Master thesis for the Master of Philosophy Degree in Environmental and Developmental Economics

Assessing European Economic Integration with the Heckscher-Ohlin Model, a Comparison between Germany and Greece.

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PREFACE

I am indebted to my supervisor Andreas Moxnes for his patience in hearing my ideas, support, insightful remarks and inspirational suggestions. I also thank him for spending time in correcting my mistakes that I made during writing this thesis.

I also thank my family for the invaluable support that offered me during my studies in Oslo.

Mistakes and weaknesses in this thesis are also of my responsibility.

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Table of Contents

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

This thesis attempts to explain the effects of the European economic integration on two member countries, namely Greece and Germany. Based on their differences in relative factor endowments, the bilateral trade pattern, the industrial structure and the product prices are analyzed in a neo classical Heckscher-Ohlin framework. The process of continuous economic integration puts pressure on the member countries for industrial restructuring in order for efficiency gains to be realized. Hence, the industrial structure of Greece, Germany and other EU member countries is also examined and reveals that member nations bear differences in their endowments and have also increased their specialization level in industries that have a comparative advantage over their EU counterparts.

Trade profiles verify the bilateral trade pattern predicted by the Heckscher-Ohlin although the existence of intra-industry trade requires the adoption of New Trade Theory terminology. Therefore, certain facts about the EU reality are confronted with the assumptions of the model in order to evaluate the degree of its applicability. This is especially relevant for future deeper and wider economic integration with forthcoming waves of enlargement and the implementation of the EU Services Directive.

1. Introduction

Economic integration deals with how different aspects of the world's economies are integrated. As trade barriers diminish between two countries or between a group of countries certain changes take place that have a large impact on particular aspects of each country`s economy. This holds both on a global and regional level and especially for the European Union which is considered as the most integrated cross-country economic area in the world.

In its nearly 60 years old history and after many waves of enlargement, the EU at present counts 27 member countries. The "four freedoms", the free movement of goods, capital, services and people, is a fundamental element of the integration process. Accordingly, firms and consumers located everywhere in the Union have equal opportunities to buy or sell goods while the owners of capital can be free to employ resources in any economic activity and in all member countries of the Union.

The free flow of goods between member countries (Intra-EU trade) accounts for almost two thirds (2/3) of the Union`s total trade and it has been estimated that the creation of the European Union has doubled the intra-EU trade.

In this thesis, I study the trade pattern, relative endowments and factor prices of two highly different EU member countries, namely Greece and Germany, and ask whether we can explain the pattern of trade in a neoclassical Heckscher-Ohlin framework. I also ask what the model would predict when barriers continue to fall. This is especially relevant for the services sector, due to the implementation of the EU Services Directive by the end of 2009. I argue that the Heckscher-Ohlin model provides the right framework for analysis since it isolates the differences in relative factor endowments among nations as the basic determinant of inter industry trade[1].

Economic integration causes changes in the product prices, which in turn affect the returns to factors of production within each country. I address these questions within the H-O model and analyze the distributional impact of trade in Greece and Germany.

[1] Trade in different products.

Chapter (5) discusses issues of industrial structure for Germany, Greece and for other EU member countries. The process of continuous economic integration puts pressure on existing production structure in order for efficiency gains to be realized. Member countries specialize according to certain country characteristics that have a comparative advantage over their EU counterparts. I show that EU member countries have increased their specialization level during the time period 1970-1997 in order for efficiency gains to be realized. I also show that Greece and Germany are very different in their labour force skill mix with the former exhibiting bias towards low shares of non-manual as well as educated workers; hence providing evidence that the application of the H-O model can hold in the EU reality.

Chapter (6) provides bilateral trade data between Germany and Greece in order to verify the predictions of the model. In addition, I present trade profiles to evaluate the effect of EU membership on both countries' trade structure. The existence of high share of intra industry trade (IIT)[2], especially for Germany, requires the adoption of New Trade Theory (NTT) terminology. The intra industry trade pattern of Greece is discussed more extensively since last two waves of EU enlargement that incorporated countries of Eastern Europe seems to have affected the direction of its trade. As Baldwin & Wyplosz (2006) discuss, when it comes to explaining trade structure, geography matters a lot and factors such as the neighboring countries and distance from the core EU market (Northwest Europe) emerge as significant determinants.

The H-O assumptions are also confronted with the EU reality. The original set up of the H-O model explains the trade structure of two countries that move from autarky to free trade. In the EU context however, it is evaluated under a process of continuous economic integration. Moreover, I discuss certain other characteristics of the European Union that are either in line or contradict the assumptions upon the model is built on.

[2] Trade in similar products

"Lest it be forgotten, the European Community stands for the harmonized integration of some of the oldest countries in the world with very diverse cultures and extremely complicated economic systems"
(El-Agraa, 1990)

2. A Brief History of the European Union

The most important problem in Europe after the Second World War was the governmental failure to deliver peace. This failure had resulted in 2 wars within 40 years and had made the need to find peace keeping mechanisms imperative. The solution of economic integration ultimately prevailed although the idea of a united Europe was far from clear in the 1940s. As El-Agraa (1990; p.79) argues, "…*almost in all existing cases of economic integration were either proposed or formed for political reasons even though the arguments put forward in their were expressed in terms of possible economic gains*." Or as Baldwin and Wyplosz (2006; p.28) state regarding the first steps of European economic integration,"… *the goals were always political but the means were always economic*…".

In order to suppress the nationalistic sentiments in Europe and to recover from the heavy material resource destruction of the war, the European Coal and Steel Community (ECSC)[3] was formed. ECSC is considered the early predecessor of the European Union and its difficult prime goal was to turn the old enemies into partners. It introduced a common free steel and coal market, independent of the national governments but it allowed a transition period of adjustment of one year. It was signed in 1951 in Paris between six countries[4] and achieved early success, the industrial production rose 58% and the coal production rose by 58% until 1960.

European Economic Community (EEC) was formed in 1957 with the treaty of Rome. The intention of the Treaty was to fuse the six independent nation-state economies into a unified economic area (Baldwin, 2005). The agreement on tariffs and quotas elimination and the implementation of a customs union was the first achievement of the treaty, but it was

[3] ECSC was introduced in the famous Schuman Declaration on 9th of May 1950.
[4] The countries that signed were France, Germany, Italy and the three Benelux states: Belgium, Luxemburg and the Netherlands.

also accompanied by the fear that national governments would offset trade liberalization with various national schemes. For that reason, the creation of an independent European commission that would monitor and ensure the enforcement of the internal market was critical.

However, the treaty of Rome went beyond creating a customs union with a common external tariff. As Baldwin and Wyplosz discusses (2006; p.70) on the economics of the treaty of Rome ``….*the goal was to create a unified economic area where consumers and firms located anywhere in the area would have equal opportunities to sell or buy goods throughout the area*. ``. Moreover, ``…*owners of capital and labor should be free to employ their resources in any economic activity anywhere in the area*. ``

The integration process in Europe was often considered as the enemy to each country's sovereignty; that is why attempts to ignore the Community's decisions were common. The interconnection between economic and political integration still remains a problem but the European Commission works as a guardian of the treaty and ensures the implementation of the Community's decisions. But, the protectionist stance of the member states through a long list of trade barriers led to a slower economic integration process that resulted in the Single European Act (1986), the first significant amendment of the treaty of Rome (1957) that aimed at creating a new momentum in Europe so as to complete the Single European Market. This protectionism, prior to the Single Act, was originally attributed to the fact that the Treaty of Rome (1957) introduced a model that was closer to a federalist rather an intergovernmental structure.

In 1992, the Treaty of Maastricht[5] (Treaty of the European Union) established the European citizenship but without replacing national citizenship. It is the year that the Single European Market was established, the core of today's union, along with its four freedoms, namely the free movement of goods, services, capital and people (workers). It also introduced the three pillars of the European Union, the European Community (EC), the Common Foreign and Security Policy and (CFSP) and the Police and Judicial Co-operation in Criminal Matters (PJCC). The EC is the one that is dealing with economic, social and environmental issues and it has its origins in the European Economic Community. Among EC`s main issues is the Single

[5] Entered into force on 1 November 1993.

Market, the common agricultural Policy (CAP) and the Economic and Monetary Union (EMU) that was responsible for the introduction of the common European currency (euro) which was introduced in 1999 but circulated in 2002. The single currency`s main goal was to coordinate national economic policies and to benefit the countries that adopted it. In other words, it aimed at increasing the financial integration, eliminating the currency exchange costs and easing the international trade, among others.

Along this period, from the 50s until present, Germany, as one of the first six founding member countries, was playing a significant role in the formation of the Union. On the other hand, Greece entered the Union in 1981 as the 10^{th} member and it is considered as one of the small economies of the union on the grounds that it accounts for between 1 and 3 per cent of the EU25`s total GDP (Baldwin and Wyplosz, 2006; p57) based on data for 2000.

3. Stages of Economic Integration

The basics of the theory of economic integration were introduced by the Hungarian economist Bella Balassa in the 1960s and it consists of six stages that each stage adds to the previous one further economic freedoms[6]. Trade liberalization entails the breakdown of physical, fiscal and technical barriers in order for the goods and services to move free across national markets. The brief historical background made clear that the process of deeper economic integration in EU has been through many stages to take its current form. Likewise, the theory of economic integration consists of certain consecutive stages (Dorrucci E. et. al., 2002):

- Free trade Area (FTA): The first level of economic integration. It consists of an area where there are no visible trade restrictions between members. Import tariffs and quotas are abolished between the signatory countries but each member can retain its national trade policy with countries that are outside the agreement. FTAs can be limited to few sectors and no further harmonization of regulations and policies is required. However, FTAs need to establish rules of origin for all third party goods that enter the free trade area in order to function properly.
- Customs Union (CU): The European Economic Community (EEC) since 1968. A CU is built on the FTA but with a common external tariff and import quotas for goods entering the union from non member countries while internal tariffs were completely eliminated. Anti dumping policies may also be introduced but the rule of origin no longer exists since all goods entering the union are now subject to the same tariff no matter from which member country are imported. However, some degree of policy freedom is lost for each signatory country.
- Common Market (CM): It is considered as a major step towards deeper economic integration. All barriers to the mobility of factors, goods, services and all kinds of resources are abolished. It requires a significant degree of policy harmonization in a number of areas. Economic interdependence between member countries is important and the need for convergence of fiscal and monetary policies is essential in order for benefits of more efficient allocation of production and increased

[6] Here only the 5 stages are going to be briefly presented.

productivity to take place. (European economic community since 1993, establishment of the European single market.)

- Economic Union (EUN): A single market with common currency where the formal coordination of fiscal, monetary, labour markets, industrial and regional development policies is vital and the enforcement of these EUN common policies is regulated by a supranational body. The adoption of a common currency eliminates exchange rates uncertainty and allows trade to follow economically efficient paths.
- Total Economic Integration (TEI): The last stage of economic integration. The economic policy is conducted by a supranational central government with unification and total harmonization of monetary, fiscal and social policies between the member countries. The integrated units have no or negligible control over their economic policy and total or complete economic integration is most common within a country rather than within a union of nation states.

At present, the European Union can be classified somewhere between the Economic Union (EUN) and the Total Economic Integration (TEI). However, the various stages of European integration do not fit neatly with the theory since each member country is free to negotiate its membership in the various agreements that are put into force along EU`s evolution.

4. Bilateral Trade Pattern

4.1 The Heckscher-Ohlin Model

The Heckscher-Ohlin model is built upon Ricardo`s theory of comparative advantage. It is a general equilibrium, two countries, two goods, two factors model that emphasizes the importance of differences in factor (resource) endowments in explaining trade between countries. The model uses as a benchmark condition the autarky (closed economy) and explains what happens when two countries open up for trade. In our case, we are going to use the H-O theorem to explain the bilateral trade pattern between Greece and Germany and we will assume that there are two factors of production, skilled and unskilled labour.

Heckscher-Ohlin Theorem: *Each county will export the good that uses its abundant factor intensively* (Feenstra, 2004; p.32).

In other words, a nation will export the commodity whose production requires the intensive use of the nations` relative abundant and cheap factor and import the commodity whose production requires the intensive use of the nation`s relative scarce and expensive factor.

The main assumptions of the model are:

Differing factor endowments: The fundamental assumption of the model and the driving force in explaining the trade pattern. In our case, we will assume that Greece is the unskilled labour (L) abundant country and Germany is endowed with skilled labour (L^*), i.e $\left(L_{GR}/L^*_{GR}\right) > \left(L_{DE}/L^*_{DE}\right)$. The production factors are of limited supply (resource constraint) in each country and labour is immobile across countries but fully mobile across sectors within countries. In other words, the total amount of skilled and unskilled labour used in the production is constrained to the endowments of the country. (1) $L_A + L_M = L$ and (2) $L^*_A + L^*_M = L^*$ holds for Greece and Germany respectively.

Each country produces two goods: Each country produces both agricultural goods (A) that are unskilled labor intensive and manufactured goods (M) that are skilled labor intensive.

Identical technologies across countries: This assumption implies that both countries have the same production function for each good (industry). None of the countries has a technological advantage in the production of each good over the other country.

Identical and homothetic tastes across countries: Consumers maximize utility to allocate their income between the two goods and they have a well defined homothetic utility function. In other words, preferences are homothetic in both countries and consumers maximization problem is $maxU(c_A, c_M)$ subject to $p_A c_A + p_M c_M \leq w_n L_n + w_n^* L_n^*$. Where n is the country and w and w^* is the wage of unskilled and skilled labour respectively. P_A is the price of agricultural goods and P_M the price of manufactured goods. Each consumer spends its available income among these two goods.

Balanced trade: The H-O model assumes that when countries open up for trade the exports of one country must be imports of the other. The balanced trade assumption is also depicted by equal size trade triangles. (Fig.4)

Perfect competition: Moreover, it is assumed that there is free trade in goods but not in factors and perfect competition prevails in all markets. The characteristic of competitive economy implies that production in each sector is found where the relative prices equal the slope of the production possibility frontier. As a result an increase in the relative price of A makes the economy produce more of the A and less M. The equilibrium condition is found by the resource constraint [(1) and (2)] and by the zero profit condition [(3) and (4)] that follows from the free entry under perfect competition.

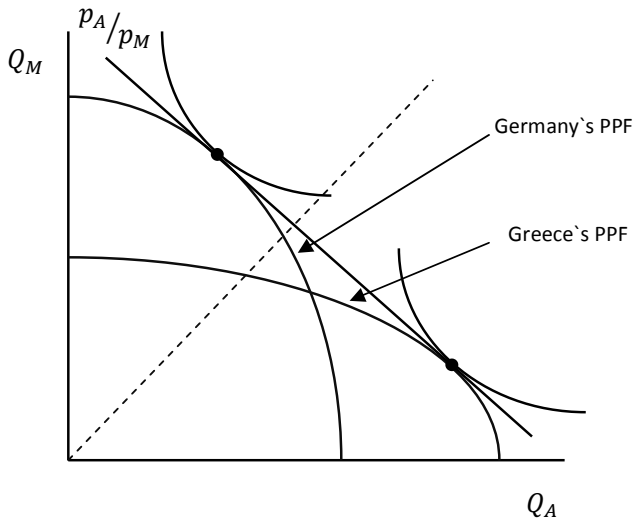
$$\left.\begin{array}{ll} (3) & p_A = c_A(w, w^*) \\ (4) & p_M = c_M(w, w^*) \end{array}\right\} \text{ Zero Profit condition}$$

Each country chooses the skilled and unskilled ratio that minimizes the cost of production by taking the relative factor price ω=w/w^* into account. It also is assumed that Factor intensities reversal (FIR) can not occur.

No transportation costs, no tariffs: It is assumed that the free flow of goods between the two countries takes place without transportation costs, tariffs or other obstruction.

However, if we want to see the effects of European economic integration, we need to check what happens when moving from autarky to free trade according to the H-O theorem. The trade pattern will be determined by the prices of the goods traded under autarky and under free trade. Each country will export the good whose free trade price is higher than its autarky price and import the other one. For that reason, it is very important to see the Production Possibility Frontiers (PPF) for each country that shows the opportunity cost of producing one good in terms of the other. Figure 1 illustrates both countries' PPFs.

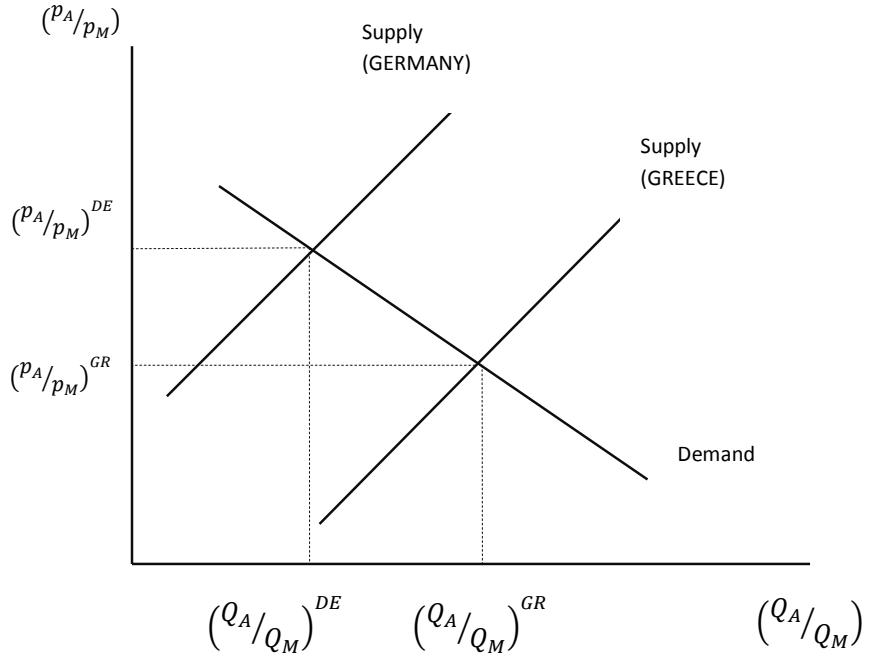
FIG.1: Production Possibility Frontiers



The shape of each country`s PPF indicates which country produces more of which good, given identical prices. Greece produces more of agricultural goods than manufactured goods, while Germany specializes in the production manufactured goods; for that reason Greece`s PPF leans towards agriculture goods and Germany`s towards manufactured goods. The PPFs in the H-O theorem are concave, in contrast to the Ricardian theory where the PPFs are straight lines, because both countries produce two goods and complete specialization is impossible by assumption. The ray (45^o line) reflects the assumption of homothetic preferences in both countries, i.e identical aggregate demand in both countries for the same prices.

We know that the relative agricultural goods price $\left(\mathrm{P}_A = {}^{p_A}/_{p_M}\right)$ will be lower in Greece than in Germany under autarky. The reason is that Greece is unskilled labour abundant country and it produces more agricultural goods, i.e it has a larger supply, and thus the price is lower as depicted in Fig.2.

FIG.2: The relative price of Agricultural goods in autarky



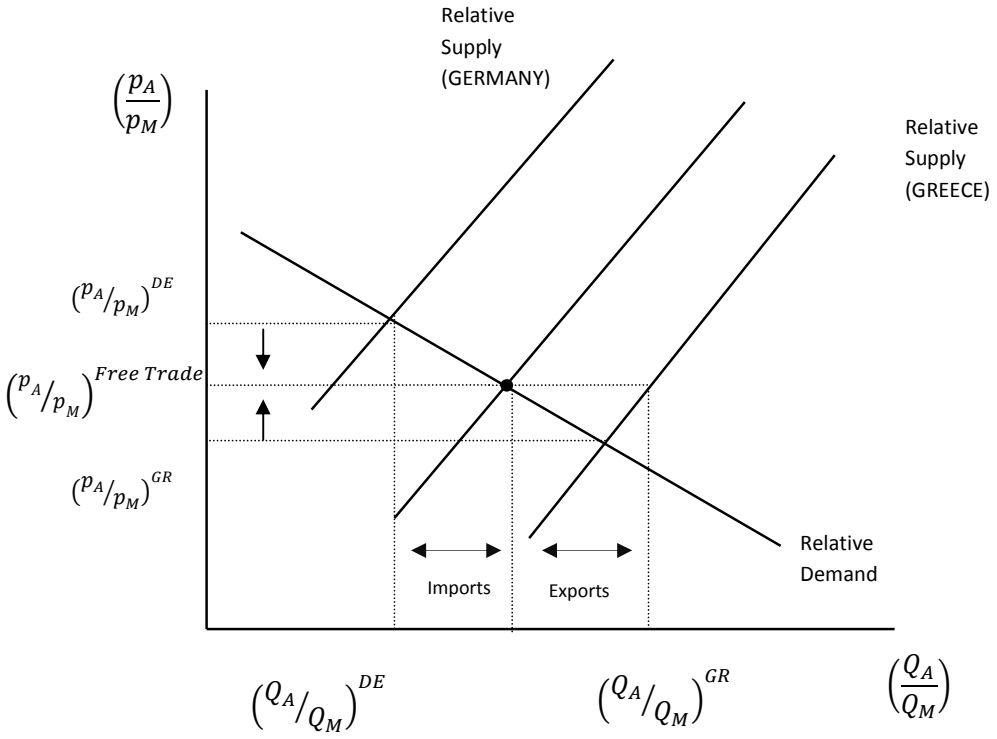
It is very important to add that under autarky, consumption equals production, i.e the aggregate domestic demand in each country is satisfied by the domestic production. However, after opening for trade, this does not hold. Since the pattern of trade is going to induce changes in the production structure of the economy, resources will be taken away from one sector and will be relocated to the other sector. This relocation is only allowed across industries within a country but not across countries because of the resource constraint assumption.

Figure 3 explains what happens when countries open up for trade. The first thing to observe is that there is now a new relative world price of agricultural goods. This free trade price needs to be higher than the autarky price of agricultural products in Greece and lower than the autarky price for the same good in Germany. Condition (5) describes the equilibrium of

the new world relative price of agricultural goods under free trade which is also portrayed in Fig.3.

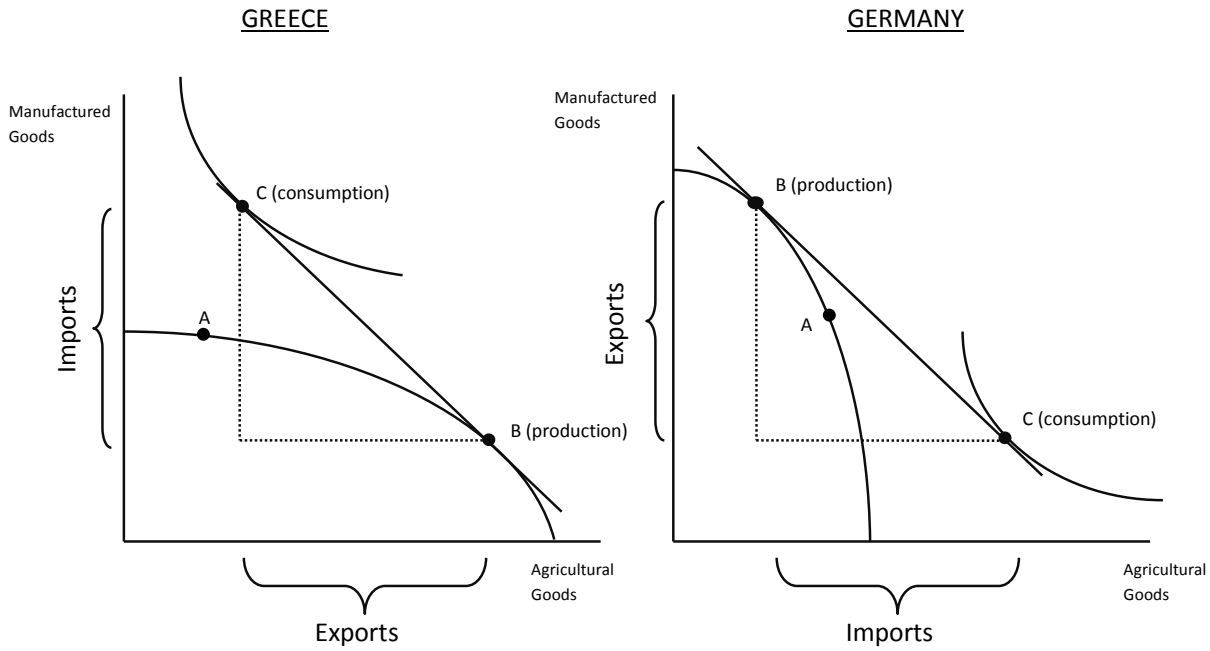
(5) $$\left(p^A/_{p^M}\right)^{GR} < p^{(Free\ Trade)} < \left(p^A/_{p^M}\right)^{DE}$$

Fig.3: The relative price of Agricultural goods in Free Trade



The graph above indicates the exports of Greece and the imports of Germany for agricultural products. The fact that the value of one country`s exports is equal to the value of the other`s country imports is based on the assumption of balanced trade. Figure 4 is more indicative of the pattern of trade for both countries.

Fig.4: The Pattern of bilateral trade



Point A in both panels indicates the equilibrium in both countries under autarky where the indifference curves of the representative consumer is tangent to the PPF for both countries. Moreover, the price line which is also tangent to the PPF has and the indifference curve has a slope of $-(p_A/p_M)$. After opening to international trade, production separates from consumption in both countries. The left panel illustrates Greece`s trade pattern, the difference between production and consumption denotes the exports of agricultural goods to Germany and the imports of manufactured goods from Germany. The reverse pattern holds for Germany`s pattern in the right panel. The trade triangles are of identical size in both countries in order to reflect the assumption of the H-O model of balanced trade between the two countries. Furthermore, after opening for trade, consumers' indifference curves are in a higher position in comparison to autarky[7], a fact that can be characterized as a welfare improvement for the representative consumer.

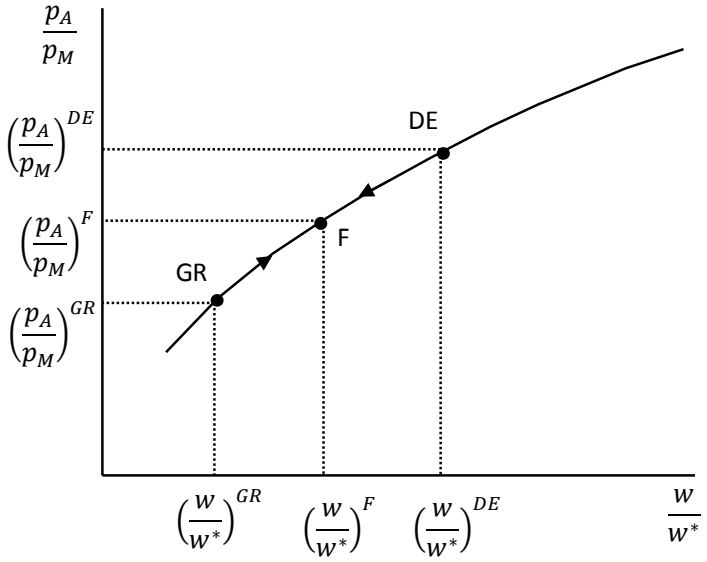
[7] In autarky, consumers` indifference curves are tangent to the PPF of both countries at point A, not depicted in the graph.

4.2 Factor Price Equalization (FPE)

What follows directly from the H-O model is the factor price equalization (FPE) theorem (Samuelson 1949). It states that when two countries with identical technologies but different factor endowments engage in international trade, then the factor prices are equalized across countries if both countries produce both goods and Factor Intensity Reversals (FIR) do not occur. In other words, this theorem implies that international trade in goods is a substitute for factor mobility across countries and that the returns of all homogeneous factors in all trading nations will be the same (Salvatore, 2007; p.139).

In the case of Greece and Germany, it is assumed that wages of the homogeneous labour will be equalized in both countries. In the pre trade condition, the relative wage of the unskilled workers was lower in Greece $\left({}^{w}/_{w^*}\right)^{GR} < \left({}^{w}/_{w^*}\right)^{DE}$ as already argued. Figure 4 illustrates how factor price equalization works in both countries after opening for trade. The horizontal axis measures the relative unskilled labour wage $({}^{w}/_{w^*})$ and the vertical axis the relative price of the agricultural goods$(P = \frac{p_A}{p_M})$.

Fig.5: Relative Factor Price Equalization in Greece (GR) and Germany (DE)



Trade produces a convergence of the relative price and in turn, prices have a strong effect on the relative earnings of the skilled and unskilled labour in both countries. $(\frac{p_A}{p_M})^F$ indicates the free trade price as in Figure 3, while $\left(\frac{w}{w^*}\right)^F$ indicates the new relative factor price that is equalized across Greece and Germany.

However, opening to international trade has implications within countries as well. These implications also stem from the price changes that occur when opening to trade. One of the main question regarding the free trade discussion is how this change in the product prices ,as already shown, affects people`s overall welfare within each country. An answer to this question is given by the Stolper-Samuelson theorem that explains this effect. The effect of the change in prices on the factor prices within each country are clarified by some mathematical articulations by Jones (1965) that lead to the Stolper-Samuelson theorem.

4.3 Changes in Product Prices

By the assumption of incomplete specialization (both goods are produced), perfect competition and no Factor Intensity Reversal (FIR), the zero profit condition will determine the factor prices. The zero profit conditions [Equations (3) and (4)] can also be written:

(6) $$p_i = a_{iL}w + a_{iL^*}w^*$$

Where α_{iL}= is the unskilled labour needed for one unit of product i

α_{iL^*}=is the skilled labour needed for one unit of product i

w and w^* are the wage rates already mentioned before

(7) c(w, w^*)=unit cost of production =α_{iL}w+$\alpha_{iL^*}$$w^*$

Total differentiation of equation (6) gives:

(8) $$dp_i = a_{iL}dw + a_{iL^*}dw^* \Rightarrow \frac{dp_i}{p_i} = \frac{wa_{iL}}{c_i}\frac{dw}{w} + \frac{w^*a_{iL^*}}{c_i}\frac{dw^*}{w^*}$$

The second equation is obtained by multiplying and dividing like terms and by using $p_i = c_i(w, r)$. This helps as in expressing the variables in percentage changes ($dlnw = \frac{dw}{w}$). Moreover, using the cost shares $\theta_{iL} = \frac{wa_{iL}}{c_i}$ (the cost share of unskilled labour in industry i) and $\theta_{iL^*} = \frac{w^* a_{iL^*}}{c_i}$ (the cost share of skilled labour industry) and by assuming that cost shares equal unity ($\theta_{iL} + \theta_{iL^*} = 1$) that follows from the fact that $c_i = wa_{iL} + w^* a_{iL^*}$

In addition we denote the percentage changes as $dw/_W = \overline{w}$ for the unskilled wage and $dw^*/_{W^*} = \overline{w}^*$ for the skilled labour. Thus we can rewrite the differentiated resource constraint condition as $\widehat{p_i} = \theta_{iL}\,\overline{w} + \theta_{iL^*}\overline{w}^*$.

This can also be written in matrix notation as:

$$(9) \qquad \begin{pmatrix} \hat{p}_A \\ \hat{p}_M \end{pmatrix} = \begin{pmatrix} \theta_{AL} & \theta_{AL^*} \\ \theta_{ML} & \theta_{ML^*} \end{pmatrix} \begin{pmatrix} \overline{w} \\ \overline{w}^* \end{pmatrix} \Rightarrow \begin{pmatrix} \overline{w} \\ \overline{w}^* \end{pmatrix} = \frac{1}{|\theta|} \begin{pmatrix} \theta_{ML^*} & -\theta_{AL^*} \\ -\theta_{ML} & \theta_{AL} \end{pmatrix} \begin{pmatrix} \hat{p}_A \\ \hat{p}_M \end{pmatrix}$$

Where $|\theta|$ is the determinant of the two-by-two matrix on the left that can be expressed as:

$$\begin{aligned} |\theta| &= \theta_{AL}\theta_{ML^*} - \theta_{AL}\theta_{ML} \\ &= \theta_{AL}(1 - \theta_{ML}) - (1 - \theta_{AL})\theta_{ML} \\ &= \theta_{AL} - \theta_{ML} = \theta_{ML^*} - \theta_{AL^*} \end{aligned}$$

Where ($\theta_{iL} + \theta_{iL^*} = 1$) has repeatedly been used.

However, since we know that the production of agricultural goods (A) is unskilled labour intensive, implies that its cost share in industry of A exceeds that in industry of M, $\theta_{AL} - \theta_{ML} > 0$, so that the determinant $|\theta| > 0$. Furthermore we have assumed that the price of the agricultural goods increases, namely $\hat{p}_A - \hat{p}_M > 0$. Now we can find the changes in factor prices

$$(10) \qquad \overline{\mathrm{w}} = \frac{\theta_{\mathrm{ML}^*}\widehat{\mathrm{p_A}} - \theta_{\mathrm{AL}^*}\widehat{\mathrm{p_M}}}{|\theta|} = \frac{(\theta_{\mathrm{ML}^*} - \theta_{\mathrm{AL}^*})\widehat{\mathrm{p_A}} + \theta_{\mathrm{AL}^*}(\widehat{\mathrm{p_A}} - \widehat{\mathrm{p_M}})}{(\theta_{\mathrm{ML}^*} - \theta_{\mathrm{AL}^*})} > \widehat{\mathrm{p_A}}$$

Since $\hat{p}_A - \hat{p}_M > 0$

And

$$(11) \qquad \overline{w}^* = \frac{\theta_{AL}\widehat{p_M} - \theta_{ML}\widehat{p_A}}{|\theta|} = \frac{(\theta_{AL} - \theta_{ML})\widehat{p_M} + \theta_{ML}(\widehat{p_A} - \widehat{p_M})}{(\theta_{AL} - \theta_{ML})} < \widehat{p_M}$$

We see that the unskilled wage increases by more than the price of agricultural goods, $\overline{w} > \widehat{p_A} > \widehat{p_M}$. Which means that unskilled workers in Greece can buy more of the agricultural good since w/p_A has gone up and more of the manufactured good since w/p_M has also gone up too. On the other hand, the wage of the skilled workers changes less than the price of the manufactured goods price which means they can afford less of both goods.

From (10) and (11) and by the assumption that $\hat{p}_A - \hat{p}_M > 0$, we have that $\overline{w} > \hat{p}_A > \hat{p}_M > \overline{w}^*$ (12), which indicates that changes in prices have a magnified effect on the factor prices.

This situation clearly benefits the unskilled workers and harms the skilled workers in Greece while the reverse pattern holds in Germany with the skilled workers being the beneficiaries of this pattern.

These results are known as the Stolper-Samuelson theorem which is analyzed in the next section.

4.4 The Stolper-Samuelson Theorem

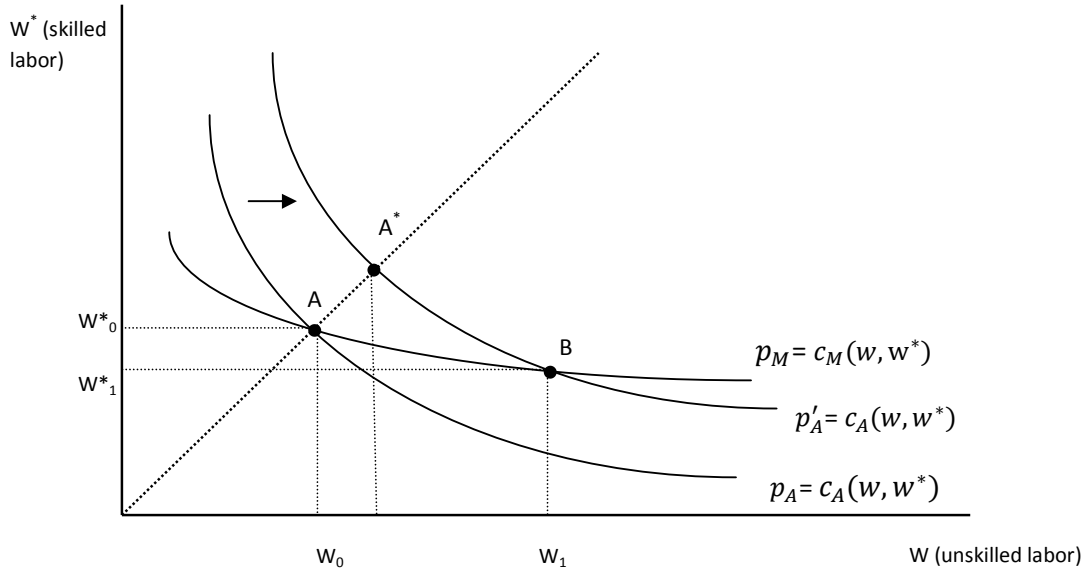
The Stolper-Samuelson theorem is one of the most fundamental results of the Heckscher-Ohlin model. It assumes that certain changes are provoked in the rewards of the factors that produce the traded goods.

Stolper-Samuelson (SS) Theorem: *An increase in the relative price of a good will increase the real return to the factor used intensively in that good and reduce the real return to the other factor.(*Feenstra, 2004; p.15*)*

Alternatively, the theorem explains the distributional effects of trade on the factors of production. Opening to world trade can trigger income inequalities within nations across industries, i.e it has certain distributional effects that make some people worse off and

some others better off. More analytically, the Stolper-Samuelson theorem states that a change in the price of a product has a magnified affect on the on the factor price. To set it in the current context, as Figure 3 shows, when Greece opens up for trade with Germany, it will export agricultural goods with a price higher than the autarky price. According to the Stolper-Samuelson theorem, it is expected that this price increase will cause a disproportionate increase in the return to the factor that is used intensively in its production, namely unskilled labor. The reserve pattern will be established in Germany where the export of manufactured goods is expected to raise the real wages of the skilled labour more than the increase of the price of the exported good. Figure 6 gives a graphical representation of the Stolper-Samuelson theorem in the case of Greece.

Fig.6: Stolper-Samuelson Theorem



Unit cost functions are homogeneous of degree one in factor prices which means that a price increase would proportionally raise the factor prices (w, w^*) of both skilled and unskilled workers. Graphically, this would be illustrated by a shift in the unit cost function, namely from point A to point A^*. However, the Stolper-Samueslon theorem predicts that the factor prices change disproportionally with the good prices as the curve that shifts is the unskilled labour intensive, namely going from point A to point B . It is clear that moving from

point A to point B increases the unskilled labour wage from w_0 to w_1, which is more than the price increase of the agricultural goods and is usually referred as the 'magnification effect'. On the losers side, we see that the skilled labour wage falls from w_0^* to w_1^*,. Although the situation described holds for Greece, the pattern described by the Stolper-Samuelson theorem will also hold for Germany but in the reverse pattern.

5. SPECIALIZATION

The trade pattern according to the H-O model presented in Chapter (4.1) was based on the assumption that Greece is the unskilled labour abundant country while Germany is endowed with relatively more skilled labour force. The shifting of the production along with each country`s comparative advantage will increase the specialization and hence, the productivity of each country. In general, a country is characterized as specialized if the bulk of its total production is conducted by a small number of industries. The specialization level of the EU countries has drawn significant attention in the literature since it is considered as an important integration effect that has many implications, as the welfare consequences that were analyzed in Chapter (4.4) with Stolper-Samuelson theorem.

5.1 Overview

An important aspect when measuring specialization is the kind of data used and the level of disaggregation. The most reliable way is the use of production data, i.e value added, employment and output while trade data can also be employed but only as a proxy for specialization; the reason is that a change in the exports of a country can stem from changes in the preferences of the consumers, i.e domestic demand, that does not reflect any change in the production structure. (Amiti, 1999). Moreover, the level of disaggregation of the data set appears to influence the result as well; more detailed production statistics tend to illustrate that bigger EU countries (Germany, Britain, UK) are more specialized when using lower levels of disaggregation (Vogiatzoglou, 2005). As Vogiatzoglou (2005; p.4) argues, “in the empirical literature, various absolute and relative measures have been used, each having advantages and disadvantages”. The overall trend in the various studies is that each country has increased its specialization level.

Amiti (1999) uses two different data sets and a measure of relative specialization, namely, country Gini coefficients. The first is a highly disaggregated EUROSTAT dataset that consists of 65 manufacturing industries (NACE) from EUROSTAT for only 5 countries (Belgium, France, Germany, Italy, UK) and the second one is a less disaggregated UNIDO dataset. It includes all manufacturing industries according to ISIC3 (27 industries) but for 10 countries (Belgium, Denmark, France, Germany, Greece, Italy, the Netherlands, Portugal, Spain, UK).

Both of the sets make use of production data at current prices and production but the EUROSTAT dataset covers the period 1976-1989 and the UNIDO dataset the period (1968-1990). The results from the UNIDO dataset report that there was an average annual increase of around 1% in specialization in both Germany and Greece[8] for the whole period covered that is in line with the international trade theory predictions; each country has increased its specialization level. However, it is important to note that in some cases there was a decline in the specialization level during the time period (1970-1980) that are in line with other studies that deal with relative specialization levels such as Greenway & Hine (1987) (Amiti, 1999).

Aiginger & Davis (2004) use value added data on 99 NACE industries and report the Entropy index of absolute specialization for 14 EU countries for the time period 1985-1998 with respect to the Single Market programme. Despite the fact that the specific study deals mostly with methodological issues, it concludes that countries increased their specialization level during 1985-1989 and 1991-1998 with a short break of 2 years (1989-1991) where the levels decreased. Their main argument is that increased competitiveness that stems from the Single European Market Program puts more pressure on the member states to increase specialization given their differences in their resource endowments.

[8] Along with Denmark, Italy and the Netherlands.

5.2 Specialization level in Greece, Germany and The European Union

However, the main source of data regarding the specialization level of Greece, Germany and the rest of the EU will be drawn from the study by Midelfart-Knarvik et al. (2000) that provides the most contemporary data. This report uses data on gross production value based on four years averages and reports a particular measure of relative specialization called the Krugman specialization index[9]. Tables of bilateral differences of 14 EU members are also reported and an overall snapshot of industry characteristics of each country (ICB index) is provided in the Appendix (A1).

The main unit of analysis is the activity level measured by the gross value of output of industry k in country i at time t, which is denoted as x_i^k and it is expressed a share. Therefore it is defined as:

(13) $$v_i^k\ (t) \equiv x_i^k / \sum_k x_i^k (t)$$

Where $v_i^k(t)$= the share of sector k in the total activity of country i at time t. In other words, (13) measures the activity of an industry in the country i.

By using the unit in (13), an Industry Characteristic Bias (ICB) index is constructed and defined as:

(14) $$ICB_i(t) \equiv \sum_k v_i^k(t) z_i^k$$

Where $\{z_i{}^k\}$ is a set of industry characteristics that are unchanged over time and are presented in Appendix (A.1). For each country, the average score on each characteristic is computed where each industry characteristic is weighted by the share of that industry in the country`s production.

Table 1 provides an overview of the industry characteristics bias of the EU countries regarding the variables: final demand bias (FINAL), total use of intermediates (INTM), use of intermediates from own sector (INTRA), economies of scale (IRS),technology level (TECH), share of non-manual workers in workforce (S/L), capital-labour ratio (K/L), share of higher educated in workforce (HS). The characterization H (high) indicates that a country ranks

[9] Or the Krugman dissimilarity index of relative specialization.

among the five countries with highest ICB scores, M (medium) refers that a country ranks among four countries with medium ICB and L (low) indicates a rank among the five countries with lowest scores.

TABLE 1: Industry Characteristic Bias 1994/97

	FINAL	INTM	INTRA	IRS	TECH	S/L	K/L	HS
GERMANY	L	M	L	H	H	M	L	H
GREECE	H	H	M	L	L	L	H	L

Source: Midelfart-Knarvik et al. (2000)

The variables S/L (share of non-manual workers in the workforce) and HS (share of higher educated in workforce) are the ones of our interest. It is obvious that the differences in labour endowments are in line with the H-O model presented in Chapter (4.1). Greece belongs to the countries group that is biased towards low share of non manual workers (S/L) in workforce and low share of higher educated workers (HS). On the other hand, Germany scores better in these categories with a high share of higher educated worker (HS) and a medium in the S/L, namely the share of non manual workers. Moreover, it is important to add that Greece`s labour force is similar to the other southern Europe member countries, i.e Portugal, Spain and Italy. On the other hand, Germany`s skilled labour force displays similarities with countries such as France, United Kingdom, Netherlands and surprisingly Ireland. As already mentioned, Greece, Portugal, Spain and Ireland have been the recipients of European Cohesion Fund that aim at reducing economic and social disparities among the EU member countries[10].

Moreover, the comparison of the industry shares $v_i^k(t)$ from (13) is shown for all 14 country pairs for the years 1994/97 (Table 2). Greater values indicate greater difference and smaller values indicate similarity. The reported value for the bilateral difference between Greece and Germany is 0,86 which implies that the (overall) industrial structure of Germany bears little similarity with that of Greece. Moreover, Greece is somehow rather dissimilar

[10] European Commission Official Website.

compared to many EU economies with the biggest being the one of Sweden, Ireland and Finland but significantly similar with Portugal`s as expected.

Table 2: Bilateral Differences, 1994-1997

	Aus	Bel	Den	Spa	Fin	Fra	Gbr	Ger	Gre	Ire	Ita	Net	Por	Swe
Aus	0	0.54	0.59	0.48	0.58	0.43	0.39	0.46	0.78	0.81	0.43	0.64	0.57	0.55
Bel	0.54	0	0.54	0.47	0.76	0.44	0.48	0.61	0.63	0.69	0.57	0.42	0.64	0.76
Den	0.59	0.54	0	0.61	0.69	0.57	0.58	0.72	0.7	0.63	0.61	0.51	0.68	0.66
Spa	0.48	0.47	0.61	0	0.78	0.33	0.38	0.43	0.57	0.85	0.53	0.58	0.5	0.63
Fin	0.58	0.76	0.69	0.78	0	0.62	0.58	0.66	0.97	0.87	0.66	0.71	0.86	0.42
Fra	0.43	0.44	0.57	0.33	0.62	0	0.19	0.35	0.69	0.78	0.51	0.46	0.55	0.51
Gbr	0.39	0.48	0.58	0.38	0.58	0.19	0	0.36	0.72	0.77	0.47	0.46	0.59	0.51
Ger	0.46	0.61	0.72	0.43	0.66	0.35	0.36	0	0.86	0.82	0.49	0.61	0.74	0.49
Gre	0.78	0.63	0.70	0.57	0.97	0.69	0.72	**0.86**	0	0.91	0.76	0.62	0.49	1.03
Ire	0.81	0.69	0.63	0.85	0.87	0.78	0.77	0.82	0.91	0	0.82	0.68	0.99	0.88
Ita	0.43	0.57	0.61	0.53	0.66	0.51	0.47	0.49	0.76	0.82	0	0.77	0.56	0.6
Net	0.64	0.42	0.51	0.58	0.71	0.46	0.46	0.61	0.62	0.68	0.77	0	0.64	0.69
Por	0.57	0.64	0.68	0.5	0.86	0.55	0.59	0.74	0.49	0.99	0.56	0.64	0	0.84
Swe	0.55	0.76	0.66	0.63	0.42	0.51	0.51	0.49	1.03	0.88	0.6	0.69	0.84	0

[SOURCE: Midelfart-Knarvik et al. (2000)

On the other hand, Germany`s industrial structure is more similar with that of France, Great Britain and Spain, which is the most advanced out of the three Cohesion countries. Midelfart-Knarvik et al. (2000) also report bilateral differences for the time period 1980-1983. The reported value for that period between Greece and Germany is 0.73, indicating that their dissimilarity grew which implies increased specialization from 80-83 to 94-97.

The Krugman index of relative specialization is constructed as follows: For each country, the share of industry`s k in that country`s total manufacturing output (gross production value) is defined as in equation (13) and then the share of the same industry in the production of all other countries is calculated which is denoted $\overline{v}_i^k(t)$

(15) $$K_i(t) = \sum_k abs\left(v_i^k(t) - \overline{v}_i^k(t)\right)$$

With (16) $$\overline{v}_i^k(t) \equiv \sum_{j \neq i} x_i^k(t) / \sum_k \sum_{j \neq i} x_i^k(t)$$

Then, the difference between the industrial structure of country i and all other countries is measured by taking the absolute values of the difference between these shares, summed over all industries, i.e equation (15).

The index takes the value of zero if the country`s i industrial structure is identical with the rest of the EU countries (low specialization) and higher value (maximum 1) if the it diverges from the EU average (high specialization). However, it is important to emphasize that the Krugman Specialization Index is a measure of relative specialization compared with a benchmark, which here is the EU.

Table3: Krugman specialization index (production data, 4 years averages)

	70/73	**80/83**	**88/91**	**94/97**
Austria	0,314	0,275	0,281	0,348
Belgium	**0,327**	0,353	0,38	0,451
Denmark	0,562	**0,553**	0,585	0,586
Spain	0,441	**0,289**	0,333	0,338
Finland	0,598	**0,510**	0,528	0,592
France	0,204	**0,188**	0,207	0,201
G. Britain	0,231	**0,190**	0,221	0,206
Germany	0,319	**0,309**	0,354	0,370
Greece	**0,531**	0,580	0,661	0,703
Ireland	0,701	**0,623**	0,659	0,779
Italy	**0,351**	0,353	0,357	0,442
Netherlands	**0,508**	0,567	0,547	0,517
Portugal	0,536	**0,478**	0,588	0,566
Sweden	0,424	**0,393**	0,402	0,497
Average	0,432	**0,404**	0,436	0,471

[SOURCE: Midelfart-Knarvik et al (2000)]

The table reports 3 years averages for 4 different time periods for each country (MIdelfart-Knarvik et al, 2000; p.6). With bold are indicated the minimum values of each country that most of them are in the time period, namely 1980-1983. It is obvious that index increased for both Greece and Germany as the theory predicts, i.e freer trade and deeper economic integration induces countries to specialize in producing goods that are relatively good at and import goods that are relatively bad at. However, Greece`s index value is higher than Germany`s during the whole period indicating more specialization. The table shows the tendency for smaller countries such Greece, Portugal, Finland and Ireland to be more specialized than bigger member states such as Germany, Great Britain and France which appear to be the least specialized countries in the EU.

This can be attributed to the limited production base of the small and peripheral member countries (Greece, Portugal) and to the fact that core EU countries with large economic size have more diversified economies (Vogiatzoglou, 2005). It should however been mentioned that the Krugman specialization index has the tendency to under represent the degree of specialization of large countries when applied to the EU (European Central Bank, 2004; p.13). However, Germany`s specialization profile seems to be slightly different with that of France and UK since it is the most specialized out of this group.

Moreover, Amiti (1999) notes that the entry of a country in the Union is accompanied with a fall in its specialization level. This may happen because this country may have high trade barriers in industries that did not have a comparative advantage in the pre accession period. By entering the Union, the abolishment of trade barriers and increased competitiveness lays pressures for structural adjustments in the production structure. Thus, the newcomer has to expand the production in the industry that has a comparative advantage over its new EU partners. This restructuring, i.e change industry in which each newcomer country specializes, is rendered as a fall and then as an increase in its specialization level.

6. TRADE PROFILES

6.1 The European Union

The European Union is the world's biggest trader and the largest open market. The last wave of enlargement in 2007 increased its member states from 25 to 27. The nations incorporated in the union benefit from the proximity of each other`s market, the barrier free distribution of goods and services and by a highly integrated transport network. Moreover, various measures facilitate the deepening of the union, as the adoption of a common currency in 2002 by twelve member states that reduces financial uncertainty among the intra EU trade partners.

It is the world`s biggest trader with a share of 17,1% of the world`s merchandise trade (exports+imports), excluding the intra-EU trade, in 2006. It ranks first in the world`s exports with a share of 16,2% and a total value of 1.166,1 billion€ and second on the imports with 1.350,5 billion€ that accounts for 18% of the world trade[11].

The trade pattern of the EU is characterized by the dominance of manufactured goods both in exports and imports, which account for 82.8% and 60.8% of its total imports and exports respectively according to the World Trade Organization (WTO)[12]. Its main trade partner is the USA, while Chinese imports have the largest share on the union`s imports.

EU runs a rather complex trade policy on a global scale that includes bilateral trade agreements with almost all member countries of the WTO and other trade arrangements. The European Free Trade Association (EFTA), the Euro Mediterranean Association and the Commonwealth of Independent States are the most important ones (Baldwin and Wyplosz, 2006; p.283). In addition to the already established agreements, the EU is almost always open for new ones as long as they exclude agriculture since the Common Agricultural Policy (CAP) has been the reason for quarrels not only among member countries but between the EU and third nations as well.

[11] European Commission Website
[12] World Trade Organization (WTO) website, Trade Profiles.

EU trades mainly with itself. The main destination of the EU`s imports and exports are other European countries, a fact that is indicative of the importance of the intra-EU trade. In 2006 the shares of the arrivals (intra EU imports) and dispatches (intra EU exports) to other members countries accounted for almost two thirds of the total imports and exports, i.e 64,1% and 68,3% respectively (EUROSTAT)[13]. However, intra-EU trade has grown relatively less than the extra EU after 2003, reflecting the growing internationalization of the EU in the global markets and the emergence of new global players such as China.

6.2 Germany

Germany is traditionally the EU`s biggest economy and the world`s top exporter in merchandise trade according the World Trade Organization (WTO). It belongs to the group of nations along with Italy, France, United Kingdom, Spain and the Netherlands that account for more than 80% of total Gross Domestic Product (GDP) of the EU25 in 2006. Among this group, Germany has the largest share (21%).

The reunification of Germany in the beginning of the 90s posed the threat of a serious trough in many sectors of the economy such as employment and output although the biggest challenge was to introduce markets to an economy with none. Although, markets and institutions were successfully introduced, the economic cost of unification had a negative effect on west Germany`s growth that affected the rest of the Europe as well (Hunt, 2006).

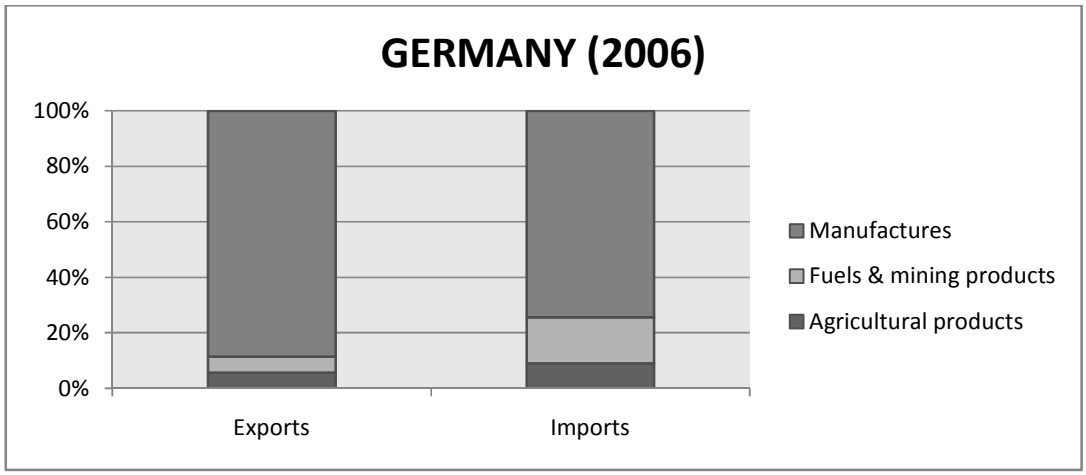
Today Germany is heavily export oriented economy with a trade to GDP ratio of 83,3% and it is a strong advocate of deeper economic and political integration in Europe[14]. It mainly trades manufactured goods with Europe as shown in Figure 6 and table 4. Germany`s manufactured sector goods accounts for 86,5% of total exports and 73.2% of total imports, while agricultural goods have a share of 8,9% and 5,5% in imports and exports respectively. Moreover, the manufactured goods sector accounts for 30,1% and the agricultural sector for 0,9% of the country`s total GDP[15]. However, in order to explain Germany`s trade

[13] "Panorama of European Union Trade, Data 1999/2006" (2007)
[14] World Trade Organization (WTO) website.
[15] Central Intelligence Agency (CIA) - The World Factbook, Official Website.

structure, certain emphasis needs to be placed on the nature of trade, i.e intra industry (IIT) or inter industry trade.

Intra industry trade is broadly defined as the two way trade in similar products while other studies have extended the definition by stating that IIT is conducted with goods that have high substitution elasticities in consumption, or simply goods that fall in the same statistical category (Brulhart, 1998a). IIT was explained by the new trade theory (NTT) that made use of concepts such as increasing returns to scale, product differentiation and home market effect (Krugman, 1980) and is further discussed in Chapter (7.1). On the other hand, standard neo-classical theory of trade (NCT) that is based on country specific characteristics assumes that the only type of trade conducted is inter-industry trade, i.e trade with completely different products.

Fig.7: Breakdown in Germany`s economy total exports & imports (%) by main commodity groups (ITS). (Excluding services)



[SOURCE: World Trade Organization]

As indicated by OECD (Organization for Economic Co-operation and Development, 2002; p.161) data of the level of manufacturing IIT as percentage of total manufacturing trade in each country, Germany belongs to the group of countries that is characterized as having high and increasing intra-industry trade along with Czech Republic, Slovak Republic, United States, Poland and Hungary. However, the extent of IIT is usually higher in manufactured goods and even higher in more sophisticated manufactured goods such as chemicals, transport and electrical equipment and electronics; goods that are core German exports

The most widely used tool in empirically measuring IIT is the unadjusted Grubel-Lloyd (GL) index (Appendix A.2). Specifically, the GL index measures the intra industry trade of a particular industry as a proportion of total trade of the same industry and it takes values from 0 to 1. An index value of zero is translated as completely inter-industry trade, while a value of 1 is an indicator of perfect intra industry type. According to Brulhart & Elliot (1998; p.235) that calculated the GL index for 12 EU member countries from 1961 until 1992 based on the manufactured goods imports and exports, Germany scored a value index of 0,68 with the EU average being 0,64 in 1992. However, one important discovery of this study was that although the level of IIT trade among the member countries grew in this period, there was a significant stagnation in the growth of IIT during 1980 and 1990.

However, the determination of the trade patterns and partners is affected by a variety of factors such as the natural endowments, industrial tradition, specialization, culture and geographical location to name a few. Germany is globally known for the quality in electrical and transport equipment and the "Made in Germany" seal has been a synonym of quality for almost a century now.

As Baldwin & Wyplosz (2006) argue, when it comes to trade, geography matters a lot. Some countries are in a more privileged geographical location than other ones. Some share borders with other EU member countries; others are landlocked or culturally and geographically closer to Africa, Latin America or the USA. The European Union is considered as a highly centralized continent in terms of economic activity (GDP share). The area of central Europe made up by western Germany, the Benelux states and south east France, takes the one half of the total EU`s economic activity although it contains only the one third of the Union`s land and the one seventh of the total population (Baldwin and Wyplosz, 2006; p.231). The geographic classification of EU includes also the intermediate region (Italy, Spain) and the peripheral region (Greece, Portugal). The classification of Europe in regions in terms of geography and its effects on each nation`s trade structure (especially of IIT type) has been widely studied in the literature. Brulhart (1998b; p.332) reports a centrality index (NUTS level 2)[16] (Appendix A.3) for 12 countries of the EU for the year 1983 that measures the economic distance of countries (regions) from the market core of the EU. Germany`s

[16] Nomeclature that Classifies the EU territory in regions. (NUTS level 2 subdivides the EU in 271 regions)

index value was 10,252 and ranked third after Belgium and the Netherlands. An important result by Brulhart (1998b) was that countries located in the core region of the EU exhibit higher levels of IIT in comparison to countries that belonged to the peripheral region (Greece). However, in countries with a low value of centrality index IIT trade grew faster than the ones with a high value, indicating a spatial industrial relocation across the EU members.

Table 4 shows the top trading partners of Germany. Comparing Tables 4 and 5, it is clear that German trading partners are dissimilar relative to Greece's trading partners. Germany`s extra-EU partners coincide with that of the EU as a whole, namely United States, China, Switzerland and Russian Federation, and with the same rank (Chapter 3.1). The presence of the Russian Federation is justified by the fact that it is the main supplier of energy in the Union.

Table 4: Exports & Imports (%) By Main Destinations and Origin (2007)

Exports		Imports	
1. European Union (27)	64.7	1. European Union (27)	59.5
2. United States	7.6	2. China	7.1
3. Switzerland	3.8	3. United States	5.9
4. China	3.1	4. Switzerland	3.9
5. Russian Federation	2.9	5.Russian Federation	3.7

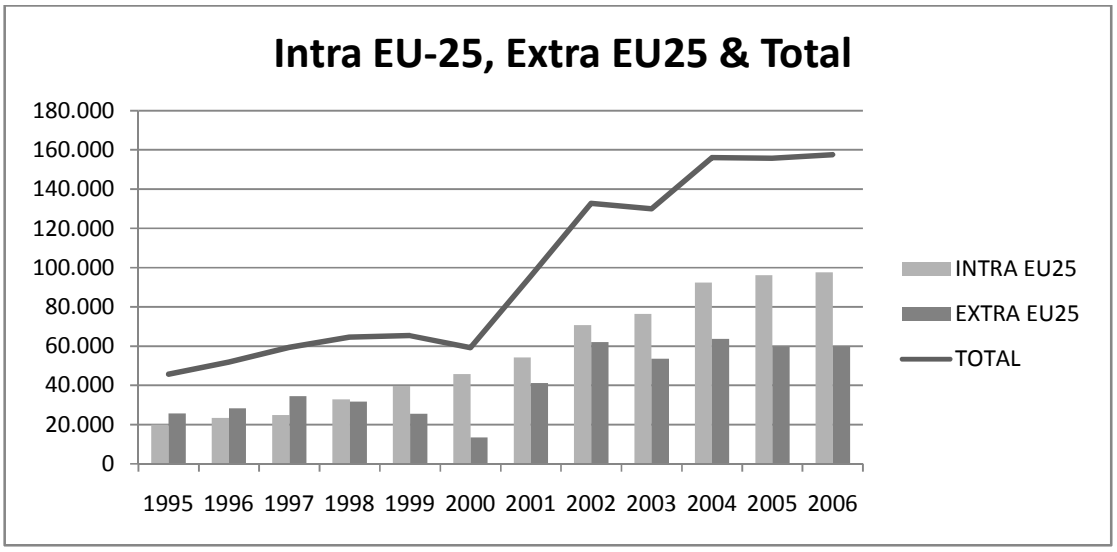
However, the share of Germany`s intra EU trade in total trade is not as high (63.7%) as someone would expected to be. Countries such as Czech Republic, Slovakia and Luxemburg exhibit higher share in this category with levels that account for more than 80% of each country`s total trade. This trend justifies the view that smaller EU countries trade more intra EU rather than extra EU. In addition, as already mentioned, Germany`s main exports are manufactured goods such as machinery and vehicles; group products that are exported further afield and reflect EU`s and Germany`s specialization in international markets[17].

In 2006, Germany`s main export EU destinations were France (84,904 €), United Kingdom (64.647 €), Italy (59.208 €) and the Netherlands (56.264 €) which was also the main EU importer in Germany with 86.581 €. Other imports also came from France (62.347 €), Belgium (83.092 €) and the United Kingdom (41.725 €). It is obvious that Germany trades

[17] "Panorama of European Union Trade, Data 1999/2006" (2007)

mostly with other industrial member countries although the highest annual growth both in imports but especially in exports is observed in the newly accessed countries such Poland and Latvia. This high growth of trade with countries that entered the EU in 2004 shows the ability of the German exporst sector in entering new markets and gaining large market shares.

FIG.8: Trade Balance (Mio €), Germany.



[SOURCE: EUROSTAT]

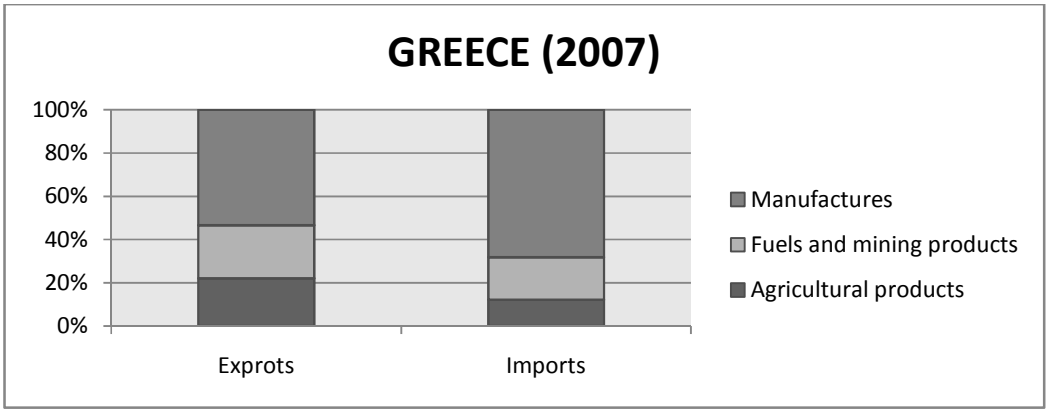
Figure 8 provides an overview of the German trade balance. Intra EU balance steadily grows and is the second highest trade surplus after the Netherlands. Likewise, the extra EU surplus is large and positive over the whole period but with fluctuations that reached its minimum in 2000.

6.3 Greece

On the other hand, Greece joined the EU in 1981. It ranked 63th in 2007 in world exports and 39th in imports with a rather low trade to GDP ratio of 44,3% (WTO). It has been a substantial beneficiary of the EU budget and has received funding from the Cohesion and Structural Funds that aim at helping the poorer peripheral regions of the EU at catching up with the average levels of the union. Its main imports are machinery, transport equipment, fuels and chemicals while its exports are food and beverages, agricultural products, manufactured goods, petroleum products, chemicals and textiles. Figure 9 gives a general overview of Greece`s breakdown of exports and imports.

The pattern of trade is rather dissimilar compared to Germany`s. The importance of manufactures in Greece`s trade pattern is moderate. On the exports side it represents the 51,6% of the total exports but on the imports side its weight is higher with a percentage of 67,6% of the overall imports for 2007. Moreover, the agricultural sector is relatively more important for Greece than for Germany, it accounts for 3,5% of the total GDP with a share of 12,2% on imports and 21,4 in exports[18].

Fig.9: Breakdown in Greece`s economy total exports & imports (%) by main commodity group (ITS)[19]. (Excluding services)

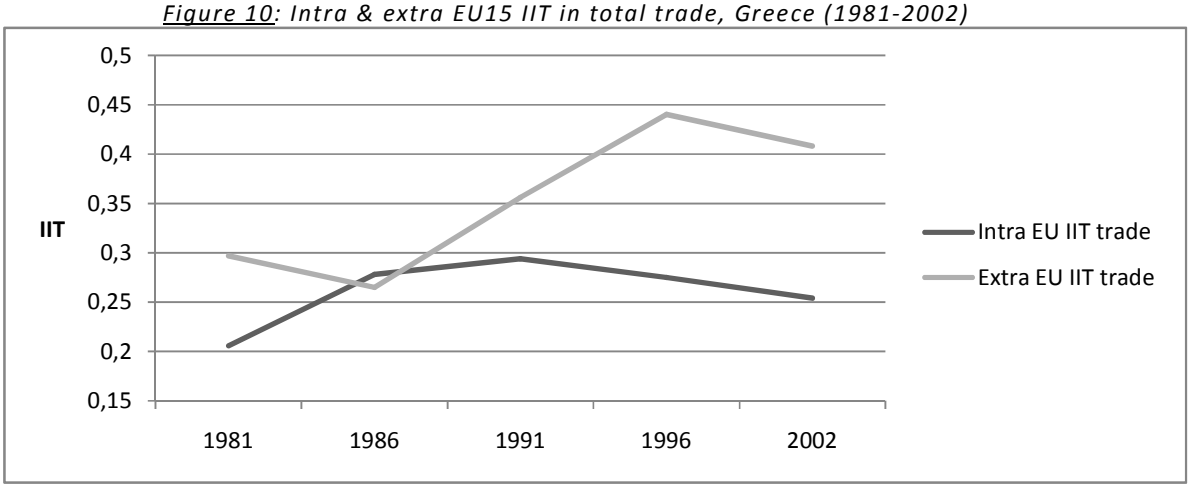


[SOURCE: World Trade Organization]

[18] Central Intelligence Agency (CIA)- The World Factbook, Official Website
[19] World trade Organization (WTO), Trade Profiles.

In contrast to Germany, Greece` exhibits low levels of IIT. The GL index value was 0,15, the lowest among in the 12 countries in 1992, with the second lowest being that of Portugal with a value of 0,31 (Brulhart & Elliot, 1998; p 235) . However, it appears that the intra EU IIT is less significant than the extra EU IIT. Vogiatzoglou (2004) analyzed the intra- and extra-EU15 trade pattern in Greece from 1981 (accession year) until 2002 regarding intra-industrial trade (IIT) with the EU-15[20]. Figure 10 provides a graphical representation of the findings.

Figure 10: Intra & extra EU15 IIT in total trade, Greece (1981-2002)



[SOURCE: Vogiatzoglou (2004)]

It is obvious that intra and extra EU IIT move in different directions. The first years of accession intra-EU IIT increased but at the expense of extra-EU IIT, which seemed to be more important in the pre-accession period. Intra-EU IIT started decreasing in 1986[21] while extra-EU IIT increased substantially, indicating a reorientation of greek exports outside of the EU markets. The same OECD report, as in Germany`s case (OECD, 2002; p.161), regarding the manufacturing IIT as a percentage of total manufacturing trade classifies Greece as a country with low levels of IIT. Actually, the relevant index has declined by 5,9% between the time periods 1988-1991 and 1996-2000.

An important fact that can not be disregarded in explaining the Greek trade structure is the political changes that took place in the Eastern Europe including the Balkan region at that time, i.e all the communist countries moved to the market economy. Greece until then shared common borders only with communist countries (Yugoslavia, Bulgaria, Albania) and

[20] In this paper EU is treated as one partner (economy)
[21] 3rd wave of enlargement, Spain and Portugal join.

Turkey and with no EU member country. As in the case of Germany the geographical component is important and probably even more crucial in the case of Greece. For more than 2 decades it was an isolated member country that indicated the east boundary of the Union. The last wave of enlargement in 2007 that incorporated Bulgaria and Romania opened new markets for Greek exports that had already been accessed since the beginning of the 90s. Labriniadis & Kalogeressis (2001) found that in more than a decade the IIT in manufactures with eastern European countries and especially with the Balkan countries had almost tripled while the respective figure with the older EU members has remained steady for the same period, indicating a reorientation of the Greek exports. As mentioned in Germany`s case, the centrality index that measures the economic distance from the core market reports the lowest value (2,293) for Greece of all 15 EU countries in the sample (Brulhart, 1998b; p.332).

Table 5 reports the main trade partners of Greece with the most important being the EU as in the case of Germany. However, the exports to the Union are more than the imports from the Union while the total Intra EU share accounts for the 58,8%[22] of the total trade; a rather small share in comparison to other member countries. Although smaller EU economies export more intra EU especially when borders are shared, this does not hold in the case of Greece for the reasons mentioned above. Furthermore other country specific characteristics affect the trade pattern as well. Greece is considered to be a sea fearing nation which favors trade over longer distances.

Table 5: Exports & Imports (%) By Main Destinations and Origin (2007)

	Exports		Imports
1. European Union (27)	65,0	1. European Union (27)	57,8
2. United States	4,2	2. Russian Federation	5,6
3. Turkey	3,6	3. China	5,0
4. Albania	2,6	4. Islamic Rep. of Iran	3,6
5. FYR Macedonia	2,3	5. Republic of Korea	3,4
6. Unspecified Destinations	2,5	6. Unspecified destinations	0,7

[SOURCE: WORLD TRADE ORGANIZATION]

Among the main exports destinations are all the neighboring countries. Greek exports can access and gain larger market shares in these emerging markets that are characterized by low competitiveness. Cultural similarity can also be regarded as a factor affecting the trade

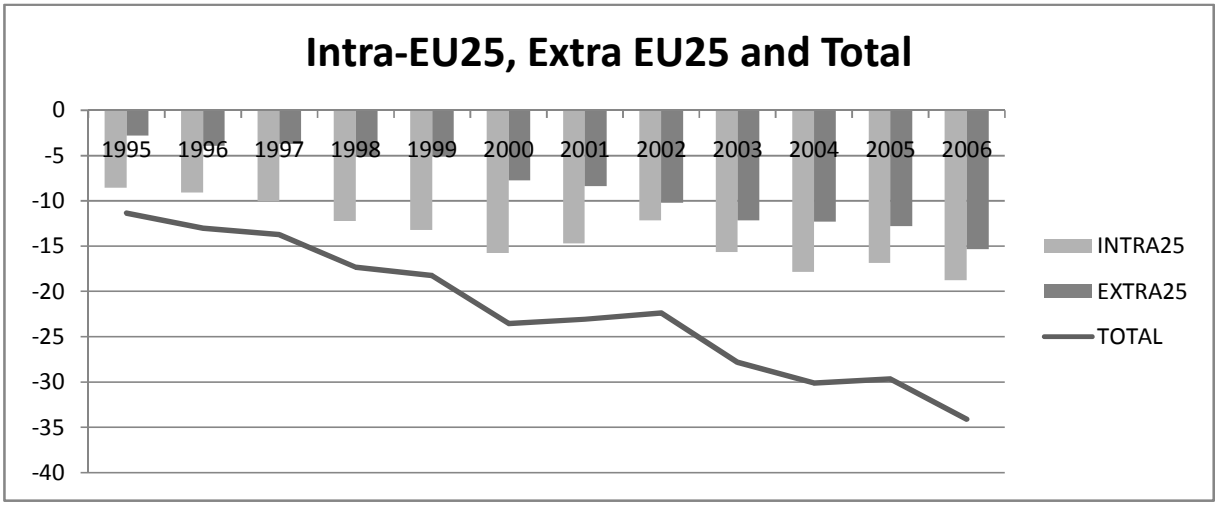
[22] "Panorama of European Union Trade, Data 1999/2006" (2007)

pattern since Greece is culturally closer to the Russian Federation and the Eastern European countries than the Western Europe.

In 2006, main EU trade partners were Germany, Italy, United Kingdom, France, Bulgaria and Cyprus. On the exports side, out of the total 8.898 Mio € of the Intra EU25 Greek exports, the main destinations was Germany (1.879 Mio €), Italy (1.860 Mio €), Bulgaria (1.052 Mio €), United Kingdom (987 Mio €) and Cyprus (889 Mio €). The interesting feature is the emergence of Bulgaria as a major client of the Greek exports. Neighboring an EU country in this case indicated closer trade relation that is enhanced by no border formalities, no tariffs and lower transportation costs. On the imports side, Germany and Italy rank first and second with 6.336 Mio € and 5.797 Mio € respectively out of the total intra EU imports of 27.657 Mio €. The next major importers are France (2.991 Mio €), Netherlands (2.599 Mio €) and Belgium (1.776 Mio €).

Greece has a sustained negative trade balance the period 1995-2006 as depicted in Figure 11. It is obvious that the contribution of the intra EU25`s deficit is higher with bigger fluctuations than the extra EU25 which also deteriorates in a more steady pace.

Fig.11: Trade Balance (Mio €) , Greece

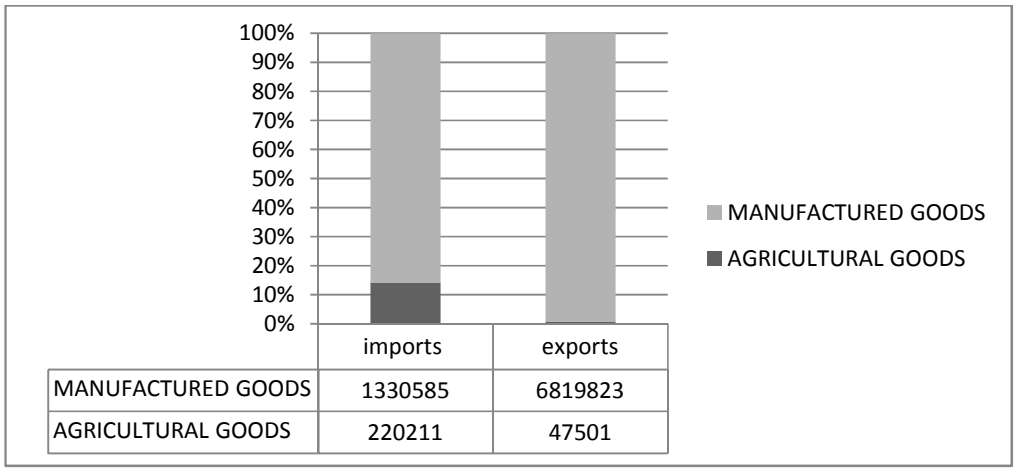


[SOURCE: EUROSTAT]

6.4 Bilateral Trade Data

The trade pattern according to the H-O model described in Chapter (4.1) is here confronted with data. Figure 12 provides an overview of the trade structure between Germany and Greece for manufactured and agricultural goods[23] for the latest available year, 2004 (OECD STAN tables). The reporting country is Germany and the original values are also provided (in thousands $).

Fig. 12: Bilateral trade structure (2004).



	imports	exports
MANUFACTURED GOODS	1330585	6819823
AGRICULTURAL GOODS	220211	47501

[SOURCE: OECD]

The graph shows that the structure is consistent with the predictions of the H-O model. Germany is the larger exporter of manufactured goods relatively to Greece. Manufacturing exports account for 99,3% of its total exports to Greece[24]. On the other side, Greece is a relatively larger exporter of agricultural goods in comparison to Germany and the same bilateral trade structure holds for the period 1988-2004.

The main conclusions from this chapter are that Greece's and Germany's exports are broadly in line with the theory presented in chapter (4.1). This holds for both their bilateral trade structure and for each county`s overall trade pattern. However, manufactured goods are the prevalent commodity group traded in the Union and account for the larger share of imports and exports for both Greece and Germany. Extending the analysis to other determinants of trade patterns with New Trade Theory terminology indicated that Greece`s

[23] In OECD, it is referred Agriculture, hunting and forestry
[24] Total exports defined as (agricultural goods + manufactured goods)

Intra-industry trade direction has reoriented towards neighboring and other Eastern European countries.

Hence, despite the fact that the application of the H-O model has offered overall constructive results, the extent of its applicability in the EU regarding certain assumptions and implications is discussed in the next Chapter.

7. THE H-O MODEL AND THE EU REALITY

The factor proportions model described has been one of the most influential ideas in international economics and therefore it has extensively been tested empirically with the most notable being the Leontief paradox (Feenstra, 2004; p.35). Although economics models have been considerably criticized for their high level of abstraction (restrictive assumptions); certain useful results can be realized. For that reason this Chapter is dedicated to finding the degree of applicability of the H-O model in the EU reality.

Usually, the H-O model explains the trade pattern of nations that move from autarky to free trade. In our example it was applied to countries that have long been members of the Union so we could argue that we evaluate the effects of ongoing deeper and wider integration process. In other words, consecutive waves of enlargement intensify trade among the member countries and the older member countries are obliged to develop trade relations with the newcomers. It has been estimated that the creation of the European Union has doubled the intra EU trade (Salvatore, 2007; p.348). By deeper economic integration it is meant the continuous and dynamic process of the union moving towards a more free trade state of affairs with laws and institutions that enable more trade among its member states. Despite the fact that free trade in goods is almost complete among the EU member nations especially after the creation of the Single Market, the integration process in the services sector is still not complete.

The Services Directive, an initiative of the European Commission, aims at creating a Single Market for services similar to the Single Market for goods; a genuine integrated market that will benefit both service providers and recipients. The former will benefit by less administrative formalities, less red tape and lower cost when entering the market of another member country, while the latter will gain by the cheaper and better quality services that will stem from increased cross-border competition[25].

[25] European Commission Official website.

7.1 Economic Integration and Intra Industry Trade

Moreover, the H-O model along with the Ricardian model are built on the Neo Classical Theory (NCT) framework and assume perfect competition as being the prevalent market structure both in goods and labour markets. Main determinants of trade among nations with relative homogeneous demands are technological and resource endowments differences and it is assumed that only inter industry trade (differentiated products) is conducted, hence leaving a large share of world trade unexplained since more than the 50% of the world trade is intra industry type. For that reason, the new trade theory (NTT) and New Economic Geography (NEG) surfaced and shed more light on the structure of the world trade (Brulhart, 1998a).

Intra industry trade (IIT) was added in the models and the size of the market emerged as a robust determinant of exports and market distortions such as monopolistic competition was incorporated in the models. As Krugman and Obstfeld argue (2006; p129), intra industry trade produces extra gains from international trade because it allows countries to benefit from larger markets. With IIT a country can reduce the number of goods that it produces, while consumers gain access to more varieties available from the world market. In that way, consumers benefit from the wider range of choices, while producers gain from economies of scale, higher productivity and lower costs.

The trade profiles of both countries presented in Chapter (6) made clear the major role that intra industry trade plays in both countries` overall trade pattern, with higher significance in the case of Germany. Hence, applying the H-O model for these two countries is not going to produce fully satisfactory results. However, the H-O model and its central result, the Stolper-Samuelson theorem, have been used to address the “trade and wage” issue, i.e to what extent imports from low-wage countries is responsible in widening the wage differential between skilled and unskilled labour, with satisfactory results (Neary, 2004). In this context, as already noted in this thesis, EU countries vary a lot in economic terms, such as with respect to relative endowments, indicating that the H-O model may still be relevant in explaining trade patterns.

7.2 Labour Market Issues

European integration and increased trade flows lead to efficiency (and welfare) gains through increased industrial specialization, but the gains are usually realized in a longer time horizon while certain costs within the labour market context rise in the short run. One of main result of the H-O model was that trade entails changes in the production structure within the trading countries. Each country will re-employ its resources in the industry that uses its abundant factor intensively in order for efficiency gains to be realized. Namely, Germany is expected to take skilled workers from the agricultural sector that contracts and place them in the manufactured goods sector that expands, thereby absorbing its abundant factor without lowering its wage; while the same holds for Greece but for the unskilled workers.

Shifting workers from one industry to the other is associated with other issues that arise such as unemployment, the specialization level of each country and wage rigidities that can be broadly referred as adjustment costs, which are not taken into consideration in the H-O model since it is assumed that all changes take place instantly in the short-run. However it is a general belief that IIT trade poses fewer adjustment problems than inter-industry trade [26]. (Krugman, 1991; p.970).

Brulhart and Elliot (1998, p.227) state that "...*Adjustment costs arise from temporary inefficiencies when markets fail to clear instantaneously in response to changes in demand or supply conditions*...". As already defined in Chapter (6.1), IIT is among goods with similar production requirements or goods that fall in the same product category; hence, labour requirements are much more similar when workers shift from within an industry than between industries. For example the reallocation of a worker from a plant that manufactures cars to a plant that manufactures trucks entails relatively smaller costs than reallocating workers as in the H-O model.

In reality these inter-industry shifts that generate these inefficiencies (market failures) require an adjustment period of re-training since sector specific skills do exist. Issues of geographical relocation of workers and of job search period also are raised that promote

[26] Smooth adjustment hypothesis.

wage differentials between the contracting and the expanding sector at least in the short run. Baldwin et al. (1980) argue that these labour market adjustment pains are usually confronted by the economists with the comment that the re-employment of the workers will take place in the long run.

The assumption of immobility of production factors across borders is central in the H-O model. Reed & Sodersten (1994; p.456) argue that this assumption is an approximation in order to codify the fact that labour (and capital) move less internationally than goods and services do; an assumption, that under the Factor Price Equalization argument and provided that countries do not achieve complete specialization, implies that trade in goods and services works as a substitute for free movement of labour (and capital).

Baldwin and Wyplosz (2006) argue that, free movement of workers is the cornerstone of EU integration and a fundamental element of European citizenship. The 2004 and 2007 wave of enlargement incorporated 10 and 2 new member countries from Eastern Europe respectively and was accompanied with temporal but gradually decreasing restrictions against labour inflows from the newcomers. However, Germany (and Austria) has voiced the intention to keep the current barriers until 2011 instead of 2009 as originally declared[27] against the CEECs (Central and eastern European countries). The possibility of massive East to West migration has not yet become a reality. Intra EU labour mobility is very low relative to the population size of the EU and compared to the immigrants from third countries. Less than 2% of the working age citizens live in other member countries and the majority comes from the old member states although all countries have recorded positive net migration flows ("Employment in Europe", 2006; p.16).

7.3 Foreign Direct Investment (FDI)

Apart from the mobility of labour, capital also moves across borders. Capital moves in the form of Foreign Direct Investment (FDI) and its existence contradicts the assumptions of the H-O model. OECD's FDI definition indicates that "*Foreign direct investment reflects the objective of obtaining a lasting interest by a resident entity in one economy (''direct*

[27] www.euractiv.com

*investor'') in an entity resident in an economy other than that of the investor (''direct investment enterprise'')" (*OCED, 1999; p.5*).* It also plays a key role in the increasing regional integration (as in the EU) and globalization process since it supplements trade and creates deeper and more direct links among (member) countries. EU is major player in the world FDI market both for inward and outward FDI since it accounted for 24% of the world FDI outflows in 2004 while the main extra EU FDI inward flow comes from OECD (non EU) countries such as the United States of America and Switzerland (EU FDI yearbook, 2006; p.11). EUROSTAT`s FDI intensity index [28] reports a value of 3.3 for Germany which is slightly below the EU27 value (3.4), while Greece has the lowest value (1.2) of all the 27 member countries for 2007.

7.4 Intra-EU Trade Barriers

Tariffs in the intra-EU trade were completely eliminated with the formation of Customs Union in 1968; this issue was also revived with the Single European Act (1986) and the creation of the Single European Market in 1992. However, in contrast to H-O assumption there are still many barriers that impede intra-EU trade that are called 'Non-Tariff Measures' (NTMs) and eventually affect the degree of trade integration among nations.

During the period 1982-2004, there were reported 512 infringements and surprisingly the most incidents took place after the completion of the Single European Market (1992); a fact that suggests that NTMs were used as a substitute for regular tariffs. Large countries tend to use NTMs more often than small member states in sectors where new technologies, innovations and scale economies are important (Faria and Guimares, 2006).

Among NTMs, there is a wide range of Technical Barriers to Trade (TBTs) that can take the form of excessive bureaucratic 'red tape' restrictions or different industrial standards (packaging and labeling requirements) among the trading nations (Baldwin and Wyplosz, 2006; p111). However, measuring TBTs is not an easy task since "direct measures are

[28] Market integration - Foreign Direct Investment intensity - Average value of inward and outward Foreign Direct Investment flows divided by GDP, multiplied by 100

remarkably sparse and inaccurate"[29] and studies usually make use of indirect measures such as trade to output ratios or openness indices that fail to capture bilateral trade barriers. Chen and Novy (2008) study the extent that TBTs affect bilateral trade flows in a gravity equation framework for 166 manufacturing industries in 11 EU countries for the time period 1999-2003. Their findings show that bilateral trade integration is indeed lower in countries and industries where technical barriers to trade are high. It is also argued that the variation of trade integration across country pairs is broadly consistent with typical gravity equation variables such as low transportation costs (bilateral distance), adjacency and language.

[29] www.voxeu.org

8. Conclusion

This thesis examined certain aspects of European economic integration by using the Heckscher-Ohlin model. The main questions addressed were: (1) Can we explain - and to what extent - trade patterns of certain countries by using a factor endowments theory of trade, and (2) how does ongoing economic integration affect the industrial structure, the goods prices and factors prices of two EU member countries?

The application of the Heckscher-Ohlin model in Chapter (4), was based on the assumption that Greece`s and Germany`s differences in relative labour endowment are a source of international trade. The former was assumed to be unskilled labour abundant exporting agricultural goods (unskilled intensive sector), while the latter was considered relatively abundant in skilled labour exporting manufactured goods (skilled intensive sector). Opening of trade results in changes both across and within countries. The Factor Price equalization Theorem (FPE) predicts that factor prices will be equalized across countries, while according to the Stolper-Samuelson theorem, the scarce factor is expected to loose and the abundant to gain within each country.

Chapter (5) examined the industrial structure of 14 EU member countries for the time period 1970-1997. Differences in relative endowments of Greece and Germany provide evidence that the Heckscher-Ohlin model can offer convincing results in explaining the bilateral trade pattern, since differences in the skill mix of the member countries do exist. Greece`s relative abundant low educated workforce is suitable for the production of agricultural goods while Germany`s relatively more skilled workers can specialize in the production of manufactured ones.

Moreover, the dynamics of the specialization level of 14 EU member countries follow the predictions of standard international trade theory; i.e deeper economic integration induces countries to increase their specialization along their comparative advantage in order for efficiency gains to be realized. Specifically, Greece appears to be relatively more specialized than most of its EU counterparts reflecting the tendency of smaller countries to achieve higher levels of specialization. Especially after joining the EU (1981), increased competitiveness and abolishment of trade barriers led to further specialization. In contrast, Germany`s specialization level bears similarities with other large in economic terms

countries (France, UK) and exhibit lower level due to factors such as its wider production base.

Trade profiles presented in Chapter (6) provided a broader overview of both countries` trade structure. The analysis included intra-industry trade (IIT) since other factors appear to determine the direction of trade as well. Geography, neighboring countries, successive waves of EU enlargement and distance from the core market play a significant role. Nonetheless, the main results remain broadly unchanged: Germany and Greece are relatively larger exporters in manufactured and agricultural goods respectively since both countries export the goods that have a comparative advantage; a fact that holds for their bilateral trade structure as well. In addition, EU membership has intensified intra-EU trade since it accounts for more than half of their imports and exports.

Certain assumptions and implications of the model were confronted with EU reality in Chapter (7). I argued that the H-O assumption of international immobile production factors fits properly in the case of labour rather than capital. In spite of being a key element of European integration, mobility of workers on a cross country basis is low. Only 2% of the working age citizens live in a different member country. In addition, the last two waves of EU enlargement in 2004 and 2007, which added 10 Central and Eastern European countries (CEEC), was accompanied with restrictions on labor mobility by many member states for fear of massive East to West migration. In contrast, capital appears significantly more mobile internationally since EU is considered a major player in the world FDI market.

To conclude, further economic integration is expected to put more pressure on member countries for further industrial restructuring and increased specialization in sectors that have a comparative advantage over their EU counterparts. Also, further enlargement of the union will affect intra-EU trade, specialization and factor prices. In particular, one implication of the model is that unskilled workers in Greece will experience an increase in real wages, while unskilled workers in Germany will experience a decline.

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[Accessed: 15/1/2009]

APPENDIX

A.1

INDUSTRY CHARACTERISTICS (ICB)

Economies of scale	– Measures of minimum efficient scale (MES)
Technology level	– High, Medium, Low, (OECD classification)
R&D intensity	– R&D expenditures as share of value added
Capital intensity	– Capital stock per employee (K/L)
Share of labour	– Share of labour compensation in value added
Skill intensity	– Share of non manual workers in workforce (S/L)
Higher skills intensity	– Share of higher educated workers in workforce
Agricultural input intensity	– Use of primary inputs as share of value of production
Intermediates intensity	– Total use of intermediates as share of value of production
Intra-industry linkages	– Use of intermediates from own sector as share of value of production
Inter-industry linkages	-Use of intermediates from other sectors as share of value of production.
Final demand bias	– Percentage of sales to domestic consumers and exports
Sales to industry	– Percentage of sales to domestic industry as intermediates and capital goods
Industrial growth	– Growth in value of production between 1970 and 1994

A.2

Grubel-Lloyd Index

i=1…n is a group of industries

$$IIT = 1 - \frac{\sum_{i=1}^{n} |X_i - M_i|}{\sum_{i=1}^{n} (X_i + M_i)}$$

M_i=imports from a particular industry

X_i=exports from a particular industry

The index takes values between 0, for complete inter-industry trade and 1, for complete intra-industry trade

A.3

Centrality Index

The index measures the accessibility of 166 NUTS-level II regions.

$$P_i = \sum \frac{Y_j}{D_{ij}} + \frac{Y_i}{D_{ii}}, i \neq j$$

i= the relevant region

j= all the other EU regions

Y_{ij}=regional gross domestic product in 1983

D_{ij}= measures the shortest distance between the largest settlements in regions i and j. Where regions are separated by water, weighted values of ferry costs were applied.

D_{ii}=intra regional distance cost, defined as one-third of the radius of a circle of the same area as region $i`s$

The indices for the 12 EU countries were aggregated, so weighted by 1983 regional population.