the economy, would be:

$$V_{\mathrm{iEU}} = A_i\, Y_{\mathrm{EU}}^{a_i}\, P_{\mathrm{EU}}^{b_i}\, D_{\mathrm{iEU}}^{c_i} \tag{3}$$

$$V_{\mathrm{iGR}} = A_i\, Y_{\mathrm{GR}}^{a_i}\, P_{\mathrm{GR}}^{b_i}\, D_{\mathrm{iGR}}^{c_i}\,. \tag{4}$$

Let us assume now that Greece joins the EU. The per capita income of the ten countries will be $Y_{\mathrm{R}} = (\Sigma_{\mathrm{j}}\, Y_{\mathrm{j}} P_{\mathrm{j}})/(\Sigma_{\mathrm{j}} P_{\mathrm{j}})$; $j = 1,\ldots,10$ and the population of the region $P_{\mathrm{R}} = \Sigma_{\mathrm{j}} P_{\mathrm{j}}$; $j = 1,\ldots,10$. The "normal" equations for each i sector of the region would then be:

$$V_{\mathrm{iR}} = A_{\mathrm{i}}\, Y_{\mathrm{R}}^{a_i}\, P_{\mathrm{R}}^{b_i}\, D_{\mathrm{iR}}^{c_i}\,. \tag{5}$$

According to the above, integration would be beneficial for the i sector if $V_{\mathrm{iR}} > V_{\mathrm{iEU}} + V_{\mathrm{iGR}}$, and it would not be beneficial if $V_{\mathrm{iR}} < V_{\mathrm{iEU}} + V_{\mathrm{iGR}}$. Alternatively, an "integration index" can be defined as:

$$I_{\mathrm{i}} = \frac{V_{\mathrm{iR}}}{V_{\mathrm{iEU}} + V_{\mathrm{iGR}}} \tag{6}$$

for each sector i (Sakamoto 1969; Katos 1982). If $I_{\mathrm{i}} > 1$, integration is beneficial for sector i, yet if $I_{\mathrm{i}} < 1$, integration will be adverse for sector i. It has been noted, however, that the "integration index" indicates only whether integration will be beneficial or not for a specific sector i, and no conclusion can be derived for all the sectors taken together if in some of them I_{i} is greater than unity and in some others it is less than unity. Additionally, we should note that the analysis here is only applicable if the "normal" equations are a good approximation of the *actual* products of a country's different sectors. Otherwise, the results will be subject to overestimation or underestimation.

3.2. The estimation procedure

To assess the "normal" products coming from equations (3), (4) and (5), coefficients a_i, b_i and c_i need to be estimated first. This can be done by estimating equations (1) and (2) in a double logarithmic form. Estimation of (1) is necessary to work out the D_{ij} variable.

V_{Tj}^* is the total gross value added to producers' prices for economy j in 1980 in ECU; $j = 1,\ldots,9$[8]; Y_j is the per capita income for 1980 in economy j in ECUs and in purchasing power parities (PPP)[9]; and P_j is the whole population of economy j for the same year. Variable D_{ij} is the relative efficiency of the ith sector of economy j; it has been calculated as $D_{ij} = R_{ij}/E_j$, where the efficiency variable E_j of the jth economy is defined as the ratio of the actual over "normal" values of V_{Tj}, i.e., $E_j = V_{Tj}^*/V_{Tj}$ (the asterisk indicates existing values). R_{ij} is the efficiency variable of sector i of the jth economy defined as the ratio of the actual over the "normal" values of V_{ij}, i.e. $R_{ij} = V_{ij}^*/V_{ij}$.

The explanatory power of the independent variables is very high, as can be seen from the high (adj R^2) coefficients: for all sectors they are over 0.95.

The income coefficients can be termed as growth elasticities rather than income elasticities for in the long term, with a rising income, factor proportions as well as demands will vary. Similarly, the population coefficients are market-size elasticities, representing the effects of the increase in market size.

The relative efficiency variable was introduced into the model to capture the effects of the changes in the relative efficiency of a sector as regards its output. It is interesting to note that the introduction of the relative efficiency variable left unchanged the values of the regression coefficients of the other two explanatory variables and also of the constant terms of equation (2), although it improved their t-statistic value. Thus, it can be seen as a "correctional" term in the equation in the sense that it is used to increase the estimates' stability and to capture some of the unexplained part of the dependent variable. This is because its t-values for all sectors are high (in 26 sectors being significantly different from zero in a statistical sense with a 5% significance level, and for the remaining 3 with a 10% significance level). Its calculated coefficient can be interpreted as the relative efficiency elasticity of output displaying the effects of a percentage change of the efficiency of a sector relative to the economy's overall efficiency

[8] The data for Luxemburg are included in the data for Belgium.

[9] PPPs were used for the conversion of the per capita income in ECU, for this way the calculated per capita income of Greece and of the other EU countries with a different level of development would be more comparable (Officer 1976).

given a certain percentage change in output (the other variables remaining unchanged).

The population variable was the statistically most significant variable, being for all sectors very different from zero at a 1% level of significance. It can be observed that for the tobacco (314), wood products and furniture (331, 332), paper (341), chemicals (351, 352), plastic products (356), glass and non-metallic minerals (361, 369), and metal products and machinery (381, 382, 383) sectors the population (size) elasticity is close to unity. This shows a constant relation between the changes in the sectors' products caused by population changes within these sectors.

Agricultural (100), food and beverages (311, 313), printing and publishing (342) and professional and scientific equipment (385) sectors have a population elasticity that is less than unity, showing us that production growth in these sectors is not keeping pace with market-size increases. This result may seem surprising for sectors 342 and 385, as one would expect a population elasticity of at least 1 for these sectors. However, the same result was obtained for the year 1979: sector 342 had a population elasticity of 0.677 and sector 385 a population elasticity of 0.858, both of them being, in a statistical sense, extremely different from zero at a 1% significance level.

On the other hand, the textiles, clothes and footwear (322, 323, 324), petroleum refineries (353), rubber products (355), pottery (361), iron, steel and other metals (371, 372) and transport equipment (384) sectors have a population elasticity of greater than 1. These sectors will thus benefit from an expansion of the size of the market on its own (other independent variables being unchanged) after the two regions' integration – and their relative positions in the economy will improve.

Regarding the growth (income) elasticities, six sectors (agriculture (100), textiles (321), wearing apparel (322), leather products (323), footwear (324) and pottery (361)) have one with negative growth. This shows that the agriculture and textile industries have lessening importance in the growth of the region's economies. It may also reflect the fact that, in the EU, the notion of economic growth is tightly related to the growth of heavy industry sectors. The growth elasticity values demonstrate the changes in the economic structure of a region. The highest growth elasticity is that for the professional and scientific equipment (385) sector; others with those of high growth are the printing and publishing (342), industrial chemicals (351), iron and steel (371) and machinery (381, 382, 383) sectors. All growth coefficients are in a statistical sense significantly different from zero at a 5% level of significance at least – apart from the coefficients of the sectors 314, 322, 324 and 372, which are significant at a 10% level.

3.3. Results

In *Table 4* the "integration index" calculated from (6) and the "normal" products for each sector of the nine EU countries and Greece before integration and of the EU 10 after integration are shown.

We can see that integration will not be beneficial for all sectors since the sectoral integration indexes are not all higher than unity: 19 sectors are found to have $I_i > 1$ and 10 sectors $I_i < 1$. Thus, no general statement can be made as to whether the integration of Greece with the EU was beneficial or not according to the Pareto criterion given in Section 3.1. We can only look at whether integration was beneficial for each sector *individually*. An examination of the first column of *Table 4* indicates that integration would be beneficial for sectors 100, 311, 382, 324, 323, 385, 354, 372, 390, 313, 383, 321, 371, 362, 351, 332, 356, 341 and 352, while for the remaining sectors it was not advantageous. The highest integration index can be seen with agriculture; high index values also pertain to the food products (311), machinery – except electrical (382), footwear – except rubber or plastic (324) and leather products (323) sectors. It should be noted, though, that all integration indices are within the range of 0.98 and 1.02, with the majority of them being very close to unity, this showing that the integration of Greece – a small country – into the EU should not have been expected to have a dramatic impact on the total output of the region as regards products.

Even though, as mentioned above, not all sectors have integration indices that are greater than unity, i.e. no statement can be made about an increase or decrease of welfare, it was tempting to calculate the integration index for all sectors via summing up the "normal" products emanating from each and every sector. The average integration index for all sectors had a value of 1.00586, showing that Greek entry into the EU led to a marginal *increase* in the region's product output. Furthermore, in *Table 4* the relative efficiencies of the EU are reported with and without the integration of Greece, and in the third column the ratio of the relative efficiency of the EU with Greece to the relative efficiency of the EU without Greece is reported in connection with each sector.

The relative efficiency index shows the position of the relative efficiency of a sector within the overall efficiency of the economy. A value of the ratio D_{ir}/D_{is} being greater than 1 tells us that the sector improved its position relative to other sectors after the country's EU accession. The values of the ratios of the relative efficiencies range from 0.96 to 1.04. The entry of Greece into the EU marginally improved the position of 16 sectors, while it worsened that of 13 sectors.

4. CONCLUSION

The purpose of this paper was to give further estimates of the static effects (a change in relative prices) and one aspect of the dynamic effects (a change in relative efficiency) of Greece's accession to the EU on trade and welfare. It was additionally to come up with a tool with which one might assess the impact of the CEECs' EU entry.

There are certain similarities between pre-accession Greece and the CEECs. *Table 5* presents a comparison between the pre-accession Greek economy and the economies of the candidate CEECs in terms of size relative to the EU, openness of the economy, competitiveness relative to the EU and level of tariff protection. First, both Greece and the CEECs (excluding Poland) are characterised as "small" countries in relative to the EU. At the time of accession Greece occupied only 6.8% of the EU's territory and had only 2.98% of the EU's population. Most of the CEECs would occupy less than 4% of the EU territory and have 3.5% of the EU's population (excluding Poland and Romania). Furthermore, Greece was "small" also in respect of the economic meaning of the word, since it produced about 1.5% of the EU's GDP. The same applies to all CEECs, which produce less than 1% of the total EU GDP (excluding Poland). Apart from being "small", Greece was also an open economy with a pre-accession degree of openness of about 35%. All CEECs (excluding Poland and Romania) are open economies with a degree of openness exceeding in some cases 50% of GDP.

In terms of competitiveness relative to the EU, the pre-accession Greek economy had about the same level of competitiveness as the Czech Republic, Hungary, Slovakia, Estonia and Poland. Finally, the level of tariff protection in the pre-accession Greek economy is about the same as the level of tariff protection in Hungary, Poland, Romania, Latvia and Lithuania. Yet it should be noted that this calculated average tariff rate both in the case of the pre-accession Greek economy and the economies of the CEECs comes from tariffs imposed on imports from third (i.e. non-EU) countries. The average tariff protection for imports from the EU (then EEC) countries was about 7% (Tsounis 1998a, p. 33), while about 60–65% of the CEECs' total trade conducted with the EU is duty-free today (Mortensen – Richter 2000, p. 21). Given that the average tariff rate of the EU countries for imports from non-EU countries is 6.7% (World Bank 2001), most of the CEECs will have to harmonise their tariffs imposed on imports from non-EU countries with the Common External Tariff system (CET) of the EU, which can be expected to cause trade creation. Of course, one should also examine the distribution of tariffs among the various sectors, which might be quite different from the distribution of tariffs according to the CET. The above similarities between the pre-accession Greek economy and the economies of the

candidate CEECs may justify this paper's argument that Greece's course towards EU integration could highlight the path for the successful accession of new applicants with similar economies to that of Greece had, relative to the EU.[10] Yet caution is needed when comparisons are made between economies at different points in time and especially when the comparisons are made using indicators that concern the whole of the economy with no particular analysis of individual/different sectors *(Table 5)*.

Regarding the first objective of the paper, it is difficult to come up with an overall evaluation of the effects of the accession of Greece to the EU because some consequences cannot be quantified (changes in the legal framework, limitations on the types of policy Greek governments can or cannot implement). Other effects are also difficult to estimate (e.g. the competitive position of Greek products on international markets).

Nevertheless, an attempt has been made here to examine static effects/one dynamic effect of the country's EU entry. For the static effects, a "shares in apparent consumption" approach was used and (with the stated assumption that the only cause of change in domestic production shares, imports from members and non-members in apparent consumption was the customs union's arrival) we can see that there was a "net" trade creation of about USD 1.6 billion (about 4.427% of the GDP of 1980). As indicated above, 86% of this trade creation was internal, and 84% of total trade diversion was external.

In the last section of this paper the dynamic effects of the entry of Greece into the EU with regard to changes in relative efficiency were examined, using an *ex-ante* model. The results found by the application of this model in respect of Greek entry into the EU suggest that entry had mixed effects in the region's different sectors. Integration was beneficial for two-thirds of the examined sectors. In general, the integration indices were very close to unity, indicating that the dynamic effects of the entry of the country into the EU have been minimal – something that was to be expected, however, since Greece is a small country relative to the EU.

[10] Further justification for the argument that candidate CEECs can learn from the experience of Greek accession to the EU, and a comparison of the pre-accession Greek economy with the economies of the candidate CEECs is provided in Nagy (1999, pp. 407–411).

APPENDIX

Description of sectors

ISIC	Description
100	Agricultural products
311	Food products
313	Beverages
314	Tobacco
321	Textiles
322	Wearing apparel, except footwear
323	Leather products
324	Footwear, except rubber or plastic
331	Wood products, except furniture
332	Furniture, except metal
341	Paper and paper products
342	Printing and publishing
351	Industrial chemicals
352	Other chemicals
353	Petrolium refineries
354	Misc. petrolium and coal products
355	Rubber products
356	Plastic products
361	Pottery, china, earthware
362	Glass and glass products
369	Other non-metallic mineral products
371	Iron and steel
372	Non-ferrous metals
381	Fabricated metal products
382	Machinery, except electrical
383	Machinery electric
384	Transport equipments
385	Professional/scientific equipments
390	Other manifactured products

Table 1

Pattern of shares

Sign of the change in the share of	Domestic	Partners	Non-Partners
1. Double trade creation (internal/external)	–	+	+
2. Internal trade creation and external trade diversion	–	+	–
3. External trade creation and internal trade diversion	–	–	+
4. Double trade erosion (external/internal)	+	–	–
5. Internal trade diversion and internal trade erosion	+	–	+
6. External trade diversion and external trade erosion	+	+	–

Source: Truman (1969 p. 205, 1975, p. 5).

Table 2

Patterns (signs) of change of the shares of expenditure in "apparent consumption"

ISIC[11]	Domestic	EU partners	Non-EU members
100	–	+	+
311	–	+	–
313	–	+	+
314	–	+	0
321	–	+	+
322	–	+	+
323	–	–	+
324	–	+	+
331	–	+	+
332	–	+	+
341	–	+	+
342	+	+	–
351	–	–	+
352	–	–	+
353	–	+	+
354	–	–	+
355	–	+	–
356	–	+	+
361	–	+	+
362	–	+	+
369	–	+	+
371	–	+	–
372	–	+	–
381	–	+	–
382	–	+	–
383	–	+	–
384	+	+	–
385	–	+	–
390	+	–	–

[11] A description of the sectors is given at the beginning of the Appendix.

Table 3

Value of the change of shares of expenditure in "apparent" consumption over the pre- and post-integration periods
(in USD, in 1980 prices and 1980 exchange rates)

	Trade creation[12]		Trade diversion		Trade erosion	
ISIC	Internal	External	Internal	External	Internal	External
100	795445702			197319864		
311	85929150			3736050		
313	7024701	8429641				
314	9796756					
321	220362268	7598699				
322	71499356	7606314				
323		11487980	3473110			
324	12865363	7602260				
331	5357793	26301894				
332	8241434	2392674				
341	17012934	11341956				
342						1514727
351		46378393	37945958			
352		74659527	17498327			
353	12309246	46159672				
354		53460657	8161932			
355	12870126			4756351		
356	17100990	9500550				
361	3644438	2939063				
362	11276816	10525028				
369	18748002	852182				
371	469306737			74817016		
372	41683947			7204633		
381	19376780			11072446		
382	106634485			28709284		
383	71987768			9162080		
384						307741981
385	10829099			9342752		
390					2179352	4358704
Sum	2029303891	327236490	67079327	346120476	2179352	313615412

Trade creation	Trade diversion	Trade erosion
2356540381	413199803	315794764

"Net" trade creation:[13] 1627545814

[12] The definitions of internal and external trade creation, trade diversion and trade erosion are given in Section 2.1 and they are summarised in *Table 1*.

[13] "Net" trade creation = (total trade creation – trade diversion – trade erosion).

Table 4

Dynamic effects of integration
(in USD, in 1980 prices and 1980 exchange rates)

ISIC	Integration index	V_{is} EU-9	V_{ir} EU-10	V_{ih} Greece	D_{ir} EU-10	D_{is} EU-9	D_{ir}/D_{is}
100	1.02162	50,024,202,101	55,563,304,206	4,363,245,489	1.436	1.390	1.03337
311	1.02008	67,227,494,294	69,376,498,976	783,347,673	2.048	1.999	1.02480
313	1.00481	15,172,703,067	15,433,654,756	187,032,885	1.444	1.442	1.00171
314	0.99807	7,986,723,389	8,078,529,076	107,407,225	1.216	1.231	0.98826
321	1.00274	20,618,576,261	21,489,066,961	811,812,045	0.757	0.761	0.99409
322	0.99927	12,229,799,131	12,617,033,477	396,496,977	0.693	0.704	0.98453
323	1.00738	2,463,500,236	2,565,347,146	83,063,407	0.576	0.590	0.97663
324	1.01100	4,351,405,437	4,491,537,327	91,274,690	0.531	0.549	0.96667
331	0.99861	8,226,311,517	8,408,718,004	194,145,579	1.008	1.007	1.00107
332	1.00174	10,074,212,574	10,213,360,282	121,410,894	1.190	1.169	1.01801
341	1.00128	11,869,377,507	11,986,196,491	101,502,952	1.042	1.032	1.00958
342	0.99826	19,457,690,330	19,600,894,476	177,461,117	1.663	1.620	1.02609
351	1.00198	27,003,537,844	27,206,658,642	149,258,617	1.207	1.181	1.02147
352	1.00007	19,869,618,031	20,123,645,724	252,569,251	1.111	1.121	0.99182
353	0.99554	18,330,686,116	18,379,991,273	131,679,773	0.394	0.406	0.97099
354	1.00634	1,757,662,829	1,800,141,075	31,145,681	3.239	3.148	1.02877
355	0.99157	5,790,908,404	5,798,612,962	56,979,726	0.528	0.544	0.97156
356	1.00156	11,320,080,035	11,514,548,669	176,511,133	1.097	1.094	1.00224
361	0.99911	3,380,453,027	3,431,704,963	54,325,464	0.647	0.672	0.96290
362	1.00228	5,593,861,595	5,643,965,396	37,247,273	1.146	1.147	0.99920
369	0.99883	17,337,032,461	17,707,020,338	390,687,954	1.112	1.111	1.00069
371	1.00256	30,286,561,204	30,525,917,990	161,488,344	0.423	0.427	0.98955
372	1.00538	7,608,153,627	7,825,463,120	175,459,741	0.451	0.455	0.99058
381	0.99993	32,256,826,466	32,669,302,155	414,657,347	1.132	1.120	1.01106
382	1.01300	67,609,657,553	68,617,256,671	127,233,052	1.483	1.442	1.02849
383	1.00384	49,365,032,606	49,810,501,269	254,858,113	0.901	0.894	1.00758
384	0.98286	29,629,075,484	29,521,036,212	406,887,478	0.571	0.577	0.98917
385	1.00698	9,778,476,281	9,854,233,487	7,442,649	1.853	1.779	1.04168
390	1.00487	5,954,196,108	6,040,739,692	57,239,120	1.580	1.552	1.01778

Table 5

Comparison between pre-accession Greece and the CEECs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Greece[14]	6.8	2.98	1.50	35,27	22.34	34	14.8
Bulgaria	3.5	2.19	0.14	36.39	24.23	25	…
Czech Republic	2.5	2.74	0.64	51.07	41.09	58	7.2
Estonia	1.5	0.38	0.06	55.44	59.09	37	1.2
Hungary	2.9	2.68	0.56	47.81	45.35	58	14.4
Latvia	2.2	0.65	0.08	35.53	25.32	27	10.7
Lithuania	2.1	0.99	0.12	36.11	19.67	30	9.2
Poland	9.8	10.30	1.82	24.24	16.58	38	18.4
Romania	7.5	5.98	0.41	25.73	20.38	32	16.7
Slovakia	1.5	1.44	0.23	54.54	32.30	53	…
Slovenia	0.7	0.53	0.23	46.14	36.92	71	…

Notes:

(1) Area as percentage of total EU area; data from Eurostat (2001a),
(2) Population as percentage of total EU population; data from Eurostat (2001a),
(3) GDP in 1999, as percentage of the EU GDP; data from Eurostat (2001a),
(4) Openness of the economy for 1999 measured as half the sum of total exports and imports in percentage of GDP (Eurostat 2000, p. 2).
(5) Openness of the economy for 1999 measured as half the sum of total exports to EU countries and total imports from the EU in percentage of GDP; data from Eurostat (2001b)
(6) Competitiveness in terms of labour productivity in 1998; EU=100; indexes from Stapel (2001, p. 6)
(7) Average level of tariff protection in 1997 (calculated as the simple average of applied rates for all products subject to tariffs); tariff rates from World Bank (2001).
... Index is unavailable.

REFERENCES

Allen, P. – Gasiorek, S. – Smith, A. (1996): Trade Creation and Trade Diversion. *The Single Market Review Series*, Luxembourg: European Communities.

Balassa, B. (1963): Economic Integration: Problems and Issues. *American Economic Review*, 53: 175–184.

Balassa, B. (1967): Trade Creation and Trade Diversion in the European Common Market. *Economic Journal*, 77: 1–21.

Balassa, B. (1975): Trade Creation and Diversion in the European Common Market: An Appraisal of Evidence. In: Balassa, B. (ed): *European Economic Integration.* Amsterdam: North-Holland, pp. 79–118.

[14] The indices for Greece refer to the year before the country's accession to the EU and were taken from Giannitsis (1988) and Tsounis (1998a).

Clavaux, F. J. (1969): The Import Elasticity as a Yardstick for Measuring Trade Creation. *Economia Internazionale*, 22: 602–612.
Chenery, H. B. (1960): Patterns of Industrial Growth. *American Economic Review*, 50: 624–654.
Eurostat (2000): *Balance of Payments.* Statistics in Focus, Economy and Finance. Luxemburg.
Eurostat (2001): *Yearbook, the Statistical Guide to Europe.* Luxemburg.
Eurostat (2001): *The 13 Candidate Countries' Trade with the EU.* Statistics in Focus, External Trade. Luxemburg.
Giannitsis, T. (1988): *Accession to the EEC and Effects on Industry and Trade.* Athens: Foundation for Mediterranean Studies.
Katos, A. V. (1982): Portugal, Spain and Greece: On the Dynamic Effects of Joining the EEC. *Journal of Economic Studies*, 7: 87–98.
Kreinin, M. E. (1969): Trade Creation and Trade Diversion by the EEC and the EFTA. *Economia Internazionale*, 22: 279–283.
Mattas, K. – Tzouvelekas, V. (1999): The Impact of EU Membership: Lessons from the Greek Experience. *Economia Internazionale*, 52: 173–181.
Mortensen, J. – Richter, S. (2000): *Measurement of Costs and Benefits of Accession to the European Union for Selected Countries in Central and Eastern Europe.* Research Report No. 263, The Vienna Institute for International Economic Studies.
Nagy, A. (1999): Lessons Drawn from the EU Accession of three South European States and its Effects on their Foreign Trade. *Acta Oeconomica*, 50: 385–415.
Officer, C. H. (1976): *The Purchasing Power Parity Theory of Exchange Rates: A Review Article.* IMF Staff Papers, 23: 1–60.
Plummer, M. G. (1991): Ex-Post Empirical Estimates of the Second Enlargement: The Case of Greece. *Weltwirtschaftliches Archiv*, 127: 171–181.
Polychronopoulos, G. (1994): The Society of Services and New Development Prospects of Greece into the European Union and Balkan Region. International Conference "Greece: Prospects for Modernisation", organised by LSE and University of Athens, 17–19 November 1994, London.
Sakamoto, T. (1969): Industrial Development and Integration of Underdeveloped Countries. *Journal of Common Market Studies*, 73: 283–304.
Sellekaerts, W. (1973): How Meaningful are Empirical Studies on Trade Creation and Diversion? *Weltwirtschaltliches Archiv*, 109: 519–553.
Siskos, E. (1998): *Black Sea Economic Cooperation: Problems and Prospects*. Athens: Papazissis Publishers. (in Greek)
Stapel, S. (2001): *Value Added, Employment, Remuneration and Labour Productivity in the Candidate Countries.* Luxemburg: Eurostat.
Truman, E. M. (1969): The European Economic Community: Trade Creation and Trade Diversion. *Yale Economic Essays*, 9: 201–257.
Truman, E. M. (1975): The Effects of European Economic Integration on the Production and Trade of Manufactured Products. In Balassa, B. (ed.): *European Economic Integration*. Amsterdam: North Holland, pp. 3–39.
Tsounis, N. (1992): The Effects of European Economic Integration on the Greek Economy and the Pattern of Greek International Trade. Unpublished Ph.D. Thesis, University of Manchester.
Tsounis, N. (1998a): The Greek Experience of the Change in Tariff Structure due to the Accession to the EEC on Resource Allocation and Comparative Advantage. Chapter 2 in Tsounis, N. (ed.): *Accession to the EU, Tariff Protection and Trade: the Case of Bulgaria, Hungary and the Czech Republic*. Athens: Papazissis Publishers, pp. 32–58.
Tsounis, N. (1998b) (ed.): *Accession to the EU, Tariff Protection and Trade: the Case of Bulgaria, Hungary and the Czech Republic.* Athens: Papazissis Publishers.

Tsounis, N. (1999): The Static Effects of the Single Market Programme on Greek Manufacture. *Economia Internazionale*, 52: 245–271.
United Nations (1963): *A Study on Industrial Growth.* New York.
Verdoorn, P. S. – van Bochove, C. A. (1972): Measuring Integration Effects: A Survey. *European Economic Review,* 3: 337–349.
World Bank (2001): *Country Reports, World Development Indicators.* World Bank Statistical Information Management and Analysis.