

***Intra- and Extra-EU IIT Patterns in Greece:
A Trend Toward De-Europeanization?***

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1. Introduction

Since the Treaty of Rome in 1957, economic integration in Europe has progressed continuously. The resulting trade liberalization and increasing economic integration within the European economic space induced a huge intra-European trade expansion over the last 45 years. Interestingly, one of the main features of early periods of European economic integration is that this trade expansion took the form of intra-industry trade (IIT) – the two-way exchange of commodities that belong in the same industry classification and exhibit similar production requirements – rather than inter-industry trade.

The early studies by Verdoorn (1960) for the BENELUX (Belgium, Netherlands, Luxembourg) customs union and Balassa (1966) for the original six members of the European Economic Community (EEC) revealed that trade among member countries took place *within* rather than *between* commodity groups. Subsequent empirical analyses confirmed the high and growing share of intra-EU IIT suggesting an upward trend in intra-industry specialization within the European Union. The motivation and importance of analyses of IIT and European economic integration lies exactly on this type of specialization. In particular, because IIT reveals intra-industry specialization it implies lower trade-induced (labor) adjustment costs to member states. “Intra-industry trade poses fewer adjustment problems than inter-industry trade” (Krugman, 1981; p. 970), and thus economic integration is less problematic for members if it entails to a large extent intra-industry specialization. In the literature, this reasoning has become known as the “smooth adjustment hypothesis”.

As the ongoing process of European economic integration is moving towards a deeper form of integration, a large number of studies on IIT are devoted to the EU (Brulhart, 1988; Brulhart and Elliott, 1998, Greenaway, etc. etc.). However, these studies take either a broad and general viewpoint of the European Union or focus exclusively on major EU-economies, such as France, Germany, Italy and the UK, whereas some “peripheral” economies, such as Greece are more or less left out from the analysis. The aim of this paper is to analyze IIT patterns for Greece and investigate the country’s experience as regards European economic integration and intra-industry specialization during her process of integration with Europe. Specifically, the main focus is on the intra-EU versus extra-EU dimension of Greece’s IIT over the 1981-2002 period, which should shed some light on the specific features and industry characteristics of these two

dimensions. This kind of analysis is particularly relevant as in recent years intra-EU trade in Greece exhibits a downward trend. As high levels of IIT imply similar economic structures between trade partners, the examination of the above-mentioned issues should give us an appreciation of whether there has been a convergence or divergence of the economic structure of Greece in relation to the EU's structure. In addition, a country-specific analysis of IIT with the central and eastern European countries is also conducted, as these countries constitute the new member states of the enlarged European Union, which obviously has important implications for the intra-EU versus extra-EU IIT development in Greece in the future.

The paper is organized as follows. In section 2, the theoretical and empirical background of intra-industry trade is presented. In section 3, we analyze intra-EU and extra-EU IIT patterns in Greece over the 1981-2002 period. Section 4 examines Greece's IIT trends with the new member states of the EU, and section 5 points out the main findings and concludes.

2. Theoretical and Empirical Background of Intra-Industry Trade

Since traditional comparative advantage models of international trade and specialization¹ are incompatible with IIT, they have long been criticized as an insufficient theoretical framework, which does not capture a considerable part of forces that are crucial in shaping and explaining trade patterns (Grubel, 1967 and 1970; Hufbauer and Chilas, 1974). The empirical observation that since the post-war period IIT shares are consistently growing, manifested the need for the development of alternative trade theories and stimulated the research on various theoretical and empirical issues of IIT.

As a response to that fact, in the 1980's and 1990's we saw developments in trade and location theory, which have been labelled as the "new" theories of trade and economic geography. The models by Krugman (1979; 1980; 1981), known as the "new trade theory", showed formally for the first time that scale economies and product differentiation could be a basis and source of international trade and aggregate welfare gains.

¹ Ricardo (1817); Heckscher (1919); Ohlin (1933).

In the traditional neo-classical trade theory, international trade and specialization is driven by national differences in technologies and relative factor endowments. In this setting, economic integration leads to inter-industry trade and thus inter-industry specialization. On the other hand, the “new trade theory” incorporates industry-specific characteristics such as economies of scale, differentiated goods, imperfect competition, trade costs, and draws attention to domestic market size. In this case, economic integration can induce inter-industry or intra-industry specialization, depending on the importance of scale economies and trade costs. As trade costs fall towards zero, IIT diminishes and the increasing returns industry tends to concentrate in the large market (the core country).

Economic integration may have serious implications for the industrial structure of trading economies if it leads to inter-industry specialization. As already mentioned, the “smooth adjustment hypothesis” postulates that IIT is associated with lower adjustment costs than inter-industry trade is. In general, adjustment costs emerge when markets fail to clear quickly in response to changes in prices or in demand and supply conditions. In the present context, trade-induced adjustment costs can arise from the imperfect substitutability of labour and wage rigidities, which both lead to incomplete adjustment (Neary, 1985). Thus, adjustment costs represent phenomena, such as the unemployment caused by trade liberalization and the cost of switching workers from the contracting import sector to the expanding export sector of the economy. In (neo-classical) theory, adjustment costs are temporary because the necessary “adjustment” takes place in the short-run. In practice, however, the adjustment process may be long-run orientated because of the inflexibilities and rigidities mentioned previously, which cause unemployment to be present also in the longer-run.

What can be deduced from the theoretical literature on international trade is that IIT will prevail among large industrialized countries with similar relative factor endowments, production technologies and demand structures, where comparative cost advantage considerations play a minor role. In addition, we would expect that the re-allocation of resources, as a result of economic integration among similar countries, would take place within industries, causing thus lower adjustment pressures. Indeed, the empirical evidence points to the fact that a large part of world trade takes place between high-income countries with similar economic structures, where intra-industry specialization prevails to a large extent (OECD, 2002). As it can be seen from Table 1, there has been an upward trend in intra-industry trade in most economies over the last decade (IIT rose

Table 1. Manufacturing IIT as a % of total manufacturing trade, 1988-2000

	1988-91	1992-95	1996-2000	Change
<i>High and increasing IIT</i>				
Czech republic	n.a.	66,3	77,4	11,1
Slovakia	n.a.	69,8	76,0	6,2
Mexico	62,5	74,4	73,4	10,9
Hungary	54,9	64,3	72,1	17,2
Germany	67,1	72,0	72,0	5,0
United States	63,5	65,3	68,5	5,0
Poland	56,4	61,7	62,6	6,2
Portugal	52,4	56,3	61,3	8,9
<i>High and stable IIT</i>				
France	75,9	77,6	77,5	1,6
Canada	73,5	74,7	76,2	2,7
Austria	71,8	74,3	74,2	2,4
United Kingdom	70,1	73,1	73,7	3,6
Switzerland	69,8	71,8	72,0	2,2
Belgium/Luxembourg	77,6	77,7	71,4	-6,2
Spain	68,2	72,1	71,2	3,0
Netherlands	69,2	70,4	68,9	-0,3
Sweden	64,2	64,6	66,6	2,4
Denmark	61,6	63,4	64,8	3,2
Italy	61,6	64,0	64,7	3,1
Ireland	58,6	57,2	54,6	-4,0
Finland	53,8	53,2	53,9	0,1
<i>Low and increasing IIT</i>				
Korea	41,4	50,6	57,5	16,1
Japan	37,6	40,8	47,6	10,0
<i>Low and stable IIT</i>				
New Zealand	37,2	38,4	40,6	3,4
Turkey	36,7	36,2	40,0	3,3
Norway	40,0	37,5	37,1	-2,9
Greece	42,8	39,5	36,9	-5,9
Australia	28,6	29,8	29,8	1,2
Iceland	19,0	19,1	20,1	1,1

Note: Countries are classified as having “high” or “low” level of intra-industry trade according to whether intra-industry trade is above or below 50 % of total manufacturing trade on average over all periods shown and “increasing” or “stable” according to whether intra-industry trade increases by more than 5 percentage points between the first and last periods, as shown in the final column.

Source: OECD (2002), p. 161.

significantly in nearly all OECD countries also between 1970 and 1990; OECD, 1994). In particular, the industrialized and high-income OECD countries, as well as some transition economies such as the Czech Republic, Slovakia and Poland, exhibit very high levels of manufacturing IIT. Notably, for the majority of OECD economies, “the extent of intra-industry trade is typically much higher across categories of manufactured goods than it is across trade in non-manufactured goods, and highest for the more sophisticated manufactured products such as chemicals, machinery and transport equipment, electrical equipment and electronics. This is because sophisticated manufacturing products are more likely to benefit from economies of scale in production and are easier to “differentiate” to the final consumer, and so facilitate trade in similar products” (OECD, 2002; pp. 160-161).

As regards the IIT development within the European Union, the accumulated evidence suggests that intra-EU IIT experienced a significant upward trend in the early periods of European economic integration, whereas between the late 1970s and the late 1980s IIT levels showed to a certain extent a stagnation. Some researchers considered these results as an indication of a general declining trend in intra-EU IIT (e.g. Greenaway, 1987; Greenaway and Hine, 1991; Globerman and Dean, 1990). However, IIT levels within the EU increased significantly in the early 1990s and afterwards (Brulhart and Elliott, 1998; Fontagne et al., 1997). Brulhart and Elliott (1998) argue on statistical grounds – namely the two revisions of the SITC classification in 1978 and 1988 – that the intra-EU IIT stagnation during the 1980s, identified by some authors and to some extent by their study, “might have been influenced by changes in statistical collation” (p. 235). In conclusion, it seems that intra-EU IIT still exhibits an upward trend, albeit a less pronounced one than in early integration years, and thus it could be argued that so far adjustment pressures within the European Union are not very large.

3. Intra-EU versus Extra-EU IIT Patterns in Greece

3.1. Methodology

The purpose of the analysis of intra-EU and extra-EU IIT patterns in Greece is to investigate the trends and characteristics of intra-regional and extra-regional IIT over the 1981-2002 period, which coincides with Greece’s period of European economic

integration.² Because the focus is on these two dimensions of intra-industry trade in Greece, this analysis is an industry-specific examination of Greece's IIT, and bilateral IIT relations – either for individual EU countries or non-EU countries – are not investigated.³ More specifically, the European Union is treated as one economy (partner), where trade flows between the fourteen EU countries and Greece are aggregated (taken together) in order to form the intra-EU dimension. Here EU refers to the EU-15 for the whole period under investigation. The same procedure is applied to the non-EU countries for the formation of extra-EU trade in Greece.

Since the extent of IIT depends crucially on the level of sectoral aggregation that is used each time (the “categorical aggregation problem”), trade data should be disaggregated at a high and reasonable level of sectoral division. Therefore, this study uses trade data that are disaggregated at the three-digit level of the Standard International Trade Classification (SITC) for the manufacturing industries (SITC sections 5-8) and at the SITC two-digit level for non-manufactures (SITC divisions 0-4 and 9). A higher level of sectoral disaggregation is used for the manufacturing industries, because, as the empirical literature suggests, IIT is more pronounced and important in manufactures. Trade data are obtained from the United Nations' COMTRADE database for the years 1981, 1986, 1991, 1996 and 2002. Intra-EU and extra-EU IIT in Greece is estimated for those years using the Grubel-Lloyd (1975) index, which is the most widely used measure of IIT in the empirical literature.

The Grubel-Lloyd (GL) index is defined as:

$$IIT = GL_i = 1 - \frac{|X_i - M_i|}{(X_i + M_i)} \quad (1)$$

where X_i and M_i are exports and imports of industry i , respectively. The GL index can be calculated for bilateral (between two countries) and multilateral (between one country and all its trading partners) trade flows, and be summed across industries after weighting by trade shares. It ranges between zero and one, where an index value of zero indicates trade in industry i to be completely of the inter-industry type, and a value of one indicates complete intra-industry trade. The GL index of IIT measures intra-

² The year 2002 is the most recent available data year for Greece.

³ However in section 4, a bilateral country- & industry-specific analysis of Greece is conducted with the central and eastern European countries, which constitute the new members of the European Union.

industry trade of a particular industry as a proportion of total trade of that particular industry. In this study, the GL indices are not adjusted for aggregate trade imbalance, as it has been shown that adjusted indices are of inferior quality compared to unadjusted indices and that there are no strong theoretical and statistical arguments for such adjustments (Kol and Mennes, 1989; Vona, 1991). In the recent literature, this approach is the standard practice.

Furthermore, our analysis of IIT is not only concerned with one time point (year), but is rather a dynamic analysis, in the sense that it examines the development of IIT patterns. Since this analysis should shed some light on the extent of IIT in different time points (evolution of IIT over time) as well as on the pattern of the change in IIT flows, the examination of the GL index over time alone is insufficient. In particular, the recent literature argues that information on the pattern of the change in trade flows, which information is particularly relevant for structural adjustment costs, cannot be revealed by the “static” GL index, and thus inter-temporal comparisons of this index are inappropriate for analyses of the structure of trade changes over time (Hamilton and Kniest, 1991; Greenaway et al., 1994; Brulhart, 1994). Instead, it is argued that some measure of marginal intra-industry trade (MIIT) is needed.

Therefore, this paper employs complementarily Brulhart’s (1994) A index of MIIT, which is based on the traditional GL index.

The A index is given by:

$$MIIT = A_i = 1 - \frac{\left| (X_{i(t)} - X_{i(t-n)}) - (M_{i(t)} - M_{i(t-n)}) \right|}{\left| X_{i(t)} - X_{i(t-n)} \right| + \left| M_{i(t)} - M_{i(t-n)} \right|} \quad (2)$$

where $X_{i(t)}$ and $M_{i(t)}$ denote exports and imports of industry i in year t , respectively, and n represents the number of years of the adjustment period.⁴ Hence, $X_{i(t)}$ and $M_{i(t)}$ represent trade flows for the end year, whereas $X_{i(t-n)}$ and $M_{i(t-n)}$ denote trade flows for the initial year of the adjustment period. This index takes values between zero and one, where a low values of the A index reflects that a country’s exports and imports in a particular industry change (increase or decrease) disproportionately, and thus marginal

⁴ Since there is no consensus on the appropriate choice of the length of the adjustment period, n is necessarily arbitrary.

(or new) trade in that industry is more of the inter-industry type. On the other hand, a high value of the A index implies that marginal trade is more of the intra-industry type.

3.2. Empirical results

Greece, who after World War II followed a strategy of economic growth that was based on import-substitution and protectionism, experienced after 1981 an opening-up of her economy and progressively entered into the European and world competition. This was a result of Greece's accession to the EEC in 1981 that led to the elimination of the external protection of the Greek industry within the European economic space.

Not surprisingly, the resulting trade liberalization and economic integration with Europe had a strong effect on Greece's trade patterns. Specifically as shown in Figure 1, after 1981 there has been a significant growth of intra-European trade flows in Greece, which is particularly pronounced in the 1981-1987 sub-period. However, during the last decade the relative importance of intra-EU trade has declined substantially. This decline has been so drastic in recent years that the share of intra-EU trade in 2002 is actually smaller than the corresponding share in 1981.

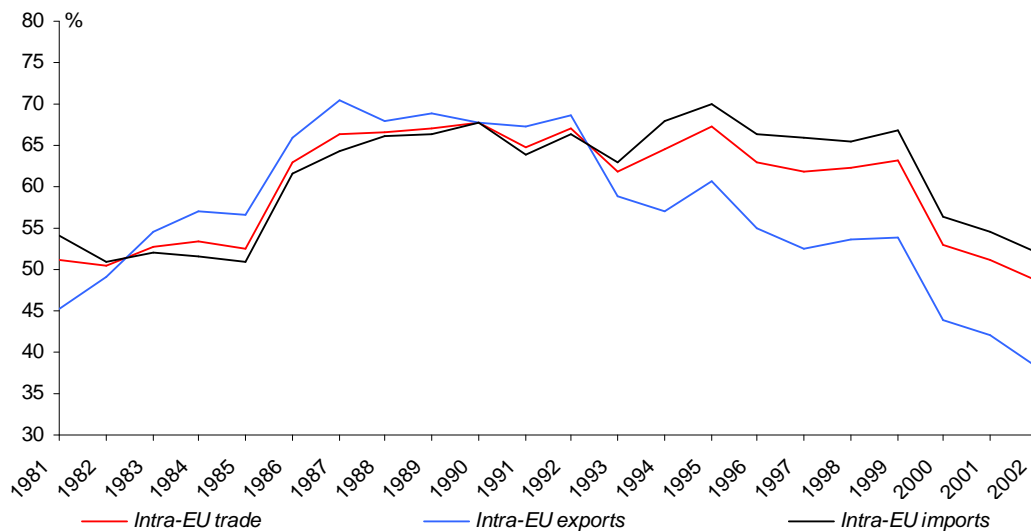


Figure 1. Intra-EU trade of Greece as a % of total trade, 1981-2002

Having looked at these broad trends, we now examine whether there exists an analogous pattern of development in intra-EU and extra-EU IIT, which is the main focus of our analysis. From Figure 2, which depicts the development of intra-EU and

extra-EU IIT in total trade in Greece over the 1981-2002 period, it is evident that intra-EU and extra-EU IIT in Greece move in different directions. The extent of Greece's IIT *outside* the EU is higher than the respective extent *within* the EU. Notably, intra-EU IIT follows a similar development with intra-EU trade in Greece in general. On the other hand, though extra-EU IIT declined in the first sub-period (1981-86), afterwards it increased dramatically. These broad trends reveal that during the first years of integration, where Greece experienced the highest intra-EU trade expansion, intra-EU IIT has increased at the expense of extra-EU IIT. In this case, Greece's IIT with non-EU countries, which was relatively more important just before and at the first year of integration, fell below the intra-EU IIT level of the year 1986.

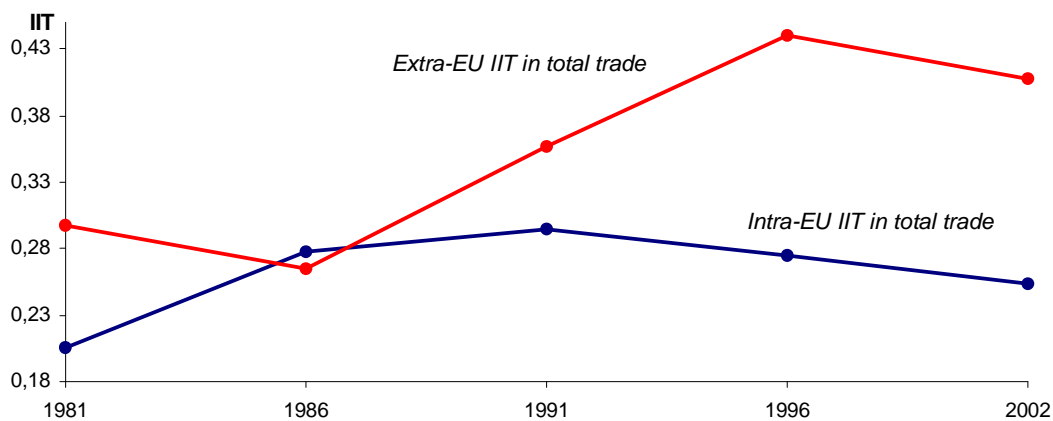


Figure 1. Intra-EU and extra-EU IIT in Greece, 1981-2002

Our analytical results for Greece's IIT patterns by industry (aggregated to SITC sections) are reported in Tables 2 and 3. From Table 2, which shows the development of intra-EU IIT in Greece, it can be seen that manufacturing IIT appears to be lower than overall IIT in Greece for the whole period under investigation. Non-manufacturing sectors exhibit consistently higher GL indices than manufacturing, especially Mineral Fuels, Crude materials, and Food and live animals with IIT shares of 78,1%, 42,6%, and 38,2% in 2002, respectively. This result runs counter to the stylized fact that manufactured goods exhibit the highest levels of IIT. Although GL indices for non-manufactures are calculated from SITC 2-digit trade statistics that may overstate to some extent the level of IIT, this finding illustrates clearly the great importance of non-manufactures in Greece's production and trade patterns, and the dissimilarity of Greece's economic structure compared with the EU's structure.

Table 2. Intra-EU IIT in Greece by industry, 1981-2002

SITC section	1981	1986	1991	1996	2002
0 - Food and live animals	0,120	0,307	0,323	0,329	0,382
1 - Beverages and tobacco	0,739	0,752	0,636	0,648	0,340
2 - Crude materials, inedible, except fuels	0,392	0,503	0,547	0,397	0,426
3 - Mineral fuels, lubricants and related mat.	0,920	0,736	0,681	0,830	0,781
4 - Animal and vegetable oils, fats and waxes	0,116	0,113	0,912	0,157	0,357
5 - Chemicals and related products	0,110	0,129	0,145	0,147	0,242
6 - Manufactured goods classified by material	0,284	0,406	0,397	0,341	0,285
7 - Machinery and transport equipment	0,059	0,084	0,080	0,129	0,121
8 - Miscellaneous manufactured articles	0,200	0,163	0,316	0,356	0,270
9 - Commodities and transactions n.e.s.	0,182	0,657	0,233	0,156	0,002
(5-8 – Manufactures)	0,174	0,226	0,238	0,239	0,213
(0-9 – All product groups)	0,206	0,278	0,294	0,275	0,254

Note: Unadjusted GL indices calculated from three-digit SITC trade data for manufactures and from two-digit SITC trade data for non-manufactures, weighted across industries.

Table 3. Extra-EU IIT in Greece by industry, 1981-2002

SITC section	1981	1986	1991	1996	2002
0 - Food and live animals	0,237	0,213	0,505	0,459	0,537
1 - Beverages and tobacco	0,023	0,202	0,360	0,253	0,301
2 - Crude materials, inedible, except fuels	0,456	0,507	0,433	0,345	0,426
3 - Mineral fuels, lubricants and related mat.	0,283	0,196	0,439	0,541	0,330
4 - Animal and vegetable oils, fats and waxes	0,129	0,081	0,499	0,772	0,860
5 - Chemicals and related products	0,676	0,605	0,454	0,501	0,449
6 - Manufactured goods classified by material	0,371	0,432	0,455	0,487	0,623
7 - Machinery and transport equipment	0,138	0,079	0,125	0,280	0,288
8 - Miscellaneous manufactured articles	0,330	0,238	0,367	0,556	0,468
9 - Commodities and transactions n.e.s.	0,245	0,036	0,025	0,002	0,825
(5-8 – Manufactures)	0,311	0,295	0,288	0,424	0,419
(0-9 – All product groups)	0,297	0,265	0,356	0,440	0,408

Note: Unadjusted GL indices calculated from three-digit SITC trade data for manufactures and from two-digit SITC trade data for non-manufactures, weighted across industries.

Furthermore, the particularly low level of manufacturing IIT also reflects this kind of dissimilarity. In 1981, Greece's intra-EU IIT in manufactures represented 17,4% of total manufacturing trade within the EU, whereas in 2002 this share amounted to 21,3%. As in the case of overall IIT, intra-EU manufacturing IIT in Greece exhibits a significant downward trend in recent years. However, between 1981 and 2002 there have been significant increases in IIT levels of some specific manufacturing industries, especially those industries that are classified under SITC sections 5 (Chemicals) and 7 (Machinery and transport equipment). As regards non-manufactures, the most pronounced changes in the GL indices between 1981 and 2002 have been reported in Food and live animals (increase in IIT), Animal and vegetable oils (increase), and Beverages and tobacco (decrease).

We now turn to the analysis of extra-EU IIT in Greece, of which we have already seen a broad picture that shows a complete different IIT development. Indeed, there are some important differences between intra-EU and extra-EU IIT patterns. In contrast with the case of intra-EU IIT, the level of extra-EU manufacturing IIT is higher than the level of overall and non-manufacturing extra-EU IIT in certain time points – 1981, 1986 and 2002 – (Table 3). In this case, some of the manufacturing industries display the highest IIT indices, especially those industries that are within SITC sections 5 (Chemicals) and 6 (Manufactured goods classified by material), whereas non-manufactures exhibit relatively moderate IIT levels (except Animal and vegetable oils, and Food and live animals).

Furthermore, there are strong opposite trends between intra-EU and extra-EU IIT in particular sectors, such as in Beverages and tobacco, Chemicals, Mineral fuels, and Crude materials. Thus while Greece's intra-EU IIT in the Beverages and tobacco sector declined between 1981 and 2002, extra-EU IIT in the same sector and period increased significantly. A similar development is found in SITC section 3 (Mineral fuels). On the other hand, Greece's IIT in chemical products increased within the EU, but it declined in the non-EU region (rest of the world).

In addition, most industries exhibit higher extra-EU IIT levels as well as higher extra-EU IIT growth rates. This can also be seen from Figure 2, where overall extra-EU IIT in Greece is higher than intra-EU IIT and displays an upward trend until 1996 with a slight decline in 2002. However, this fall of the IIT level is due to the decline of non-manufacturing IIT (between 1996 and 2002 extra-EU manufacturing IIT in Greece is about at the same level – Table 3). Thus it is evident that there is a diverging trend

between intra-EU and extra-EU IIT. It seems that Greece's intra-EU trade is dominated by non-manufactures with a declining relative importance of manufacturing IIT. Extra-EU IIT, on the other hand, has an upward trend and manufacturing IIT is relatively more important.

Another aspect of our analysis is marginal intra-industry trade, which reveals the structure of trade changes and is particularly relevant for structural adjustment and thus adjustment costs. Although in this analysis we are not concerned with adjustment, we use the results to draw inferences on trade changes. MIIT in Greece is calculated for both intra-EU and extra-EU trade and for the time intervals 1981-86, 1986-91, 1991-96, and 1996-2002 (Tables 4 and 5). Instead of commenting on each industry separately, we point out (stress) the most important findings. Overall intra-EU MIIT in Greece displays a downward trend (the proportion of IIT in new trade created during the time intervals decreases in the subsequent sub-periods), whereas in the case of manufactures there is an initial increasing trend that afterwards stagnates (Table 4). In the first sub-period (1981-86) about 25% of marginal trade was IIT, while in the last sub-period (1996-2002) about 20% of new trade created during this interval was IIT.

Table 4. Intra-EU MIIT in Greece by industry, 1981-2002

SITC section	1981-86	1986-91	1991-96	1996-2002
0 - Food and live animals	0,4138	0,3321	0,1720	0,1603
1 - Beverages and tobacco	0,6831	0,5287	0,2763	0,0000
2 - Crude materials, inedible, except fuels	0,3310	0,2740	0,2902	0,3070
3 - Mineral fuels, lubricants and related mat.	0,4279	0,0683	0,0159	0,8701
4 - Animal and vegetable oils, fats and waxes	0,1121	0,1350	0,0003	0,0839
5 - Chemicals and related products	0,1972	0,1723	0,1258	0,1277
6 - Manufactured goods classified by material	0,2555	0,3431	0,2663	0,3226
7 - Machinery and transport equipment	0,0545	0,0683	0,1639	0,1360
8 - Miscellaneous manufactured articles	0,1181	0,2488	0,2288	0,1824
9 - Commodities and transactions n.e.s.	0,0409	0,2791	0,4403	0,3569
(5-8 – Manufactures)	0,1460	0,2117	0,1978	0,2021
(0-9 – All product groups)	0,2514	0,2355	0,1855	0,2047

Note: A indices of MIIT calculated from three-digit SITC trade data for manufactures and from two-digit SITC trade data for non-manufactures, weighted across industries.

Table 5. Extra-EU MIIT in Greece by industry, 1981-2002

SITC section	1981-86	1986-91	1991-96	1996-2002
0 - Food and live animals	0,3143	0,4665	0,2591	0,4182
1 - Beverages and tobacco	0,2820	0,4799	0,1078	0,0613
2 - Crude materials, inedible, except fuels	0,0235	0,1457	0,0892	0,2654
3 - Mineral fuels, lubricants and related mat.	0,9330	0,5175	0,9393	0,0167
4 - Animal and vegetable oils, fats and waxes	0,0306	0,5123	0,6069	0,5128
5 - Chemicals and related products	0,1627	0,3938	0,4098	0,2922
6 - Manufactured goods classified by material	0,1049	0,2689	0,3502	0,3456
7 - Machinery and transport equipment	0,1807	0,1020	0,2845	0,2371
8 - Miscellaneous manufactured articles	0,0673	0,2116	0,5772	0,1916
9 - Commodities and transactions n.e.s.	0,0003	0,0294	0,0002	0,0009
(5-8 – Manufactures)	0,1293	0,1911	0,3839	0,2593
(0-9 – All product groups)	0,2341	0,2529	0,3955	0,2109

Note: A indices of MIIT calculated from three-digit SITC trade data for manufactures and from two-digit SITC trade data for non-manufactures, weighted across industries.

As we would expect, in the first sub-periods MIIT levels were higher, as in these time intervals IIT levels increased. However, this has not to be always the case, as an increase in the IIT level between two time points is compatible with an increase in inter-industry trade flows and vice versa. Looking at the extra-EU side of MIIT, we see that in general a similar pattern emerges (Table 5). Here also, MIIT is relatively more important in non-manufactures, except in the last time interval. However, in extra-EU MIIT there is an upward trend in both manufacturing and non-manufacturing MIIT, except in the last time period. The highest level of extra-EU MIIT is found in the time interval 1991-96, where about 40% of new trade created was IIT. In conclusion, it is evident that the increases in the IIT levels in Greece – for both intra-EU and extra-EU – are associated with a large amount of inter-industry trade flows.

Having examined the observed IIT levels in Greece, we now conduct a more analytical examination by considering certain industry characteristics. These characteristics should reflect some basic features of IIT in Greece as well as important factors that shape the observed IIT patterns. For the purpose of our analysis, a good categorization of industries (commodity groups), which contains relevant information on some industry characteristics, has been compiled by UNCTAD (2002), which “classifies each product

group into different categories according to the mix of different skill, technology and capital intensities and scale characteristics” (p. 87).

The categories distinguished are the following:⁵

1. Primary commodities
2. Labour-intensive and resource based manufactures
3. Manufactures with low skill and technology intensity
4. Manufactures with medium skill and technology intensity
5. Manufactures with high skill and technology intensity

In order to uncover the features and factors of Greece’s IIT, we categorize our industry sample according to this classification. More specifically, we classify each commodity group of our sample into one of these categories and transform these categories into dummy variables, which we regress on the calculated GL indices (observed IIT levels). This regression analysis is conducted separately for both intra-EU IIT and extra-EU IIT in Greece. The regression results, which are reported in Tables 6 and 7, indicate that the primary commodities variable exercises the strongest effect on Greece’s intra-EU IIT, followed by the labour-resource dummy.

Table 6. Determinants of intra-EU IIT in Greece

Variable	Coefficient	t-value	p-value		
<i>PRIMARY</i>	0,368	18,548	0,000		
<i>LABOUR-RESOURCE</i>	0,326	17,417	0,000		
<i>LOW-SKILL</i>	0,226	9,383	0,000		
<i>MEDIUM-SKILL</i>	0,129	7,235	0,000		
<i>HIGH-SKILL</i>	0,124	7,698	0,000		
R = 0,709	R ² = 0,503	Adjusted R ² = 0,500			
<i>Analysis of Variance</i>					
Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F-value	p-value
Regression	50,451	5	10,090	169,402	0,000
Residual	49,795	836	0,060		
Total	100,245	841			

Note: Linear Regression through the origin (the no-intercept model). The total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.

⁵ In the UNCTAD (2002) report one more category is distinguished, “Unclassified products”, which is not considered in our analysis.

Table 7. Determinants of extra-EU IIT in Greece

Variable	Coefficient	t-value	p-value		
<i>PRIMARY</i>	0,369	15,097	0,000		
<i>LABOUR-RESOURCE</i>	0,515	22,364	0,000		
<i>LOW-SKILL</i>	0,457	15,437	0,000		
<i>MEDIUM-SKILL</i>	0,391	17,790	0,000		
<i>HIGH-SKILL</i>	0,387	19,547	0,000		
R = 0,816	R ² = 0,666	Adjusted R ² = 0,664			
<i>Analysis of Variance</i>					
Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F-value	p-value
Regression	150,114	5	30,023	332,988	0,000
Residual	75,375	836	0,090		
Total	225,488	841			

Note: Linear Regression through the origin (the no-intercept model). The total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.

This illustrates that non-manufactures and – to a lesser degree – labour- and resource-intensive manufactures account for a large part of observed intra-EU IIT levels in Greece, whereas manufactures with high skill (medium skill) and technology intensity are less important in shaping Greece’s IIT within the EU.

On the other hand, extra-EU IIT determinants show a significantly different picture (Table 7). It is evident that the labour-resource variable exhibits the highest estimated coefficient, while the low-skill dummy the second highest coefficient. Notably, primary commodities appear to be the least important factor of extra-EU IIT in Greece, which is in complete contrast with the intra-EU case. Though the most important factors are labour- and resource-intensive manufactures as well as low-skill and technology intensity manufacturing activities, medium and high technology activities explain also to a large extent the level of extra-EU IIT in Greece.

In conclusion, it seems that traditional factors of comparative advantage are relatively more important vis-à-vis determinants of the “new trade theory” (technology and scale intensities) for both intra-EU IIT and extra-EU IIT in Greece. This is because intra-EU IIT is determined to a large extent by primary and labour/resource intensive products, and though Greece’s extra-EU IIT level is higher and a large proportion is manufacturing IIT, the latter is also based more on comparative advantage considerations than technology and scale intensities.

4. Greece's IIT with the CEECs

In this section, we examine briefly Greece's IIT patterns with the central and eastern European countries (CEECs), which since 1st of May 2004 constitute the new members of the European Union. Although the eastward enlargement of the EU has taken place recently, the examination of IIT in Greece with the CEECs over the last decade is particularly relevant for Greece's intra-EU and extra-EU IIT development in the future. In particular, the investigation of IIT trends with these countries should give us valuable information and insights on trade patterns, economic similarity, and trends and future developments. If, for example, our findings indicated high and increasing IIT levels for Greece with these countries, this would suggest similar economic structures between Greece and the CEECs with a converging trend of similarity over time. If this would be the case, Greece IIT would be expected to show a certain converge towards the EU level of IIT in the future, and thus Greece to become more similar with the enlarged EU in the future.

Therefore, we have calculated IIT indices – calculated according to equation (1) – for Greece with each of the eight new member countries of central and eastern Europe for the years 1992 and 2002.⁶ Though Table 8 reports our analytical results by country and industry, a first picture of IIT patterns with the CEECs can be gained from Figure 3, which depicts Greece's IIT development in total trade in the period 1992-2002. It becomes immediately apparent that Greece's bilateral IIT levels with these countries are particularly low, especially with the Baltic countries (Estonia, Latvia and Lithuania).

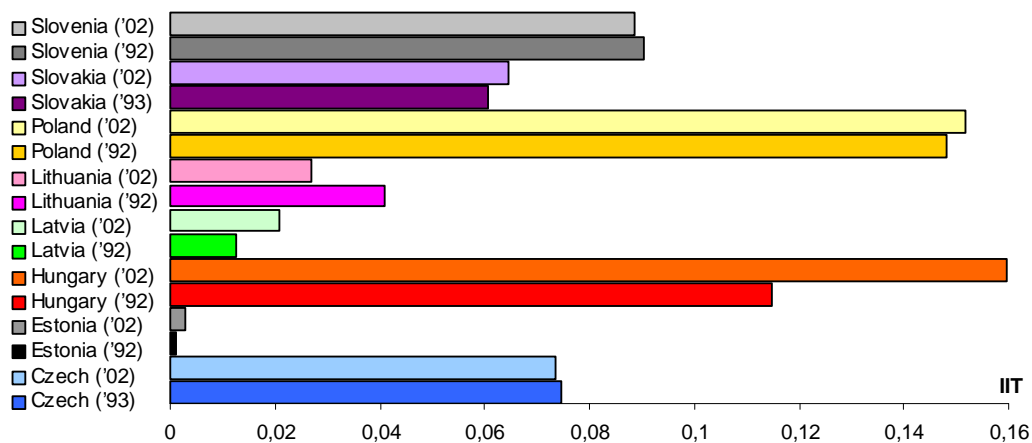


Figure 3. IIT in Greece with the Central and Eastern European Countries, 1992-2002

⁶ For the Czech Republic and Slovakia the calculated indices refer to the years 1993 and 2002.

Table 8. IIT in Greece by eastern European country and industry, 1992-2002

SITC	Czech Republic		Estonia		Hungary		Latvia		Lithuania		Poland		Slovakia		Slovenia	
	1993	2002	1992	2002	1992	2002	1992	2002	1992	2002	1992	2002	1993	2002	1992	2002
0	0,0306	0,0106	0	0	0,1446	0,1590	0	0,0098	0,0164	0,0133	0,0812	0,1254	0,0227	0,0527	0,0015	0,0133
1	0,1013	0,1630	0	0	0,0529	0,0172	0,2386	0,0850	0	0	0,1621	0,0952	0,0436	0	0	0
2	0,0378	0,0144	0	0	0,0437	0,0029	0	0	0,0846	0	0,1418	0,2266	0,0325	0,0072	0	0,3068
3	0	0,3618	0	0	0,3795	0,7985	0	0,0182	0,0649	0	0	0	0	0	0	0,1765
4	0	0	0	0	0	0,0392	0	0	0	0	0	0	0	0	0	0
5	0,2002	0,3346	0	0	0,0230	0,3154	0,0224	0	0	0	0,0355	0,2716	0,0673	0,0778	0	0,0392
6	0,0958	0,0829	0	0,0074	0,1130	0,1775	0	0,0009	0,0015	0,0582	0,2856	0,1351	0,0841	0,1194	0,4417	0,0646
7	0,0203	0,0304	0	0,0026	0,0752	0,0966	0	0,0533	0,1116	0,0852	0,1333	0,1159	0,0378	0,0295	0	0,1008
8	0,3719	0,2873	0,0494	0,0064	0,3316	0,2289	0	0,0140	0	0,0330	0,3722	0,3673	0,3825	0,1242	0,0407	0,2605
9	0,9159	0,7276	0	0	0,3510	0	0	0	0	0	0	0	0,1237	0	0	0
(5-8)	0,0889	0,0843	0,0011	0,0046	0,0956	0,1624	0,0142	0,0035	0,0200	0,0384	0,1928	0,1625	0,0935	0,0870	0,2011	0,0879
(0-9)	0,0747	0,0736	0,0010	0,0028	0,1148	0,1596	0,0125	0,0208	0,0408	0,0269	0,1482	0,1519	0,0608	0,0645	0,0904	0,0885

Note: Unadjusted GL indices calculated from three-digit SITC trade data for manufactures and from two-digit SITC trade data for non-manufactures, weighted across industries.

The highest bilateral IIT indices are found for Poland and Hungary. In addition, during the period under investigation overall bilateral GL indices either decreased or remained at about the same level. Greece's IIT increased only with Hungary. From Table 8 it can be seen that Greece's manufacturing IIT is relatively more important with almost all eight CEECs. However, between 1992 and 2002 Greece's IIT in manufactured products declined with most countries, while it increased only with Hungary.

Finally, we have also calculated MIIT indices – calculated according to equation (2) – for the time interval 1992-2002 (Table 9). From Table 9 it becomes apparent that although in some industries IIT levels increased between 1992 and 2002, the structure of trade changes (marginal trade) has been to a large degree of the inter-industry type. In conclusion, combining the results from Tables 8 and 9 it is evident that Greece does not exhibit an increasing trend of IIT with the CEECs and thus, her economic structure is not converging towards the economic structure of these countries.

Table 8. MIIT in Greece by country and industry during the 1992-2002 period

SITC	Czech	Estonia	Hungary	Latvia	Lithuania	Poland	Slovakia	Slovenia
0	0,0085	0	0,0911	0	0,0131	0,0449	0,0815	0,0100
1	0,0448	0	0	0,0619	0	0,1405	0,0464	0
2	0,0339	0	0,0591	0	0,0677	0,2040	0,0168	0,3080
3	0,3605	0	0	0,0183	0	0	0	0,3136
4	0	0	0	0	0	0	0	0
5	0,2615	0	0,0919	0	0	0,3289	0,0236	0,0368
6	0,0668	0,0033	0,1684	0,0008	0,0061	0,1645	0,0602	0,0419
7	0,0246	0	0,0979	0,0141	0,0300	0,0977	0,0178	0,1012
8	0,1264	0,0085	0,1377	0,0135	0,0133	0,2894	0,0774	0,2227
9	0,9675	0	0,3445	0	0	0	0,0976	0
(5-8)	0,0627	0,0027	0,1190	0,0024	0,0093	0,1564	0,0438	0,0769
(0-9)	0,0608	0,0020	0,1086	0,0125	0,0075	0,1378	0,0422	0,0793

Note: A indices of MIIT calculated from three-digit SITC trade data for manufactures and from two-digit SITC trade data for non-manufactures, weighted across industries.

5. Conclusions

In this paper we investigated intra-EU and extra-EU IIT trends in Greece in the course of her process of European economic integration, and provided some evidence on industry characteristics and the underlying factors of Greece's IIT patterns. Our

empirical analysis revealed that intra-EU and extra-EU IIT in Greece exhibit diverging trends. Greece's IIT outside the EU is higher and displays a significant upward trend (though a certain stagnation in recent years is present), whereas the extent of intra-EU IIT in Greece is generally lower and shows a decreasing trend. In addition, Greece's manufacturing IIT within the EU is lower than IIT in non-manufactures and much lower than extra-EU manufacturing IIT, which is relatively more important in Greece's extra-EU IIT.

These findings suggest a particularly high degree of inter-industry specialization of Greece within the EU, and thus a large dissimilarity in the economic structure of Greece compared to the EU's structure. Greece's intra-EU IIT is largely determined by primary commodities (agricultural products and raw materials) and labour- and resource-intensive manufactures, which indicates that relative factor endowments play a crucial role for Greece's IIT within the EU. Extra-EU IIT in Greece seems to be shaped mainly by manufactures with high labour- and resource-intensities and low skill intensity, while primary goods represent the least important factor.

Thus, comparative advantage considerations seem to determine Greece's intra-EU and extra-EU IIT. Finally, Greece's IIT with the CEECs can be characterized as particularly low, especially with the Baltic countries. Moreover, there have been no significant increases in bilateral IIT levels (except with Hungary) during the 1992-2002 period, but instead IIT has either decreased or remained unchanged. Hence, it seems that inter-industry specialization between Greece and the CEECs is relatively more important.

Notably, during the 1990s IIT with the EU in most CEECs experienced a significant growth, especially in the Czech Republic, Slovenia, Hungary, Poland and Slovakia (Fidrmuc, 2003). While the CEECs have become more similar to the EU during the 1990s, as indicated by the high and increasing IIT levels, Greece has become more dissimilar to the EU and to some extent to the CEECs, which constitute the new members of the enlarged EU. Thus, it seems that there is a trend towards de-europeanization in Greece in recent years, as regards intra-EU IIT and intra-industry specialization within the EU. This trend will be more pronounced in coming years, if the IIT levels of the CEECs continue to converge towards the IIT levels of major EU economies.

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