FAKULTÄT FÜR !NFORMATIK
Faculty of Informatics

Trade linkages and trade flows in OECD countries
Model of the Sectoral trade

DIPLOMARBEIT

zur Erlangung des akademischen Grades

Diplom-Ingenieur/in

im Rahmen des Studiums

Business Informatics

eingereicht von

Martin Josef Pogatsch
Matrikelnummer 0525076

an der
Fakultät für Informatik der Technischen Universität Wien

Betreuung
Betreuer/in: ao. Univ. Prof. Dr. Gerhard Hanappi

Wien, 30.03.2014

(Unterschrift Verfasser/in) (Unterschrift Betreuer/in)

Kurzfassung

Mit dieser Arbeit wollen wir Handelsströme und Handelsverflechtungen in den OECD Staaten erfassen und analysieren. Wir fangen damit an uns einen groben Überblick über den intra-industriellen Handel zu verschaffen. Dann blicken wir zuerst auf bewährte Handelsmodelle, wie das Ricardo Model und das Heckscher Ohlin Model und darauf aufbauend auf das Handelsmodell für intra-industriellen Handel von Paul Krugman. Dieses Modell soll uns dabei helfen den Handel, vor allem denjenigen Handel zwischen Industriestaaten, zu erklären. Wir analysieren die Entwicklung der Produktivität und Lohnstückkosten. Auch werden wir uns die Entwicklung der Handelsflüsse der letzten Jahre ansehen. Auch betrachten wir uns die Handelsflüsse zwischen OECD Staaten im allgemeinen und auch für einige Sektoren im speziellen. Hier analysieren wir je einen Sektor aus dem landwirtschaftlichen Bereich, der Chemieerzeugung und dem Maschinen- und Maschinenteile erzeugenden Bereich. Wir wollen zukünftige Entwicklungen und Auswirkungen auf Länder erkennen.

Abstract

In this paper we want to illustrate and analyze the trade flows and trade linkages in the countries of the OECD. First we will explain what intra-industrial trade is. Next we will look at two trade models. These are the Ricardo Model and the Heckscher-Ohlin Model. With these models as fundament, we will analyze Paul Krugman's intra-industrial trade model. This model explains flows of trade, in particularly the trade flows between industrialized countries. We will also analyze the development of the unit costs and the labor productivity. Then we will analyze trade flows from the past. We especially examine the trade flows between industrialized countries. We also discuss trade in particular sectors. We analyze each sector of the agriculture branch, the chemical branch and the machine- and mechanical parts branch. The target is to find future trends and the impacts to countries.

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Introduction

In the late 1970s, Paul Krugman developed a new trade theory, now better known as the "New Trade Theory". His goal was to find a solution to the current trade flows. Krugman took two ideas and combined them into one theory. The first idea was that the perfect market does not exist. There is only a monopolistic competition between some firms which have great revenue. These companies are able to differentiate their products from the others firms'. In the 1930s Edward Chamberlin founded this groundbreaking idea, which challenged the ideas of classic economists. The second idea is the economy of scale effect. With the scale effect, an internal economy leads to a situation in which a larger company can produce a product more cheaply than a smaller company. Subsequently, only larger companies that can produce below-average costs for a branch can stay. In the following years, Krugman both further developed and extended his theory.

The world is getting smaller and smaller. Companies are getting bigger and bigger and companies around the world produce products. Some branches create enormous revenue and some branches have created chains of their factories across the globe. Sometimes, too, the goods have long distances between the production sites and the customers, which was one effect of opening borders for the trade of goods. This was one effect of the open borders for goods. The cost of transportation is shrinking and many firms have the ability to reach more potential customers. This effect was evident in Europe after the 1950s, with the foundation of the precursor to the EC and the fall of the USSR and the increase in EU membership. Furthermore, this effect was not only obvious in America with the foundation of MAFTA also around the world, as evidenced by the foundation of GATT. The foundation of the WTO in 1994 and its following increases in membership are further evidence of this effect.

We have two older trade models, which explain trade flows. Firstly, the Ricardo model, which can only explain international trade on a low level and with some restrictions. Secondly, the Heckscher-Ohlin (HO) model explains inter-industry trade, for all countries are now focusing on production which allows the use of the more abundant factor. Therefore, this model can explain why highly industrial countries trade with countries with less industry. We could not explain intra-industry trade between developed countries, because according to the HO model, certain trade flows should not hold. Also, the HO model does not explain, why very similar products are responsible for the increase of trade between the developed countries.

To demonstrate what Intra-Industry Trade is, we will compare Krugman's New Trade Theory with the Ricardo Model and the Heckscher Ohlin Model. We will also give insight to the New Trade Theory ad any assumptions about it. One of our goals is to explain trade flows and trade linkages in the OECD countries, but our main goal is to analyze the intra-industry trade. We will discuss development of specific branches as well as the possible future trends of industry branches, trade, and the exchange rates of certain countries

I. Theoretical Part

In this section we will discuss the current and the past situation. We will explain important terms and models, so that the reader gets an overview about trade models and the topic of intra-industrial trade and why intra-industrial trade flows and linkages exists.

1. International Trade – an overview

In this chapter, we want to give the reader an overview. It is important to get an insight about the terms and what means intra-industrial trade. First we look in the past and present existing basic models. Also we look on the policy and why we have the actual situation for trade flows in North America, Europe and the World. Then we make a short explanation what are intra-industrial trade and inter-industrial trade and how we can measure trade flows. At the end of the chapter we will present the trade classifications to further analyze intra-industrial trade.

1.1 Seeking in the past

1.1.1 Models and Theories

We have created a few models to explain international trade. A simple and old model is the Ricardo-model. It will explain why countries trade with each other. The main message of this model is that a country exports products to places where it has a relative advantage in its production. We call that a comparative advantage. This model is very simple. There is only one production factor and the model has any restrictions. The Ricardo-model provides us with an explanation and introduction in international trade. The important terms are the “comparative advantage” and “productivity”. One prediction of the model helps us really. It is the prediction that a country export commodities, where the country has a relative high productivity in relation to other countries.

Furthermore, we will look at the Heckscher-Ohlin Model, otherwise known as the “Factor Proportions Theory”. This model has some advantages to the Ricardo-model. First, there are two production factors, capital and work. Two countries could have another factor endowment. We have two countries, the home country and the foreign country. For example the home country has more from production factor capital in ratio to the factor labor, as the foreign country. The basic assumption of the Heckscher-Ohlin Model is that a country exports commodities. The country uses for the production of these goods that production factor where it is well abundance. The empirical verification of that model succeeded only partially. The Heckscher-Ohlin Model could not explain some situations and trade flows in the world. This model goes one step further and provides solutions to explain inter-industrial trade.

1.1.2 The Policy view

The period before World War I was a time of free trade. There were also customs and restrictions from the governments of the respective countries. Industrial Revolution and its many inventions, it became possible to transport goods cheap and easily within or between countries or regions. This ends with the world war one. After the World War I the trade-flows raise again, but the trade volume never reached the level before the world war one. With the beginning of the world economy crisis in Europe and America, the governments started a “beggar the neighbor” policy. The governments want to save their own economies. They increased customs and restrictions. So they increased the crisis with their policy. This was the false answer to the crises, but do not forget the governments want only the best for their

own country. During and after the World War II, economists and politicians from countries of western allied Nations analyzed the situation. They have seen what happened after the World War I. It was necessary that Europe and the World needed another solution after the end of World War II, different from that 1918. The first target for them was the reconstruction of the destroyed Europe, the foundation of organizations for peaceful and economic cooperation. These were on one side the United Nation and on the other side the International Monetary Fund and the World Bank.

Now, let's discuss Europe and the situation at the beginning of the 1950s. Europe was divided into two blocks, the Western and Eastern Block. The question in the western block was how it would be possible that the European countries never fight against each other. The answer came from politicians, entrepreneurs and economists. It was necessary to cooperate better in economic and business. This cooperation process started with the foundation of the General Agreement on Tariffs and Trade. This was a worldwide cooperation. Germany became a member when a representative signed the agreement in 1951. Other European contract-members were Great Britain, France, Netherlands, Belgium, Luxemburg, Norway and the CSSR. The main targets of this contract were the reduction of customs, tariffs and trade barriers. The European Integration process started with the foundation of the European Cooperation for Coal and Steel or Montanunion. Some years later followed the WEU, a military cooperation, the EURATOM and EEC. The result of this process was a better cooperation between the European partners in many areas and levels. It started a period of rising welfare, productivity, GDP and trade flows.

Other countries or areas had the same problem as Europe. In the year 1860, Abraham Lincoln won the presidential election in the USA. The country was deeply divided into champions and protestors of a strong central government. The country was split for many other reasons. Abraham Lincoln knew that only a united America had the power to be independent from the European countries. The continent was divided into different local federal-states, with different interests and legislations. Trade and travels were complicated. The many borders, tariffs and restrictions would hinder this. He saw the problems in Europe, like in Germany. The country was split up in many federal-states. In a way, Abraham Lincoln was the founder of United States of America in that way what we known them today.

We see that economic cooperation and trade between countries have positive effects. In both examples lead this to rising GDPs and trade flows. Let us look back to Europe. The low or zero barriers between the partner countries made it possible, that each country or area has now a specialized economic. Each country or area has advantages in its economic, which is based on its market-size, geographic position, the population, mining, education, legislation or many more. Because of the bigger market-size the companies in the different countries reach more people. The people have more choice in many commodities and services. So it is not necessary to produce every product.

Politicians have reached their main target. European countries have not fought since the World War II. The economy, welfare, productivity, satisfaction and trades have risen strongly since 1950 in the European countries. Europe has reached a status in history that never existed before.

The next figure shows the development of the world trade-volume from the year 1700 until 1970. You can see clearly the rising of the world trade in the different time periods with dips during the world wars. The index is based on the year 1913.

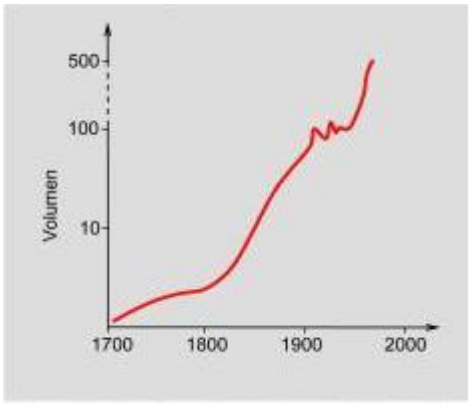

Figure 1 World-trade-volumes 1700 – 1970 Resource [2]

1.2 Difference between inter-industry trade and intra-industry trade

1.2.1 Inter-industry trade

This type of trade is history's typical trade. It is an exchange of commodities at different production sectors. One part of this trade is that one country has an advantage in producing a commodity. The foundation of this trade is a comparative advantage. If we look back to the Heckscher-Ohlin model, we can imagine that one country has a better capital endowment and produces goods with intensive use of capital. The other country has a better labor endowment and produces goods with intensive use of labor.

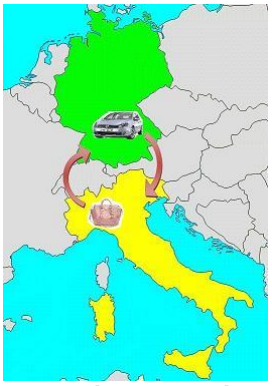

Figure 2 Example Inter-Industry Trade

The example here on the left side shows us a typical picture of inter-industry trade. We have two countries, Germany and Italy. Germany has an advantage at producing cars and Italy has an advantage at producing clothes. Germany exports cars and Italy exports clothes

1.2.2 Intra-Industry trade

Intra-industry trade is a special form of trade. The two countries have no comparative advantage. It is a trade between same sectors. Both trading partners have nearly the same capital-labor-ratio. Every company in the two countries produces different products. The consumers are looking for different products, also from products of the foreign country, because they have personal preferences. This is the base of intra-industry trade. The advantage of increasing returns of scale prevents a country from having to produce all commodities itself. The increasing returns of scale can be one reason for foreign-trade. We will show this later in chapter XX.

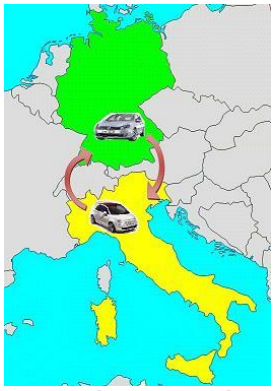

Figure 3 Example Intra-Industry Trade

Here on the left side, we have an example of intra-industry trade. Two countries Germany and Italy has no advantages and nearly the same capital-labor-ratio. So the both produce cars. But the cars are differently. Customers in Germany and Italy are looking for both types of cars.

1.2.3 Types of intra-industry trade

Now we have a definition of intra-industry trade. But this trade type can divided into several parts. These are homogenous intra-industry trade, horizontal intra-industry trade and vertical intra-industry trade.

Horizontal intra-industry trade (HIIT)
With the horizontal trade no differences in quality of the products exist, that are traded between the countries. Like home country exports wrenches to foreign country and foreign country exports also wrenches to home country.

Vertical intra-industry trade (VIIT)
Vertical trade contains a difference in the quality of the traded products. Let's look back at the example in figure 3. Germany exports VW Touraegs and Italy exports Fiat 500. The people see here a quality difference in the products.

1.3 How we measure intra-industry trade - The Grubel-Lloyd index

In the year 1975 Herbert Grubel and Peter Lloyd published a book based on the intra-industry trade. Both of them saw what happened in the recent years. The opening of the European Economic Community led to trade between the same sectors with similar commodities of different countries of the community. They were not the first people to detect this. They wanted to bring the theoretical part and the empirical part together. Thus, they found a method to measure intra-industry trade. Here we can see the result.

$$Bj = \frac{(Xj + Mj) - 1Xj - Mj1}{(Xj + Mj)} \quad (1.1)\ [1]$$

$$\mathrm{Bj} = 1 - \frac{1\mathrm{Xj} - \mathrm{Mj1}}{(\mathrm{Xj} + \mathrm{Mj})} \quad (1.2)\ [1]$$

[1] Resource [5], David Greenaway, Chris Milner (2003) page 1

The formula is simple and easy to understand. Both formulas lead to the same result. J in Bj stands for a specific sector. Bj is the result, it is between 0 and 1. If Bj is approximately 1, then is a high intra-industry trade. If Bj approximately 0, then the result is a low intra-industry trade. Xj stands for the exports in this specific sector j and Mj stands for the imports in the sector j.

The next three formulas help us to understand the Grubel-Lloyd index if we have two or more countries or commodities. The formula summarizes the exports and imports. Grubel and Lloyd corrected their formula, by themselves. You see that the result of the index is always lower than one. So you have always trade imbalances. Thus, the trade index is only one if the imports equal the exports. They enhance formula 3 to formula 5.

$$GL_j = \frac{\sum_i^n (X_i + M_i) - \sum_i^n |X_i - M_i|}{\sum_i^n (X_i + M_i)} \quad (1.3)\ [2]$$

$$GL_j = 1 - \frac{\sum_i^n |X_i - M_i|}{\sum_i^n (X_i + M_i)} \quad (1.4)\ [2]$$

$$GL_{j\ korr} = \frac{\sum_i^n (X_i + M_i) - \sum_i^n |X_i - M_i|}{\sum_i^n (X_i + M_i) - \left|\sum_i^n X_i - \sum_i^n M_i\right|} \quad (1.5)\ [2]$$

The result of formula 5 was the international division of trade among countries into inter-industry trade, intra-industry trade and trade imbalances.

Both discovered that if we look at the ratio of inter-industry trade and intra-industry trade, it was necessary to correct both trades by eliminating the trade imbalances. Other indexes exist to measure intra-industry trade. These use the same trade and trade-flows information, these are the Aquino index, Bergstrand index and Glesjer index. There are two ways to measure intra-industry trade. One type measures the trade flows between countries. The other looks at similarity of the trade connections of the countries. The Grubel-Lloyd index is the first type.

[2] Resource [7], Jochen Meyer (2000) page 8

1.4 Trade Classification

We have discussed how to measure intra-industry trade. One point was that we looked at the imports and exports of one sector. What, though, is the definition of a sector? We present two classifications of the sectors. One is the Standard International Trade Classification SITC the other is the Broad Economic Categories BEC.

1.4.1 The Standard International Trade Classification

This classification was founded by the UN and it is used to measure international trade. It is important to make it possible to compare international trade between countries. The economy of country is divided into different sectors. The division of the sectors is regularly under control the UN. The UN changes the division of the sectors. At the moment, it is their fourth revision. Dividing the sectors that way can be helpful to the UN.

"*For compiling international trade statistics on all merchandise entering international trade, and to promote international comparability of international trade statistics. The commodity groupings of SITC reflect (a) the materials used in production, (b) the processing stage, (c) market practices and uses of the products, (d) the importance of the commodities in terms of world trade, and (e) technological changes*." [3]

What we see here is the definition of the SITC. The finest SITC can be divided into a five-digit code. This was necessary, because if we look at the rough definition, every country has a lot of intra-industry trade in each sector with other countries. Only if we look at a finer level, we can see where we have intra-industry trade. This separation is very exact. With this classification, however, it is possible to find intra-industrial trade flows and linkages between countries.

1.4.2 Broad Economic Categories

The Broad Economic Categories definition was also founded by the UN. It should give a fast overview about the trade flows of a country. It groups the transportable commodities divided by their use. It uses the SITC system. When we more deeply analyze the definition of the Broad Economic Categories, we can see that the division is very broad and therefore, not exactly like the SITC.

[3] Resource [3], United Nations International Merchandise Trade Statistics

2. Trade Models

In this chapter we present the two models of international trade. First, we will present the Ricardo Model and Second the Heckscher Ohlin or Factor Proposition Model. Both models give an insight why exists trade. Also, both models help us to understand how trade between countries is possible.

2.1 The Ricardo Model

The Ricardo Model will explain in a simple way why international trade exits. The most important term in this model is the comparative advantage, in combination with relative and absolute cost advantage. Do not forget this model has any restrictions, but it is very helpful to understand international trade.

2.1.1 Comparative Costs and International Trade

The term comparative costs refer to the different production techniques practiced by the different countries. Under this assumption, one country can produce a good cheaper than another country and the other country can produce also a good cheaper than the first country. Based on these facts, it is logical that the countries begin with trade that allows every country involved to earn money. Let us take two countries, Austria and Italy. In this case we only have one productions factor this is labor. Also, we have two commodities which can be produced by both countries. These commodities are beer and ham. Every country has its own production techniques. Therefore, it is necessary for the production of one commodity to have a certain number of labor output. This is the unit cost of one good.

Commodities	Unit costs of production in terms of labor	
	Austria	Italy
Ham	7	5
Beer	4	9

Table 1 unit costs of production in terms of labor example 1

Let us show an example. In this example, we will ignore the costs of transport between the countries. One can see that Italy has lower unit costs for the production of ham in comparison to Austria. However, Austria has lower unit costs for the production of beer. That both countries gain from trade, it is necessary that Austria concentrates on the production of beer and Italy concentrates on the production of Ham. Austria trades beer for ham and Italy trades ham for beer. The term of trade is one. Both countries trade one unit of a good against one unit of the other good. If one looks at the table, one can see the different costs in terms of labor. Under the assumption that every country specializes in one product with a cost advantage, Austria produces one unit of beer using four units of labor and exchanges it for one unit of ham. Italy produces one unit of ham using 5 units of labor and exchanges this for one unit of beer.

So what are the advantages of the trade? First, Austria needs only 4 units of labor to produce one unit beer and then exchanges the beer for the ham. Austria saves by this trade 3 units of labor, because if Austria produces the ham alone, it is necessary to produce one unit ham Austria needs 7 units of labor. Secondly, Italy only needs 5 units of labor to produce one unit of ham. Italy saves 4 units of labor with this trade. In this example, both countries have an absolute cost advantage in the production of one good. So every country has gain from trade.

Let us define the term comparative cost. There are two possible descriptions. The first definition is the ratio of the unit costs between the two goods produced in the same country. The second one is the ratio of unit costs of the same good in the two countries. Therefore, if a and b stand for the commodities and the numbers for the countries, we can define the comparative costs as follows. a_1 and a_2 the one good in the first and second country and b_1 and b_2 for second good in the first and second country. If we look back to definitions, $a_1/b_1 = a_2/b_2$ is also the same as $a_1/a_2 = b_1/b_2$. There is no difference, if we compare a_1/b_1 and a_2/b_2 or a_1/a_2 and b_1/b_2. One of the basic assumptions of the Ricardo model is that there are differences between the comparative costs. Also, one condition of the model is that the terms of trade between the comparative costs and may not be the same.

Commodities	Unit costs of production in terms of labor	
	Austria	Italy
Ham	7	5
Beer	11	9

Table 2 unit costs of production in terms of labor example 2

In the next example we want to show the great contribution of the Ricardian theory. In this case, one country has a cost advantage in the production of both commodities. One can see that Italy can produce both goods at lower unit costs than Austria. At first no international trade is possible. Let us look at the comparative costs, this is 7/11 = 0.63 for Austria and 5/9 = 0.55 for Italy. Italy has a relative advantage in the production of ham. The unit costs for ham are 28.5 % lower in Italy than in Austria. Also, Italy has an advantage in the production of beer. The unit costs for beer are 18 % lower in Italy than in Austria. So, Austria has a disadvantage in the production of both goods, but the disadvantage in the production of beer is smaller. The unit costs in Austria are 40 % higher in the production of ham and 22 % higher in the production of beer. The terms of trade must be greater than 0.55 and smaller than 0.63, because at this rate Italian ham is traded with Austrian beer and all countries gain from this trade. We set the terms of trade at 0.58. Italy trades with one unit of ham 0.55 units of beer. This is the relative price of the commodity and its comparative cost. If we go back to the terms of trade, which is 0.58, Italy gets 0.58 units of beer for one unit of ham. This is more, as Italy produces beer by itself, the ratio is 0.55. Also, Austria gains more from this trade, because only 0.58 units of beer are necessary for one unit of ham. The ratio is 0.63 for Austria and 0.58 is lower, than this ratio. Both countries made a gain from trade.

One can further prove this if we can analyze the terms of trade, which is 0.58 und the production costs. Italy needs 5 units of labor for one unit of ham. In the international market Italy gets 0.58 units of beer. If Italy produces the good beer by itself 0.58 x 9 = 5.22 units of labor are necessary. On the Austrian side, 11 units of labor are necessary to produce one

unit of beer. If we do not trade, 0.58 x 11 = 6.38 units of labor are necessary for one unit ham. You see it is better to trade, for every country specializes in one commodity and trades with other countries. One important thing is that the terms of trade lie between the comparative costs. If the terms of trade do not lie between them, one country is not interested in trade. This is easy to understand, because this country can produce both products more cheaply in within their own country. In example 2, if the terms of trade are 0.55 or lower, Italy is not interested in trade. Let us set the terms of trade to 0.50. In this case Italy would get 0.50 units of beer for one unit of ham. When Italy produces the beer by itself, 0.50 x 9 = 4.50 units of labor are necessary. However, if Italy trades to get one unit beer, 5 units of labor are necessary. This is a loss by trade.

2.1.2 Graphic Representation

With help of a graphic representation, we can show the theory of the comparative cost. Therefore, we will use two variables. X is the quantity of ham and y is the quantity of beer. The numbers describe the countries and L followed by a number, stands for the whole labor force of a country. The whole sum of ham of country can be described by the following formula.

$$x = \frac{1}{a_1} L_1 \qquad (2.1)\ [4]$$

The sum of a country's beer can be described by the following formula.

$$y = \frac{1}{b_1} L_1 \qquad (2.2)\ [4]$$

One can observe that for Country One, a_1 stands for the unit costs of labor for producing ham and b_1 stands for the unit costs of labor for producing one unit of ham for a_1 or one unit of beer for b_1 for country one. L_1 stands for labor force of country one. If we insert into both formulas 2.1 and 2.2 real values, than we get the maximum possible amount of x, or ham and y or beer, that Country One can produce. Knowing this, we will divide y by x. The result is the following formula.

$$\frac{y}{x} = \frac{\frac{1}{b_1} L_1}{\frac{1}{a_1} L_1} = \frac{a_1}{b_1} \qquad (2.3)\ [4]$$

$$y = \frac{a_1}{b_1} x \qquad (2.4)\ [4]$$

Starting with formula 2.3 we get formula 2.4. We see here that we can present the ratio of both goods without the total labor-force, only with the unit costs of labor of a and b. This ratio of a_1/b_1, as we know from the last chapter 2.1.1 is the comparative cost. This formula is also valid for the goods of Country Two.

[4] Resource [9], Giancarlo Gandolfo (1994) page 10

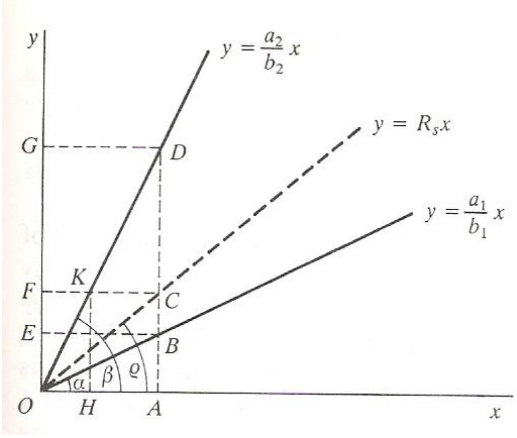

Figure 4 graphic representation of comparative costs Resource [9] page 11

Figure 4 displays a lot of interesting information. The two straight lines starting at point O stands for the comparative costs of both countries. The line which extend from O to D and beyond represents country two, whereas the line from O to B and beyond represents country one. The slope of each line stands for the comparative costs of each country. We can explain this in a mathematical way through the following equation a_1/b_1 = tan alpha and a_2/b_2 = tan beta. One important condition is that the terms of trade lie between both lines. If the line of Country One intersects with the line of country two, than $a_1/b_1 = a_2/b_2$. There would be no trade. In figure 4, we present the terms of trade with the dashed line. The formula for this line is.

$$\frac{y}{x} = R_s \qquad (2.5)\ ^5 \qquad y = R_s x \qquad (2.6)\ ^5$$

With help of the figure and the mathematical formulas, we define one important condition for international trade. There must be differences between the countries and the terms of trade must lie between both lines, or, in a mathematical way.

$$\frac{a_1}{b_1} < R_s < \frac{a_2}{b_2} \qquad (2.7)\ ^5$$

On this condition, we see that Country One should specialize in the production of the commodity x and Country Two should specialize in the production of commodity y. In the figure we see this as follows. The comparative cost line between the terms of trade line and the horizontal axis represents that country which can produce commodity one better. In our figure is this Country One. The comparative cost line between the terms of trade line and the vertical axis represents that country which can produce commodity two better. As you see is this Country Two. Let us make an example. An amount of OA of good x is traded by an amount of OF of good y. You can see that the quantity of OA is exported from Country One to Country Two and Country Two exports the quantity of OF to Country One. Country One does not import good y, because it produces the good y by itself. Then Country One can only produce the quantity of OE = AB of good y. However, if Country One trade with country two,

[5] Resource [9], Giancarlo Gandolfo (1994) page 10

it can import the quantity of OF = AC of good y. Without trade, Country One loses the quantity EF = BC of good y. Now we will explain the situation through an example using Country Two. A quantity of OG = AD of good y must be dispensed if Country two produce a quantity of OA of good x. Country Two trades with Country One only the amount OF = AC is necessary to get the same amount of good x. Country Two producing the amount of OF of good y and trade this quantity for OA = FC quantity of x. Without trade, Country Two has only the amount of OH = FK of good x. This is a loss of a quantity of KC of good x.

2.1.3 Terms of optimization

The terms of optimization show us that with help from international trade, it is possible to produce more goods. If every country produces its own commodities on the basis of its production costs and maximum labor-force, then it is the output, not the maximum possible output. When every country concentrates its production on the goods, with which it has a comparative cost advantage, the output of the world rises to its maximum possible output. This has other advantages: first, the real income of the labor-force, or the worker rise to a maximum; second, it is the best use of labor-force.

Let us look at each country. We begin by defining of the prices. So p_x and p_y are the absolute prices for the goods x and y. The real national income of a country is $Y = p_x * x + p_y * y$. In this formula, x and y are the quantities of each respective good. If we take Y and divide it by p_y, the result is the real national income, in which Y_r is measured by y. The two following formulas show us this step. Both have three restrictions. We can use only the less or the whole labor-force of each country and not more. It must be produced equal or more as null goods of and y.

$$max\ Y_{1R} = (p_x/p_y)x_1 + y_1\ sub\ a_1x_1 + b_1y_1 \leqq \bar{L}_1, x_1 \geqq 0,\ y_1 \geqq 0 \qquad (2.8)\ [6]$$

$$max\ Y_{2R} = (p_x/p_y)x_2 + y_2\ sub\ a_2x_2 + b_2y_2 \leqq \bar{L}_2, x_2 \geqq 0,\ y_2 \geqq 0 \qquad (2.9)\ [6]$$

We take the price of the both commodities as given. We then set this situation in perfect competition and set the transport costs at null. The price ratio that we have is equal the international terms of trade. With help from the formulas 2.8 and 2.9, we can create the formula.

$$Y_R = (p_x/p_y)x + y \qquad (2.10)\ [7] \qquad y = -(p_x/p_y)x + Y_R \qquad (2.11)\ [7]$$

These formulas represent our “isoincome” line. This line has negative slope. It represents the maximum possible production. All possible combinations of quantity x and y can be produced, but only if they are on this line and all of the labor-force is used. In quantities x and y intersect within the triangle OA’’B’’, then the country does not use all labor-force. If the intersection of x and y fall above the line A’’B’’, then this product cannot be produced in this country. Figure 5 shows us the graphic solution of the problem. Point B’’ is the optimum point

[6] Resource [9], Giancarlo Gandolfo (1994) page 14

[7] Resource [9], Giancarlo Gandolfo (1994) page 15

in this figure. Since OB'' is greater than OA'', Country two raises its real national income to a maximum. This may only happen if Country two concentrates on the production the good y and Country one does the same with the good x.

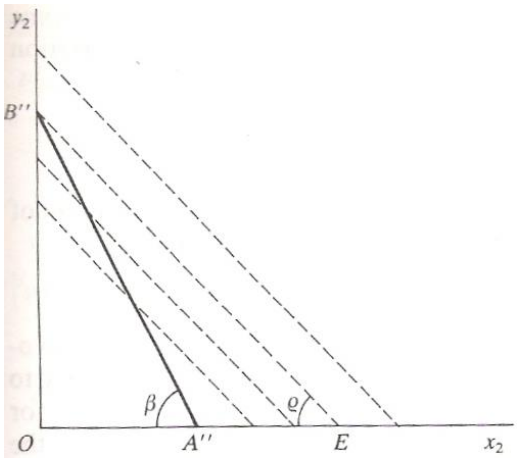

Figure 5 transformation curve and maximization of real income Resource [9]

With these assumptions, we can now concentrate on the world. Our target is to raise the world real income to a maximum. The following formula helps us. The variables xm and ym stand for the world quantity of good x and y.

$$Y_{RM} = (p_x/p_y)(x_1 + x_2) + (y_1 + y_2) = (p_x/p_y)x_M + y_M \qquad (2.12)$$ [8]

Using this formula, we can now compute the world transformation curve. We can calculate the maximum amount of goods x and y. The reader can see the result of the in Figure 6. On the x axis, one can see the amount of OA, it is the sum of O'A' from Country One and O''A'' from Country Two. The amount of OA of good x is the maximum of x which can be produced in the world. On the other hand we have the amount of OB on the y axis. This is the sum of O'B' from Country One and O''B'' from Country Two. The quantity of OB from Goods y is the maximum of y which can be produced in the world. Our target is to maximize the world output. Let us look at figure 6. Here we have the transformation curve from point B above R to point A. We said to maximize the output, it is necessary for Country One to concentrate on the production of Good x and Country Two to concentrate on the production of Good y. At point R we have this situation. Point R is also called the Ricardo point. At this point of intersection, a reduction in the production of commodity x begins as well as an increase of production of commodity y. If one follows the line RB in the figure from point R to point B, one can see the decrease in output for the world. The same are valid if you reduce the production of y and increase the production of x. So R stands for a maximization of the real world income, OH_x is the maximum amount of good x and OH_y is the maximum amount of good y.

[8] Resource [9], Giancarlo Gandolfo (1994) page 16

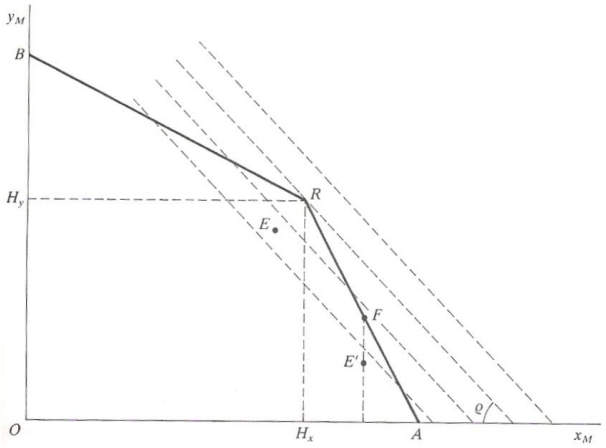

Figure 6 world transformation curve and maximation of real world income Resource [9] page 17

2.1.4 Generalizations

In the last chapter, we used only two goods and two countries. In this chapter, we will broaden this example. In this case, we will also use two goods but an added number of countries n. Every country has different comparative costs and it is possible that two countries have the same costs. For the first step, we will order the comparative costs of the countries like here.

$$\frac{a_1}{b_1} < \frac{a_2}{b_2} < \ldots < \frac{a_n}{b_n} \qquad (2.13)\ [9]$$

We have the terms of trade like in the examples before. The terms of trade are very important. It divides the enumeration of the comparative costs into two parts. One part is smaller and the other part is greater. If one country has comparative costs, which are equal in terms of trade, then it does not trade with the other countries. One can see here.

$$\frac{a_1}{b_1} < \ldots < \frac{a_i}{b_i} \leqq R_s < \frac{a_{i+1}}{b_{i+1}} < \ldots < \frac{a_n}{b_n} \qquad (2.14)\ [10]$$

Now, we will divide the comparative costs divided into two groups. The group which has lower comparative costs than R_s concentrates in the production of commodity x. The group which has greater comparative costs than R_s concentrates in the production of commodity x.

[9] Resource [9], Giancarlo Gandolfo (1994) page 18

[10] Resource [9], Giancarlo Gandolfo (1994) page 19

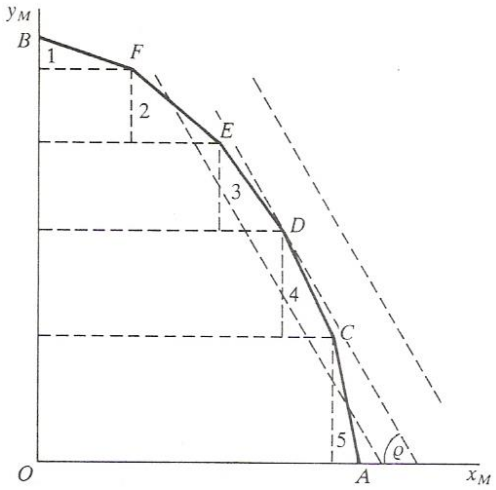

Figure 7 the world transformation curve with n countries Resource [9] page 19

As one can see in Figure 7, there is a graphic illustration of the transformation curve of five countries. We want to maximize the world's output of good x and y. This situation is possible in point D. To produce the necessary quantities of goods x and y, the countries 1, 2 and 3 have to produce the good x and the countries 4 and 5 have to produce the good y. We will present this in formula 2.14, in which it looks like the following.

$$a_1/b_1 < a_2/b_2 < a_3/b_3 < R_s < a_4/b_4 < a_5/b_5 \qquad (2.15)\ ^{11}$$

Next, we will extend our example and say we have m goods and n countries. Let us start with m goods and two countries. Now, we will take the unit costs of labor of every good and we make a ratio of the costs of Country One and Country Two. We will order the comparative costs in an ascending order, as the following formula shows.

$$\frac{a_1}{a_2} < \frac{b_1}{b_2} < \frac{c_1}{c_2} < \ldots < \frac{m_1}{m_2} \qquad (2.16)\ ^{11}$$

For the next step we will include a variable wage rate in every country. The wage rate is measured in money units or gold. This wage rate is a condition for international trade. Every good in every country is influenced by the wage rate. We take the wage rate, w, all goods whose comparative costs are higher than w are exported by Country Two. All goods whose comparative costs are lower than w are exported by country one. If one product has the same comparative costs as the wage rate, it is produced by both countries. In this case, no country will export this good. Now we want to show this in a mathematical way. First, we will compute the price of every good in each country. We will use the wage rate and the unit costs of labor. It is demonstrated by the following

[11] Resource [9], Giancarlo Gandolfo (1994) page 20

$$
\begin{aligned}
&p_{A_1} = w_1 a_1, \quad p_{A_2} = w_2 a_2, \\
&p_{B_1} = w_1 b_1, \quad p_{B_2} = w_2 b_2, \\
&\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \\
&p_{M_1} = w_1 m_1, \quad p_{M_2} = w_2 m_2.
\end{aligned}
\qquad (2.17)\ ^{12}
$$

In the next step, we want to show that there are price differences.

$$w \leqq \frac{a_1}{a_2} \qquad (2.18)\ ^{13} \qquad 1 \leqq \frac{a_1 w_1}{a_2 w_2} \qquad (2.19)\ ^{13} \qquad p_{A_2} \leqq p_{A_1} \qquad (2.20)\ ^{13}$$

On the basis of perfect competition, in which there are no transport costs and free trade, we can say that every commodity is bought in that country with lower costs. If we take the formula $p_{a2} < p_{a1}$, we can see that Country Two produces Good A at lower costs. Country One imports Good A from Country Two. Do not forget all imports must be paid by exports. If we look at the formulas 2.18, we can see that all products are produced at lower costs in Country Two. However, the equation 2.19 and 2.20 show us the same picture. If this is true, then no international trade can exist. Now, we will analyze the other part of the commodities. If $w >= m_1/m_2$, then Country One produces the Good M at a lower price than Country Two. If this is true, there is no international trade. Now, we can look at the following situation.

$$p_{A_1} < p_{A_2} \qquad (2.21)\ ^{13} \qquad p_{M_2} < p_{M_1} \qquad (2.22)\ ^{13}$$

On the left half of the equation, the same situation occurs as in formula 2.21. There is one commodity, which can be exported by Country One. On the other half of the equation that formula 2.22 demonstrates, commodity M can be exported by Country Two. With help from wage rate, w, we can divide all goods into two parts. One group of commodities is exported from Country One to Country Two and the other group of commodities is exported from Country Two to Country One. But do not forget in the worst case there is only one product in a group.

The following figure and table show us an example for m goods and n countries. In Figure 8 the distances like O_1A_1 represent the unit costs in terms of labor for Good A of Country One. As we know from this chapter, every country exports a good for which it has the lowest comparative costs in comparison to the other countries. We can see the result in table 6. We can see which country imports and exports which products as well as the current comparative costs as given by Figure 8.

[12] Resource [9], Giancarlo Gandolfo (1994) page 20

[13] Resource [9], Giancarlo Gandolfo (1994) page 21

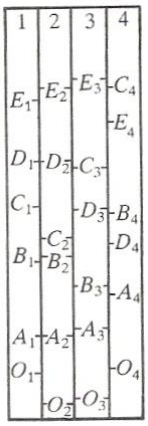

Figure 8 exchange of more than two goods among more than two countries Resource [9] page 22

	Country 1	Country 2	Country 3	Country 4
Exports	A	C	B	D, E
Imports	B, C, D, E	B, D, E	A, C, D, E	A, B, C

Table 3 pattern of trade of five goods among four countries Resource [9] page 23

2.1.5 Restriction of the Ricardo Model

The Ricardo Model has a few restrictions. That makes it easier to explain situations between countries and the international trade. At the first glance, only two countries are represented in this model. We will later extend the basic model. These countries have only one production factor. This is the labor-force of all people. This is also a critical point, because all people cannot work with the same intensity. The model bases on homogeneity. Another important point is that in this scenario no unemployment exists. All people work. Both countries are allowed to have a different amount of population in the basic model. The population cannot migrate between the countries. The productivity of the worker is constant, for both commodities. Also, the productivity is constant, no matter how much of the goods are produced. The second point is, only two commodities exist. Under this condition, the production-function is only linear. So it is easier to handle. The most important assumption of the Ricardo model is that absolutely no trade restrictions exist between these countries. There are no customs and no trade restrictions in any form. There exists only free trade. In both countries complete competition in all markets exist. The price of each commodity correspond the marginal costs of each commodity. The wage rates in both production sectors of a country have the same wage rate. So you can see, there are a lot of restrictions for the model to work.

2.1.6 Examples and misunderstandings of the comparative advantage

Oftentimes, people have difficulty understand the Ricardo Model. One point is the competitiveness. A country can only survive in world of free trade if it continues being competitive. This assumption is based on the argument that a country has to reduce the costs for labor every year. Also, it is possible that a country cannot take part in international trade, because it cannot produce any commodity cheaper than another country.

Competitiveness is very important in today's world. The greatest misunderstanding of the Ricardo Model is that a country does not need an absolute advantage in the production of a commodity. If you look back, in the first example – 2.1.1 - every country has an advantage in the production of one commodity. Austria has an advantage in the production of beer and Italy has an advantage in the production of ham. If we extended this example, Italy now has an advantage in the production of both goods. However, both countries trade with each other. In the extended model, Austria has a relative advantage in the production of beer. We call this comparative advantage. Most people, though, misunderstand absolute and relative advantage. They think that a country needs an absolute advantage to export these goods. In this model, an absolute advantage is not necessary to export goods. The competitive advantage of a country is not based on the ratio productivity of a branch of goods, rather it is based on the ratio of the wage rate of the home country versus the foreign country. The wage rate bases on the productivity of all good-branch in a country. In the extended example, Austria is less productive than Italia in the production of beer. However, it is even less productive in the production of ham. Consequent Austria is less productive as Italia, Austria pays lower wages. Since Austria pays lower wages, it can produce beer at a lower cost than Italy.

"Wage dumping" is a term that has spread around the world. A country produces a good cheaper than another country. This cannot be correct. For reasons we will now explain, it is incorrect to say that one country produces a good more cheaply than another country. To use the example of Italy and Austria, it is correct to say that Austria pays lower wages and it is less productive. The lower cost of the production of beer is based on the lower costs of production in Austria. But there is no matter for Italy on which bases the gains of trade. The gains of trade can be based on the lower wages in Austria, or on the higher productivity of this branch of goods in Austria. For Italy it is interesting to trade its own good, where Italy has an advantage, with Austria, where Austria has an advantage. Thus, both countries gain from trade. In short, in this model, if a country is more productive, than it has a higher wage rate.

"Exploitation" is a term to follow "chain competition" and "wage dumping". This is a question for the developed countries. It is beneficial to exploit another country and the inhabitants. First, the country exports a good or a collection of goods, because the country has a relative advantage. The workers get lower wages. However, what happens if the countries to do not trade? Let's go back to our previous example. Italy does not trade with Austria. In this example Austria is the country which pays lower wages. Without trade, the wages in Austria are lower. Because the unit costs of labor for the production of one unit of ham are greater than in Italy, Austria has to produce the ham by itself at higher costs.

2.1.7 Conclusion of the Ricardo Model

The Ricardo Model gives us good insight into the trade flows at a basic level. It has many restrictions, in that all assumptions about the model must be fulfilled. However, we will take away some important information from this model. First, every country has an advantage in the production of one good. Labor is the one and only production factor in this model. If we enhance this assumption, it is totally right that every region or country in the world has its own advantages, and that these advantages are very low. These advantages can be, for example by the natural resources, infrastructure, labor force, knowledge, geographical position and many more. Second, we know that each country has its advantages in the production of one or more goods in the comparison to other countries. Two countries can use their comparative advantage only, when they are trading with each other. Without trade, they cannot use their advantage and gain nothing from trade. Third, we have talked about the unit costs of production in terms of labor. The costs are based on the necessary input of labor to produce one unit of a good. The costs are mostly different for the same and differently good. If the necessary input of labor is very small for a product, then is a country in the production of this good very efficient. To make a more general description, if the input of labor for the production of goods is very low, then the country has a high productivity. This high productivity is also represented by high wages.

2.2 The Heckscher-Ohlin Model

The Heckscher-Ohlin Model or Theorem bases on the theories of Eli Heckscher and Bertil Ohlin. The use the Ricardo Model and extend the model to find a better explanation for international trade. They concentrate on one important part of the Ricardo Model. This is the comparative advantage.

2.2.1 Basic Assumptions and their Meaning

Basic Assumptions of this Model are very simple. There are two countries, and each of them produces two goods with help of two production-factors. These production-factors are capital and labor-force. The purpose of this model is to explain international trade given the different endowment of the production-factors. Heckscher and Ohlin give a good explanation of this situation: *"Each country exports the commodity which uses the country's more abundant factor more intensively."* (Heckscher, Ohlin)

Like the Ricardo Model, the Heckscher-Ohlin Model, or HO model has restrictions, too. There are no restrictions which prevent international trade. No tariffs, customs or other possible restrictions exist between the countries. There is only free trade. In this situation, perfect competition exists for both goods in both countries. The two production factors are immobility. They cannot change the country. The production functions of labor and capital have a positive but shrinking and constant trajectory. The production function is the same in Country One as it is in Country Two.

There are also differences between the production function of the two goods. One important assumption is the equivalence of the demand in both countries. The commodities are consumed at equal rates in both countries at the same price level. The use of the factor in each country is fixed. It is not possible to reverse the intensity of these factors.

Let us look at the production function. One point is that there are no differences in the technology in the production functions. However, there must be differences in the production function of the two commodities, because without differences, we would not have two different products. Thus, each country has a different product. This product has a production function, which utilizes the given factors of the country. The country has an advantage for the production of one type of product. The next interesting assumption is the equal demand. Both countries have the same and identical tastes. This is presented by the same utility function for one good in each country. Furthermore, the income elasticity of the demand is constant and equal one for both commodities. The last assumption is there is no reversal factor-intensity. To explain this, it is necessary to demonstrate that there is only one way to use these factors to their maximum capacity. As we know, we have two production factors. These are capital, K, and labor, L. We also have two goods, A and B. Product A uses the factor capital more than product B. Thus, the ratio of production $A_{K/L}$ is higher than the ratio of product $B_{K/L}$. Our production function uses a fixed technique. We can compute the usage of the production factors, if we use the production functions. However, if we use production functions, which have different techniques, we have a problem. Every production function using a different technique uses different amounts of said production function. Thus, the factor price for each good is different at each production function. It is very important to fix the technique for the production function. We can say at that usage of factors, we have the following factor price. If this condition is fixed, we can order the goods. It is possible to say that Commodity A is more capital-intensive than Commodity B. This is valid for all factor price

ratios. Without this condition, it is not possible to order the commodities. For at every factor price level, the order of the goods is different. At one level, Commodity A has a higher usage of the capital factor. At another level, Commodity B has a higher usage of the capital factor.

We do not allow factor intensity reversals. The isoquants of commodities A and B only intersect once. With conditions such as constant returns to scale and the same products have the same production function and a linear path, it is possible with help of the input ratio to compute the factor price ratio. All this information allows us to print a diagram for a better understanding and to show the output. In the diagram, it is possible to visually compare the isoquants of Good A and B visually. The following figure contains two pictures, a and b. Let us concentrate first on the left picture of the figure. We see two isoquants depict production at minimum costs. That is the minimum factor costs for capital and labor. We get the points E on the isoquant AA and E' on the isoquant BB. These are our minimum cost combinations for both goods. The capital to labor ratio is depicted through the slope of OE for Good A and OE' for good B. Commodity A is the capital-intensive product and commodity B is the labor-intensive product. Now we change the factor price level. Now, the result is that point F on the isoquant AA and F' on the isoquant BB are our minimum cost points. We now have another slope for both products. These are OF for good A and OF' for Good B. The details though, do not change. Good A is the capital-intensive product and Good B is the labor-intensive product again. Now let us concentrate on the right side of the figure. In this figure, the isoquants intersect twice. This is not allowed in this particular model. However, we want to show in a figure, what problems we have, if we allow factor intensity reversals. We still have two isoquants, AA and BB, and we have a factor price ratio at the point E, for AA, and E', for BB. At that price level, Good A is the capital-intensive product and Good B is the labor-intensive product. Then we change the price level. We are now at the points F for AA and F' for BB. If we change the price level, though, the details change with it. Product B is the capital-intensive product and product A is the labor-intensive product. If we look at the figure, we can see the line OR. For each price levels above this slope we get the good A as the capital intensive and the good B as the labor intensive. For each price level under the slope OR, the opposite is true.

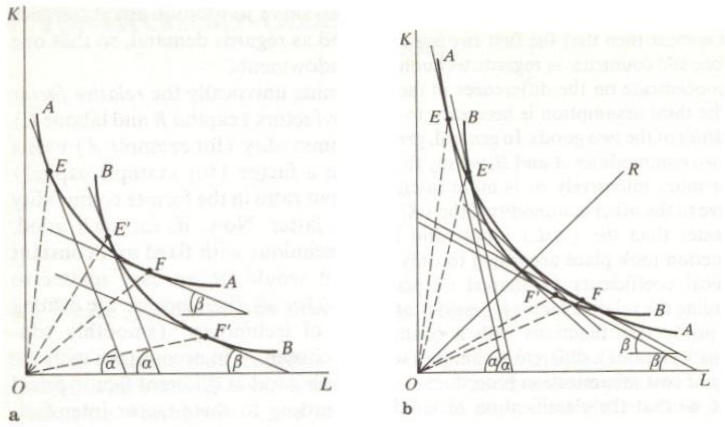

Figure 9 factor intensities example without and with factor intensity reversals Resource [9] page 78

In the next figure, we can see the capital labor ratio of each good. On the left side we have the first example, the isoquants intersect once. On the right side we have the second example, the isoquants intersect twice. Here, factor intensity is allowed. One can see the ratio of relative price of capital and labor on the horizontal and vertical axis. All functions are monotonically increasing. The producers of the Goods A and B can exchange capital for labor, or labor for capital. In the first example on the left side, this exchange does not change

the order of the capital intensive products. In this exchange, the producer moves along the line $(K/L)_A$ for good A and $(K/L)_B$ for good B. We look on the right side at example two, than we have a different situation. If we exchange labor for capital or capital for labor, it is possible to change the characteristics of the capital-intensive products. Here we can see this at point I. Above point I, Good A is the capital-intensive product, under point I, Good B is the capital-intensive product. We can observe here that factor intensity reversals lead to intersecting points, at which the capital labor ratio between the goods changes. In this example, the only intersecting point is on the right side. If we have n number of intersecting points between the isoquants, then we have n – 1 intersecting points where the capital labor ratio changes. The factor intensity reversals are based on the possibility of an exchange between labor and capital. In other words, the factors of the production are reversed for Good A and B.

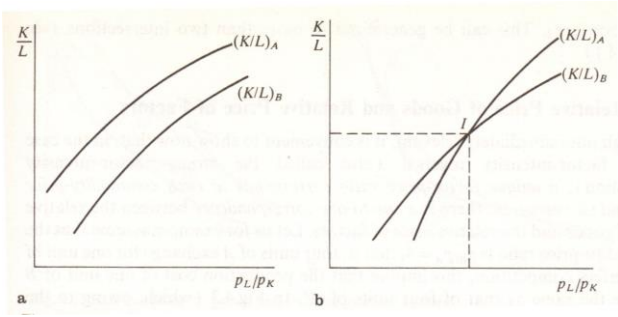

Figure 10 behavior of the capital labor ratio without and with factor intensity reversals Resource [9] page 79

Under the assumption that factor intensity reversal is not allowed, each factor price stands in a relationship with each commodity price and vice versa. There is a relationship between the relative factor prices and the relative commodity prizes. To demonstrate this in the following example, we set the commodity prize ratio $p_B/p_A = 5$. This allowed us to change five units of good A for one unit of good B. The production costs of five units of Product A and 1 unit of Product B are the same. If the factor prices are equal, it is possible to find the minimum cost point at each isoquant for products A and B. When we find that point on every isoquant, we connect the points and get a line. The slope of this line shows us the relative price of the factors. On the left side of the following figure, one can see the line CC. This line has only one intersection for each isoquant. The figure shows us that each factor price ratio has a relation to each commodity price level. The slope stays the same for any other combination of isoquant A and B. In our example we increase A and B about twenty percent. The new line is parallel to the original line CC. The slope is the same and the factor price ratio is the same as in CC. The relationship between the relative factor prices and the relative goods prices can be inverted. In the second example, factor intensity reversal is allowed. This makes the right side of the figure possible. The isoquants A and B have two intersections. Two lines result from the two intersections. They contact both isoquants. These are the lines C'C' and C''C''. We have now a problem, because on the existing factor-price ratio has one to one relationship with the commodity price ratio.

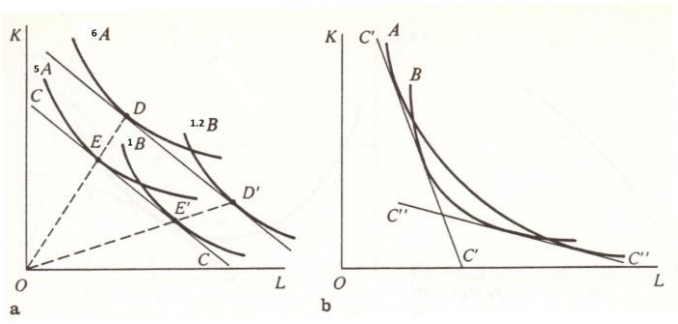

Figure 11 relative price of goods and relative price of factors Resource [9] page 81

Now we want to show how the relative price of the commodities and the relative price of the factors interact. We will provide examples with and without factor intensity reversals so that we can see the difference between the results. As we know, the relationship between commodities prices and factor prices is unique, if we do not allow factor intensity reversals. In the next figure, we will shift the line from 5 A to 6 A. The commodity price ratio is now p_B/p_A = 6. The factor prices react also. As we see in the following figure, the line CC creates new intersections to form a new line. In the figure we can see that the greater commodity price ratio leads to a greater factor price ratio. The price of labor is increasing. As a result, the price of Good B also increases, since Good B is the labor-intensive product.

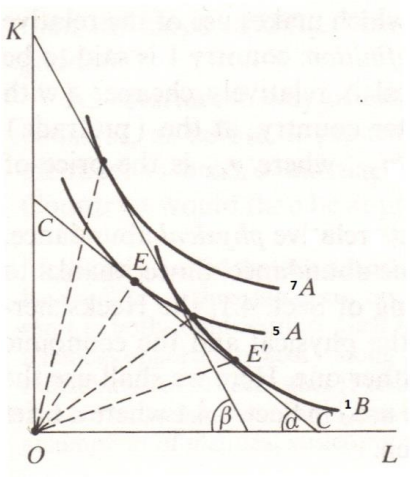

Figure 12 change in the factor price ratio and change in the commodity price ratio Resource [9] page 81

Finally, we will show in the following figure the relationship between the good prices and the factor prices. The left side of the following figure demonstrates the relationship between the relative good prices and the relative factor prices. Each good price has a unique factor price. If we allow factor intensity reversals, we have only one point where this condition is true. This is point m. At any other point on the right side, every commodity-price ratio corresponds to two factor price ratios.

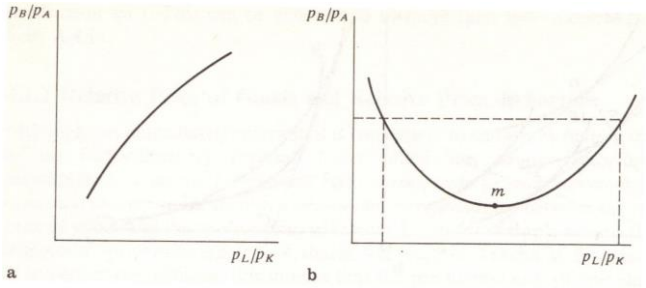

Figure 13 change relationship between relative price of factors and relative price of goods Resource [9] page 82

2.2.2 The Heckscher Ohlin Theorem - an explanation

The basic assumption of the HO Theorem is that each different country has a different factor endowment. These countries have two factors, capital or labor. Each country uses the more abundant factor more. However, there are two different definitions of better endowment. First, we have the physical definition. Let us say the Country one is the capital abundance country and Country two is the labor abundance country. This means that Country one has more units of capital in comparison to labor and Country two has more units of labor in comparison to capital. We can show the differences in the endowment. These looks like $K_1/L_1 > K_2/L_2$ [14]. We can show that Country one has more units of capital than Country two. The next definition is the price definition. We look now at the prices of both factors. We make the same assumptions like in the first example. Country one is the capital abundance country and country two is the labor abundance country. Thus, capital is cheaper in Country one than in Country two. We can show this with the following equation. $p_{1K}/p_{1L} < p_{2K}/p_{2L}$ [14], since p_{1K} is the price of the factor capital in Country one, this is cheaper in Country one. This makes the ratio of p_{1K}/p_{1L} smaller than the ratio of p_{2K}/p_{2L}. Both definitions are used in the theorem. The physical definition shows us the physical abundance of both factors and the price definition shows us the economic abundance. In this chapter we use the physical definition.

For the next example, we will make a few assumptions. First, we will assume that we have two countries and two factors, capital and labor. Both produce two goods, these are products A and B. Country one is the country with the better capital abundance endowment and Country two is the country with the better labor abundance endowment. Next, we will assume that Product A is the capital-intensive product and Product B is the labor-intensive product. With these assumptions and the other definitions of the HO model, Country one exports Good A and country two exports Good B.

We want to show that the countries will export these products. Let us look at the situation before the countries start to trade. Each country has a possible production transformation curve. We see this for both countries in the next figure. The commodity-price ratio is equal in both countries. The next figure demonstrates this trait for both countries. Line p_2p_2 is parallel to line p_1p_1. Country one produces at point H_1 and Country two produces at point H_2. At the existing price of goods, Country one produces a greater amount of Good A than Good B and Country two produces a greater amount of Good B than Good A. We can see this through the difference of the slopes of the lines. The slop of OR_1 is greater than that of OR_2.

[14] Resource [9], Giancarlo Gandolfo (1994) page 82

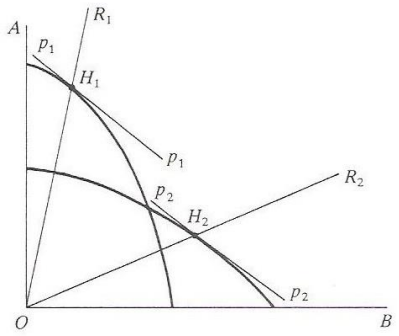

Figure 14 possible production transformation curves and the HO Theorem example one [9] page 83

There is another way to look at this example. We have the same definition, but now the ratio of A to B is equal in both countries. In this case, there is only one slope, OR, for both countries. This slope crosses both possible production transformations curves. Country one produces at point H_1 and Country two produces at point H_2. H_1 is greater than H_2. The result of this is that it is cheaper to produce Good A in Country one than in Country two, and it is cheaper to produce Good B in Country two than in country one. This is easy to explain. Let us look at the opportunity costs. If we look at the opportunity costs of the Good A in Country one, than the costs of Good A are lower than the costs of B. This is equal for country two and good B. Country one loses less if it produces Product A. Country two loses less many if it produces Product B. The result is that Country one is the capital abundance country, so it produces commodity A at lower opportunity costs. Country two is the labor abundance country, it produces commodity B at lower opportunity costs. Both increase their production and use the abundance factor intensively.

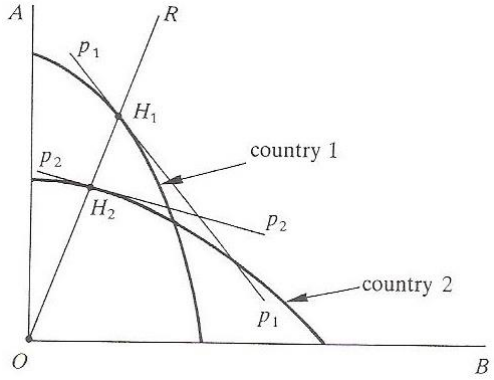

Figure 15 possible production transformation curves and the HO Theorem example two Resource [9] page 84

To go a step further in this example, trade is now made possible. The HO model includes assumptions, such as free trade, complete competition, an equal demand in each country and no costs for the transport of the products. We have the assumption that the demand is the same in both countries. The consumers in Country One and two want to consume the Good A and B in the same ratio. However, Country One produces more of Good A and Country Two produces more of Good B. The commodity price of the goods is the same in both countries. If both countries want to serve the demand, it is necessary to export goods. So Country One exports Good A to Country Two and imports Good B from Country Two.

Country Two exports Good B to Country One and imports Good A from Country One. After the trade of both goods, each country has its wanted quantity achieved.

2.2.3 Factor Price Equalization

The Factor-Price Equalization is one important point of the HO theorem. One condition of this factor is that both factors are fixed in a specific country. The factors cannot change between the countries. This condition is responsible for the equalization of the relative factor prices and the absolute factor prices. We should remember that one result of the HO model is the specialization in one product. Now we want to explain the factor price equalization. First, we do not allow factor intensity reversals. Due to this assumption, we know that every factor-price ratio has a relationship to a commodity-prices ratio. This ratio is the same for both countries. Next, on the base of free trade and free transport, the price of each good is the same in every country the same. Commodities A and B cost the same in Country one and Country two. In other words, the relative price of the commodities is the same. This is based on the fact that the relative factor prices are equal in each country. We know that every country uses the same technology and produces its goods at an optimum point on the possible production transformation curve. See figure 14 or 15. Both countries use the same ratio for the production of one product.

$$\left(K/L\right)_{1A} = \left(K/L\right)_{2A} \qquad (2.23)\ [15]$$

$$\left(K/L\right)_{1B} = \left(K/L\right)_{2B} \qquad (2.24)\ [15]$$

In this situation, there are constant returns to scale and the marginal productivity is the same because the marginal productivity has a direct relationship to the input ratio of the production factors. The marginal productivity, however, is unattached to the scale. The MP is the same for both factors capital and labor in each country.

$$MPK_{1A} = MPK_{2A} \qquad (2.25)\ [15]$$

$$MPL_{1A} = MPL_{2A} \qquad (2.26)\ [15]$$

$$MPK_{1B} = MPK_{2B} \qquad (2.27)\ [15]$$

$$MPL_{1B} = MPL_{2B} \qquad (2.28)\ [15]$$

[15] Resource [9], Giancarlo Gandolfo (1994) page 85

If we have full specialization in both countries, we have a problem concerning the last definitions. If we are under the assumption that Country one produces only Good A and Country two produces only Good B, we cannot define MPK 2A and MPL 2A, because Country two does not produce this product. The same is true for MPK 1B and MPL 1B. We have a complete competition. Under this condition, the rule *"value of the marginal product of a factor = price of the factor"* [16] must be accepted. We can show this with the factor Capital for Country one and two.

$$p_A * MPK_{1A} = p_{1K} \qquad (2.29)\ ^{16}$$

$$p_A * MPK_{2A} = p_{2K} \qquad (2.30)\ ^{16}$$

$$p_B * MPK_{1B} = p_{1K} \qquad (2.31)\ ^{16}$$

$$p_B * MPK_{2B} = p_{1K} \qquad (2.32)\ ^{16}$$

With help from this equations and the subsequent marginal productivity follows this, we have the evidence that $p_{1K} = p_{2K}$ and for labor $p_{1L} = p_{2L}$. We can thus demonstrate the factor price equalization.

In the next two figures we want to make a visually explanation of the factor price equalization. We make a new figure with help of figure 10a and 13a. In these figures, we want to demonstrate the relationship between the capital-labor ratio and factor price ratio of capital and labor. We will use Countries One and Two and two Commodities A and B again. The ϱ_1 and ϱ_2 represents the capital labor ratio in both countries. If we look at the following figure, we can see that Country One has the greater ratio. Thus, Country One is the capital abundance country and Country Two is the labor abundance country. With help of the ratio ϱ_1 and $\varrho_{2,}$ it is possible to show the price ratio of factors in the figure for each country. Let us look at the horizontal axes. We can see the point p_1' and p_1''. These points are the borders for the relative price of factors of Country One. If Country One produces with a factor price at point p_1', then it produces only Good A. However, if Country One produce with a factor price at point p1'', then it produces only Good B. The same is true for Country two. At point p_2', Country Two produces only Good A at point p_2'' only Good B. We see that the area, in which the relative factor prices are moving, is very small. Due to the small area, we have only a small section where we have factor price equalization. This is in our example between the points p_1' and p_2''. The factor prices must be positioned into this segment. In the figure, the commodity prices fall in the segment, between the points D and E. If we look at the figure we see that, when the capital-labor ratios ϱ_1 and ϱ_2 of both countries is very different, the distance between them is great. Therefore, it is unlikely that both countries have an area of equalization. Both countries tend to specialize and produce only one good.

[16] Resource [9], Giancarlo Gandolfo (1994) page 86

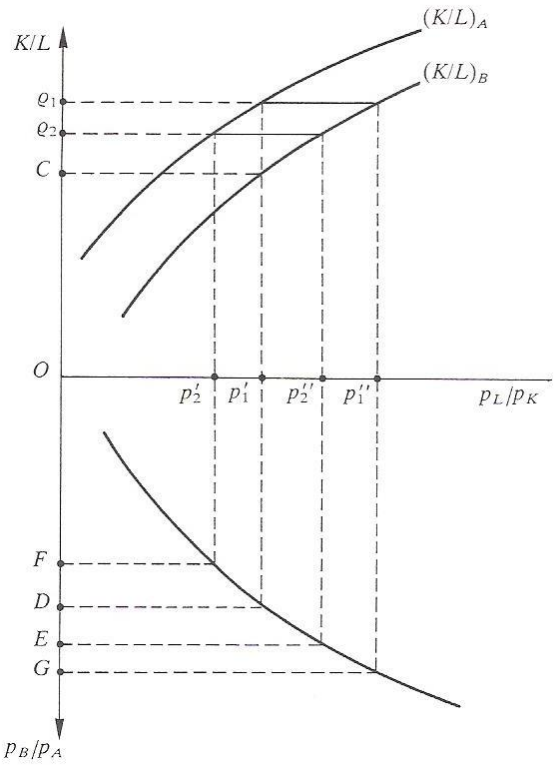

Figure 16 factor price equalization theorem Resource [9] page 88

Now, we will present some possible scenarios to get a better insight on the HO model. In the first scenario, both countries have an area of equalization. In the previous state of trade, both countries have relative factor prices, which have a relationship to relative commodity prices. These prices fall into the same area. Once both countries start to trade, the relative factor price of both factors in both countries becomes equal. Thus, the price of the goods is now between the two relative prices that existed before trade equilibrium. This is because the commodity prices have a relationship to the factor prices.

In Scenario two, no area of equalization exists. Therefore, we will use the next figure. One or both countries produce only one product. Due to this assumption, we have no relative factor price equalization. Let us look at the next figure. We see Country One good prices have a range between point D and G. In this case, we will set Country One's good prices at G'. Country Two's good prices have a range between point F and E, but we will set Country Two's good prices at F'. Thus, the relative factor price of Country One is between p_1'and p_1'' and for Country Two it is between p_2' and p_2''. We still have no trade. Now we start to trade. So the relative prices of commodities are now between the points F' and G'. Now we show the production locations at the different points between F' and G'. If the relative factor price is between F' and E, then Country two produces Good A and B and Country One produces only Good A. The relative factor price is at point p_1'. If the relative factor price is between E and D, Country One produces only Good A and Country Two produces only Good B. Last, if the relative factor price falls between D and G', Country One produces both goods and Country Two produces only good B. In the situation that one country specializes in the production of one good, then no unique relationship between the relative factor price and the relative good price exists. In this situation of specialization, the relative factor price tends to the point of full specialization into the segment. We see this in the following figure. The factor price is one of the border points of a segment.

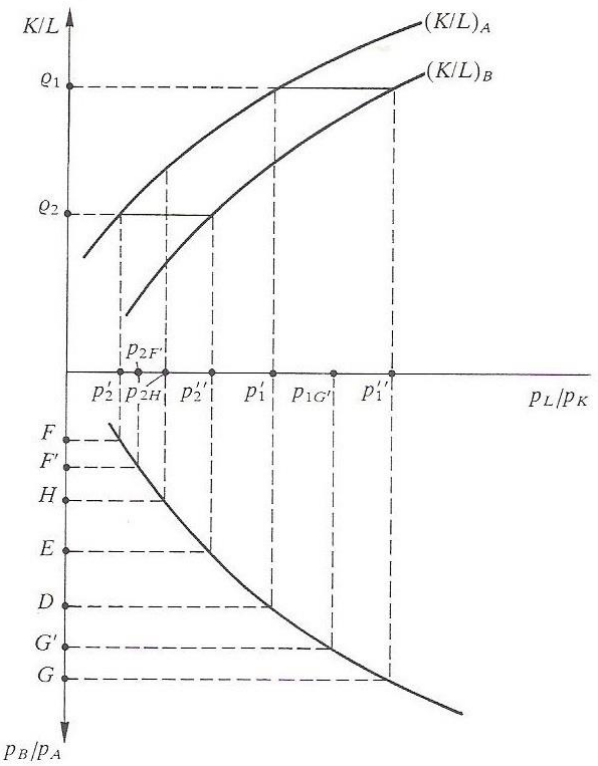

Figure 17 factor price equalization theorem another possible case Resource [9] page 89

In the third scenario, we have an area in the figure in which we have equalization. This situation exists before trade starts. The relative price of goods of Country one is between E and G and of Country Two is between F and D. When trade starts, both price ratios are into the same area between points F and G. However, we must not forget what happens, if we look at the last scenario. If the price ratio falls between D and E, without the border point D and E, we have the situation of factor price equalization. If the price ratio moves between F and D or E and G, though, we have a problem again. One country produces only one commodity. In this situation of specialization, factor price equalization is not possible.

What we now know is that the position of the terms of trade is very important. With help from this position we are able to say whether or not factor price equalization will occur. The information about the terms of trade results from the demand. All three scenarios give us insight into different situations. We can see that factor price equalization makes the factor prices and the commodity prices equal. However, when there is no factor price equalization, as in the last scenario, the factor prices are more similar after trade the before trade.

2.2.4 Extensions of the HO Model

Here we want to show what happens, if we extend the HO model. We begin by assuming that there is equal demand in both countries, which, as we know, is one condition of the HO model. Now, each country has another demand. In this example, we will say that every country that has a stronger demand for its good, where it has an advantage in the production. Therefore, the demand of Good A in Country One is stronger, because Country One is the capital abundance country and Good A is the capital-intensive good. The demand of Good B is in Country Two stronger, because Country Two is the labor abundance country and Good B is the labor-intensive good. If trade is allowed, it is easy to figure out what

happens. Each country exports the good for which the factor for production is scarce elsewhere. The next figure shows us this situation. In the figure, points E_1 and E_2 represent us the situation before trade. E_1 is the optimum point on Country's One possible production transformation curve. E_1 lies on the slope p_1p_1, which represents the prices of the goods. It is the same for point E_2 and Country Two, as well as slope p_2p_2. Now, we allow trade and optimum points change. The optimal production point moves from E_1 to E_1' for Country One and from E_2 to E_2' for Country Two. Both points lie on the slope RR. We see Country One produces at point E_1', but it has a strong demand for Good A. We see that Country One consumes a combination of Good A and B at point E_1''. To reach this target, Country One imports the amount of E_{1A}'H_{1A} of Good A and exports the amount of E_{1B}'H_{1B}. Country Two undergoes a product combination at point E_2''. It imports the amount of E_{2B}'H_{2B} of Good B and exports the amount of E_{2A}'H_{2A} of Good A. We see that every country imports the product for which it has an advantage in production, or, in other words, for which it has an abundance of the production factor. The country exports the good for which the production factor is less abundant. This is not an assumption of the HO model. We will use only one possible example of different demand. However, equal demand is not necessary in order for the HO theorem to stay valid. The different demands in each country do not hurt the condition of the factor price equalization.

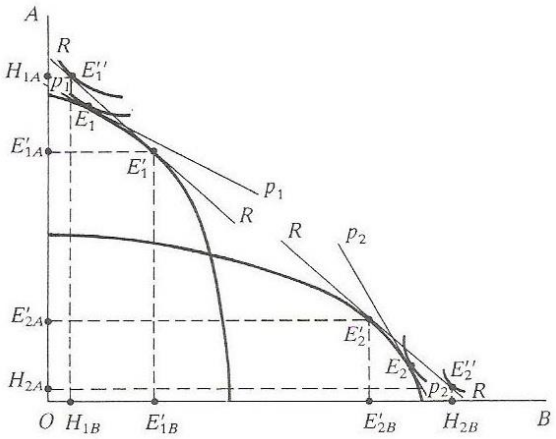

Figure 18 different structures of demand and invalidity of the HO theorem Resource [9] page 91

To extend the HO model further, we want to look at factor intensity reversals. We know from the last chapters the relationship between the capital labor ratio and the factor price ratio and the relationship between the factor price and the commodity price. In Figures 10b and 13b, we will take the left sides each figure to make a new figure. In the first situation we have the factor endowment for Country One and Two, these are ϱ_1 and ϱ_2. At this level the factor ratio produces no problems and the HO theorem stay valid. We still have Good A which is more capital-intensive than Good B. In this area, we have no problems with the HO theorem. Now, though, we will change the situation.

We will set the factor ratio for Country Two at point ϱ_2'. The factor ratio point ϱ_2' is on the other side of the reversal point. Thus, we have factor intensity reversals. The HO theorem is now invalid. If we look at the situation before trade, Country One has the relative commodity price $(p_B / p_A)1$ and Country Two has the relative commodity price $(p_B / p_A)2$. We also know that Country One will export Good A and Country Two will export Good B. We have a problem that hurts the assumptions of the HO theorem. Country One is the capital abundance country and it exports the capital-intensive Product A. Country Two is relatively seen to Country One the labor abundance country. Country Two exports the capital-intensive Good B. We have no factor price equalization. If we look at the following figure, we can see

that the prices of the traded products move in the same direction. So, it is possible that in the event of trade, we have an approximate trend of the relative factor prices. Now we check the situation for different number of reversal points. We know that it is possible that we have more as one intersection point. If there are an odd number of reversals, then the goods become equal, like in the last described example. If the number of reversals is even, every good can be identified as capital- or labor-intensive by using the known factors. At this point, there are two possible situations. The pattern of trade does not follow the HO theorem and the relative prices of the factors move in different directions. The pattern of trade follows the HO theorem and the prices of the factors move to the same point, but the factor prices do not merge at one point.

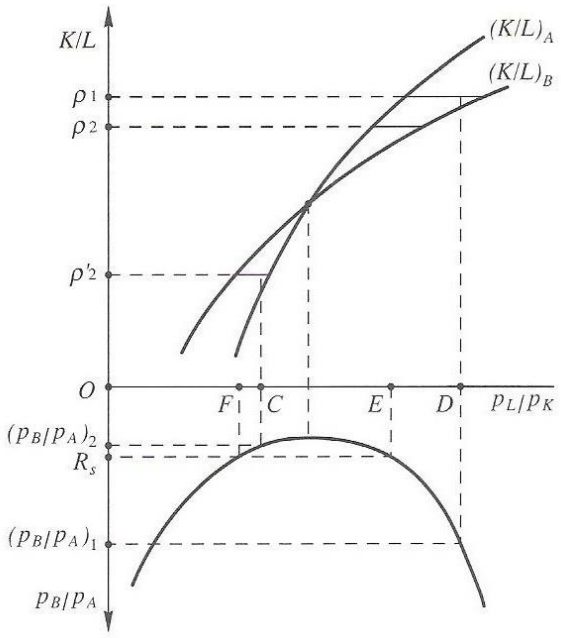

Figure 19 factor intensity reversals and effects Resource [9] page 93

2.2.5 Leontief Paradox

The Leontief Paradox resulted from the 1947 empirical study of import-export data of the USA. Before this time, the Heckscher-Ohlin Model was the basic main model for trade in the world. Then, in 1953, Wassily Leontief made a study. His data came from the USA's imports and exports in 1947. He computed the export data to find the spent labor and capital. Labor was measured by one man-year, the capital was measured per unit by one million dollar for prices in 1947. It was easy to collect and compute the exports of the USA, but he also wanted the data from the imports. However, he had no import-export data from every country which exported commodities to the USA. So, he researched at the imports. He wanted to know what commodities the USA imported. Then he looked at similar goods, which were produced in the USA. The target was to find the import data from the domestic industries which are in competition to foreign industries. He compared these industries and took this data from the domestic industries to compute his study. How great was the capital intensity of the USA. This was what he wanted to know, and therefore stated "*whether it is true that the United States exports commodities the domestic production of which absorbs relatively large amounts of capital and little labor and imports foreign goods and services which - if we had produced them at home - would employ a great quantity of indigenous labour but a small amount if domestic capital*" (Wassily W. Leontief). Now, let us look at the result of his work and the differences between statement and the table below.

	Capital (dollars, in 1947 prices)	Labour (man-years)	K/L
Exports	2.550.780	182.313	13,991
Imports replacements	3.091.339	170.004	18,184

Table 4 Leontief's import-export table data 1947 Resource [9] page 94

If we look at the table, Leontief's study shows us that there is something wrong. Leontief's research opposed the Heckscher-Ohlin Model. The USA exports labor-intensive goods and imports capital-intensive goods. We know that the USA was a relative capital abundant country, relative to all its trading partners in the world.

There are many scientists who prove the Leontief Paradox. We can divide the group into two halves. The first group checked Leontief's work and empirical data. They checked to see if he had made mistakes. Their main target was to keep every assumption of the Heckscher-Ohlin Model. The second group believed that the Leontief Paradox was correct. They tried to prove the accuracy of the Heckscher-Ohlin Model and its assumptions. The target of this group was that one or more assumption of the model is false, making whole model incorrect.

We begin with the first group. If we look at the year 1947, it was clear that the USA was the only industrial country which was endured no destruction during World War II. So, it is possible that the workers in the USA were more productive than the worker of other countries during this time. The USA also had well-trained workers. Based on this productivity, the USA exported labor-intensive goods. Leontief himself said that the labor factor of the USA should be multiplied by 3 before it is compared with other countries.

The next argument against the Paradox is the efficiency. The American workers are more efficient and productive than workers from other countries, because they have a greater amount of capital per worker than other countries. Another argument for the labor factor is the high skill of the workers, managers and others in the USA. The knowledge and the working experience of the human capital are very important for every country. That factor was very high in the USA after World War II. The USA had another organization and company structure which positively influenced the productivity of the labor and capital factors. The relative factor abundance stayed the same. A later study states that the labor factor should by multiplied only by 1.2 to 1.25. This study was based on interviews and empirical data from over 2000 companies in USA and other countries. The researchers compared the input of labor and capital to produce the same good in the USA and other countries. We see that in later studies, the productivity of the labor factor in the USA was greater, but only by 20 until 25 percent and not 300 percent. Another study proved that Leontief ignored the factor of natural resources. Due to this fact, is absolutely clear that a group of workers with equipment would extract less oil from American oil fields than from oilfields in Saudi Arabia or Venezuela. We will now take this factor of natural resources and include it in Leontief's calculations. Because the United States imports goods which are intensive in natural resources, the result is different. The United States is less abundant with the addition of natural resources. The USA exports commodities which are capital- and labor-intensive. The result of this inclusion of natural resources is the change of the Leontief's calculations. So, the model has three resources: capital; labor; and natural resources. Now, the calculations correspond to the Heckscher-Ohlin Model assumptions.

Next, we will look at the second group. One argument is that the USA has a difference demand structure than other countries. The people want to consume capital-intensive goods. That is the reason why the USA imports capital-intensive goods. However, a study from Houthakker (1957) shows us that this is incorrect. It demonstrates that a country whose per-capita income increases will consume more labor-intensive goods and services. So, this result of this study opposes Leontief's Paradox.

One further point is the assumption that all countries produce the same products. This is not true. It is possible that the countries produce similar goods. Another problem arises, though, if a country produces a new good. At that point, Leontief's Paradox gives us the answer and explanations. Lastly, when we look at the Stern and Maskus study (1981), they take Leontief's Paradox and use the import-export data from 1958 and from 197, which produces different results. Other researchers took the import-export data from other countries and proof the Leontief's Paradox. Some Countries confirm while other do not confirm the Paradox. One important factor in the research is the year of the data collection.

At the end of this chapter, we have a better understanding of the meaning of Leontief's Paradox. We have read the arguments. The conclusion of Leontief's Paradox is that the Heckscher-Ohlin Model is not a constant model for all countries at all times. It is only partially and temporarily valid for all countries. We remain committed to the Heckscher-Ohlin Model. but the general assumption that a country exports a capital-intensive good when the country is abundant in capital t and imports a labor-intensive good when labor is less abundant must still be proven. On the basis of Leontief's Paradox, the Heckscher-Ohlin Model is only partially and temporarily valid for each case.

2.2.6 Conclusion of the Heckscher-Ohlin Model

The Heckscher-Ohlin Model gives us another insight into trade flows. It divides countries into capital abundant or labor abundant countries. This made it easy to understand why industrialized countries, which are at first gland capital abundant, export goods which need capital as production factor. On the other hand, exports, emerging markets and underdeveloped countries produce goods which require labor as production factor. The model has several advantages to the Ricardo Model. One advantage is that there are now two production resources. These are capital and labor. However, there are several restrictions, too. For example, factor intensity reversals are not allowed in this Model for the same production function and the same demand function for the same product in different countries. The transport of goods is allowed, but not the shift of capital or labor. This model takes the basic Ricardo Model and enhances it. It is thus possible to explain trade between countries rich in capital and countries rich in labor. We can now explain inter-industry trade. It is the different distribution of capital and labor in the world. After all, we have the results from Wassily W. Leontief’s studies. Leontief’s research and many others which both defend and attack the Heckscher-Ohlin Model show us a differentiated picture. The Model is valid, but not at any given time and place.

3. Why exists Intra Industry Trade - A simple Overview

In this chapter, we want to examine why intra-industry trade exists. We use Paul Krugman's theories and assumptions to justify our ideas. These theories and assumptions have some restrictions, but it is very helpful to understand intra-industry trade.

3.1 Reasons for Intra Industry Trade

3.1.1 Economy of scale

The Economy of Scale exists in many branches, and it is easy to understand why. If a company has a high production factor, then the output raises higher along with the input due to the production factor. The output increases more and more with increasing of the input. The following will illustrate this effect: Two countries, Spain and France, use labor as their only production factor. Spain has 45 working hours and France has 60 working hours to produce their goods. Both can produce two commodities and both can chose how they divide their production factor to produce each good. Any division is possible. However, the best choice for Spain is to produce the first good and for France to produce the second good. Each country uses their production factor as well as they can. Additionally, the positive effect of the Economy of Scale was that they produced more with this form of division than they would have if they had divided it differently.

There is one problem: The people from Spain want to consume Good Two and the people from France want to consume the Good One. At this point, let us allow trade in this example. Now, it is possible for the people from Spain and France to consume all commodities they want. What was the advantage of that point? First, we will allow the countries to use the advantages of the mass-production, concentration and specialization on one product or product-group. In the real world, every country chooses a product-palette. Second, if we allow trade, all people have access to all commodities of the world. Since this model of trade is based on the Economy of Scale and the fact that bigger producers are better, we are led to a market structure with an incomplete competition.

3.1.2 Market structure

We have written that the Economy of Scale Effect leads to a market structure known as "incomplete competition". It is important to determine what the effect of the increasing production is. What were the effects of the Economy of Scale? Do the average costs of production decrease or increase? There are external and internal Economy of Scale Effects. External effects are typical when the costs of production are dependent on the size of the branch and are independent of the size of the company. Internal effects are the opposite of the external effects.

Let us explain this by using an example: We have a branch with 5000 production units and 20 companies. Every company produces 250 units. First, we increase the branch size, so there are now 40 companies which produce 250 units per company. The increase of the branches reduces the companies' costs. That is a typical external Economy of Scale Effect. The greater production of the branch leads to higher efficiency, but the size of the companies does not change. The second scenario is that the number of firms decreases. In this case there are only 10 companies which produce 500 units each. If the productions costs fall, it is due to the effects of the internal scale of economy. The bigger company produces more efficiently. Internal Economy of Scale Effects leads us to a branch with a low number of companies and a high number of production-units. That creates incomplete competition. The internal effect leads to an unsatisfactory situation. Big companies have more advantages

than smaller companies. On the other hand, external Economy of Scale Effects leads us to a branch with many small companies. There is full competition in this case, because there are many competitors. Economies of Scales are very important for foreign trade, but in most countries, the internal effects overpower in most countries and lead to incomplete competition. If we look to bigger companies, there is greater production output. Bigger companies also have a better technology base, better and faster working processes, and a research and development department with sufficient money and researchers.

3.1.3 Monopolistic Competition

Monopolies are created for a variety of reasons, but the typical monopoly very seldom exists. A company with enormous earnings in a specific sector allows other companies to enter into this sector. The result of this process is that the one and only monopolist does not exist, or it exists only for a short time or in a small number of branches or regions. The sectors which have internal Economy of Scale Effects is typical organized as “oligopoly”. All companies in this sector are large enough to influence the price of goods, but there is no monopoly. One important factor of oligopoly is the company’s reaction to determining the price of a product. Every company has to check the reactions of other companies and the reactions of the customers when prices change.

We will now concentrate our model of monopolistic competition. It is a special form of an oligopoly and it is easier to handle. In our model, we make the following assumptions: Every company has its own product; the good is different to all other goods of the other companies; each customer can distinguish between the products of the different companies. So, every company in this sector has a kind of monopoly for its own good. The second assumption is that each company in this sector accepts the prices of the competitors. Also, each company ignores the reaction of the other companies if the price of a good changes. So, we have explained the term “monopolistic competition”. Every company acts like a monopolistic leader even though it is an oligopoly market structure.

This model is very simple, but it is simplicity makes it easy it to explain the advantages of foreign trade. We have made the basic assumptions, now we will make the conclusions.

Under these assumptions, we have the following situation: A company's part of the market is greater if there is a higher demand for its goods and if the prices of the competitors’ goods are higher. Contrary to this situation, a company's part of the market is smaller if there is less demand for its goods and if the prices of the competitors’ goods are lower. An additional factor is the number of companies which are working in this sector. It is clear that the greater the number of companies there are within a branch, the smaller the market for each individual company becomes. With this assumption, it is possible to create following equation:

$$Q = S * [\, 1/n - b * (P - \dot{P}) \,] \qquad (3.1)$$ [17]

Variable Q is the number of sales in the market for a specific company. Variable s stands for the whole sales of all companies in this sector. N is the number of companies in this sector, and b is a constant, which defines a fluctuation of sales through a change in the price of a company. P stands for the price of a specific company’s good, and Ṗ stands for the average price of its competitors. So, we can compute the market share of each company. If every company sells its product at the same price, every company has a market share of S/n. A company which sells its product at a higher price than the average price has a smaller market share. A company which sells its product at a smaller price than the average price

[17] Resource [1], Paul Krugman, Maurice Obstfeld (2009) page 174

has a bigger market share. The average price of the product in this sector does not influence the amount of sale.

We want to concentrate this model on the competition between the companies. The cost structure of a company looks like the following formulas.

$$C = F + c * Q \qquad (3.2)\ [18]$$

$$AC = C/Q = F/Q + c \qquad (3.3)\ [18]$$

C stands for the whole costs and F stands for the fixed costs. Q is the variable for the amount of products and c is the variable for marginal costs. AC stands for the average costs. We all know that the variable costs are connected to the good, but the fixed costs are stable. Fixed costs exist if 100 pieces of a good or 1.000.000 pieces of a good are produced. With a rising number of goods (Q), we can divide our fix costs by a higher number of produced goods. If we increase the number of goods, it decreases our average cost function. Now, let journey to monopoly firm. A monopoly firm set the number of produced goods at that point where the marginal revenues intersect with the marginal costs. The gain from the monopoly is the difference between the average costs and the demand curve.

We want to analyze the behavior of the branch. To do so, we use the same demand function and cost function for the whole branch. The firms are now symmetrical, which makes it easier to check the branch without looking at the individual firm. If we want to examine the branch, we need only the number of companies, n ,and the average price, Ṗ. With this information, it is possible to track changes in the branch by foreign trade. To get this information, we will do the following: First, we look at the number of companies in a branch and the typical average costs of a company. With an increasing number of companies in a branch, we have a decreasing number of produced goods for each company as well as increasing average costs for each firm. Second, we have an average price within the branch. If we have an increasing number of companies in a branch, we have a decreasing average price for that branch and an increasing competition in the branch. Third, we look at the entries and escapes in a branch. If the average price lies above the average costs, then additional companies which enter into the branch. If the average price falls below the average costs, then companies leave from the branch. In the long term, the number of companies intersects with the cost function. At this intersection are the variables' average costs, the number of companies, and the price function. Also at that point are the variables price and number of companies.

Number of companies and average costs

Now we check the first point. We want to analyze the relationship between the average costs and the number of companies in a branch. All companies are symmetrical. If all companies sell their goods at the same price, then is P = Ṗ. All companies are at the equilibrium point. If we look at Formula 3.1, we can see that Q = S/n. We know that the average costs of a company stand in a reverse relationship to its produced number of goods. The average costs stands in a direct relationship with the size of the market and the number of firms in this branch.

$$AC = F/Q + c = n * F/S + c \qquad (3.4)\ [19]$$

The next figure shows us the two functions schematically. This gives us a good overview of the position of a branch and what follows subsequently. The target is always the equilibrium

[18] Resource [1], Paul Krugman, Maurice Obstfeld (2009) page 172

[19] Resource [1], Paul Krugman, Maurice Obstfeld (2009) page 175

point. If the average costs per company are too high, then some companies leave the branch, the costs shrink, and the price rises to E. The opposite situation occurs if the average costs per company are too low.

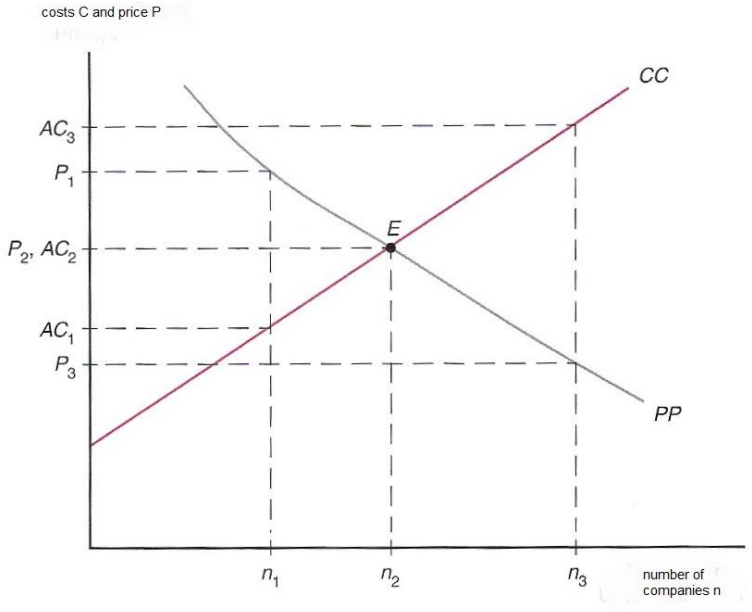

Figure 20 market equilibrium at monopolistic competition Resource [1] page 176

Number of companies and price

We know that the value of a company is in a direct relationship with the number of companies in the branch. It is clear that with an increasing number of companies, the competition is greater. A great number of firms lead to a lower price. However, we must also consider the demand. The demand in the branch is linear, so it is possible to calculate the price. All the firms in the branch set their own price and ignore or accept the prices of the other firms in the branch. Also, they ignore or accept reactions from other firms about the change of the price of their own good. The next formula shows us the calculation for the amount, Q, of a product from one company.

$$Q = (S / n + S * b * \dot{P}) - S * b * P \quad (3.5)$$ [20]

We know from the previous formula that b is a constant that defines the change of the sales by a change in the price of a company. If we input the known variables into the formula to calculate the marginal revenue, we get the following formula:

$$MR = P - Q / (S * b) \quad (3.6)$$ [20]

Furthermore, we know that the companies want to maximize their profits. The next step therefore compares marginal revenues to marginal costs.

$$MR = P - Q / (S * b) = c \quad (3.7)$$ [20]

After some mathematical transformations, we get the following formula. This formula shows us the value of a typical firm in a branch:

$$P = c + Q / (S * b) \quad (3.8)$$ [20]

[20] Resource [1], Paul Krugman, Maurice Obstfeld (2009) page 177

If all companies in the branch have the same value, then we know that all companies have the same amount of sales. This is Q = (S / n). If we include this term in the last formula, then we get the following formula:

$$P = c + 1 / (b * n) \quad (3.9)$$ [21]

Now we have shown the direct relationship between the price of each company, the price of a branch, and the number of companies in a branch. Lastly, we can say that if we look at formula 3.9, we can conclude the following: With an increasing number of firms in a branch, we have a decreasing price for each company. Figure 20 provides visual proof. The line PP has a negative slope.

Number of companies in the equilibrium

If we look at Figure 20, we see two lines. Line PP has a falling slope, demonstrating that an increase in the number of firms in a branch creates a decrease in the price, which each firm is able to set. The second line, CC, has a rising slop. This line shows us that with an increasing number of firms in a branch, we have increasing average costs per firm. The lines intersect at Point E. At that point, we have the number of n_2 companies, the profit maximize price P_2 and the average costs AC_2. We want to show that in the long-term, the number of companies equals n_2 at the equilibrium, Point E. If the number of firms is lower than n_2, then the prices are set at P_1 and average costs at AC_1. As a result of this situation, the monopoly profits in the branch. If the number of firms is higher than n_2, though, then the price is set at P_3 and average costs at AC_3. Another situation then occurs, because the branch has undergoes a loss. If one branch makes great profits, other firms will enter into this branch. The profits will then shrink, and the number of firms will rise. If a branch has a great loss, a few firms will leave the branch. In a long-term process, the number of firms will move to the equilibrium, Point E. There we have n_2 number of firms in the branch, and the price is P_2.

We will use a model to explain monopolistic competition. In this model, we can calculate the number of firms in a branch, in which case the branch is in equilibrium. Also, we are able to compute the average price of a branch. If we take our model and combine it with international trade, we can see the importance of the Economy of Scale Effects.

This model is created with the assumption of monopolistic competition. The assumption has some requirements regarding the markets, the Economy of Scale Effects and the competition. The competition model for our example is the monopoly or the oligopoly. If an oligopoly exists, there is a problem. In the model, we will ignore that problem. In reality the companies in an oligopoly do not operate like a company in a monopoly. The companies in an oligopoly act and react to changes in the branch.
We want to describe two typical effects of oligopoly. In this model, we will exclude these effects. First, we will describe the effects of coordinated behavior. We can also call this effect “collusion” or “cartel”. The companies set the price of a good in a branch higher than the profit maximizing price. The effect is that the companies earn more. This behavior is typically defined in agreements or in implied assumptions by the companies. These agreements are forbidden in most countries in the world, because the extra profit for the companies is a loss for the customers. The second effect sounds crazy. The companies enhance their production and reduce their profits. With higher amounts of goods in a branch, it is very hard for new companies to enter into the branch. The advanced good output prevents the entry of new firms in the branch.

In the model of monopolistic competition, there are some restrictions. These restrictions make it possible to explain Economy of Scale and the effects on international trade. Since there is no general valid model for the behavior of oligopoly, it is hard explain international

[21] Resource [1], Paul Krugman, Maurice Obstfeld (2009) page 177

trade with a model on the base of monopoly or oligopoly. The model ignores some of the effects.

3.2 Monopolistic Competition and International Trade

The model of monopolistic competition illustrates idea that if foreign trade is possible and allowed, international trade will expand the market. In a local market where the Economy of Scale Effects exists, it is the amount of produced goods and the variety of the goods that are limited. If countries cooperate and allow international trade across their borders, then a larger market is created. This larger market expands the amount of produced goods and the variety of the goods. The common market becomes greater than the individual markets. Every country concentrates their production of goods on a smaller number of products than before and imports the other products from the other countries. This new market enhances the choice for the consumers. The international trade has few advantages under the assumption that all countries have the same resources and technology. The model shows us that foreign trade combines properties which normally oppose one another, for instance the size advantage of the production of goods and, second, the variety of goods. The model of monopolistic competition leads to a greater market, lower average costs, and greater product variety. International trade expands the market, and the international market is greater than every home market of a country. The integration of the markets has the same effect as growth of a country's home market.

If we have monopolistic competition within a branch, then we have some factors which influence the branch. First, the size of the markets defines the number of firms in a branch. Second, the number of firms set the price in a branch. If the market is bigger, then we have more firms with more sales, lower average costs, lower prices of goods, and more product variety. Let us remember Figure 20. It demonstrates the relationship between the number of firms, prices and costs. Now, we want to compare two markets: One market is smaller than the other market. If we look at Formula 3.4, we know that if a branch has more sales for a fixed number of firms, the average costs of each firm decrease, and the sales for each firm increase. When we have two markets with different sales, then one is market smaller than the other. The smaller market has a cost curve which lies above the curve of the greater market. The price curve does not change, because the number of companies in both markets does not change. If we look at Formula 3.9, we can find the solution. The variable for the market size is not part of this formula. It is not possible for the market size to influence a change of the price curve. The following figure shows us the shift of the cost curve. A greater market has more companies. The shrinking average costs and greater sales lead to a lower price. We have a new equilibrium. The cost curve shifts down and the intersection point shifts from Point 1 to Point 2. We have a new price at P_2 and the number of companies is now n_2.

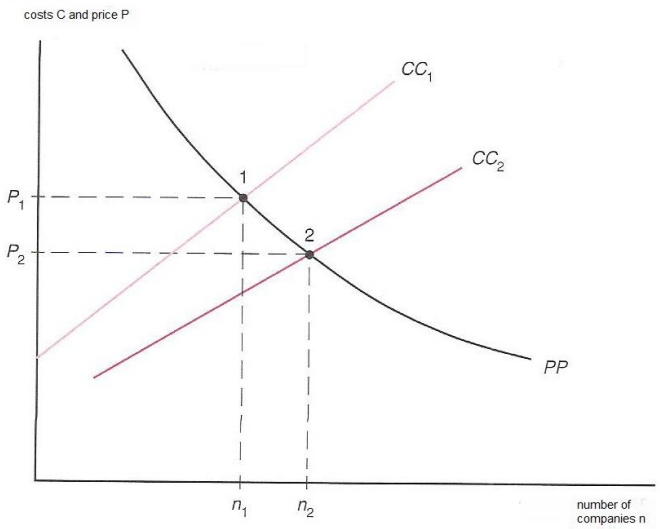

Figure 21 change of the market equilibrium at monopolistic competition by an increasing market Resource [1] page 180

3.2.1 Example for an integrated market

At this chapter we provide an example for a monopolistic competition. This example is taken from the Resource [1] Krugman, Obstfeld (2009) pages 181-183. We will examine the automotive industry. We have two countries. Each country has a market for the automotive industry. First, we define the demand function, which is valid for both countries. We take the formula 3.1 and insert for b = 1/21.000. So we get the following formula.

$$Q = S * (1 / n - (1 / 21.000) * (P - \dot{P}) \qquad (3.10)$$

Next, we set our fixed costs at 360.000.000 € and our marginal costs at 4.000 €. So. we get the following formulas for the whole costs and average costs:

$$C = 360.000.000 + (4.000 * Q) \qquad (3.11)$$

$$AC = (360.000.000 / Q) + 4.000 \qquad (3.12)$$

Both countries and A and B have different market sizes. Each country has the same fixed costs and marginal costs. If we want to find the long-term Equilibrium Point. we have to enter both countries' data into the Formula 3.9. In the next formula, some results are rounded to the nearest whole number:

$$P_A = € 7.000 = c + 1 / (b * n) = 4.000 + 1 / ((1 / 21.000) * 7) = 4.000 + 3.000 \qquad (3.13)$$

$$P_B = € 5.750 = c + 1 / (b * n) = 4.000 + 1 / ((1 / 21.000) * 12) = 4.000 + 1.750 \qquad (3.14)$$

The average costs of the companies are the following.

$$AC_A = € 7.000 = (F / S) + c = 360.000.000 / 120.000 + 4.000 = 3.000 + 4.000 \qquad (3.15)$$

$$AC_B = € 5.750 = (F / S) + c = 360.000.000 / 205.667 + 4.000 = 1.750 + 4.000 \qquad (3.16)$$

If we combine both markets into one market, we have total sales of 3.308.000 cars. Now, we want to calculate what happens with the number of companies, the average costs and the prices. We compute that in the integrated market, there are 14 firms able to produce.

$$P_I = € 5.500 = c + 1 / (b * n) = 4.000 + 1 / ((1 / 21.000) * 14) = 4.000 + 1.500 \qquad (3.17)$$

$$AC_I = € 5.500 = (F / S) + c = 360.000.000 / 236.286 + 4.000 = 1.500 + 4.000 \qquad (3.18)$$

When we look at Country A, there are seven companies whose sales per company results in120.000 cars. These cars have average costs and prices of € 7.000. Next, we examine Country B. Country B consists 12 companies. Each of them produces 205.667 cars and have average costs and prices of € 5.750. Our calculation shows us that 14 firms are able to produce in the greater integrated market. The integrated market has fewer companies than the sum of Countries A and B. Few companies are able to produce to a lower price, so the companies are able to sell the cars to a lower price of € 5.500.

The next table gives us an overview of Countries A and B, the integrated market, and the different values of the variables. We see will examine the data of each single market and the integrated market.

	country A	country B	integrated market
total sales of cars	840.000	2.468.000	3.308.000
number of companies	7	12	14
sales per company	120.000,00	205.667,00	236.286,00
average costs	7.000,00	5.750,00	5.500,00
price of one car	7.000,00	5.750,00	5.500,00

Table 5 example for profits in an integrated market

Table 8 portrays the data from different markets, and the figures below show us the trend of the cost curve and price curve in the different markets. Figure 22 gives a visual representation of the Equilibrium Point at seven companies and a price of € 7.000. Figure 23 shows us the equilibrium point at 12 companies and a price of € 5.750. Looking next at Figure 24, we can observe the new integrated market. The greater market has 14 companies and a price of € 5.500 in the equilibrium. In all three figures, the yellow lines, called PP, stand for the price of one car and the red lines, called CC, stand for the average costs of one car.

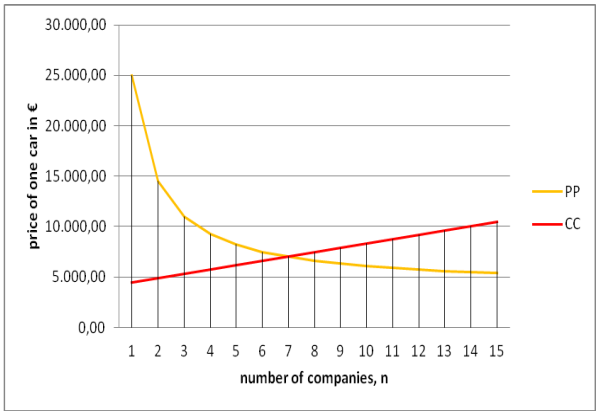

Figure 22 equilibrium of the car market country A

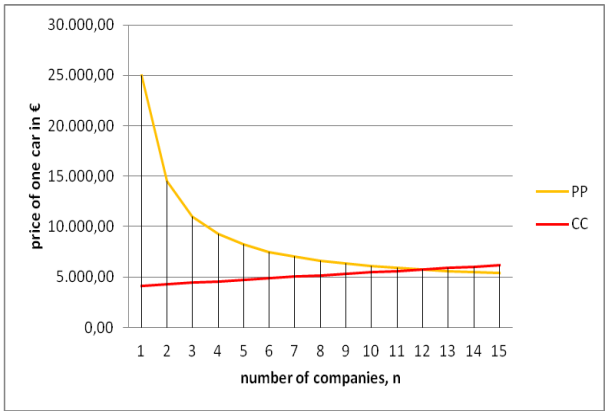

Figure 23 equilibrium of the car market country B

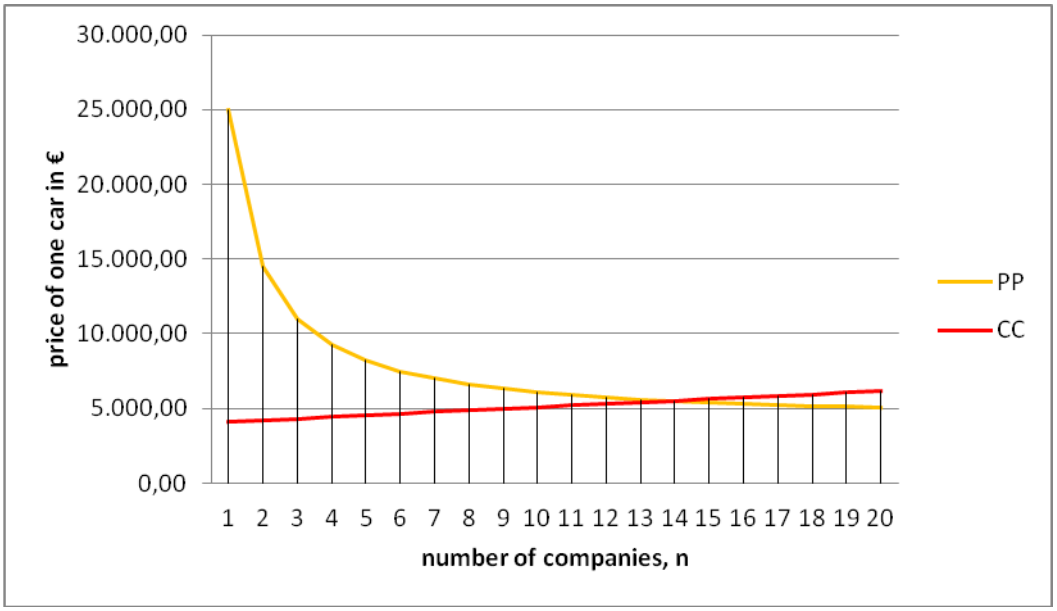

Figure 24 equilibrium of the integrated car market

Now we have seen what happens if two countries merge their individual markets to one great market and this in one industry. But do not forget is only possible if both countries trade with each other. This one great market provides the consumers more variety at the goods and cheaper goods. The companies can serve a greater market and produce at lowe costs. If a company want to gain from this economy of scale effect, it is necessary to produce the goods in one country. But the company has to sale its goods in both countries.

3.2.2 Economy of scale effects and the comparative advantage

Our model for monopolistic competition is very helpful and our automotive industry example shows us how it works. However, the model does not show us the effects of economy of scale at trade patterns. In our model exists no transport costs and both countries have the same production costs. The fix costs and marginal costs are equal. The integrated market allows 14 companies to produce. But we cannot say where they have their production place. The production places can be all in one country.

We want to look at other effects on trade patterns. Now, our target is to see the relation between the economy of scale effects and the comparative advantage. Let us start with an example from the Heckscher-Ohlin model. We have two countries home and foreign. Both have two production factors. These are capital and labor. We have two branches; these are the textile- and food-branch. The textile-branch is the capital-intensive branch. The home country has the greater capital-labor ratio. So is the home country the capital abundance country. But this model has a difference to the Heckscher-Ohlin model. The textile-branch has a monopolistic competition. All firms in the textile industry produce their own specific good. One country cannot produce the whole bandwidth of textile goods. It is possible that both countries produce textile goods, but they are not the same. The monopolistic competition influences the trade patterns very strong.

Without the monopolistic competition is the textile industry a branch without difference products. We have the situation of a typical Heckscher-Ohlin model. The capital rich country produces the capital-intensive good. Then it exports these goods. The labor rich country produces the labor-intensive good and exports it. This is the typical situation of inter industrial trade. If we allow the monopolistic competition, then we have another situation. The home country is net exporter of textile goods and importer of food. But the companies in the foreign

country produce textiles too. These textiles are different, as the textiles goods which are produced at home country. But the consumers want to buy the products from the foreign country, too. So, home country imports and exports goods of the textile branch.

The model of monopolistic competition shows us two kinds of trade. First, the inter industrial trade. A country has an advantage in the factor endowment. It uses this advantage to produce goods and trade with other countries which have not this advantage. In our example exports the capital rich country the capital-intensive good to the labor rich country. The labor rich country exports the labor-intensive good to the capital rich country. The comparative advantage is for international trade very important. Second, it is the intra industrial trade. Here we have no comparative advantage. If both countries have the same capital-labor ratio the branches of the countries will be produce different products. These products are responsible for intra industrial trade. The advantages of the rising economy of scale effect are responsible that each country produce only a part of the bandwidth of goods. Economy of scale effects are independent reasons for foreign trade.

The pattern for the intra industrial trade does not allow to predict where the different products are produced. The model gives us no answer. So, it is the coincidence, which decides in which country the different products are produced. This is difference to the inter-industrial trade. We know where every good is produced. We know now two types of trade based on the Heckscher-Ohlin model. When a country, which trade with other countries has a different factor endowment as the other countries, then the inter-industrial trade dominates. If the countries have approximately the same capital-labor ratios, then intra industrial trade dominates.

4. Intra Industry Trade Model

In this section, we will analyze theoretical view of the Intra-Industry Trade Model. We will present some papers by Paul Krugman and analyze his ideas in order to better understand them. The foundation for this model was presented in Chapter 3.

4.1 At the beginning was an idea - increasing returns, monopolistic competition and international trade

4.1.1 Introduction

We have a problem: We cannot explain why industrialized countries trade with each other. Even actual trade theories cannot give an answer to this situation. Let us look at the international trade flows. After World War II, there was enormous growth in international trade between the developed countries. Paul Krugman had the idea that the factor Economy of Scale, and not just differences in technology of the Factor Endowment, was responsible for this situation and not only the different technology or the factor endowment of the countries. However, the assumption of increasing returns, which Krugman concludes is responsible for growth in trade, opposes the normal market structure, or "perfect competition".

In this chapter, we will Krugman's model. The target is to explain the international trade between industrialized countries, focusing on the base of internal Economy of Scale and a specific market structure. Krugman does not state that differences in technology or the different endowment of specific countries are the only responsible for international trade. We concentrate on the Internal Economy of Scale, because the External Economy of Scale cooperates with perfect competition as market structure. The Internal Economy of Scale works with the Chamberlin monopolistic competition as market structure. The approach of the Chamberlin monopolistic competition has some advantages: First, it is easy to analyze this simple model and the development of the increasing returns the trade flows; second, we have only one equilibrium point in the model, which is easier to handle; third, the model works with the approach of many different goods. This model cooperates with Grubel and Lloyd's theory of intra-industry trade.

4.1.2 Monopolistic Competition in a closed Economy

In this chapter, we explain the basic model of monopolistic competition. Krugman simplifies Dixit and Stiglitz's model. The target is not to create a general model, rather it is to create formulas for the utility and cost function. Both formulas are the structure for further analysis. In this case, there is an economy with only one production factor: Labor. The economy can produce a lot of different products. Every product has an index, i, which stands for one specific product. We will order the products from 1 to n according to their index. The number n is a large number, but it is small if we compare it to the total possible produced products. The inhabitants of the economy have the same utility function, in which all products are represented equally.

$$U = \sum_{i=1}^{n} v(c_i) \text{ where } v' > 0 \text{ and } v'' < 0 \qquad (4.1)\ [22]$$

[22] Resource [11], Paul Krugman (1979) page 470

In this formula, c_i is the consumption of the i-th good. Now we define the variable ε.

$$\varepsilon_i = -\frac{v'}{v'' c_i} \qquad (4.2)\ [23]$$

Epsilon stands for the elasticity of the specific product i. We take the assumption that the following equation is true.

$$\partial \varepsilon_i / \partial c < 0 \qquad (4.3)\ [23]$$

Also, we have the same cost function for all products. We have only one production factor. This is labor. Our cost function is linear.

$$L_i = \alpha + \beta x_i \qquad (4.4)\ [24]$$

The variables α and β are greater as 0. L_i is the amount of labor which is used to produce the product i. X_i is the number of produced goods of i and α stands for the fixed costs of producing this specific good. The Cost Function has an increasing number of produced goods, decreasing average costs, and constant marginal costs. Each type of product which is produced will be consumed. We can observe this in the next formula.

$$x_i = Lc_i \qquad (4.5)\ [24]$$

Next, we have the assumption of full employment. Every labor force is used for the production of goods. We see this here.

$$L = \sum_{i=1}^{n} l_i = \sum_{i=1}^{n} [\alpha + \beta x_i] \qquad (4.6)\ [24]$$

We have three variables which we will use in our computations: the price of each product relative to the wages p_i / w; the output if each product x_i, the amount of products which are produced. Also, we know that each product is produced at the same amount and at the same price. This is valid for all i. We see this in the next formula.

$$\left.\begin{aligned} p &= p_i \\ x &= x_i \end{aligned}\right\} \qquad (4.7)\ [24]$$

In order to reach our target, we will take three steps. First, we will examine one company's demand curve in our model. Then, we will look at a company's price-setting process and the relationship between output and profit. Third, we will look at the change of the profit in the branch through a change in the number of companies in the branch.

Let us analyze the demand curve of one individual company. Each company maximizes its utility. This is limited by a budget constraint. Conditions for the maximization resemble the following.

[23] Resource [11], Paul Krugman (1979) page 470

[24] Resource [11], Paul Krugman (1979) page 471

$$v'(c_i) = \lambda p_i, \qquad i = 1, \ldots, n, \qquad (4.8)\ ^{25}$$

Lambda stands for the marginal utility of the income. If we look at Formula 4.7, it is possible to set a relationship between individual consumption and individual output. Next we enter into formula 4.8 for c_i the formula 4.5. Then, we will bring the remaining price on the left side to the right side. As a result, we get the following formula, which represents the demand of an individual firm.

$$p_i = \lambda^{-1} v'\left(\frac{x_i}{L}\right) \qquad (4.9)\ ^{26}$$

With this formula we are able to say that, if the number of produced goods is high, then the change in price of every company has no effect, or only a very small effect, on the marginal utility of the income. We can say that Lambda is a constant. Also, we can say that the elasticity of the demand of each firm looks like the following.

$$\varepsilon_i = -v'/v''c_i \qquad (4.10)\ ^{26}$$

Next, we want to explain the Profit-Maximizing Pricing behavior of each company. We know that every firm is small in relation to the whole market. The decisions of one company have no effect on other companies. We can see through the next formula that each firm sets its price.

$$\Pi_i = p_i x_i - (\alpha + \beta x_i)w \qquad (4.11)\ ^{26}$$

The marginal costs and the elasticity of the demand influence the Profit-Maximizing Price. The following demonstrates this concept.

$$p_i = \frac{\varepsilon}{\varepsilon - 1}\beta w \qquad \text{Or} \qquad p/w = \beta\varepsilon/(\varepsilon - 1) \qquad (4.12)\ ^{26}$$

We cannot set the price, because the elasticity of the demand is not independent from the output. If we want to find the Profit-Maximizing Output and Price, we must first combine Formula 4.12 with the assumption that the whole profit's Equilibrium Point is 0. If new companies enter into the market, then the profit of each company decreases at least to 0. Thereafter, no more firms can enter into the market. The next figure shows us this effect. The horizontal axis represents the output of one firm and the vertical axis represents the revenues and costs of one company. The revenues and costs are shown in wage units. Line TC stands for the total costs, and OR, or OR_1, stands for the revenue function. We start with a certain number of firms. The revenue function for each company is OR. Each company sets its amount of produced goods at that point, where the marginal revenues are equal to the marginal costs. In this case, this occurs at point A. Point A is above the TC line. So, the price of a good is above the average costs. The companies therefore make profits. These profits in turn increase the number of companies in the market. The marginal utility of income increases. However, the revenue function is shrinking. This is demonstrated in Figure 25. The new equilibrium is at point B. At this point, the equilibrium of marginal revenues and marginal costs as well as the equilibrium of the average revenues and average costs exist. This is also called "*Chamberlin's tangency solution*" (Edward Chamberlin, 1962).

[25] Resource [11], Paul Krugman (1979) page 471

[26] Resource [11], Paul Krugman (1979) page 472

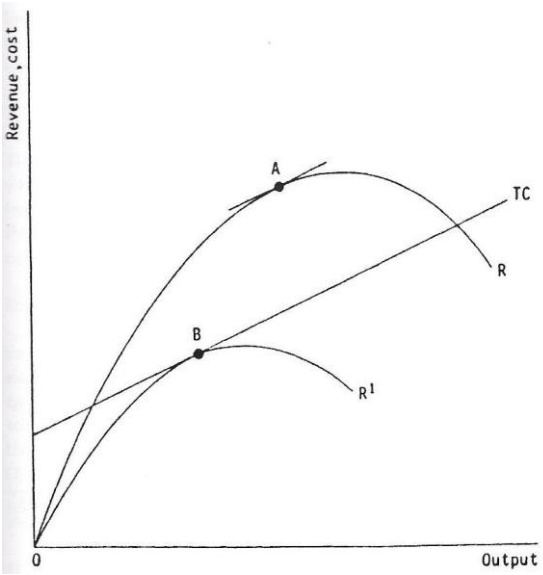

Figure 25 Chamberlin's tangency solution Resource [11] page 473

We will now further describe the Equilibrium Point. To do so, we will use the price and output of goods of one company. Our basic functions, though, are the costs and utility function. In the next figure, we will explain the relationship between price and output. The horizontal axis stands for the per-capita consumption of one good while the vertical axis stands for the price of one good measured in wage units. Let us examine the price condition in Formula 4.12. We can see that there is a relationship between Output C and the Price-Wage ratio p / w. In Figure 26, we can observe the result of this formula as Curve PP. The price lies at any position above the marginal costs. If C increases, then the price also increases. The elasticity of the demand decreases as Output C increases. Another relationship between c and p / w can be found in the Equilibrium Points. Here, the profit is 0. Let us take Formula 4.11 and transform it to following formulas.

$$0 = px - (\alpha + \beta x)w \qquad (4.13)\ [27]$$

Or

$$\frac{p}{w} = \beta + \frac{\alpha}{x} = \beta + \frac{\alpha}{Lc} \qquad (4.14)\ [27]$$

One can see we that a rectangular hyperbola results above the line p / w = β. In Figure 26, the curve is called Curve ZZ. We now have two curves: Curve PP and Curve ZZ. These curves intersect at one point. At this point, the consumption and price of every good is limited. Thanks to our understanding of the consumption of every product, we understand the output of each product per company. This is x = L * c. Also, we assume there is full employment. Thus, we can compute the number, n, of different goods which are produced.

$$n = \frac{L}{\alpha + \beta x} \qquad (4.15)\ [28]$$

We now know the way to compute the equilibrium in our model. However, we do not know which of the n products are actually produced. However, this is not important to know, because the goods have the same utility and cost function.

[27] Resource [11], Paul Krugman (1979) page 473

[28] Resource [11], Paul Krugman (1979) page 474

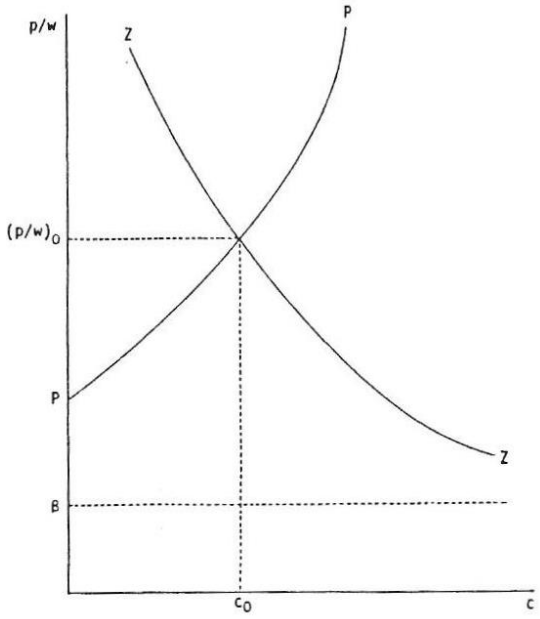

Figure 26 equilibrium point Resource [11] page 474

4.1.3 Growth, trade and factor mobility

We have now a model consisting of one factor: Labor. We have read that Economy of Scale Effects is possible with this factor, but it is limited by the size of the market. In the next step, we will demonstrate how Krugman increases the scope of the market. In order to do so, Krugman presents three possible options: Labor force, trade and migration. We will now clarify these three options as well as their impacts.

Effects of Labor force growth

We will begin by using the Figure 26 and the model from the last chapter, then we will increase the labor factor. We use the same definition for the PP and ZZ Curve. Equilibrium occurs at Point A. Now, we increase the labor factor. If we look at Formulas 4.12 and 4.13, we can see that an increase of the labor, L, has no effect on Curve PP. However, the increase of the labor does have an effect on Curve ZZ. Curve ZZ shifts to the left side. We now have a new equilibrium at Point B. The marginal costs, c, decrease and the price-wage ratio decreases, too, but the amount of produced goods and the variety of goods increase. We can show this with the following formula; a transformation of Formula 4.14.

$$x = \frac{\alpha}{p/w - \beta} \qquad (4.16)\ ^{29}$$

[29] Resource [11], Paul Krugman (1979) page 475

With help from these formulas, we can compute that the amount of produced goods must increase. The formula, here n = L / (α + β * L * c), demonstrates this. If we have an increasing L and a decreasing c, then the result is a greater n. The results of these calculations only hold, though, when Curve PP is an increasing curve and the elasticity of the demand decreases with a decrease in the marginal costs, c. Remember that we assume in this example that the elasticity of demand increases when the price of a product increases. We will now look examine the welfare of the economy in this model. It is not useful to compare the implied growth and welfare, our calculations confirm that the labor force rises in our model. On the one hand, this increases real wages and, on the other hand, gives consumers a greater variety, for the economy can then produce a greater variety of goods.

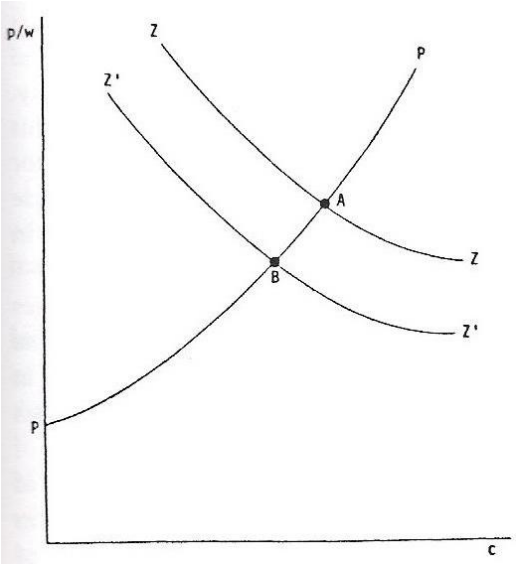

Figure 27 equilibrium point shift as a result of increasing labor force Resource [11] page 475

Effects of Trade

Here we will demonstrate the effects of trade on the economy. In order for trade to be possible, we first need two countries. Both countries' economies are equal, as was mentioned in the example in Chapter 4.1.2. Both countries have identical demand and use the same technology. In a standard trade model, there is no reason for both countries trade with each other. In this trade model, though, is a reason to trade and both countries gain from the trade. Now we will set a few conditions for trade: There are no transportation costs; the same demand and technology are responsible for the same wage rates in both countries; the price of each good in the branch is the same. We have now a new market, different from that in the last section. This market is greater. The merge of both markets into one greater market effects trade the same way as an increase in the labor force of one country. Now, though, both countries have a profit from this one greater market, because both countries have higher real wages and the consumers have a greater variety of products. We cannot say where each product is produced, but every product is produced only in one country. The companies have no reasons to produce the same product in both countries. The trade-volume is limited. Each company maximizes its utility function. These effects are demonstrated through the following formula.

$$U = \sum_{i=1}^{n} v(c_i) + \sum_{i=n+1}^{n+n^*} v(c_i) \qquad (4.17)$$ [30]

[30] Resource [11], Paul Krugman (1979) page 476

Formula 4.17 demonstrates the utility function of both countries. The first sum represents the sum of the home country, where Goods 1through n are produced. The second sum represents the sum of the foreign country, where goods n through n* are produced. Now, we want to show that the amount of products which are produced in each country depends on the size of the labor force in both countries.

$$n = \frac{L}{\alpha + \beta x},$$

$$n^* = \frac{L^*}{\alpha + \beta x} \qquad (4.18)\ ^{31}$$

Additionally, we now know that the price of each good is the same. So, each country will buy products by the size of the labor force. The country's imports is L* * (L + L*), or, in other words, the value of the imports is equal to the national income times the import. The following formula illustrates this.

$$M = \frac{wL \cdot L^*}{L + L^*}$$

$$= \frac{wLL^*}{L + L^*}$$

$$= M^*. \qquad (4.19)\ ^{31}$$

There is a maximal trade volume, which is part of the world income, if the size of the labor force in both countries is equal. The volume of trade is limited, and we do not know the direction of trade. The Economy of Scale Effect has several effects, including an increase in trade flow between countries, which have no international differences in demand technology or factor endowments.

Effects of Factor mobility

Here we extend the existing model to allow the labor force to move from one country to another country. We must remember that in 1957, Mundell, trade using the Heckscher Ohlin Model as a basis, demonstrated that movement of specific factors is a substitute for international trade. These factor movements can be explained by restrictions on international trade, such as tariffs, transportation costs, and several other restrictions.

We have the same model as in the last chapter: Trade between two countries, which have the same demand and technology. Both countries gain from the trade and the greater market leads to the Economy of Scale Effect in the production as well as a greater choice of products for consumers. However, we can get the same gains without trade if we allow the total movement of the labor force to go from one country to the other country. In Krugman's model, the value of trade and the growth of the labor force are equal. When there are restrictions on trade flows, it is realistic that the labor force moves from the country with the lower labor force to the country with the greater labor force. In the next scenario, trade is not allowed, but the transfer of labor is allowed. Then the labor force moves to the country which has the larger wages and more variety of goods. In the end, the entire labor force is concentrated in one country. However, the starting conditions are responsible for making the population of both countries reside in one county. Thus, we can see through our model that regions or countries which have a greater labor forces attract more labor force. With the

[31] Resource [11], Paul Krugman (1979) page 477

increasing labor force within a region or country, this region or country becomes more and more attractive for the labor force.

If we consider our two country models, then it is very important to know which country starts with the greater labor force. In this case, the countries have the same labor productivity and there is no difference between the levels of the countries' welfare. This creates a small difference in the starting condition of this model, which leads to a situation in which the labor force moves in the wrong direction. Let us think about a scenario in which one country has higher fixed and variable costs for the labor force. Then, the model demonstrates the beginning of the movement to the other country. However, the country with higher costs has the greater labor force. So, the movement has occurred in the wrong region. We see in this chapter that if trade is not allowed and is strongly restricted, the production factors move. The factor in this model is the labor force, but this takes place only if the production factors are allowed to move to another country. Thus, the factor movements replace the international trade. The factor movements lead to a concentration of the production factors in one country or region. The ending condition in which all factors are concentrated in one area depends on the factors' starting condition. It is therefore possible, if one condition changes, that the concentration of a production factor is in the false country or region.

4.1.4 Summary

In this chapter, we have discussed the possibility of international trade even when countries have the same technologies and factor endowments. The basis for this argument is the Chamberlinian approach of trade and the assumption of increasing returns of scale. We saw that the extension of the labor force and the extension of the market have the same effect on trade. With an increasing labor force, we get larger real wages and greater variety of products. So, there is one possible explanation for international trade between industrialized countries.

4.2 Scale Economics, Product Differentiation and the Pattern of Trade

4.2.1 Introduction

In this chapter, we will to explain the meaning of international trade. We know that international trade flows in great masses between industrialized countries. This model is an extended model from Chapter 4.1, and come of its assumptions are more restrictive than the model from 4.1. In that model, there are no effects on the Scale of Production for trade. The gains of trade exist only in the greater product diversity of the greater market. However, it is necessary to get useable results. This chapter should give some answers as to how transportation costs influence the model and how different types of products influence a country's trade patterns.

4.2.2 Transport Costs

We have several numbers of goods. In the home country are n number of goods, and in the foreign country are n* number of goods. The following formulas illustrate this.

$$n = L(1-\theta)/\alpha \qquad (4.20)\ [32]$$

$$n^* = L^*(1-\theta)/\alpha \qquad (4.21)\ [32]$$

We will calculate the transportation costs as a part of the good costs. In this case, an amount of goods are lost between the transports from one country to another. This is 1 - g loss during transportation, so only g amount of goods arrive at their target. From Formulas 4.20 and 4.21, we know that n numbers of goods are produced in the home country and n* numbers of goods are produced in the foreign country. Also, we know that the price of each good is the same. However, with the additional transportation costs, foreign goods have a higher price. Consumers from the home country have to pay the price $\hat{p}^* = p^*/g$ for goods from the foreign country and consumers from the foreign country have to pay the price for goods from the home country. If the prices of the different countries are not the same, then the consumers do not consume foreign goods in the same way as they consume home goods. Instead, the consumers consume $(p/\hat{p}^*)^{1/(1-\theta)}$ units of foreign goods at a specific ratio to home good. We want to find the equilibrium. It is therefore necessary to look at the amount of products which are transported between the countries. If one consumer of the home country consumes one foreign good, then he or she has an added direct and indirect demand of 1 / g unit for a good. After we calculate the ratio of home and foreign products, our next step is to compute the demand for home consumers. We calculate the ratio of the demand and formulate it for both countries.

$$\sigma = (p/p^*)^{1/(1-\theta)} g^{\theta/(1-\theta)} \qquad (4.22)\ [33]$$

$$\sigma^* = (p/p^*)^{-1/(1-\theta)} g^{\theta/(1-\theta)} \qquad (4.23)\ [33]$$

[32] Resource [13], Paul Krugman (1980) page 952

[33] Resource [13], Paul Krugman (1980) page 953

Also, we know that every consumer spends his or her own money for goods. His or her wages must be equal to how much he or she spends. So, we get the following equation: (n * p +σ * n* * p*) * d = w. In this formula, d stands for a good from the home country. The same equation with different variables is valid for the foreign country.
Through this formula, we now know the behavior of the consumers. Now we want to look at the companies. The home and the foreign demand elasticity, or 1 / (1 - θ) , is the same for company. The transportation costs affect neither the price set by the firms nor the number of firms in the market. The transportation costs have also no effect on the amount of produced goods per company.
.

$$p = w\beta/\theta;\ p^* = w^*\beta/\theta \qquad (4.24)\ ^{34}$$

$$n = L(1-\theta)/\alpha;\ n^* = L^*(1-\theta)/\alpha \qquad (4.25)\ ^{34}$$

We now observe the formulas which define the price and the number of firms both in the home and foreign country. There is only one way in which the transportation cost influences the model: They influence the result only, when the wages vary between the countries. The amount of companies and the size of each company, though, stay the same.
Now we can observe how the model reacts under the influence of transportation costs and how stable it is.

According to our research, the model does not react to changes in transportation costs. The number of goods and the relative wages stay stable in home and foreign country. Only the relative wage rate, w / w* = ω , reacts. This rate must not be equal 1, however. We can limit ω if we look at the conditions of the Equilibrium Point. The demand and supply for the home country labor force are the same for the foreign country as well as the Balance of Payments Equilibrium. We will now compute the Balance of Payments Equilibrium. Therefore, we use Formulas 4.22 and 4.23 and combine them with other of the model's formulas. The result is the following expression.

$$B = \frac{\sigma^* n\omega}{\sigma^* n + n^*} L^* - \frac{\sigma n^*}{n + \sigma n^*}\omega L$$

$$= \omega L L^* \left[\frac{\sigma^*}{\sigma^* L + L^*} - \frac{\sigma}{L + \sigma L^*} \right] \qquad (4.26)\ ^{34}$$

We see the Balance of Payments, B, of the home country are calculated in wage units of the foreign country. If σ and σ* are functions of p / p* = ω and B = 0 in this case, then it is possible to limit the relative wages. We now examine Function B (ω) in the following figure: If the relative wage is ω = 0, then there is a balanced trade flow. Using Formula 4.26, we can formulate a scenario. If σ is an increasing function of ω, and if σ* is a decreasing function of ω we get two possible results: Either B (ω) has a negative result, if and only if ω is greater than ϖ, or B (ω) has a positive result, if and only if ω is lower than ϖ. Both results show us that ϖ is the unique equilibrium of the relative wages.

[34] Resource [13], Paul Krugman (1980) page 954

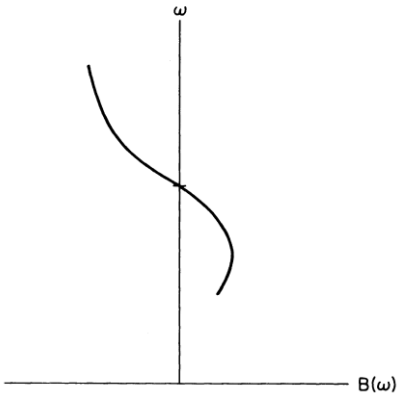

Figure 28 balance of payments Resource [13] page 954

With this result we can go one step further. We must first make some assumptions: One of these countries is larger as the other country; the other conditions stay the same. One result of this proposition is that the wages are higher in the larger country. To prove our assumptions, we must calculate B (ω). We set ω = 1 and σ = σ* < 1. We insert our variables into Formula 4.26 and reduce our formula. We get following balance of payments.

$$B = LL^*\left[\frac{1}{\sigma L + L^*} - \frac{1}{L + \sigma L^*}\right] \qquad (4.27)\ ^{35}$$

Let us look at Formula 4.27 and the different possible results for B. B is positive if L > L* and if the equilibrium is greater than the relative wage ω. B is negative if L < L* and the equilibrium is lower than the relative wage ω. We see that in different markets where we have the effects of Economy of Scale, the positive effect is the largest in the largest country, because the largest country has the largest market and labor force. This market has also a positive advantage against the other markets in its terms of trade. It is simple to explain this situation: If there are two markets, then it is cheaper to produce in close vicinity to the larger market. This reduces the costs for transportation. We want to employ labor force in all countries, though, so it is necessary to have different wages in the countries to equalize this effect.

[35] Resource [13], Paul Krugman (1980) page 954

4.2.3 Home Market Effects on the Pattern of Trade

We have the model which bases on the effect of economy of scale. This leads to increasing returns. Also we have now transportation costs. It is logical that the production of goods concentrate in that region or country where these goods have the greater demand. These have two reasons. First the region or country with the greater demand after these goods leads to economy of scale effects. Second the production of the goods near to its consumers leads to low transportation costs. On base of this facts it is clear that a region or country export these goods where it have a greater demand and consequent the advantages. If we decreasing returns instead of increasing returns, then the region or country import these goods with the greater demand and do not export these goods. In this chapter we want to explain on base of the model 4.1 some effects. We show the effects in any scenarios. Therefore we extend the base model to find the explanation.

A Two-Industry Economy

We begin with the base model in a closed economy. In this economy, there are two types of product: alpha and beta products. We call them alpha and beta products. The alpha products have following description $c_1,\ldots,c_n$, and the beta products have following description $\tilde{c}_1,\ldots,\tilde{c}_n$. The population of the country is split into two groups. One part of the population has only a utility for the consumption of alpha products, or L. The other part of the population has only a utility for the consumption of beta products, or L˜. The utility functions for each product type are.

$$U=\sum_i c_i^\theta;\ \tilde{U}=\sum_j \tilde{c}_j^\theta \qquad 0<\theta<1 \qquad (4.28)\ *^{36}$$

Parameter θ is the same for both functions. We look now at the products' cost functions, which are equal for both products.

$$l_i=\alpha+\beta x_i \qquad i=1,\ldots,n$$
$$\tilde{l}_j=\alpha+\beta\tilde{x}_j \qquad j=1,\ldots,\tilde{n} \qquad (4.29)\ ^{36}$$

In typical cost function, l is the labor force for the good production and x is the amount of produced goods. Now, we look at the demand of the two types of goods. The different demand depends on the size of the population that wants to consume this type of good. So, we get the following formulas.

$$x_i=Lc_i \qquad i=1,\ldots,n$$
$$\tilde{x}_j=\tilde{L}\tilde{c}_j \qquad j=1,\ldots,\tilde{n} \qquad (4.30)\ ^{37}$$

If we combine this with the condition of full employment, we get the following formula.

$$\sum_{i=1}^{n} l_i+\sum_{j=1}^{\tilde{n}}\tilde{l}_j=L+\tilde{L} \qquad (4.31)\ ^{37}$$

We have now our definitions and formulas. If we look back, we can see that they are similar to the base model. Also, there is the condition that firms are allowed to enter into the market and decrease the profits to zero. The price and the amount of the produced goods are equal

[36] Resource [13], Paul Krugman (1980) page 955

[37] Resource [13], Paul Krugman (1980) page 956

to the formula of the base model, in which only one type of product exists. In this extension, though, there are now two types of goods. So, the production is divided into two parts. The income of the labor force that consumes one type of good must be equal the sum of production of these goods. We see this here.

$$npx = wL; \quad \tilde{n}\tilde{p}\tilde{x} = \tilde{w}\tilde{L} \qquad (4.32)\ **$$

The wage of each group is the same. So are the price and the amount of produced goods. We get the following equation where $n/\tilde{n} = L/\tilde{L}$. The fraction of produced goods for each good type is equal to the part of the two different types of the population.

Demand and Trade Patterns with two countries

The next scenario involves two countries. Both are based on the model that we have described on the last page. Transportation costs also take part in this scenario. Part of the home country's population, f, only consumes the alpha products. In the foreign country, the other part of the population only consumes the alpha products. If f is greater than 0.5, then the home country is the greater producer of alpha products and the foreign country is the greater producer of beta products. Therefore, the home country is the net exporter of alpha products. If f is smaller than 0.5, then the home country is the greater producer of beta products, and the foreign country is the greater producer of alpha products. Therefore, the home country is the net exporter of beta products. Also, both countries have equal labor force. The next formulas show us this mathematically.

$$L + \tilde{L} = L^* + \tilde{L}^* = \bar{L} \qquad (4.33)\ [38]$$

$$L = f\bar{L}; \quad L^* = (1-f)\bar{L} \qquad (4.34)\ [38]$$

To verify that the wage rates are the same, we must again assume that the ratio of the demand for each imported good to the demand for each good produced in the home country is equal in each country. The next formula shows us this again.

$$\sigma = \sigma^* = g^{\theta/(1-\theta)} < 1 \qquad (4.35)\ [38]$$

Next we look at the net consumption in each country. A country's net consumption is the sum of all in the own country produced goods and the imported goods. The price p and the amount of the produced goods is the same for both countries. The next formulas provide the sum for each country.

$$npx = \frac{n}{n+\sigma n^*} wL + \frac{\sigma n}{\sigma n + n^*} wL^* \qquad (4.36)\ [38]$$

$$n^*px = \frac{\sigma n^*}{n+\sigma n^*} wL + \frac{n^*}{\sigma n + n^*} wL^* \qquad (4.37)\ [38]$$

Using these formulas, we are able to compute the relative number of goods which are produced in each country. We get the ratio of n / n*. If we want to determine whether or not alpha goods are produced in both countries, then the following must be true: n > 0 ; n* > 0. Next, we divide the result of Formulas 4.36 and 4.37 through n and n*. This result is Formula 4.38, which we then simplify to Formula 4.39.

[38] Resource [13], Paul Krugman (1980) page 956

$$L/L^* = (n + \sigma n^*)/(\sigma n + n^*) \qquad (4.38)\ ^{39}$$

$$n/n^* = \frac{L/L^* - \sigma}{1 - \sigma L/L^*} \qquad (4.39)\ ^{39}$$

Now we have the evidence: If L / L* = 1, then the ratio n / n * is the same. The demand and production patterns of both countries are equal. If the demand of a country is different from the demand of the other country, then we get a shift in the production of the goods. A greater demand for one type of product leads to a greater production of this type of good in that country. However, L / L * must lie between the border of σ and 1 / σ, or in mathematical terms, σ < L / L * > 1 / σ. Outside the borders σ and 1 / σ give only bad results. As in Formula 4.38, if n or n* or both are lower than 0, bad and not useable results arise from this formula. Also, the formula is not useful if L / L * lies outside these borders, because if the ratio L / L* is lower than σ, then is n = 0. In the resulting situation, the home country only produces beta products. If the ratio L / L* is greater than 1 / σ, then n* = 0. The effect that the home country only produces the alpha products then occurs. The next figure depicts this even in a graph

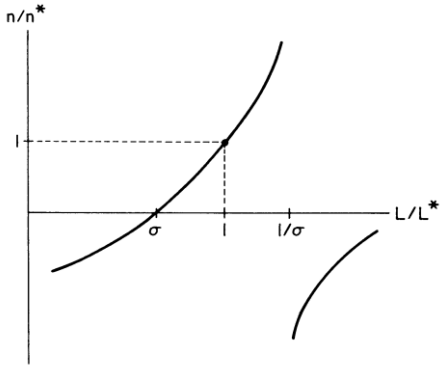

Figure 29 relationship between in labor force ratio and number of goods ratio in a scenario with two good types and two open economies Resource [13] page 957

An equilibrium now exists. To check the situation, we will determine what happens when firms work against the demand of a country. Imagine what happens if a company produces a good, which has no demand in its own country. This company has the same price as the foreign firms, but company's sales would be less than the ratio in the next formula. With the resulting sales, the one company would not be able to compete.

$$\frac{\sigma^{-1}L + \sigma L^*}{L + L^*} < 1 \qquad (4.40)\ ^{39}$$

The last formulas and the figure show us the subsequent situation in the home country. When two countries have different tastes and therefore different demands for goods, then every country specializes in the production of the type of goods, for which there is greater demand and the country is a net exporter for these types of goods. We have now the evidence to determine the pattern of export.

Next, we will look at the transportation costs and the situation in which L / L * lies between σ and 1 / σ. We know that $\sigma = g^{\theta/(1-\theta)}$. We also know that g stands for transportation costs and that the costs are the ratio of variables through fixed costs, or θ / (1 - θ). The ratio of costs as well as the transportation costs shows us how considerable the Economy of Scale Effect is. We see one effect of the incomplete specialization in the two countries. Both

[39] Resource [13], Paul Krugman (1980) page 957

countries produce both types of goods, but each country is specialized in the production of one type of good. Specialization is greater if the costs for the transportation of the goods are greater. This effect also reduces the Economy of Scale Effect. If this effect exists, a country would import and export products of both types. A country is the net exporter of the type of goods for which it has the greater market and if it is a net importer of other types of goods. In the next formula we see the Trade Balance for the alpha products.

$$\begin{aligned} B_\alpha &= \frac{\sigma n}{\sigma n + n^*} wL^* - \frac{\sigma n^*}{n + \sigma n^*} wL \\ &= wL^* \left[\frac{\sigma n}{\sigma n + n^*} - \frac{\sigma n^*}{n + \sigma n^*} \frac{L}{L^*} \right] \\ &= \frac{\sigma w L^*}{\sigma n + n^*} [\, n - n^* \,] \end{aligned} \qquad (4.41)\ [40]$$

In Formula 4.41, no relative labor supply exists at the final stage. The Trade Balance is influenced by the number of alpha goods which are produced in the home country and in the foreign country. This is represented in the formula as n and n*. Also, we see in the last figure that the function n / n* is an increasing function of the labor ratio L / L*. Ergo, the country with the greater home market is a net exporter of the alpha type goods, but only in the state of incomplete specialization.

Generalizations and Extensions

We have calculated that countries export the types of goods for which they have great markets. The assumptions for the model, however, are very strict. If we want to extend this model, then we have to be careful. Let us start with a scenario in which all conditions are the same, but we set the size of the population of the different countries and the demand on random values. The result of this scenario is that we have a complicated calculation, but the result is the same as it was before. The country with the larger home market for one type of good is a net exporter for this type of good. However, the effect arises which causes the countries to have different wages. The countries with the smaller markets have to equalize this effect with lower wages for its labor force.

It can be that larger countries have an advantage in the production of goods which are typical for large countries, because these countries have an greater Economy of Scale Effect. Here we have for example the aircraft industry: All these scenarios lead us to the main message of Chapter 4.2: A country exports the types of goods for which the home market is greater. If we change some assumption in the model, this effect does not change.

[40] Resource [13], Paul Krugman (1980) page 958

4.3 Intra-industry Specialization and the Gains from Trade

4.3.1 Introduction

This chapter concentrates on the explanation of the factor proportions and trade flows. We want to find the relationship between the Grubel-Lloyd Index and the similarity in the Factor Endowment. The goal was to find answers for three questions: Why are the greatest trade flows between countries with similar Factor Endowment? ; Why do we have in these trade flows lots of intra-industrial trade? ; Lastly, has there been a great trade volume increase over the past few decades without the effects of reallocation of resources or income distribution? The model in this chapter is also an extended model from chapter 4.1. It is not a general model, because it is restrictive. This model has strong assumptions so that we may get good and exact results. Also, it has a few restrictions and it is very simple. The model demonstrates show some facts in order to make this situation plausible.

4.3.2 Model Explanation

We know from last chapters that intra-industrial trade is based on the Economy of Scale Effect. This effect, though, has a disadvantage: Imperfect competition, or the aforementioned Chamberlinian monopolistic competition. We know all the assumptions and effects of this kind of monopolistic competition. The countries do not produce all possible goods, because they are deterred from the fixed costs of production for all these goods.

The concept of the industries in this chapter is very special. An industry is defined as a group of goods. This type of goods is replaceable within the group on the supply and demand side. In the model, we have two types of goods. Also we have the resources that are flexible in the production of one type of good, but which are not transferrable to the other type of good. All products look same and the goods have the same cost and utility function. The model represents two industries. Both industries have a certain number of goods. We see here the utility function for the whole country.

$$U = \ln\left(\sum_{i=1}^{N_1} c_{1,i}^{\theta}\right)^{1/\theta} + \ln\left(\sum_{j=1}^{N_2} c_{2,j}^{\theta}\right)^{1/\theta},$$
$$0 < \theta < 1, \qquad (4.42)\ [41]$$

The variable $c_{1,i}$ is the consumption of the i-th product of the Industry Branch One. The other sum shows us the variable $c_{2,j}$, in which j is the consumption of j-th product from the Industry Branch Two. The variables N_1 and N_2 limit the amount of possible goods in each industry. Also, it is interesting to note that the number of produced goods, n_1 and n_2, are smaller than N_1 and N_2. The utility function has some good properties. One half of the income of the country is utilized for goods of Industry One and the other half for goods of Industry Two. There are a lot of goods for which the demand has an elasticity of 1 / (1 - θ). Also, we can see the gains and losses from trade.

In this case, these goods are imperfect substitutes in terms of demand. In the case of the supply for the consumer, the goods are perfect substitutes. These are only valid within one specific industry. We have two production factors: Type 1 labor and Type 2 labor. Both labor force types are specific for its respective industry branch. Each specific labor force type's variable is used in its specific industry branch. Labor Force One is only used in Industry

[41] Resource [12], Paul Krugman (1981) page 962

Branch One and Labor Force Two is only used in Industry Branch Two. We have a cost function with fixed and variable costs. The variable $l_{1,i}$ stands for the labor force used to create the i-th good of Industry One. $x_{1,i}$ stands for the amount of produced i-th goods in Industry One. The wage rates are called w_1 and w_2. When we want determine the nominal costs, we have to multiply the wage rate by the specific labor force.

$$\begin{aligned} l_{1,i} &= \alpha + \beta x_{1,i}, \qquad i = 1, \ldots, n_1, \\ l_{2,j} &= \alpha + \beta x_{2,j}, \qquad j = 1, \ldots, n_2, \end{aligned} \tag{4.43}$$ [42]

Once all produced goods have been calculated, the result is x. We know that in the model, full employment exists. The labor force is equal in both countries. So, we add all labor to the total labor force and get 2 as a result. Variable z in the next formula provides us with the variable for factor proportion. This variable provides an explanation for intra-industrial trade. Also, we get information about the effects of trade on income distribution.

$$\left.\begin{aligned} \sum_{i=1}^{n_1} l_{1,i} &= L_1 = 2 - z \\ \sum_{j=1}^{n_2} l_{2,j} &= L_2 = z \end{aligned}\right\} 0 < z < 1 \tag{4.44}$$ [43]

Now we want to find the equilibrium point in the model. Thus, we have to limit some variables, such as the number of produced goods in each branch, the output, the price of the goods and the relative wages for both types of labor. Next, we want to calculate the prices for each industry branch. We know that all companies have different products. Also, we know the elasticity of the demand, which is 1 / (1 - θ). Let us define the maximum profit price formula for both industries.

$$\begin{aligned} p_1 &= \theta^{-1}\beta w_1, \\ p_2 &= \theta^{-1}\beta w_2, \end{aligned} \tag{4.45}$$ [43]

Each industry has its own price. Now that we know the prices, we also know the costs. We are able to define the profit formula for each company in both industries. The variables x_1 and x_2 stand for the amount of goods which a typical company produces.

$$\begin{aligned} \pi_1 &= p_1 x_1 - (\alpha + \beta x_1) w_1, \\ \pi_2 &= p_2 x_2 - (\alpha + \beta x_2) w_2, \end{aligned} \tag{4.46}$$ [43]

We know that companies are able to enter or leave the market. This makes the profit for the whole market zero, also called the *"Chamberlin's tangency solution"* *. If we want to calculate the size of a company and the number of companies in each industry branch, then we set the profit formulas from 4.46 at null and insert for p_1 and p_2 Formula 4.45. As a result, we get the following formula.

$$x_1 = x_2 = \frac{\alpha}{\beta} \cdot \frac{\theta}{1 - \theta} \tag{4.47}$$ [43]

[42] Resource [12], Paul Krugman (1981) page 962

[43] Resource [12], Paul Krugman (1981) page 963

With the variables x_1 and x_2, we can compute the size of each company in both branches. Then we are able to compute the number of firms with help from Formula 4.44. We get the following formulas.

$$n_1 = (2 - z)/(\alpha + \beta x_1),$$
$$n_2 = z/(\alpha + \beta x_2). \qquad (4.48)\ ^{44}$$

Last, we want to calculate the relative wages. Both industries have the same amount of sales, and we know that the profits are null and the wages for each specific industry is $w_1 * L_1$ and $w_2 * L_2$. The amount of sales are the same, so the result is $w_1 * L_1 = w_2 * L_2$. If we enter this information into Formula 4.44, the following formula results.

$$w_1/w_2 = z/(2 - z). \qquad (4.49)\ ^{44}$$

We see here a model for monopolistic competition in the equilibrium point. All goods are equally produced, and each product is different. In the model we have two critical variables: Relative wages (z), and θ, which shows us the degree of substitutability of the products in a branch. If θ has a small value, then we have a lot of different goods in the economy, and the Economy of Scale Effect becomes very important. Also, we know that $\theta = (\beta * w_1) / p_1 = (\beta * w_2) / p_2$. The terms $\beta * w_1$ and $\beta * w_2$ define the marginal costs of the production. At the Equilibrium Point, there are equal average costs, so θ shows us the proportion of marginal costs to average costs.

4.3.3 Factor Proportions and the Pattern of Trade

The model that we use now also has two different types of products. These products are produced by a specific group in the labor force. In this case, though, two countries trade with each other and create a greater market. Each country has two types of labor force. The Economy of Scale Factor exists and there are many different products. Now, we want demonstrate that countries which have similar Factor Endowments will have an intra-industry trade. On the other hand, countries with differences in the Factor Endowments have typical Heckscher-Ohlin trade. First, we want to measure the intra-industrial trade. Therefore, we will use Grubel and Lloyd's formula. The value X_k stands for the exports of the country in the industry k, and M_k stands for the imports of the country in the same industry. When the result of the formula is one, we have a balanced trade between these countries within this industry. If the result is zero, however, then we have a complete specialization in the countries. Each country is a net exporter or net importer for an industry branch.

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$$I = 1 - \left(\sum_k |X_k - M_k|\right) \Big/ \left[\sum_k (X_k + M_k)\right], \qquad (4.50)\ ^{44}$$

Next, we want to define the term "similarity" in terms of the Factor Endowments. To do so, we will discuss two countries. The first country, or home country, is the same as in the Chapter 4.3.2, but the second country, or foreign country, is a mirror image of the home country. The size of the labor force is equal, though the division of the groups of labor force is different. This is demonstrated in the next formula.

[44] Resource [12], Paul Krugman (1981) page 964

$$L_1 = 2 - z \qquad L_2 = z$$
$$L_1^* = z \qquad L_2^* = 2 - z. \qquad (4.51)\ [45]$$

Variable z stands for the endowments of the labor force in the different groups. When z is one, then the factor endowment is similar in both countries. If Variable z is smaller than one, then we have a rising difference in the factor endowment. The next figure gives us a visual overview. This figure is square and O, which stands for the home country endowment, and O*, which stands for the foreign country endowment. Also, the figure has two diagonals. Diagonal OO* stands for the case that both countries have the same factor endowment and the other diagonal stands for the case that both countries have the same economic size. Also, we see the Endowment Point E. This point demonstrates the Factor Endowment of the two countries. If z is one, then E lies in the middle of Diagonal OO*. When z declines, though, then E moves along the diagonal OO*.

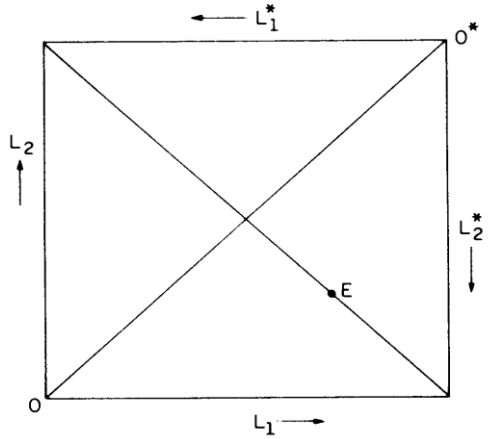

Figure 30 distribution of factors between two countries Resource [12] page 966

Now, we allow that both countries trade with each other. We make a lot of assumptions and restrictions, though. In this case, there are no transportation costs, we can limit the pricing behavior, the size and the number of firms. We can also limit the relative wage of the labor force and the volume and pattern of trade. The elasticity of the demand is 1 / (1 - θ). So we are able to formulate the price equations.

$$p_1 = \theta^{-1}\beta w_1,$$
$$p_2 = \theta^{-1}\beta w_2,$$
$$p_1^* = \theta^{-1}\beta w_1^*,$$
$$p_2^* = \theta^{-1}\beta w_2^*. \qquad (4.52)\ [46]$$

Based on these assumptions, we can say that all wages in all countries and branches are equal.

$$w_1 = w_1^* = w_2 = w_2^*. \qquad (4.53)\ [46]$$

[45] Resource [12], Paul Krugman (1981) page 965

[46] Resource [12], Paul Krugman (1981) page 966

Next we can compute the size of a company at the Equilibrium Point. This is valid for both industry branches.

$$x = \alpha\theta/\beta(1 - \theta). \quad (4.54)\ [47]$$

Last, we calculate the number of firms in each country and branch. We have the assumption of full employment of the labor force.

$$n_1 = n_2^* = (2 - z)/(\alpha + \beta x),$$
$$n_2 = n_1^* = z/(\alpha + \beta x). \quad (4.55)\ [47]$$

The result of our calculations leads us to the target that the factor prices are equalized. The production does not change, however. Now we want to determine what happens with the volume of trade and the trade pattern. Both industries have the same expenditure in both industry branches. Also, both countries have the same sales for each industry. The expenditure of one person in the home country for goods from Industry Branch One of the foreign country is 0.5 * [n^*_1 / (n_1 + n^*_1)]. Do not forget the amount of produced goods is proportional to the amount of labor force. Now let us define the exports and imports sums. Y is the income of the home country. It is equal to the income of the foreign country. The exports from the home country are called X_1 and the imports are called M_1 for the industry branch 1. The home country's exports are called X_2 and the imports are called M_2 for the Industry Branch 2. Here is the mathematical definition.

$$X_1 = \tfrac{1}{2}Y \cdot [(2 - z)/2],$$
$$X_2 = \tfrac{1}{2}Y \cdot (z/2),$$
$$M_1 = \tfrac{1}{2}Y \cdot (z/2),$$
$$M_2 = \tfrac{1}{2}Y \cdot [(2 - z)/2]. \quad (4.56)\ [48]$$

With these definitions, we can say that the total exports of the home country is $X_1 + X_2 = 0.5 * Y$. There is no relationship between the trade flow and the income of a country. The variable z has no effects on this. This explains why countries with similar Factor Endowments trade with each other. The model shows us that countries with similar Factor Endowments trade at the same sum with each other as countries with different Factor Endowments.

Next, we want to look at the trade between countries with similar Factor Endowments. So, we insert into the Grubel-Lloyd Index Formula the values from the last formulas 4.50. The result is very interesting.

$$I = z \quad (4.57)\ [48]$$

"The index of intraindustry trade equals the index of similarity in factor proportions." [48]

We now have a result which appears to be the assumptions of the model. Also, the model demonstrates the assumption that countries with similar factor endowment and Economy of Scale factor leads to trade. This model has a few restrictions and also some strict assumptions. These generalizations lead us to a very helpful and useful result.

[47] Resource [12], Paul Krugman (1981) page 966

[48] Resource [12], Paul Krugman (1981) page 967

4.3.4 Gains and Losses from Trade

Here we want to show what happens with the income and income distribution in the countries, which have intra-industrial trade. The goal is to determine which group of the labor force profits and which group loses from this trade. We will primarily look for a solution in which both groups profit from trade. We know the Utility Function of each person and their wage. These people consume the half of its income for products of Industry One and the other half for products of Industry Two. The utility function is influenced by the wage of the people, the prices of the goods in both industries, and the amount of produced goods. So we get the following utility function.

$$\begin{aligned} U &= \ln [n_1(w/2n_1p_1)^\theta]^{1/\theta} + \ln [n_2(w/2n_2p_2)^\theta]^{1/\theta} \\ &= -2 \ln 2 + \ln w/p_1 + \ln w/p_2 + \frac{1-\theta}{\theta} \ln n_1 + \frac{1-\theta}{\theta} \ln n_2 \end{aligned} \qquad (4.58)\ [49]$$

One positive effect of Formula 4.58 is that we have summarized a group of terms. The utility is influenced by the real wages of the labor force measured in goods and product diversity. We want to analyze the utility and split them for each industry branch. So, we get the utility U_1 for the labor from Industry Branch One and U_2 for the labor from Industry Branch Two. The variables w_{11} and w_{12} stand for the real wages of the labor from Industry Branch One, which are measured through the goods of Industry One and Industry Two. Also, the variables w_{21} and w_{22} stand for the real wages of the labor from Industry Branch Two, measured in goods of Industry One and Industry Two. We now set the values into Function 4.58 for each utility. Then we get the following formula.

$$\begin{aligned} U_1 &= \ln w_{11} + \ln w_{12} + \frac{1-\theta}{\theta} \ln n_1 + \frac{1-\theta}{\theta} \ln n_2 \\ U_2 &= \ln w_{21} + \ln w_{22} + \frac{1-\theta}{\theta} \ln n_1 + \frac{1-\theta}{\theta} \ln n_2 \end{aligned} \qquad (4.59)\ [49]$$

These formulas help us to find the effects of trade. We begin with a scenario in a closed economy. When factor prices are the same, we must concentrate on the Distribution Effect. The real wage of a worker stays the same for the products of the industry in which the worker is active. His or her real wage is measured by the other industry's increase or decrease in products, given the condition that the labor factor is abundant. In the home country, there is a positive effect in Industry One's factor labor and a negative effect for Industry Two's the labor. Also, a positive effect for both industries is the greater market, which increases the diversity of the goods. We must look at the abundant. For the next scenario, however, we also have to look at scarcity factor, because both of the countries have symmetrical industries.

Now we are at the next scenario in which free trade is allowed between the two countries. We take the utility function for Industry Two and make the derivation of the utility function, then subtract the utility function from this derivation. There are three terms in this formula. The first term has negative values and stands for income distribution losses. The second and third term stand for the positive effects of a greater market. Now, we want to show how we the result is a positive sum.

[49] Resource [12], Paul Krugman (1981) page 968

$$U_2' - U_2 = \ln w_{21}'/w_{21} + \frac{1-\theta}{\theta} \ln n_1'/n_1 + \frac{1-\theta}{\theta} \ln n_2'/n_2$$

$$= \ln z/(2-z) + \frac{1-\theta}{\theta} \ln 2/(2-z) + \frac{1-\theta}{\theta} \ln 2/z \qquad (4.60)\ [50]$$

We cut off the terms and represent the formula in another way.

$$U_2' - U_2 = \frac{2\theta - 1}{\theta} \ln z - \frac{1}{\theta} \ln 2 - z + \frac{2-2\theta}{\theta} \ln 2 \qquad (4.61)\ [50]$$

Based on Formula 4.61, we can deduce that when θ is smaller than 0.5, then the scarce factor profits from trade. Since the first term is bigger than 0, the second and third terms balance each other out. The variable θ stands for the substitutability of the products in an industry branch. For this scenario, we must consider that *"if products are sufficiently differentiated, both factors gain from trade"* [50].

If θ is bigger than 0.5, then it is possible that both factors would profit from trade. This outcome is dependent upon the similarity of the countries' Factor Endowment. We now have three possible outcomes for this scenario: First, z is equal to one, making the subtraction bigger than 0; Second, z is nearly null, making the subtracted amount potentially negative infinity; Third, the subtraction increases by value z_1. The critical value for z is called ż, and here the subtracted amount is nearly equal to null. When z is bigger than ż, then all factors gain from trade. We see this in the next figure. If z is smaller than ż, however, then the scarce factor experiences a loss from trade. As we know from earlier pages, the variable z stands for the similarity in the Factor Endowment between two countries. For this scenario, must remember that *"if countries have sufficiently similar factor endowments, both factors gain from trade"* [51].

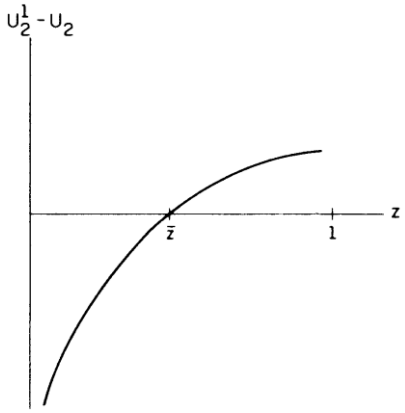

Figure 31 factor similarity at intra-industrial trade Resource [12] page 970

Our last scenario concentrates on inter-industrial trade. This trade depends on the condition of how replaceable the goods are for each other. Can one good be substituted for another? We will now look at Formula 4.61 and make a partial derivation of the subtracted amount from θ. Let us rewrite this formula: d (U' 2 - U2) / d θ = θ^{-2} ln z * (2 - z) < 0 *. If θ becomes greater, then the function will shift downward and factor ż will rise. For this scenario, we must again remember that *"The less differentiated are products, the more similar countries must be if both factors are to gain from trade"* ***.

[50] Resource [12], Paul Krugman (1981) page 969

[51] Resource [12], Paul Krugman (1981) page 970

In the next figure, we will summarize the results of our three scenarios. The horizontal axis represents the value of θ and the vertical axis represents the value of z. All values have a range from null to one. The two factors' similarity of factor endowment and diversity of goods are especially critical where a country is represented. When a country is in an area of the graph, called "conflict of interest" in Figure 32, then either the Effect of Economy of Scale is not important or the countries have different Factor Endowments. If the Factor Endowments are different, then the scarce factor loses through trade. If a country lies on the part of the graph called "mutual benefit", however, then intra-industrial trade outweighs the income distribution effects and all groups gain from trade.

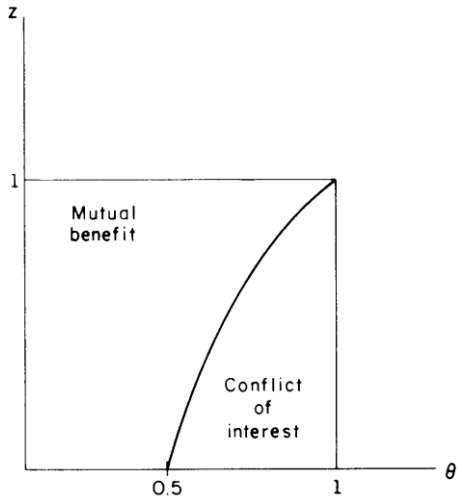

Figure 32 sectors of gains and losses for trade at given z and θ Resource [12] page 970

4.3.5 Summary

At the end of this subchapter, we have gained some knowledge about the big questions of intra-industrial trade. A lot of trade flows from industrialized country to industrialized country, or the big trade flows are between countries with similar Factor Endowments. These trade flows are typical of intra-industrial trade. The countries trade using goods from the same industry branch. One important factor is that the trade flows do not greatly and negatively influence the countries' income distributions. This model provides an explanation as to why the countries trade with each other. Each country is limited in its production by its labor force amount. The country is able to produce a fixed number of different goods. Also, the Effect of Economy of Scale is limited to one country. When two countries with similar factor proportions begin to trade, then the countries reach a greater market with their products. Do not forget that both countries produce their goods using similar factors. These trade flows do not negatively influence the income distribution.

4.4 Conclusion of Intra Industry Trade Model

In this chapter, there have been many explanations and lots of information about why intra-industrial trade exists. The model, which is the basis of these trade flows, in the first sub-chapter, provides an explanation by demonstrating the main assumptions which Paul Krugman made. First of all, there is no perfect competition in the market. Each company acts as if it were a monopoly and able to differ their products from other companies. The second assumption is the Economy of Scale Effect. One country is not able to produce all goods by itself. The average costs for the production differs. When two or more countries allow trade, then they have a greater market for their products. Each country concentrates on the production of its own goods, but it is able to export its' own products to the other countries and import the products from the other countries which are not produce there. Thus, the consumers have a greater diversity.

In the next sub-chapter, we will work with the theme of transportation costs and its effects on the pattern of trade. Therefore, we will use an extended and more restrictive model. One extension is the usage of two types of products in this example. The transportation costs influences not only the trade flows. Countries export these goods to places where their own demand is greater. The greater the demand in the home market, the more the country will concentrate on the production of this type of good. This country therefore gets a net exporter for this specific type of good. If one country has a greater labor force than another country, the model will react. In the greater market, the workers receive a greater relative wage than in the smaller market, because there are no transportation costs to take goods to the local market. It is also logical to produce the goods nearby the market, where the goods are sold and consumed. Furthermore, given the starting condition with two different amounts of labor force in the two countries, there is an accumulation of labor in the country that has the greater labor force at the start.

The last sub-chapter provides a description for intra-industrial specialization in the countries as well as who wins or loses from trade between the countries. Also, we analyzed questions about why we have trade flows between industrialized countries with the similar Factor Endowment, and why there are no effects on the income distribution. We have gotten an insight about the important factors. One important factor for trade flows in this country is the situation between two possible trading countries. How similar are their Factor Endowment and how different are their products? Also, it is important to note which condition has to be met in order for all factors in these countries to gain.

We are able to say now that the monopolistic competition, or the Chamberlinian Monopolistic Competition, is the factor which leads us to the Economy of Scale Effect. Monopolistic competition opposes the typical perfect competition of the most trade models. Also, the Economy of Scale Effect, with its increasing returns resulting from the monopolistic competition, opposes the typical constant returns in most trade models. This model for intra-industrial trade is not a general model, but it provides an explanation for the trade flows, which the Ricardo Model and the Heckscher-Ohlin Model cannot explain. With the assumptions of this model, it is possible to explain a part of the trade flows which other models cannot explain. It can also be that these models do not utilize this form of trade.

II. Practical Part

In the second part of this study, we want to support our theoretical explanations using hard facts. We will demonstrate the true state of trade with help from data and other information. This part should be helpful to get an overview and an insight about the theory.

5. Labor Productivity and Unit Labor Costs

In this chapter we want to discuss the development of the real productivity and the real Unit Labor costs. Both values give us a good overview about the economic development of a country. These values also show us the position of a country in the international field of competition. Now, we want to explain the variables in short words.

The real labor productivity shows, one the one hand, how efficient an economy is and, on the other hand, how competitive an economy is. The calculation for the productivity is simple: It is the division of the output by the input. There are two possible results for productivity: First, there is the productivity per employee; second, the productivity per working hour. We will concentrate on the productivity per employee. In this calculation, the real GDP and the number of employed people are used. The number of unemployed people, people in education and people in retirement, are ignored.

As we know from the Ricardo Model, the productivity stands for that factor which decides where a product will be produced. If a country has an advantage in the production of a good, then that country has less input and/or bigger output. This country then has a high productivity in the production of this good or for the branch in relation to other countries. Another factor we know is that countries with total high productivity in relation to other countries have an advantage in all branches. High productivity in relation to other countries also reflects higher wages in these countries. Industries, companies and service companies are able to integrate developments in technology in their products, working processes, working material or employees. If we look at the actual situation of the world, there are several regions and country groups in the world with different productivity levels. Therefore, these countries experience different growth rates. Countries at low levels are able to rise stronger and faster than countries at higher levels. The productivity growth rate shows us how well a country raises its production in relation to its input. In our example, it is the number of employed people.

The Real Unit Labor costs are the division of the labor wages through the nominal GDP. This result shows us which part of the wage increase could not be taken by the prices. This result also demonstrates the Real Unit Labor costs, or the impact of the labor force wage on the GDP. In other words, it provides the wage rate. There are also some important facts about this calculation. First, unemployed people are ignored in this division. Second, only the part of the labor force in the work force is calculated.

In the next several figures, we can see the development of the Average Real Labor productivity and the average real Unit Labor costs. In the first figure, we see the development in the labor productivity between the years 1992 and 2001, and in the second, we see the development between the years 2002 and 2011 in the countries of the European Union and some other countries. The horizontal axis represents the average growth or decrease in the Average Real Unit Labor costs over the time period. The vertical axis represents the average growth or decrease in the average real labor productivity over this time period.

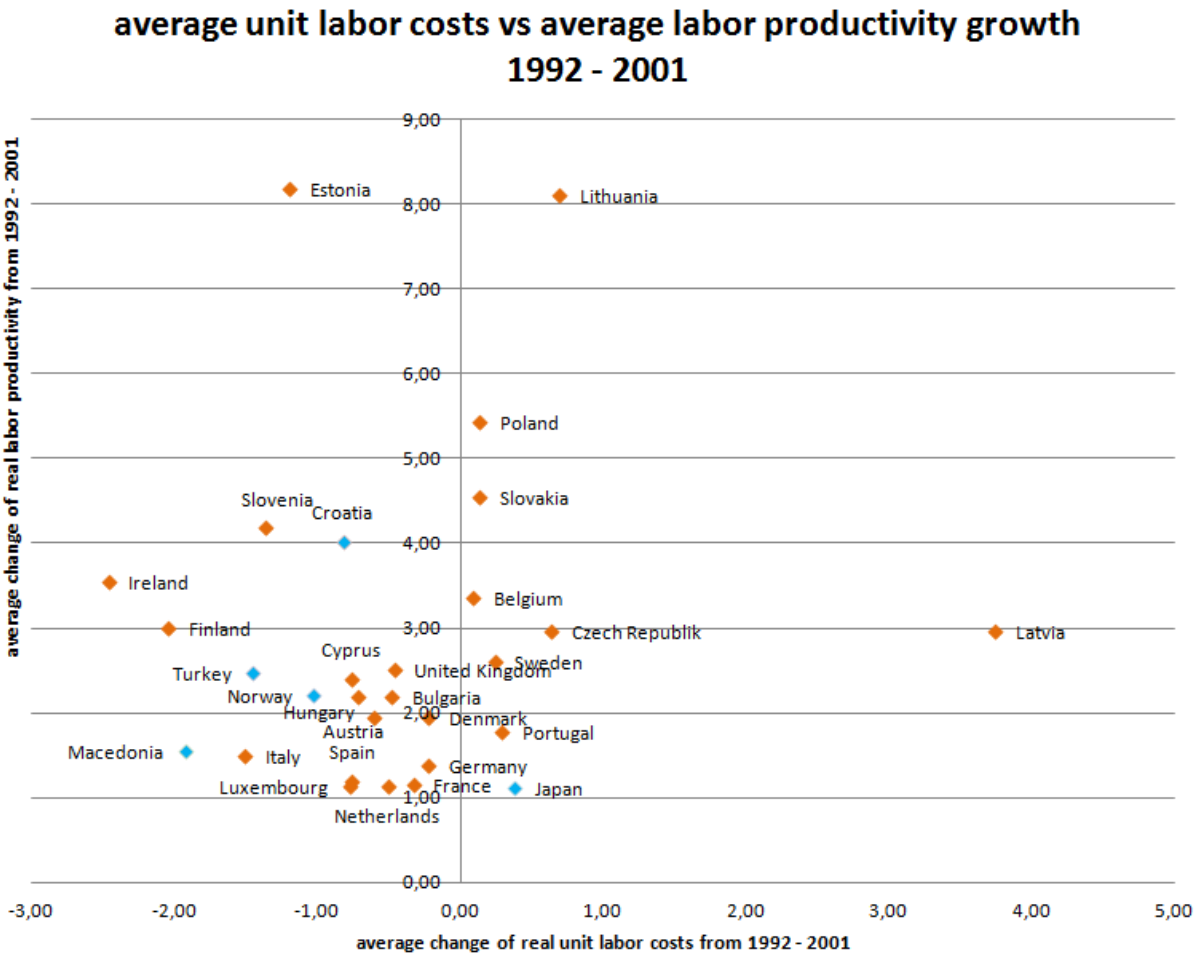

Figure 33 average yearly unit labor costs vs. average yearly labor productivity growth 1992-2001

These are very interesting results. First, no country experiences a decrease in its productivity during this time period. Second, nearly all countries increase their labor productivity more than their Unit Labor costs. It is also obvious that there is a concentration of countries between the area of -1.5 and +1.0 Real Unit Labor Costs and +1.0 and +3.0 Labor Productivity. Countries at the outskirts of the axes are typical former Eastern Bloc countries. They have greater rise in productivity. There are only two exceptions: Hungary and Bulgaria. The concentration of countries on the left side of vertical axis is also very conspicuous. This is a signal that many countries have reduced their Unit Labor costs over this period. Also, all countries increase their productivity.

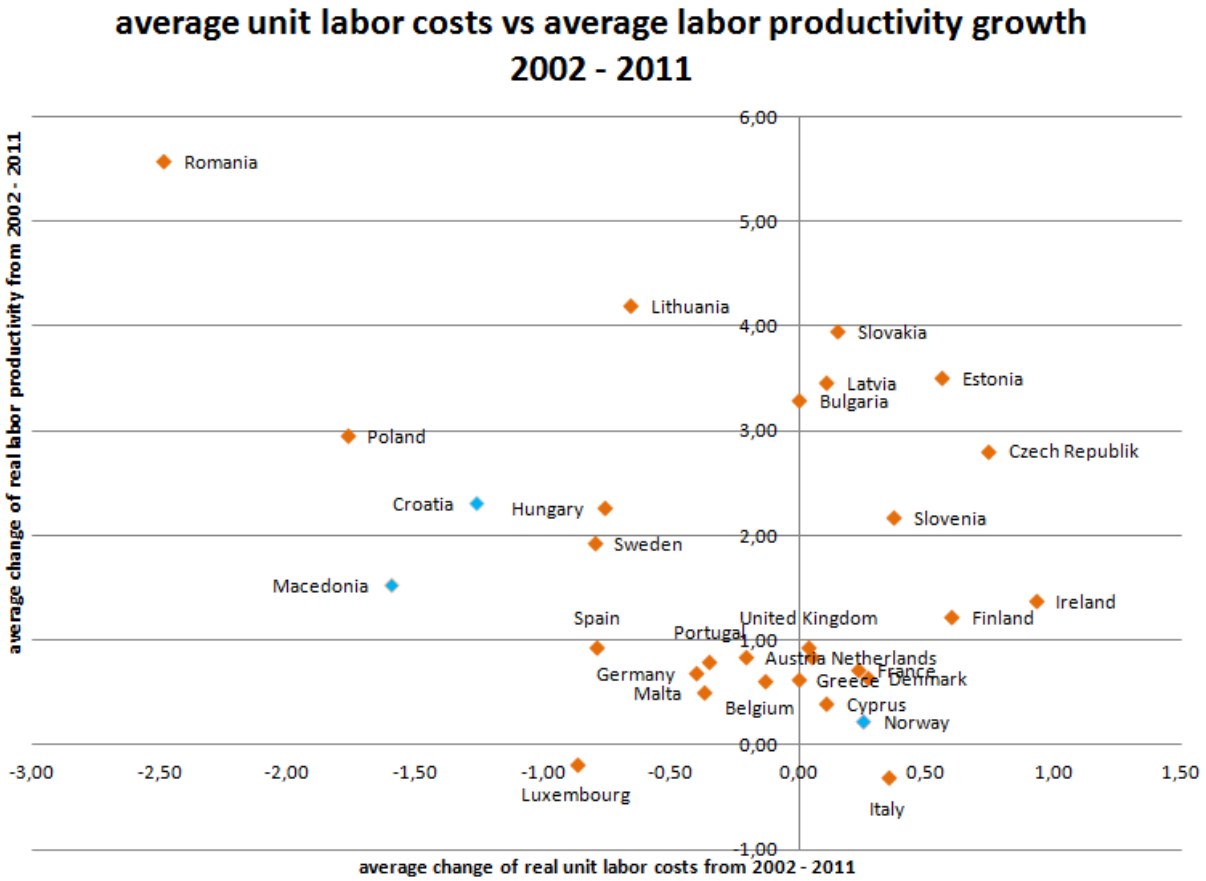

Figure 34 average yearly unit labor costs vs. average yearly labor productivity growth 2002-2011

We will now discuss the next time period. The former Eastern Bloc countries are again in the outskirts. In this period, these countries also have a greater growth in productivity. Most countries lie in the area between -1.0 and +0.5 Real Unit Labor Costs and 0.0 and +1.0 Real Labor Productivity. These are the old European Union states, except for Malta and Cyprus. They have a high productivity level and only a small growth. In this period, not each country is able to enhance its productivity as strongly as its unit costs. Some countries lie on the border. However, Italy, for example, has a small decrease in its productivity. Italy also has an increase in its unit costs. On the other hand, Luxembourg has a small decrease in its productivity, and a decrease in its unit costs. Romania also lies on the periphery of the diagram. We can see that this country has a strong decrease in its unit costs and a strong increase in its productivity.

If we compare both figures with each other, some facts become obvious. First, the countries of the former Eastern Bloc have strong increases in their productivity in the first and second figure. In the second figure, several of these countries have an increase in their Unit Labor costs too. Second the countries of West Europe or the old European Union countries are close together. In both figures, most of this countries increase their productivity. In the second figure, however, more countries are unable to reduce their Unit Labor costs than in the first figure. We can see that there is a shift of these countries to the right side. We can summarize that the countries of the former Eastern Bloc, which are now members of the European Union, have a consistent increase in productivity. The old countries of the European Union have a small increase in their productivity, and some of the countries have problems in reducing their Unit Labor costs. Also, some countries of the old member states increase their Unit Labor costs.

6. Trade flows

Here we present the results from our research about trade flows within the European Union. Also, we will compare and contrast the trade flows of the European Union countries with the countries in the rest of the world. First, we will examine general trade flows, then we will concentrate on the trade flows at special SITC groups and the specific trade flows between the countries.

6.1 Trade flows within the EU and the EU with the world

6.1.1 Trade flows within the EU

We will now discuss the trade flows of the European Union countries. It is important to consider the development of these trade flows. Then, we will be able to see the trade linkages between the countries. The next figures portray the situation of trade within the European Union in the years 2001 and 2011 using units in millions of Euro. We start with the year 2001.

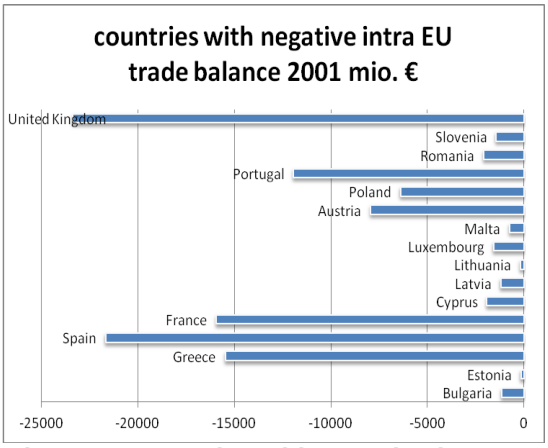

Figure 35 countries with negative intra EU trade balance 2001 mio. €

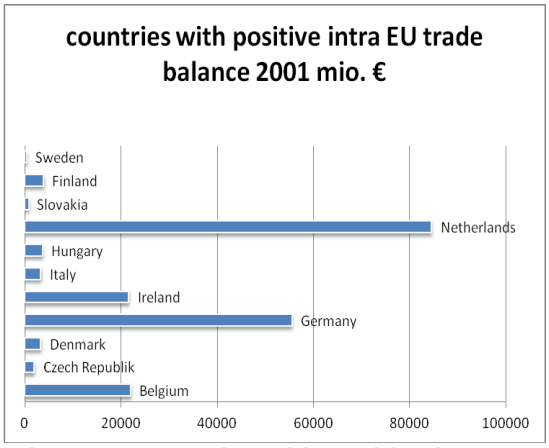

Figure 36 countries with positive intra EU trade balance 2001 mio. €

The figure on the left displays the countries with a negative Trade Balance with its other EU partners in the year 2001. The regions with the greatest deficits are the United Kingdom, Spain, France and Greece. It first appears as though these countries have many imports from other EU countries. In the figure on the right, we can see which countries have a positive Trade Balance with its EU partners. The countries with the greatest surpluses are the Netherlands, Germany, Belgium and Ireland. In this year, these countries have the most exports to its other EU partners. We will now move on to the year 2011 to observe what happened.

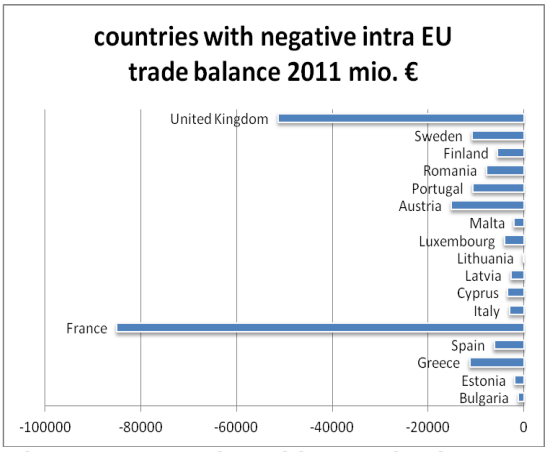

Figure 37 countries with negative intra EU trade balance 2011 mio. €

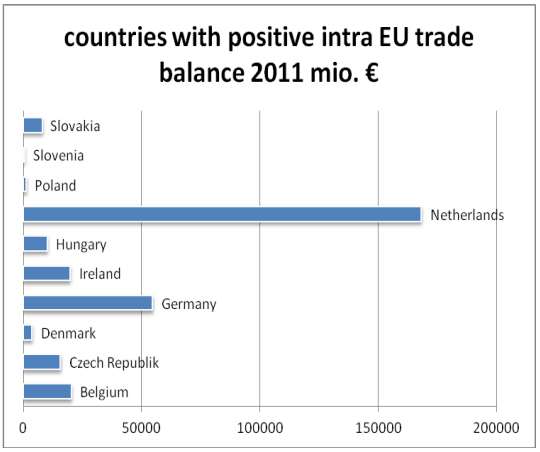

Figure 38 countries with positive intra EU trade balance 2011 mio. €

In the figure on the left, we can observe which countries had a negative Trade Balance with their EU partners in the year 2011. Let us look at the differences between trade in the EU in the years 2001 and 2011. We can see that countries like Italy, Sweden and Finland now have a negative Trade Balance with their EU partners. France has more than a €69 billion decrease in trade from the year 2001 to 2011. Also, the United Kingdom has a more than a € 27 billion decrease and Sweden has more than a €11 billion decrease. Spain has more than a €15 billion in its deficit. On the right side of the figure, one can see the countries with a positive Trade Balance with its EU partner in 2011. We can then see that countries like Slovenia and Poland now have a positive Trade Balance with their EU partners. The Netherlands has more than a € 83 billion increase from 2001 to 2011. Germany maintained its surpluses. Slovakia and Poland both have more than a €7 billion increase, and Hungary has more than a € 6 billion increase. The Czech Republic has more than a €13 billion increase.

If we now analyze these developments in trade flows, then we can see that regions like the United Kingdom and France enormously enhance their deficits against the EU partners. Other countries maintain their deficits or surpluses. Some countries, however, like Italy, Sweden and Finland, now have a negative Trade Balances. The main winner within the European Union is the Netherlands, with a big increase in its exports to its EU partners. Other countries were comparable to the Netherlands, such as Hungary, Slovenia, Slovakia, Poland and the Czech Republic. At first glance, it appears that these are all Eastern European countries. So we can say that the increased membership of the European Union from the year 2005 has enhanced the trade flows of these countries to the other European partners. The Netherlands has also gained from the development over the past few years. Other countries have maintained or made only small changes in their positions.

6.1.2 Trade flows of EU countries with the rest of the world

Here we can observe the trade flows of the European Union countries with the rest of the world. We start in the year 2001 and portray the countries both with negative Trade Balances and positive Trade Balances. Then, we will portray this data for the year 2011 and analyze any changes. It will be interesting to note which countries have strengthened their trade linkages to countries outside the European Union.

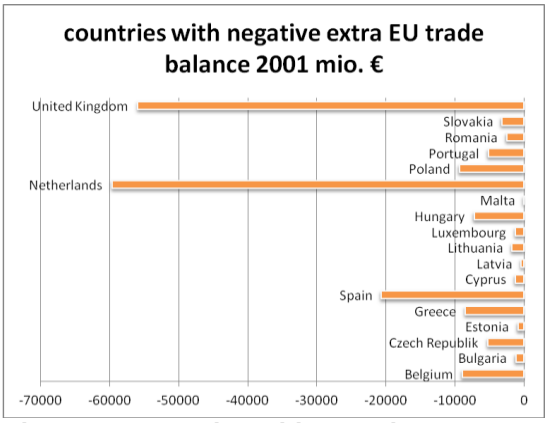

Figure 39 countries with negative extra EU trade balance 2001 mio. €

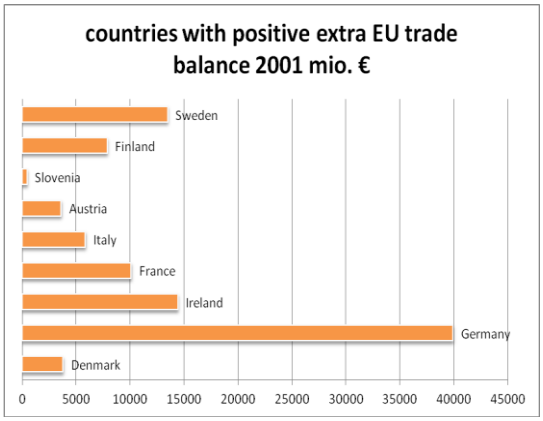

Figure 40 countries with positive extra EU trade balance 2001 mio. €

In the figure on the left, the United Kingdom, Netherlands, Spain, Belgium and Poland have the greatest deficits in their Trade Balances with countries outside the European Union. In the figure on the right, we see the countries with positive Trade Balances. Germany has the absolute greatest surpluses in trade. After Germany come Ireland, Sweden and France. Now, we will compare the situation from 2001 to 2011 and analyze these developments.

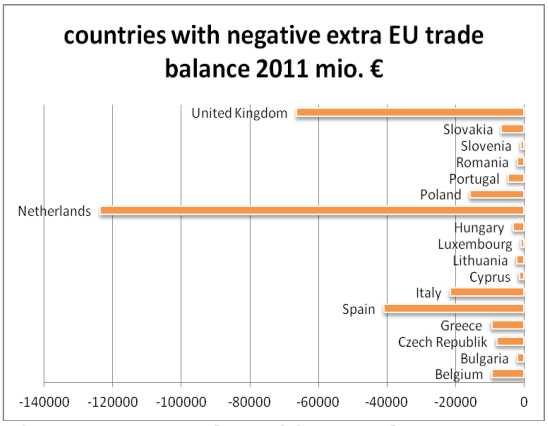

Figure 41 countries with negative extra EU trade balance 2011 mio. €

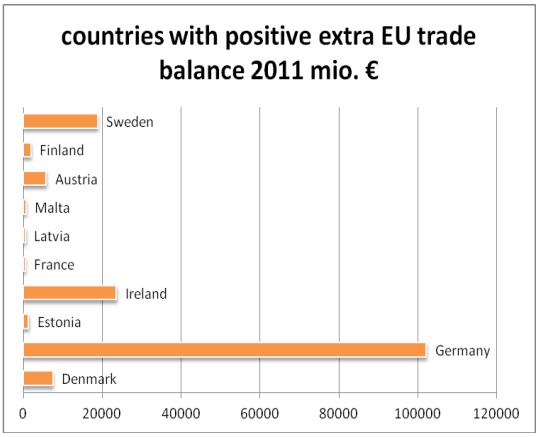

Figure 42 countries with positive extra EU trade balance 2011 mio. €

The figure on the left portrays the countries with negative Trade Balances in 2011. Italy has a negative Trade Balance, with more than a € 27 billion decrease from 2001 to 2011 in its Trade Balance. Also, Slovenia now has a negative Trade Balance. Spain and the Netherlands have doubled their deficits. Spain has as of 2011 more than a €40 billion deficit above, while the Netherlands has more than a €1,223 billion deficit as of 2011. Other countries have a decrease in their Trade Balances, such as Poland´s over €6 billion has a decrease and the United Kingdom over €10 billion decrease. The figure on the right portrays the countries with positive Trade Balances with countries outside the European Union in

2011. We can see that Malta, Latvia and Estonia now have positive Trade Balances. Germany has more than a €62 billion increase in its surpluses. In contrast, France has a decrease in its surpluses. In 2011, France only had a surplus of €464 million. Ireland and Sweden have both increased their surpluses. Ireland has more than a €9 billion increase in its surpluses. Sweden has more than a €5 billion increase in its surpluses.

If we look at the trade flows from the EU countries to countries outside the EU, then a different situation arises. The addition of new countries into the European Union has not had significant effects. Only three countries, Malta, Latvia and Estonia, have positive Trade Balances with countries outside the EU in 2011. Italy and Slovenia have negative Trade Balances with countries outside the EU in 2011. Other countries maintain their positive or negative trend. This means that any countries which maintain the level of their Trade Balance, such as Belgium, Bulgaria, Cyprus, Lithuania, Luxembourg and Portugal. Germany has significant growth in its exports and the United Kingdom and the Netherlands both have big growth in their imports. We cannot present a clear development for a specific group of countries or a region. In this case, each country in the European Union has its own trade linkages with partners outside of the EU. This is based on historical and geographical development over a number of years.

6.1.3 Total trade balance

Next, we will display the total Trade Balance of the countries of the European Union. This is the sum of all trade flows from one country to all other countries and vice versa. It portrays the actual situation of all countries in the European Union and their Trade Balances. We will begin with the situation in 2001 and then 2011.

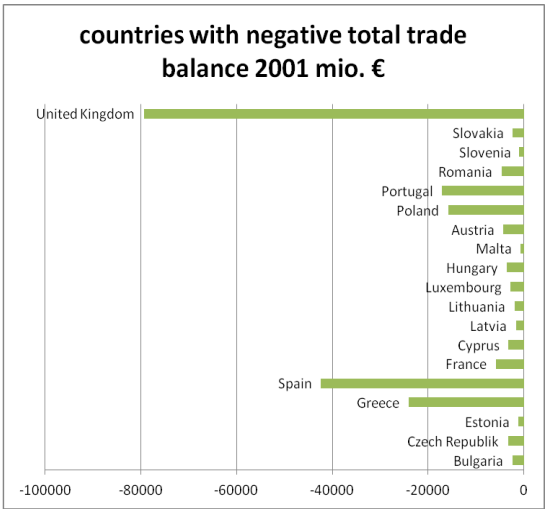

Figure 43 EU countries with negative total trade balance 2001 mio. €

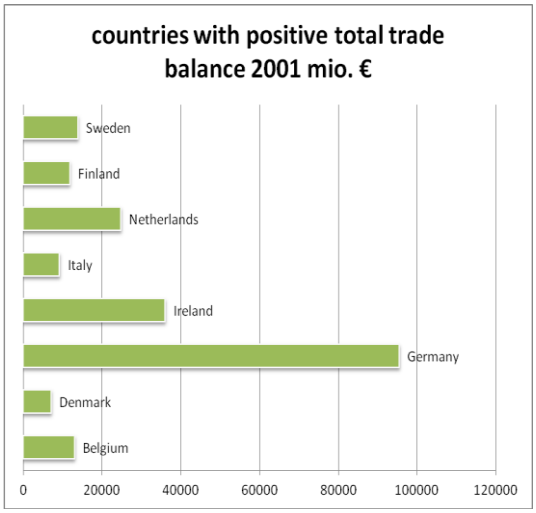

Figure 44 EU countries with positive total trade balance 2001 mio. €

In 2001, the United Kingdom, Spain and Greece have the greatest Trade Balance deficits of all countries in the EU. Also, all countries of Eastern Europe as well as Cyprus and Malta have negative Trade Balances. Germany has the absolute greatest Trade Balance surplus, followed by Ireland and the Netherlands. Nearly all founding members of the Union have Trade Balance surpluses, excepting only Luxembourg and France. Also, all Scandinavian countries have surpluses.

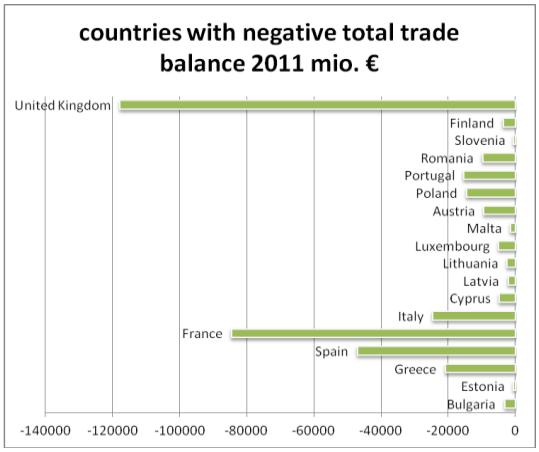

Figure 45 EU countries with negative total trade balance 2011 mio. €

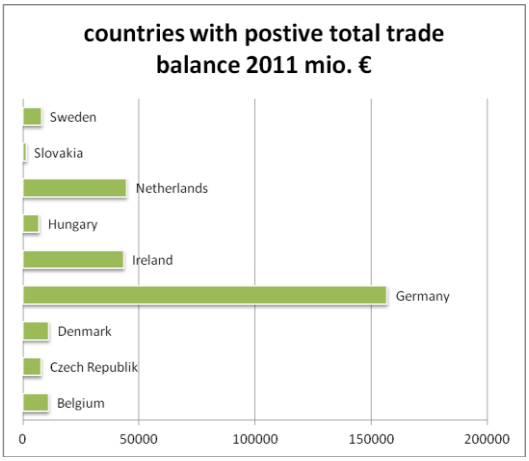

Figure 46 EU countries with positive total trade balance 2011 mio. €

Through examination of the total Trade Balance, we can see the development of different countries very well. Countries such as France, the United Kingdom and Italy have great increases in their imports, which leads to growth in Trade Balance deficit from 2001 to 2011. Also, Finland has a great decrease in its exports and an increase in its imports. In 2011, Finland had a Trade Balance deficit over €3 billion, which is a decrease from 2001, when the deficit was €15 billion. The countries that have most decreased their deficit are three countries in Eastern Europe: The Czech Republic, Hungary and Slovakia. All these countries have positive Trade Balances and an increase in exports in 2011. Ireland has an increase in its exports too, and it has more than a €billion increase in its Trade Balance. Also, two countries which have a positive Trade Balance in 2011 are the Netherlands and Germany. The Netherlands bases their Trade Balance increase, which is over €19 billion, on the increasing exports to its EU partners. Germany bases their positive Trade Balance increase, which is over €61 billion, on increasing their exports to countries outside the European Union.

6.2 Trade flows at special SITC

In this chapter, we want to show the development of special SITC groups from 2001 to 2011. We will examine the intra-European Union trade to provide an overview of what happened between these years. We can see whether countries have an increase or a decrease in their exports and imports. Also, we will determine how different countries react to developments. We will see if a country is very specialized in a specific area of good production. When we compare both years, then we can see if this specialization has increased. We look at three different SITC group: Each sector of the agriculture branch; the chemical branch; and the machine and mechanical parts branch.

6.2.1 SITC group 054 - vegetables

First, we examine Group 054. The main Group 0 stands for food and live animals. The subgroup 054 stands for *"Vegetables, fresh, chilled, frozen or simply preserved (including dried leguminous vegetables); roots, tubers and other edible vegetable products, n.e.s., fresh or dried*" [52]. Thus we get an overview about the development of a part of the agriculture branch.

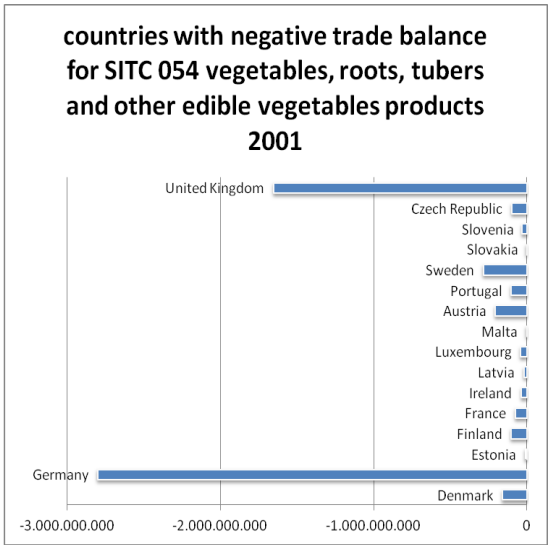

Figure 47 countries with negative intra EU trade balance at SITC 054 - 2001 in €

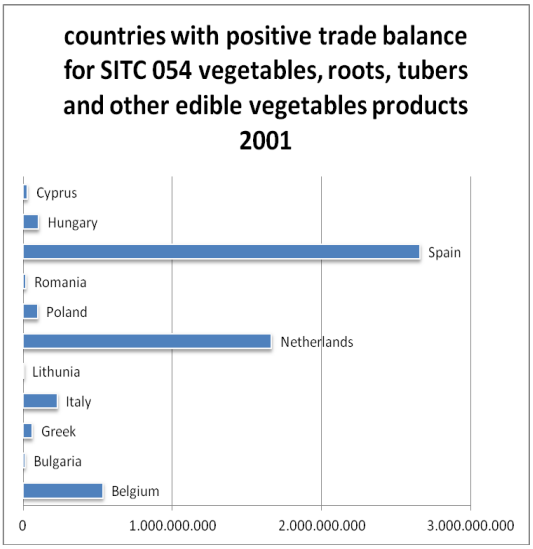

Figure 48 countries with positive intra EU trade balance at SITC 054 - 2001 in €

On the left side of the figure, we can the countries with a negative Trade Balance. This includes Germany and the United Kingdom, or the two countries which have the greatest deficits. On the right side of the figure are the countries with positive Trade Balances. Spain, the Netherlands and Belgium have the greatest surpluses. Next we look at the data from the year 2011 and analyze the changes.

[52] Resource [16], United Nations Statistics Divison (2012)

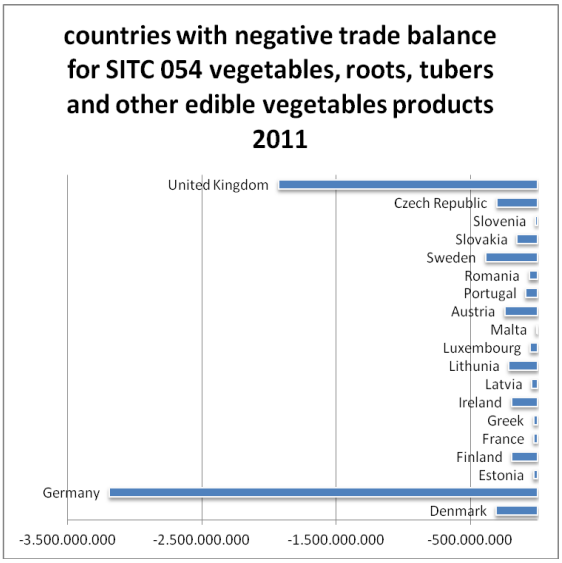

Figure 49 countries with negative intra EU trade balance at SITC 054 - 2011 in €

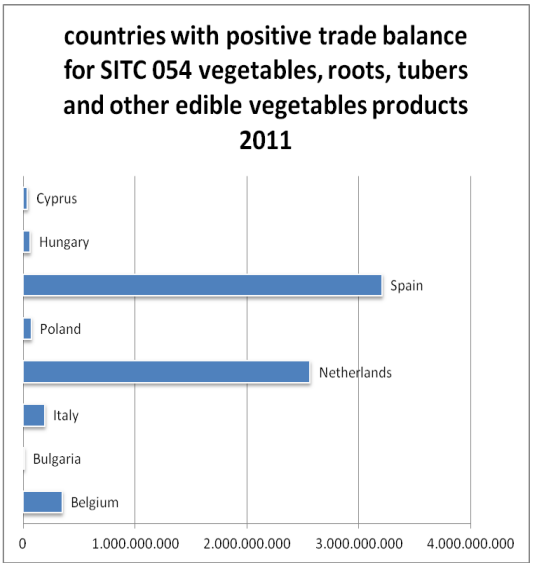

Figure 50 countries with positive intra EU trade balance at SITC 054 - 2011 in €

At first glance, we can see that Germany and the United Kingdom have the greatest deficits in 2011. Germany has a decrease of over €386 million and the United Kingdom has a decrease of €275 million. Also, other countries have a decrease in their Trade Balances. For example, the Czech Republic has a decrease of over €202 million, Lithuania over €219 million and Belgium over €186 million. On the other hand, countries like Spain and the Netherlands have great surpluses in their Trade Balances and great increases in this branch. Spain has over a €548 million increase in its Trade Balance from 2001 to 2011. The Netherlands has an increase of over €899 million. In this first look at a specific SITC sector, we can determine the countries´ form of specialization. Some countries, which were specialists in this sector in 2011, have broadened their specialization.

6.2.2 SITC group 542 - medicaments

Now we will examine SITC Group 542. The main group 5 stands for chemicals and related products. The subgroup 542 stands for the products of medications, including those for animals.

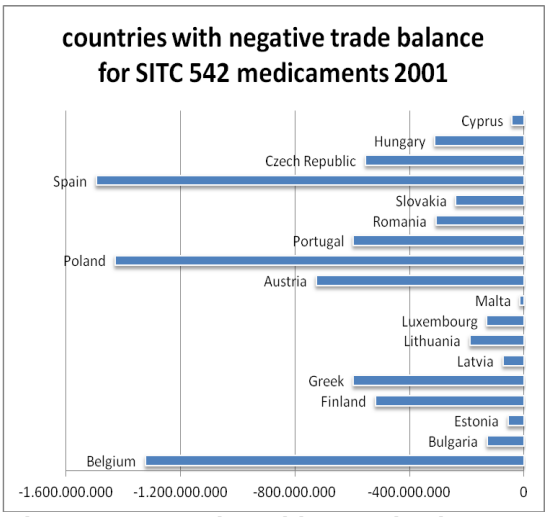

Figure 51 countries with negative intra EU trade balance at SITC 542 - 2001 in €

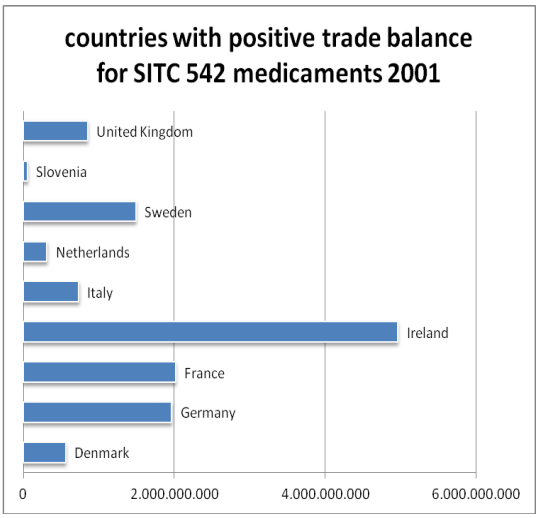

Figure 52 countries with positive intra EU trade balance at SITC 542 - 2001 in €

We see on the left side of the figure countries with Trade Balance deficits. The countries with the greatest deficits are Spain, Poland, Belgium and Austria. In opposition, on the right side we see the countries with Trade Balance surpluses. The countries with the greatest surpluses are Ireland, France, Germany and Sweden. Now let us look at the year 2011 and the differences which have taken place over the years.

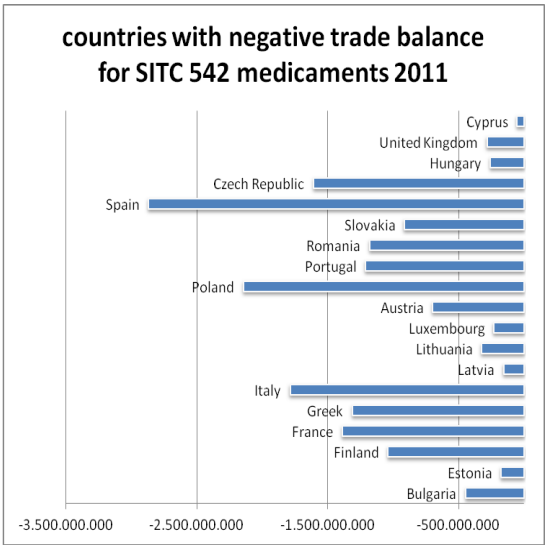

Figure 53 countries with negative intra EU trade balance at SITC 542 - 2011 in €

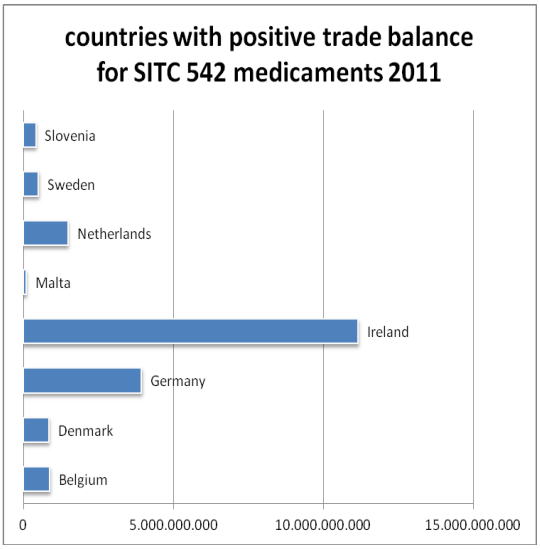

Figure 54 countries with positive intra EU trade balance at SITC 542 - 2011 in €

We can see the shifts in Trade Balances very well. Spain, Poland and Italy have the greatest deficits. Italy has a decrease in its Trade Balance of over €2.5 billion. Spain has a decrease in its Trade Balance of over €1.3 billion. France, though, has greatest decrease in its Trade

Balance with over €3.4 billion. On the other hand, Ireland has an enormous growth. Ireland has an increase of over €6.2 billion, and Ireland now has a positive Trade Balance of over €11 billion. Furthermore, countries with great growth include, Germany, with a growth of over €1.9 billion, Belgium, with an increase of over €2.2 billion, and the Netherlands, with an increase of over €1.1 billion. Here we can see that several countries such as Ireland, Germany, Belgium and the Netherlands have specialized in this sector. Meanwhile, other countries have reduced their efforts and increased their imports in this sector.

6.2.3 SITC group 781 - motor cars and other vehicles

At last, we will look at Group 781. Group 7 stands for machinery and transport equipment. The subgroup which we will now analyze, is characterized by *"Motor cars and other motor vehicles principally designed for the transport of persons (other than motor vehicles for the transport of ten or more persons, including the driver), including station-wagons and racing cars"* [53]. This group is very interesting, because it portrays the situation of the European automobile industry in 2001 and 2011. We can see the shifts into a small group of countries.

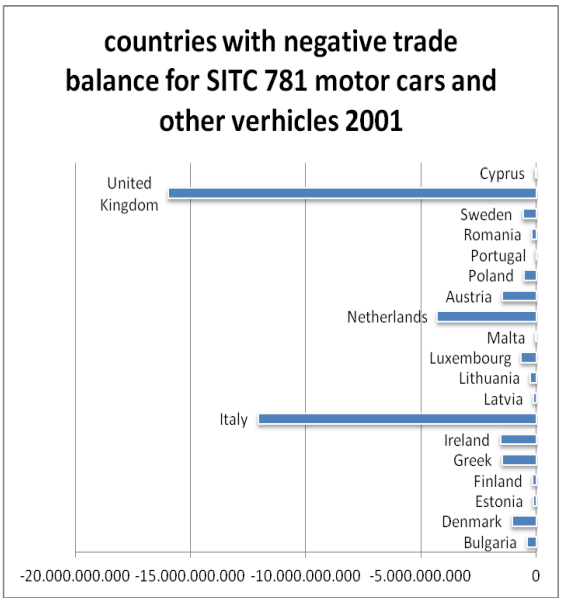

Figure 55 countries with negative intra EU trade balance at SITC 781 - 2001 in €

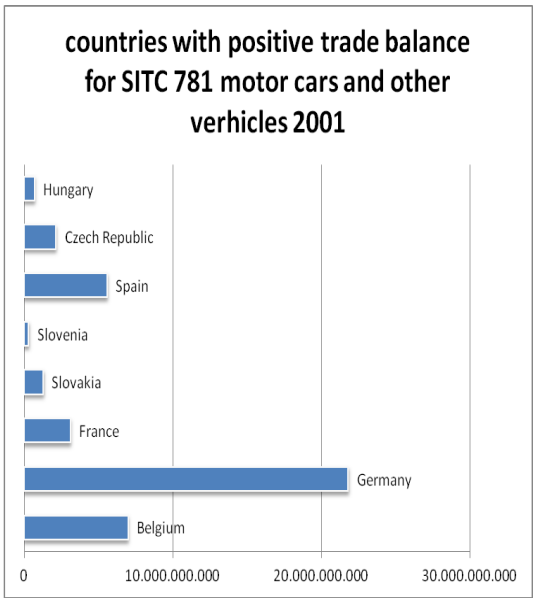

Figure 56 countries with positive intra EU trade balance at SITC 781 - 2001 in €

Here, we can see the situation in 2001. The situation presents countries which have great automobile industries with positive Trade Balances. Germany has a surplus of over €21.8 billion, Belgium of over €6.9 billion, and Spain of over €5.5 billion. The United Kingdom has the greatest deficit with over €15.9 billion. Second place for the greatest deficit goes to Italy, which has its own automobile industry. Italy has a deficit of over €12 billion.

[53] Resource [16], United Nations Statistics Divison (2012)

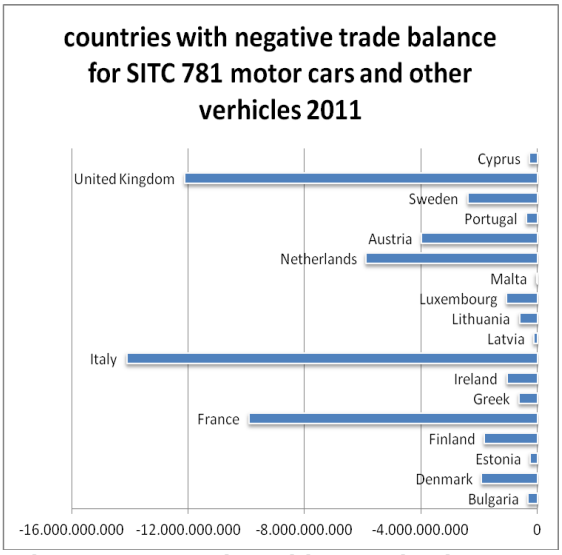

Figure 57 countries with negative intra EU trade balance at SITC 781 - 2011 in €

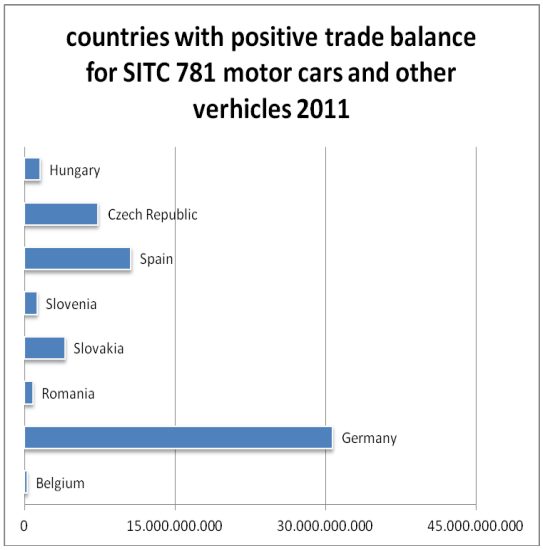

Figure 58 countries with positive intra EU trade balance at SITC 781 - 2011 in €

To first look on the left side of this figure, we can see that Italy now has the greatest deficit with over €14.1 billion. This is a decrease in its Trade Balance by more than €2 billion. The United Kingdom has a deficit of over €12.1 billion. Thus, the United Kingdom has an increase of over €3.8 billion, but they nonetheless have a deficit. The country with the greatest decrease in Trade Balance in this sector is France. France has a decrease of over €13 billion. They have now a deficit of over €9.9 billion. On the right side are the countries with Trade Balance surpluses. We can see that a group of Eastern European countries have great Trade Balance increases in this sector. These countries include the Czech Republic, with an increase of over €5.1 billion, Slovenia, with an increase of over €954 million, and Slovakia, with an increase over €2.7 billion. Hungary and Romania also have an increase in their Trade Balances. In the Western part of the European Union, Belgium has a great decrease in its Trade Balance, but at the moment it has a trade surplus. Only Spain, with an increase of over €5 billion, and Germany, with an increase of over €8.8 billion, have great increases in this branch.

6.3 Growth of Exports and Imports of European Union Countries

Let us look at the growth of trade flows of the European Union countries. We will start with the year 2001 and compare it to 2011. We will concentrate on trade within the European Union. The results are very interesting and confirm the results from this chapter.

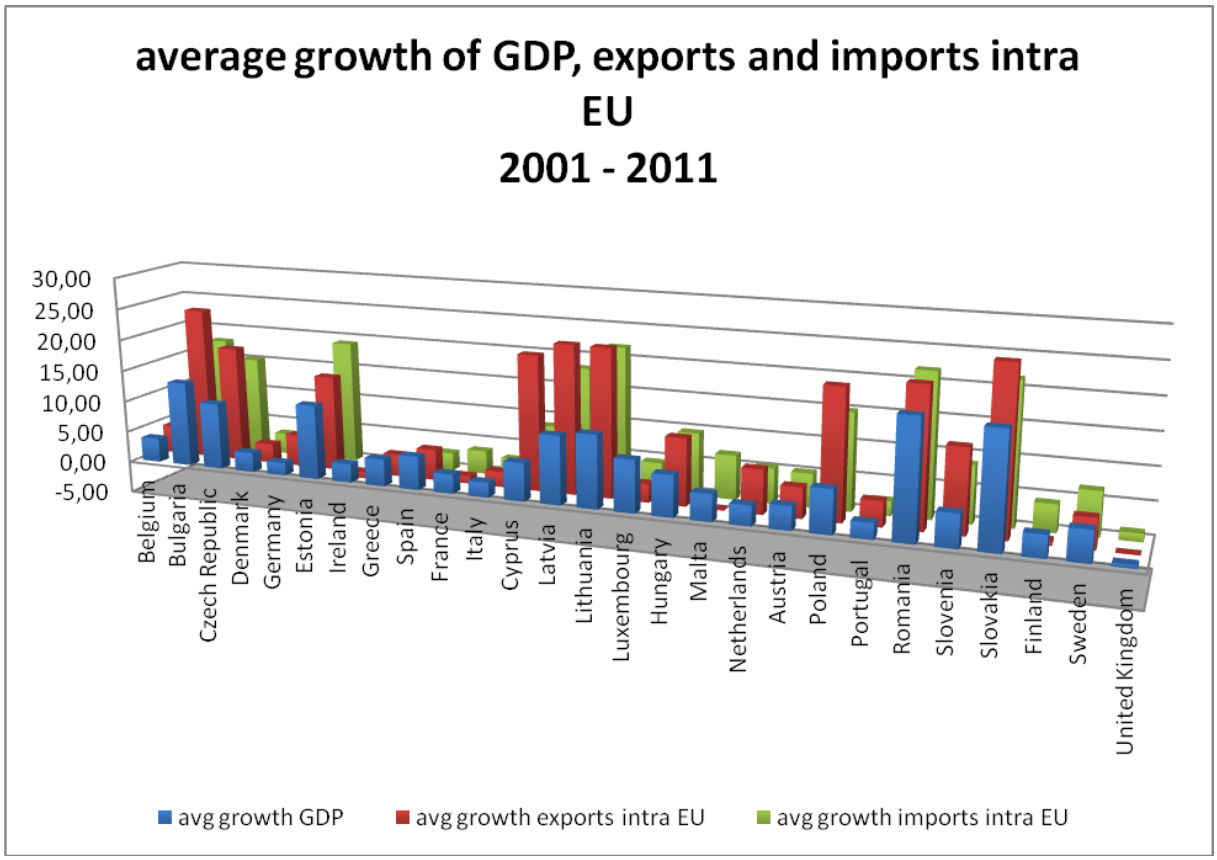

Figure 59 average yearly growth of GDP, exports and imports intra EU of EU countries 2001 - 2011

We see here the yearly average development of the GDP, the exports and imports of intra EU trade of the European Union countries. At first glance, we see that the countries with newest membership have greater growth in all three areas over the observed time range. For example, the newest twelve members have an average growth in GDP of 10.1 %, 15.4 % in intra imports, and 17.8 % in intra exports. On the other side, the older fifteen members have an average growth of 3.5 % in GDP, 3.4 % in intra imports, and 3.1 % in intra exports. So, we can say the growth of the new members is very large in relation to the old members. However, the old members' output is much greater at the beginning of the observed time range, whereas the new members have a much smaller output. Imagine, though, that we are observing a time range of over 10 years. There is a difference in the GDP growth of over 6.5 %, in the intra imports of over 12 %, and in the intra exports of over 14.7 %. The new member states have and have had a great period of increase. There is a difference at the GDP growth over 6.5 % and by the intra imports over 12 % and by the intra exports over 14.7 %. The new member states have and had a great catching up.

The situation today demonstrates that these countries are maintaining this increase. If you look at the red and green bars in the last figure, then you can see that the 12 newest members of the European Union have the largest bars. When we look at the old part of the Union, we can see also some interesting facts. Austria, Belgium, the Netherlands and Sweden have above average growth rates among the old member states.

So, the entry of the new members into the European Union resulted in an impetus of growth. The countries would not have this impetus without membership to the Union. Furthermore, some older members have average growth because of the entry of these new countries into the Union. We can say that the enlargement of the Union has brought great advantages for the new member countries, for some of the old member countries have upgraded their average growth through this enlargement. Generally, we could say that this enlargement has resulted in a greater market for all companies within the Union as well as an enhancement of the trade flows between old and the new member countries. Some of the old member countries use the enlargement of the Union better than others.

6.4 Conclusion of the Trade flows

In this chapter, we have seen a lot of information and hard facts about trade flows within the European Union. We see the trend of the economic development. If we look back at Chapter 5, we can see that the Eastern European countries have greater growth in their productivity from 2001 to 2011 than countries within the older part of the European Union. Furthermore, increased membership to the European Union has brought the newer member countries great advantages. The old member countries of the European Union also have advantages. First, we will look at Eastern Europe. These countries all have low labor unit costs and great growth in productivity. All of them have their own currency; some of them have entered into the Euro Zone over the past few years. With entry into the European Union, these countries now have access to greater market. Also, the old members of the European Union now have access to new markets. This makes it possible for the new member countries to have greater growth in their GDP, productivity and Trade Balance. Nearly all new member countries have advantages to their membership in the Union. Above all, the Czech Republic, Poland, Slovakia, Hungary and Slovenia have the most advantages to the membership.
On the other hand, some countries in the European Union have a decreasing Trade Balance. These countries are France, the United Kingdom, Sweden and Finland. All of these countries increase their imports from 2001 to 2011. There are, however, countries which have done well in Western Europe too. These countries are Spain and the Netherlands. Spain reduced its deficit by more than €15 billion and the Netherlands doubled its Trade Balance surpluses.

Based on these facts, we can say that the countries of the European Union specialize in a group of specific sectors. A few factors are crucial for this specialization, including the state of technology, productivity, labor unit costs and economic position in relation to the rest of the world in this branch. The greater market provides more consumers than the home market of each country. The greater market also has more competition, however. Companies which are not competitive must leave the market. When we look at special SITC Groups, which we have analyzed, we can see each country's level of specialization. In each analyzed sector, there is a group of countries which have positive Trade Balances. If we look at the year 2001 and then at 2011, we are able to see that some countries increase their positive Trade Balance. Other countries reduce their positive Trade Balances and some countries with negative Trade Balances maintain their deficit in years close to 2001. However, a small number of countries very drastically decrease their Trade Balances, which can be a sign of strong reduction of companies in this branch, connected with a strong increase in imports. This is evidence that in countries, whose branches do have competitive companies or production sites, the production of goods is reduced. The consumers will buy imported products of this branch from foreign firms

7. Possible Future Trends and the Future of Europe

In this chapter, we want to show possible future trends and the position of Europe in the world. We know that every country has a specific situation which is different to other countries. Each country has chosen a set of laws and guidelines, which influence its companies and labor force both directly and indirectly. These have consequences for the country's production, exports, productivity and unit costs. Also, these laws and guidelines impact the competitiveness of a country in relation to the world.

Each government must accept that today, we live in a strongly connected world. It is impossible to shield a country from the rest of the world without harmful consequences. Every decision a government makes influences not only the home country, but also other countries. For example, if a country reduces its corporation tax rate, then it is interesting for other firms to come to this country or for new firms to be founded. Also, when a country reduces its income tax rate, then the factor labor is cheaper than before. Every country must be aware that measures against other countries' products and services will lead to other countries using the same or stronger measures against products and services of the home country. There are several regions and countries in the world which are connected to economy mergers. These, for example, are NAFTA and the EU. In these mergers, it is very difficult to shield the economy against products and services from other membership countries.

Another important point is that one country cannot produce the whole palette of products and services which exist in the world. Countries with access to greater resources can produce a greater palette, but still not the whole palette. Thus, each country should concentrate on its given resources, including the labor force, capital and technology, to produce a number of products and services. The other products that are not produced in the home country can be imported. In this palette of goods and services, a country stands in competition with other countries. In the case of the European Union, a company in a member country stands directly in competition with other companies in the Union. The company, though, not only has the home market to serve, but the firm can also serve the whole market of the Union without restrictions. We see that the European Union has built up a great market for all companies and consumers of the member countries. The reduction of customs and other trade restrictions builds up a larger market. The positive effects of the greater market outweigh the negative effects of stronger competition for the companies. We should accept that the stronger competition forces the companies to use their resources as well as possible. Also, it is necessary to use and invest in new technologies in order to enhance the company's productivity.

Every government should be looking at their Trade Balance and service balance. Each government's money and fiscal policy has instruments which influence the trade and service balance. The use of these instruments leads to different results, which can be strongly delayed. Both great deficits and great surpluses over a long time are not good for the economy of a country and for the country itself. Deficits and surpluses over a short or moderate amount of time are acceptable and sometimes typical if a country has advantages or disadvantages in one or more branches in relation to other countries. It is not advantageous to have great deficits or surpluses because these effects lead a country into a situation, in which it is a great creditor or debtor against another country. The currencies of both countries react to these effects, too. This effect also leads to a situation which a lot of capital moves from one country to another country, or in a union, from one region to another region. Since the capital balance must equal the trade and service balance, the current account is equalized.

At the moment, the European Union stands at a differentiated position. The Union has more than 500 million inhabitants. Only China and India have more inhabitants. Also, an important

fact to take into account is that GDP at market price is € 24.400 [54] per inhabitant. The companies and the working people stand not only at an internal competition within the Union, but they also stand in a direct competition with the rest of the world. The unit costs in the Union, though, are very high and these are very different in the countries from West to East and from North to South and through the different branches. Let us look at the Chapter 2.1 and the Ricardo Model. The European Union has a high productivity, which is presented through its high wages. With the effect of this high productivity, the Union has an advantage over other countries. Any branch of the emerging markets may catch up. We can see this effect, for example, in the textile branch. In the last decades, we saw a movement of this branch from the industrialized countries to the emerging markets, or, in other words, to countries with lower unit costs. We saw also an interesting movement in the direction of China. Several firms use the low unit costs in nearly all branches by producing their goods in China. Through its policy, China has had an enormous trade surplus in the last few years. The effects of this movement also lead to enormous wage increases in some branches.

It is very hard to predict the future trend of the Euro and future trends of the Euro in relation to other currencies like the USD or YEN, but what we have seen in the last chapters is that the trade flows between the countries of the Union increase very strongly. Also, the trade flows to countries outside of the Union have increased very strongly. The sum of the countries of the Union has a trade deficit with countries outside the Union. Based on the trade flows, it is at the moment very hard to predict any trend of the Euro, but what we can say is that the Euro had and has positive effects for some countries within the European Union. Some countries were and are able to export their goods to other countries in the Euro community without a loss in currency. This trend will continue if the countries with Trade Balance deficits do not react with any drastic measures.

One measure, which should be the duty of the European Union, the Commission and each government of a member country, is to reduce or maintain the number of unemployed people at a low level. Also, it is important to increase the productivity. The factor unit costs must be under observation. The unit costs should increase in the same or a steadier way in relation to the productivity so that a country does not lose its competitiveness. Europe has one resource in large quantities, which is the well- and best-educated labor force, which is basis for a future increase in productivity. It is very important to maintain this trend in the education of the people. Also, it is the basis for innovation, research and economic development. An innovative and research-friendly environment is a certainty for science advance. The investment of countries and firms in Research and Development is one of the most important investments in the future. These could be possible only with a strong intra-cooperation within the European Union and other partner countries in Europe, so that the Union can make it possible to survive and to be strengthened in the international competition.

[54] Resource [8], Eurostat (2011-2012)

8. What we have learnt

When we look back, then we have learnt a lot of new things. First we have seen that there must be a political will. This will makes it possible that countries cooperate. In the case of the European Union it is a political and economy union, in other cases like the WTO it is a trade union. But both or all countries must see the advantages of the international trade. With the opening of the borders and the reduction of the customs, restrictions and other trade obstacles rises the international trade. Each country stands in competition with other countries and the companies start to produce at that places, where they have the best production conditions. Because the companies have only the production costs and the transportation costs at a low level between two countries without trade restrictions. Then we have seen in a simple way the differences of trade and how we can measure the intra industrial trade between the different sectors. We see in which types the sectors are divided. This give us a good overview about the topic and starting position for the next steps.

Next, we analyzed the Ricardo trade Model. This was very helpful. The model gives us a basic overview on trade, but the model has a few restrictions. The main message of this model is the existence of the comparative advantage. Whenever two countries have different labor unit costs for the production of a group of goods, each country has an advantage in the production of a good. This is the comparative advantage. Even if a country has an absolute advantage in the labor unit costs for all products, the other country has still a comparative advantage in the production of one good. So, we have learned that wherever the starting position of two countries is, both have a comparative advantage in the production of one good. They have a reason to start the trade with each other to get the gains from the trade flows. Only if both countries trade with each other do they get the gains. Also, we have learned about the term “productivity”. We know the Labor Unit Costs are these costs which are necessary to produce one amount of a good. These costs present the productivity of a country. If a country needs less labor unit costs for the production of one amount of a good than another country, then that country is more productive. We see that low Labor Unit Costs represent high productivity. This high productivity stands in direct relation to high wages.

After the Ricardo Model, we analyzed the Heckscher-Ohlin Model. This model gives us a new view. The model has several extensions of the Ricardo Model, but also some restrictions. In this model, we have two production types: Labor and capital. There are countries that are very abundant in capital or very abundant in labor. Each type of good needs a combination of labor and capital for its production. When a good needs more capital than labor, then it is a capital-intensive good. When a good needs more labor as capital, then it is a labor-intensive good. Each country produces these goods where it is well abundant. This provides an explanation as to why the industrialized countries, which are at first glance more abundant in capital, produce capital-intensive products. We get a good and intensive explanation for inter-industrial trade. This was not our main target, though, and in opposition we have the results from Wassily W. Leontief. His nuclear information about the Heckscher-Ohlin Model is that the HO Model is valid, but not at any given time and any given place. So, we now have two trade models to explain international trade. Both have advantages and disadvantages and also some restrictions. They could not explain intra-industrial trade, though. This was our target in this paper.

We then concentrated on Paul Krugman’s theory and his Intra-Industrial Trade Model. Krugman has an explanation for intra-industrial trade, which is based on the Economy of Scale Effect and Monopolistic Competition. We started with a simple explanation and example from the automotive industry to explain Paul Krugman's theory. In a simple way, we showed that the Economy of Scale Effect must be internal. This led us to a situation which the other models does not have. The market structure in the model is based on a monopolistic competition, a competition in which all companies are able to define their own specific product in relation to the products of the other companies. We have now a trade

model which is based on incomplete competition. The other trade models are based on complete competition. Also, we made an example to illustrate this competition. We illustrated that a merger of two markets into one great market has some advantages in this new trade model. The production costs and prices shrink. On the other hand we see that the number of firms in the market also decreases. So, the trade model shows us that in a greater market, only a smaller number of firms survive. Companies with an average cost structure have to leave the market. The other companies are able to serve a greater market at lower costs. The consumers have a greater choice of goods and lower prices. Furthermore, we analyze the Krugman's Intra-Industry Theory and his different starting points. Krugman works to give us the theoretical insight into his theory, which is very interesting. Krugman explains the connection between the monopolistic competition and the internal Economy of Scale Effect with help of his own simple basic trade model, which has several restrictions, too. Paul Krugman adapted his model to demonstrate different explanations for trade. A country must either trade with the same good between two countries, having calculated the transportation costs considering the position from production sites nearer or further to the consumers, or trade with two goods between two countries. He uses the adapted model to explain a few problems. We get a good overview about Krugman's Trade Model and his different explanations for questions about international trade. So, we now have a good knowledge about the standard trade models and a deeper knowledge about Paul Krugman's trade model. Paul Krugman's different insight on the market composition provides a possible explanation for intra-industrial trade.

In the next section, we will start the practical analysis. First, we look at the values of the Unit Labor costs and the labor productivity. The target was to show the relationship between them to prove the validity of the Ricardo Model. We want to show the different situations in the countries of the European Union and some other countries. First, we look at the years from 1992 to 2001 and then at the years from 2002 to 2011. We see the different trends in the countries and regions. These analyses give us evidence and explanations about the Ricardo Model. Countries with high productivity also have high unit costs, and thus high wages. These countries work on a higher level in relation to less productive countries, but countries with less productivity also have their advantages. These countries are able to produce goods at lower wages. In our figures, we witnessed different groups of countries and their positioning in the world. We are able to see trends in both figures. So, we see the different development of the countries of Europe from the past to the present. It was interesting to analyze these trends. If we look at the first and second figure of this analysis, we see that the trend for region of Eastern Europe remains the same. Also, Western Europe maintains the trend; we have only individual “stray bullet” countries which cannot be controlled like the rest of the countries within a region.

We went further with the analysis of the trade flows between the countries of the European Union. Also, we found very interesting results from the data. First, we saw that the trade flows increase over the years. The trade flows interact directly with the current economic development. An increase in the economic development leads to an increase of imports and exports of this country. The expansion of the European Union also influences the trade flows. After the expansion, companies have a greater market to supply. If one follows the theory of Paul Krugman and the effects of a greater market on the firms of a branch, then we have some evidence for his theory. We analyzed some branches and looked at the changes over the years. We came to the conclusion that there is to some extent specialization in each country. This held true in every country. In many cases in which countries have negative Trade Balances in a branch, these countries maintain their level or increase their Trade Balance deficit. Also, countries with a positive Trade Balance in a branch increase or maintain their Trade Balance surpluses. Only isolated countries work against this trend. Ultimately, we looked at the development of the GDP, the exports and imports within the European Union. We see that above all, the new members of the EU have greater growth rates in every regard over the years. We see that the newer members of the EU profit from the greater market to a greater extent than the older members of the EU.

Conclusion

In this paper, we have analyzed trade models and reasons in order to explain the trade linkages and trade flows between countries. Our main area for this research was Europe. First, we analyzed the time after World War II. At this time, many European people wanted no more war in Europe. So, they started a movement toward a united Europe. This Europe should be based on a strong economic cooperation. Stronger economic ties and open borders for products, services and people made it possible to increase the trade flows between countries. We have the same situation in the rest of the world. The WTO and its members want to reduce customs, trade restrictions and other trade obstacles. Thus, we have the political reasons for international trade.

Our next step was to analyze existing trade models. The Ricardo Model and the Heckscher-Ohlin Model gave us a good overview, but our target was to analyze the trade flows between industrialized countries. So, we took Krugman's Trade Model for Intra-Industrial trade. Krugman takes a different starting point to explain trade flows. His model is not based on full competition in an economic branch, but on a monopolistic competition. Through that, Krugman can explain trade flows between countries with the same industry branch. Based on his own model, Krugman made some extensions. These extensions explain useful trade linkages and trade relationships between industrialized countries and their economic branches. Based on this model, we have now the mathematical reasons for intra industrial trade.

The analysis gives us the statistical answers and evidence for the trade models. Our examination of the labor productivity and labor unit costs shows us the situation of the countries in Europe over the last two decades. We see the different starting situations at the beginning of 1992 and the development until 2011. We were able to identify the less productive countries and highly productive countries, and we can see their different growth rates. Next, we looked at the flows of the countries of the European Union. We analyzed the trade flows between the countries and the trade flows with the rest of the world. After this, we see the Trade Balance of the countries with the countries of the EU and the rest of world in 2001 and 2011. We see which countries are the great net exporters and net importers in the European Union and with the rest of the world. We looked at specific branches to get a better view on intra-industrial trade. We analyzed three branches: One part of the agriculture branch; the chemical branch; and the machinery branch. After the evaluation of the data, we could see in all three branches a specialization of the countries. Countries with an advantage use these advantages against other countries in this branch and enhance their exports. These trends demonstrate the effect of monopolistic competition. Companies which cannot compete in the new greater market with other companies have to leave the market. Last, we looked at the different development of the GDP and imports and exports of the countries of the European Union. We see that many Eastern European countries have greater growth rates than countries in the older part of the European Union. Some Western European countries also have greater growth rates than average. So, there is a win-win situation for many countries through the expansion of the European Union.

Finally, we can say that Paul Krugman's Trade Model for intra-industrial trade gives us a good explanation for trade flows between industrialized countries. Our statistical analysis provides the evidence. This grade of specialization will be stronger in the future through the extension of new markets and the reduction of trade barriers with existing markets. This leads to stronger competition within the branches and lower costs and prices for goods. The assumptions of this model should be enforced. Only free trade allows us to produce goods and services at the best point of efficiency in the world, and the competition between companies allows customers to have the choice between different products and services of one type of good. This competition, as well as the monopolistic competition, leads us to new, innovative goods.

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Appendix

SITC Code	SITC Code descriptions
0	Food and live Animals
1	Beverages and tobacco
2	Crude materials, inedible, except fuels
3	Mineral fuels, lubricants and related materials
4	Animals and vegetable oils, fats and waxes
5	Chemicals and related products, n. e. s.
6	Manufactured goods classified chiefly by material
7	Machinery and transport equipment
8	Miscellaneous manufactured articles
9	Commodities and transactions not classified elsewhere in the SITC

Table 6 Appendix SITC Code and Descriptions 1 Resource[3]

SITC Code	SITC Code descriptions
7	Machinery and transport equipment
7132	Internal combustion piston engines for vehicles of 78, 722, 74414-15, 89111
7239	Parts, n. e. s. , of the machinery of 723 and 7443 (excluding 72348)
73	Metalworking machinery
743	Pumps (other than liquid), air or other gas compressors and fans, etc; parts
752	Automatic data processing machines and units thereof
7611	Television receivers, color
7731	Insulated wire, cable, other insulated electric conductors; optical fiber cables
7812	Motor vehicles for the transport of persons, n. e. s.
792	Aircraft and associated equipment; spacecraft and their launch vehicles; parts

Table 7 Appendix SITC Code and Descriptions 2 Resource [3]

BEC Code	Description
1	Food and beverages
11	Primary
111	For industry
112	For households
12	Processed
121	For industry
122	For households
2	Industrial
21	Primary
22	Processed
3	Fuels
31	Primary
32	Processed
4	Machinery
41	Capital equipment
42	Parts
5	Transport
51	Passenger cars
52	Other
521	Industrial
522	Non industrial
53	Parts
6	Consumption goods
61	Durable
62	Semi durable
63	Non durable
7	Goods nes

Table 8 Appendix BEC Code and Description Resource [3]

table real unit labor costs date june 2012 - index 2007											
country	avg 1992 - 2001	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	0,08					0,0	-0,6	-0,7	1,1	-1,5	2,2
Bulgaria	-0,48					-10,7	-5,8	16,8	-0,2	-4,8	1,8
Czech Republik	0,63					2,5	2,5	-2,4	-0,3	1,3	0,2
Denmark	-0,23	-0,5	0,2	-4,0	0,2	0,3	-0,7	2,2	0,5	-2,4	1,9
Germany	-0,23	1,3	-0,2	-2,1	0,1	-0,4	-1,5	-0,4	0,4	1,2	-0,7
Estonia	-1,20			10,1	-5,5	-4,4	-2,4	-0,7	-2,6	-1,8	-2,3
Ireland	-2,47					-2,2	-4,1	-1,7	-3,5	-2,7	-0,6
Greece											-3,4
Spain	-0,76	1,8	0,8	-3,0	-4,1	0,1	-0,3	-0,7	-0,7	-0,5	-1,0
France	-0,33	-0,2	0,1	-1,8	-0,3	-0,2	-0,8	-1,1	0,8	-0,2	0,4
Italy	-1,51	-0,6	-1,8	-3,3	-3,5	0,3	0,2	-4,6	-0,5	-1,3	0,0
Cyprus	-0,77					1,0	1,4	-3,4	-1,1	-0,5	-2,0
Latvia	3,74		51,8	5,8	-15,7	4,4	1,6	-3,1	-1,7	-5,9	-3,5
Lithuania	0,69			8,3	-6,9	7,3	3,0	3,1	2,9	-9,1	-3,1
Luxembourg	-0,78	3,6	-2,5	-0,7	-11,8	-0,1	1,8	-0,6	-4,4	0,5	6,4
Hungary	-0,72					-0,8	-1,3	-1,7	-1,6	1,5	-0,4
Malta										-3,9	5,6
Netherlands	-0,51	1,7	0,3	-2,2	-1,7	-0,9	-1,3	0,8	-0,5	-1,2	-0,1
Austria	-0,61	0,9	0,7	-0,9	-1,4	-1,6	-0,6	-0,5	-0,5	-1,4	-0,8
Poland	0,13					2,7	0,2	-1,1	-1,4	-2,5	2,9
Portugal	0,28					1,6	0,0	-0,5	-0,9	1,2	0,3
Romania										15,1	5,3
Slovenia	-1,37					-3,5	-3,1	-2,0	-1,9	2,0	0,3
Slovakia	0,13				-2,7	3,4	3,7	-0,3	-3,0	2,0	-2,2
Finland	-2,05	-2,6	-6,5	-3,2	-2,5	0,8	-3,0	-2,0	-0,2	-1,9	0,6
Sweden	0,24			-1,7	-3,2	3,8	-0,8	-0,5	-2,1	3,7	2,7
United Kingdom	-0,47		-2,6	-2,1	-1,5	-2,4	-0,4	1,4	0,4	1,7	1,3
Norway	-1,03	0,9	-2,8	-0,2	-1,6	-2,6	-0,3	7,8	-2,1	-11,6	2,2
Croatia	-0,82						-2,6	1,6	4,2	-3,2	-4,1
Macedonia	-1,93							1,6	-1,5	-7,0	-0,8
Turkey	-1,46				-11,5	2,0	1,4	-25,6	26,4		
Japan	0,38	0,2	0,7	-0,4	0,4	-0,5	0,1	1,4	1,5	0,0	

Table 9 Appendix real unit labor costs 1992-2001 Resource [8]

table real unit labor costs date june 2012 - index 2007											
country	avg 2002 - 2011	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Belgium	-0,13	0,3	-0,9	-2,7	-0,9	-0,5	-0,2	2,3	2,6	-1,8	0,5
Bulgaria	0,00	-3,0	-0,6	-2,1	-1,7	-3,5	0,1	3,7	8,1	2,7	-3,7
Czech Republik	0,74	3,5	2,2	-1,0	-0,4	-0,1	-0,7	1,5	0,5	1,0	0,9
Denmark	0,27	1,0	0,6	-1,9	-0,7	0,1	2,4	1,8	4,6	-4,7	-0,5
Germany	-0,40	-0,7	-0,2	-1,6	-1,5	-2,3	-2,3	1,5	4,2	-1,7	0,6
Estonia	0,56	-0,8	0,9	1,0	-2,1	0,3	5,0	8,3	2,4	-6,6	-2,8
Ireland	0,93	-4,0	0,5	1,8	2,5	0,5	2,9	10,1	1,7	-4,6	-2,1
Greece	0,00	6,5	-2,3	-0,7	2,5	-4,6	0,0	2,2	4,3	-3,4	-4,5
Spain	-0,79	-1,2	-1,4	-1,5	-1,0	-1,0	0,8	2,4	1,2	-3,0	-3,2
France	0,23	0,8	0,0	-0,7	0,0	-0,3	-0,9	0,7	2,7	-0,1	0,1
Italy	0,35	0,2	0,9	-0,4	0,6	0,2	-0,7	2,0	1,9	-0,9	-0,3
Cyprus	0,11	3,6	4,6	-1,3	-1,4	-2,4	-3,0	-2,7	6,6	-2,9	0,0
Latvia	0,11	-4,2	1,3	-0,5	4,7	4,6	5,8	6,9	-6,7	-7,7	-3,1
Lithuania	-0,66	1,5	1,8	0,8	-0,6	3,3	-1,9	0,6	2,4	-9,1	-5,4
Luxembourg	-0,87	0,1	-4,4	-0,6	-2,4	-5,1	-2,0	1,7	8,4	-3,0	-1,4
Hungary	-0,76	0,1	0,4	-0,9	0,2	-1,4	0,8	-0,9	-0,6	-6,1	0,8
Malta	-0,37	-2,1	2,5	0,7	-3,2	2,0	-2,3	0,2	3,3	-3,3	-1,5
Netherlands	0,05	0,9	0,3	-0,5	-2,8	-1,1	-0,2	0,9	5,6	-2,1	-0,5
Austria	-0,21	-1,1	0,3	-2,1	-0,8	-0,8	-0,8	2,0	3,8	-1,8	-0,8
Poland	-1,77	-4,4	-3,7	-6,0	-2,3	-2,5	-1,3	4,3	-1,4	0,8	-1,2
Portugal	-0,35	-0,5	0,8	-1,5	1,0	-1,8	-1,6	1,9	2,2	-2,6	-1,4
Romania	-2,49	-18,7	-2,0	-10,7	8,8	-5,1	1,5	6,6	-1,2	1,8	-5,9
Slovenia	0,37	-1,5	-1,0	0,3	-0,2	-1,0	-1,5	2,0	5,6	1,4	-0,4
Slovakia	0,15	0,3	-1,2	-3,0	1,5	-1,2	-0,6	1,5	8,2	-1,8	-2,2
Finland	0,60	-0,4	1,5	-0,5	1,7	-0,5	-2,4	3,7	7,2	-1,8	-2,5
Sweden	-0,80	-1,1	-1,5	-1,2	-0,7	-2,4	1,4	-0,1	2,3	-2,9	-1,8
United Kingdom	0,04	-1,3	-0,2	-0,5	0,4	-0,4	-0,2	0,5	4,0	-1,2	-0,7
Norway	0,25	5,0	-1,0	-4,7	-5,2	-2,0	4,6	-1,5	11,7	-3,1	-1,3
Croatia	-1,65	1,3	1,4	-3,0	-0,5	-11,4	0,0	2,1	4,8	-6,1	-5,1
Macedonia	-1,47	-0,4	0,0	-9,9	-8,8	6,2	-12,9	2,6	9,9	-1,1	-0,3
Turkey											
Japan											

Table 10 Appendix real unit labor costs 2002-2011 Resource [8]

table real labor productivity june 2012 - index 2007											
country	avg 1992 - 2001	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Belgium	3,36	1,7	-0,3	3,7	20,9	1,2	3,0	0,2	2,1	1,6	-0,5
Bulgaria	2,18					-11,8	-2,6	5,1	9,2	8,3	4,9
Czech Republik	2,97					4,0	-0,1	1,6	3,9	5,0	3,4
Denmark	1,95	3,1	1,4	3,8	2,3	1,9	1,8	0,7	1,7	3,0	-0,2
Germany	1,38	3,3	0,3	2,5	1,3	0,9	1,9	0,7	0,4	1,3	1,2
Estonia	8,18			1,8	13,6	8,4	11,7	8,8	4,4	11,3	5,4
Ireland	3,55					7,4	5,1	-0,6	3,2	4,6	1,6
Greece	2,93					2,8	4,2	0,4	3,1	3,0	4,1
Spain	1,19	2,4	1,9	2,9	3,0	0,8	0,3	0,0	0,2	0,0	0,4
France	1,15	2,2	0,5	1,8	1,1	0,5	1,5	1,6	1,0	1,0	0,3
Italy	1,49		1,9	3,9	3,1	0,6	1,5	0,5	0,4	1,7	-0,2
Cyprus	2,40					1,3	1,7	3,4	2,9	3,3	1,8
Latvia	2,97	-26,7	-4,8	13,7	12,2	5,6	3,8	5,1	5,1	9,6	6,1
Lithuania	8,10					4,2	6,8	8,5	1,2	17,0	10,9
Luxembourg	1,13					-1,0	2,8	1,9	3,3	2,7	-2,9
Hungary	2,18					0,1	3,0	2,5	0,4	3,2	3,9
Malta	2,18										-3,2
Netherlands	1,14	0,3	0,8	2,3	0,8	1,1	1,1	1,3	2,1	1,7	-0,1
Austria	1,94	1,7	1,1	2,4	3,0	2,1	1,6	2,7	2,0	2,7	0,1
Poland	5,43					5,0	5,6	3,8	8,8	5,9	3,5
Portugal	1,78					2,0	1,7	2,3	2,7	1,8	0,2
Romania	5,00									3,2	6,8
Slovenia	4,18					5,8	6,9	3,6	3,7	2,7	2,4
Slovakia	4,54				7,7	4,8	5,5	4,9	2,6	3,4	2,9
Finland	3,00	3,8	5,5	5,1	2,2	2,1	2,7	3,1	1,4	3,2	0,9
Sweden	2,60	3,4	2,7	5,0	2,3	2,4	4,0	2,5	2,5	2,0	-0,8
United Kingdom	2,51		3,2	3,5	1,8	1,9	1,6	2,8	2,2	3,3	2,3
Norway	2,21	3,7	2,0	3,6	2,1	3,0	2,4	0,0	1,1	2,6	1,6
Croatia	4,02						3,3	5,1	2,3	-0,2	9,6
Macedonia	1,55							-0,1	5,0	4,2	-2,9
Turkey	2,47				3,4	4,8	10,3	1,7	-5,4	7,2	-4,7
Japan	1,11	-0,3	-0,2	2,3	1,8	2,2	0,9	-0,8	1,2	2,9	1,1

Table 11 Appendix real labor productivity 1992-2001 Resource [8]

table real labor productivity june 2012 - index 2007											
country	avg 2002 - 2011	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Belgium	0,61	1,5	0,9	2,2	0,3	1,6	1,2	-0,8	-2,7	1,4	0,5
Bulgaria	3,29	4,4	2,5	4,1	3,6	3,1	3,2	3,5	-2,9	5,3	6,1
Czech Republik	2,81	1,5	4,6	5,1	4,6	5,6	3,5	0,8	-3,5	4,5	1,4
Denmark	0,64	0,4	1,5	2,9	1,4	1,3	-1,1	-2,4	-2,7	3,6	1,5
Germany	0,69	0,6	0,5	0,9	0,8	3,1	1,5	-0,1	-5,2	3,2	1,6
Estonia	3,51	5,1	6,3	6,4	6,7	4,5	6,6	-3,8	-4,7	7,4	0,6
Ireland	1,37	4,2	2,3	1,1	0,4	0,9	1,5	-1,9	1,2	4,0	:
Greece	0,63	1,2	4,7	1,9	-0,7	3,6	1,4	-0,9	-3,0	-1,7	-0,2
Spain	0,94	0,2	-0,1	-0,4	-0,5	0,1	0,4	1,1	3,2	2,6	2,8
France	0,72	0,4	0,8	2,4	1,1	1,4	0,9	-0,6	-1,6	1,3	1,1
Italy	-0,31	-1,2	-1,5	1,3	0,4	0,2	0,4	-1,4	-3,9	2,5	0,1
Cyprus	0,40	0,0	-1,9	0,4	0,3	2,3	1,8	1,4	-1,3	1,1	-0,1
Latvia	3,46	4,2	5,5	7,6	8,4	5,9	5,8	-4,2	-5,3	4,7	2,0
Lithuania	4,20	3,1	7,9	7,4	5,2	5,9	6,8	3,6	-8,6	6,9	3,8
Luxembourg	-0,18	0,8	-0,3	2,1	2,4	1,4	2,1	-3,8	-6,2	0,8	-1,1
Hungary	2,27	4,6	3,9	5,8	4,3	3,5	0,1	2,4	-4,2	0,9	1,4
Malta	0,50	2,2	-0,9	0,2	2,1	1,5	1,1	1,5	-2,4	0,0	-0,3
Netherlands	0,84	-0,4	0,8	3,1	1,5	1,7	1,3	0,3	-2,8	2,0	0,9
Austria	0,84	1,8	0,2	2,0	1,2	1,9	1,9	-0,6	-3,0	1,4	1,6
Poland	2,96	4,6	5,1	4,2	1,4	3,0	2,2	1,2	1,2	3,4	3,3
Portugal	0,80	0,2	-0,3	1,6	1,1	0,9	2,4	-0,5	-0,3	3,0	-0,1
Romania	5,58	17,0	5,3	10,3	5,8	7,1	5,9	7,3	-4,7	-0,2	2,0
Slovenia	2,18	2,2	3,2	4,0	4,5	4,2	3,4	1,0	-6,3	4,0	1,6
Slovakia	3,95	4,5	3,7	5,3	5,0	6,1	8,2	2,4	-3,0	5,8	1,5
Finland	1,22	0,9	2,0	3,7	1,5	2,5	3,1	-2,2	-5,9	4,9	1,7
Sweden	1,93	2,4	2,9	5,0	2,9	2,6	1,0	-1,5	-2,7	5,0	1,7
United Kingdom	0,94	1,9	2,5	1,9	1,1	1,7	2,8	-1,8	-2,8	1,9	0,2
Norway	0,23	1,1	2,2	3,5	1,3	-1,0	-1,4	-3,1	-1,3	0,8	0,2
Croatia	2,31	0,7	4,8	2,4	3,5	5,6	1,5	1,1	-4,2	2,9	4,8
Macedonia	1,53	1,4	4,8	6,9	2,2	1,8	1,8	-1,2	-3,4	0,5	0,5
Turkey	3,66	8,1	6,3	6,1	6,9	5,5	3,5	-1,5	-6,7	2,6	5,8
Japan	1,02	1,9	2,0	2,1	0,9	1,2	1,8	-0,7	-4,0	5,5	-0,5

Table 12 Appendix real labor productivity 2002-2011 Resource [8]

intra eu 27 trade balance in mio. Euro						
countries	1999	2001	2004	2007	2010	2011
Belgium	20490	22046	22838	27345	19615	20304
Bulgaria	-686	-1171	-1654	-4559	-1787	-1175
Czech Republik	1360	1959	3171	7164	12712	15726
Denmark	1884	3336	4935	664	3242	3624
Germany	40307	55547	94524	126577	67982	54639
Estonia	-445	-177	-1111	-3352	-1382	-1949
Ireland	17384	21605	20255	13479	20421	19737
Greece	-13147	-15478	-17615	-21092	-14382	-11352
Spain	-16696	-21691	-31947	-48212	-13764	-6252
France	-3906	-15950	-23803	-52381	-73633	-85058
Italy	5351	3366	-1629	6721	-7914	-3044
Cyprus	-1421	-1936	-2553	-3600	-3825	-3424
Latvia	-844	-1222	-1823	-4263	-1874	-2741
Lithuania	-715	-198	-1300	-4072	-445	-261
Luxembourg	-1923	-1588	-450	-377	-2737	-4133
Hungary	987	3719	3768	6518	10581	10050
Malta	-853	-760	-1143	-1454	-1566	-2120
Netherlands	57340	84507	92909	133624	152991	168209
Austria	-7726	-7956	-9767	-7709	-10921	-15210
Poland	-10121	-6413	-5854	-7953	250	1177
Portugal	-10195	-11955	-11027	-16362	-15631	-10747
Romania	-918	-2093	-3187	-15314	-7038	-7794
Slovenia	-1417	-1459	-2837	-1756	252	471
Slovakia	656	872	409	4056	5836	8062
Finland	5080	3941	859	-855	-4821	-5559
Sweden	4044	409	216	-4105	-7034	-10864
United Kingdom	-11897	-23380	-47781	-63671	-53481	-51368

Table 13 Appendix intra EU trade balance in Mio. € Resource [8]

extra eu 27 trade balance in mio. Euro						
countries	1999	2001	2004	2007	2010	2011
Belgium	-7034	-8999	-5758	-13194	-7945	-9343
Bulgaria	-720	-1242	-1981	-3790	-1897	-1944
Czech Republik	-3149	-5279	-3960	-4005	-7937	-8002
Denmark	2378	3791	2238	3090	6198	7501
Germany	24895	39948	61554	67682	85981	102217
Estonia	-540	-923	-824	-54	874	1339
Ireland	5576	14436	14293	14045	21987	23649
Greece	-5111	-8542	-12493	-19005	-17459	-9494
Spain	-12309	-20728	-28917	-51025	-40998	-40832
France	13080	10112	8658	393	8618	464
Italy	8655	5867	408	-15317	-22068	-21586
Cyprus	-991	-1322	-1108	-1668	-1581	-1448
Latvia	-311	-459	-659	-854	246	597
Lithuania	-1050	-1791	-1181	-1231	-1557	-2206
Luxembourg	-906	-1284	-2602	-3341	-1294	-856
Hungary	-3786	-7271	-7765	-6638	-5071	-3133
Malta	41	-32	240	227	384	664
Netherlands	-45689	-59700	-62562	-91202	-109359	-123675
Austria	2791	3622	8537	8134	6056	5816
Poland	-7259	-9426	-5923	-10699	-14073	-15736
Portugal	-4285	-5221	-4378	-5271	-4660	-4597
Romania	-863	-2569	-4159	-6448	-2488	-1988
Slovenia	-30	461	1713	692	-926	-1003
Slovakia	-1695	-3290	-2111	-5589	-6112	-6623
Finland	4424	7893	7242	6927	5360	1913
Sweden	11258	13487	18141	15481	14278	18861
United Kingdom	-37581	-55975	-51213	-71698	-64068	-66390

Table 14 Appendix extra EU trade balance of EU countries in Mio. € Resource [8]

eu 27 total trade balance in mio. Euro		
countries	2001	2011
Belgium	13047	10961
Bulgaria	-2413	-3119
Czech Republik	-3320	7724
Denmark	7127	11125
Germany	95495	156856
Estonia	-1100	-610
Ireland	36041	43386
Greece	-24020	-20846
Spain	-42419	-47084
France	-5838	-84594
Italy	9233	-24630
Cyprus	-3258	-4872
Latvia	-1681	-2144
Lithuania	-1989	-2467
Luxembourg	-2872	-4989
Hungary	-3552	6917
Malta	-792	-1456
Netherlands	24807	44534
Austria	-4334	-9394
Poland	-15839	-14559
Portugal	-17176	-15344
Romania	-4662	-9782
Slovenia	-998	-532
Slovakia	-2418	1439
Finland	11834	-3646
Sweden	13896	7997
United Kingdom	-79355	-117758

Table 15 Appendix total trade balance of EU countries in Mio. € Resource [8]

intra EU trade SITC 054	imports		exports		trade balance	
countries	2001	2011	2001	2011	2001	2011
Belgium	714.932.152	1.129.562.225	1.250.690.717	1.479.237.699	535.758.565	349.675.474
Bulgaria	8.003.695	38.108.409	19.769.102	48.397.828	11.765.407	10.289.419
Denmark	198.276.437	386.946.404	38.289.765	78.181.720	-159.986.672	-308.764.684
Germany	3.251.455.132	3.869.934.718	449.219.739	680.813.974	-2.802.235.393	-3.189.120.744
Estonia	13.661.382	34.108.283	1.915.629	4.458.500	-11.745.753	-29.649.783
Finland	110.061.650	195.457.015	7.023.095	4.332.411	-103.038.555	-191.124.604
France	1.172.119.688	1.556.790.187	1.096.975.959	1.528.134.337	-75.143.729	-28.655.850
Greek	70.378.835	126.382.021	129.480.284	99.432.810	59.101.449	-26.949.211
Ireland	164.875.349	298.023.269	129.341.625	105.145.083	-35.533.724	-192.878.186
Italy	559.335.267	846.119.497	789.831.739	1.040.876.847	230.496.472	194.757.350
Latvia	21.226.814	57.926.189	1.726.944	14.364.335	-19.499.870	-43.561.854
Lithuania	17.125.975	256.938.647	23.853.967	44.551.210	6.727.992	-212.387.437
Luxembourg	46.410.974	62.294.634	5.032.216	9.253.264	-41.378.758	-53.041.370
Malta	5.661.985	14.030.402	2.544.384	3.067.436	-3.117.601	-10.962.966
Netherlands	859.335.126	1.124.150.657	2.524.348.235	3.688.767.112	1.665.013.109	2.564.616.455
Austria	300.496.148	426.722.897	93.425.955	181.853.833	-207.070.193	-244.869.064
Poland	126.831.943	442.014.685	225.389.202	514.572.876	98.557.259	72.558.191
Portugal	173.176.890	244.478.819	69.686.808	156.211.637	-103.490.082	-88.267.182
Romania	11.726.006	101.848.976	29.071.987	41.152.285	17.345.981	-60.696.691
Sweden	317.620.567	451.749.843	32.404.812	65.208.474	-285.215.755	-386.541.369
Slovakia	24.462.906	184.235.892	23.936.922	29.541.994	-525.984	-154.693.898
Slovenia	37.399.174	79.574.267	6.188.550	64.418.974	-31.210.624	-15.155.293
Spain	350.579.773	508.385.954	3.012.064.392	3.718.207.995	2.661.484.619	3.209.822.041
Czech Republic	127.122.479	407.691.454	28.231.405	106.207.654	-98.891.074	-301.483.800
Hungary	27.247.580	89.557.317	130.453.404	151.990.852	103.205.824	62.433.535
United Kingdom	1.841.329.870	2.172.240.915	188.023.483	243.518.498	-1.653.306.387	-1.928.722.417
Cyprus	8.389.192	20.237.601	34.987.363	59.599.692	26.598.171	39.362.091

Table 16 Appendix intra EU trade of EU countries at SITC 054 in € Resource [8]

intra EU trade SITC 542	imports		exports		trade balance	
countries	2001	2011	2001	2011	2001	2011
Belgium	6.290.632.485	14.920.940.779	4.967.625.636	15.806.583.488	-1.323.006.849	885.642.709
Bulgaria	132.854.139	599.973.762	3.361.444	155.289.191	-129.492.695	-444.684.571
Denmark	869.929.773	1.738.705.867	1.430.200.278	2.590.736.188	560.270.505	852.030.321
Germany	5.501.660.370	15.835.023.603	7.465.500.058	19.780.820.953	1.963.839.688	3.945.797.350
Estonia	71.441.081	210.279.640	14.807.136	35.206.462	-56.633.945	-175.073.178
Finland	632.579.358	1.210.171.969	112.589.229	169.905.436	-519.990.129	-1.040.266.533
France	4.952.333.218	11.091.010.497	6.970.373.992	9.701.809.170	2.018.040.774	-1.389.201.327
Greek	946.029.914	2.066.969.584	349.570.471	755.749.719	-596.459.443	-1.311.219.865
Ireland	824.363.211	1.809.841.582	5.787.033.446	12.975.835.011	4.962.670.235	11.165.993.429
Italy	3.989.162.857	8.622.934.630	4.725.206.949	6.834.533.772	736.044.092	-1.788.400.858
Latvia	109.668.401	280.428.864	36.046.881	124.116.557	-73.621.520	-156.312.307
Lithuania	207.953.380	533.681.295	18.911.287	208.618.410	-189.042.093	-325.062.885
Luxembourg	155.460.601	290.436.915	25.373.679	57.949.223	-130.086.922	-232.487.692
Malta	38.085.720	63.221.692	23.744.602	158.035.993	-14.341.118	94.814.301
Netherlands	2.598.841.097	4.387.885.457	2.910.881.626	5.873.113.664	312.040.529	1.485.228.207
Austria	1.244.201.899	2.257.705.770	517.376.036	1.558.741.629	-726.825.863	-698.964.141
Poland	1.487.534.842	3.194.637.876	57.939.794	1.050.563.607	-1.429.595.048	-2.144.074.269
Portugal	773.690.911	1.577.206.574	176.045.848	365.206.730	-597.645.063	-1.211.999.844
Romania	312.851.216	1.696.098.706	5.105.123	516.742.279	-307.746.093	-1.179.356.427
Sweden	1.019.601.787	1.929.448.309	2.510.053.660	2.437.398.564	1.490.451.873	507.950.255
Slovakia	320.096.469	1.147.238.951	80.577.459	231.419.619	-239.519.010	-915.819.332
Slovenia	171.234.130	465.747.655	225.846.991	880.914.511	54.612.861	415.166.856
Spain	3.109.769.606	6.596.601.666	1.614.620.953	3.726.003.936	-1.495.148.653	-2.870.597.730
Czech Republic	657.810.660	2.177.759.858	103.980.340	570.396.949	-553.830.320	-1.607.362.909
Hungary	485.405.005	1.962.151.009	172.413.997	1.704.237.819	-312.991.008	-257.913.190
United Kingdom	5.476.948.623	9.038.932.245	6.328.016.713	8.755.439.169	851.068.090	-283.493.076
Cyprus	68.534.245	147.322.130	25.761.593	93.176.231	-42.772.652	-54.145.899

Table 17 Appendix intra EU trade of EU countries at SITC 542 in € Resource [8]

intra EU trade SITC 781	imports		exports		trade balance	
countries	2001	2011	2001	2011	2001	2011
Belgium	11.878.479.404	15.644.658.592	18.872.988.743	15.917.110.202	6.994.509.339	272.451.610
Bulgaria	386.580.708	428.211.254	481.586	111.381.406	-386.099.122	-316.829.848
Denmark	1.397.688.682	2.365.500.783	343.577.008	453.309.842	-1.054.111.674	-1.912.190.941
Germany	21.870.265.427	23.575.175.053	43.697.052.699	54.285.251.756	21.826.787.272	30.710.076.703
Estonia	141.767.920	414.188.728	2.349.243	169.400.704	-139.418.677	-244.788.024
Finland	952.062.920	2.030.551.493	789.696.705	204.889.772	-162.366.215	-1.825.661.721
France	16.868.875.341	23.140.317.596	19.985.595.998	13.235.355.227	3.116.720.657	-9.904.962.369
Greek	1.516.639.816	663.536.539	26.341.976	36.654.436	-1.490.297.840	-626.882.103
Ireland	1.964.660.584	1.052.564.481	415.222.752	7.941.927	-1.549.437.832	-1.044.622.554
Italy	18.414.810.883	18.646.183.484	6.364.093.700	4.539.636.666	-12.050.717.183	-14.106.546.818
Latvia	137.757.150	383.144.225	2.568.543	260.191.821	-135.188.607	-122.952.404
Lithuania	285.046.343	722.177.583	9.147.776	107.836.977	-275.898.567	-614.340.606
Luxembourg	902.668.124	1.439.562.169	241.410.310	387.326.544	-661.257.814	-1.052.235.625
Malta	57.777.059	54.083.013	29.514	2.666.971	-57.747.545	-51.416.042
Netherlands	7.466.829.599	9.099.718.727	3.170.411.434	3.209.823.929	-4.296.418.165	-5.889.894.798
Austria	3.914.243.381	6.611.873.029	2.439.319.849	2.639.024.063	-1.474.923.532	-3.972.848.966
Poland	2.026.134.568	3.449.387.775	1.499.771.266	5.833.906.730	-526.363.302	2.384.518.955
Portugal	2.668.732.621	2.643.412.437	2.656.122.698	2.277.751.537	-12.609.923	-365.660.900
Romania	208.411.557	1.003.141.527	22.552.710	1.846.381.654	-185.858.847	843.240.127
Sweden	2.336.686.496	4.986.698.279	1.756.464.912	2.602.565.990	-580.221.584	-2.384.132.289
Slovakia	505.815.890	1.157.568.886	1.805.747.818	5.217.472.375	1.299.931.928	4.059.903.489
Slovenia	473.451.950	863.246.165	777.680.154	2.122.335.381	304.228.204	1.259.089.216
Spain	11.686.564.012	8.052.139.281	17.277.842.350	18.679.926.668	5.591.278.338	10.627.787.387
Czech Republic	715.690.320	1.870.712.387	2.848.643.565	9.199.653.990	2.132.953.245	7.328.941.603
Hungary	879.506.055	1.167.084.578	1.582.097.368	2.754.590.951	702.591.313	1.587.506.373
United Kingdom	24.178.119.142	22.312.514.842	8.226.941.386	10.203.820.972	-15.951.177.756	-12.108.693.870
Cyprus	77.276.174	267.908.088	289.115	7.037.656	-76.987.059	-260.870.432

Table 18 Appendix intra EU trade of EU countries at SITC 542 in € Resource [8]

	exports intra EU mio. €			imports intra EU mio. €			GDP at marketsprices mio. €		
	2001	2011	growth	2001	2011	growth	2001	2011	growth
Belgium	165.616	246.762	49,00	143570	226458	57,73	259.803,0	368.304,0	41,76
Bulgaria	3.467	12.648	264,81	4639	13823	197,97	15.552,3	38.483,2	147,44
Czech Republic	32.184	96.743	200,59	30225	81017	168,05	71.872,6	154.913,0	115,54
Denmark	40.125	53.535	33,42	36789	49911	35,67	179.226,1	239.776,3	33,78
Germany	406.045	627.200	54,47	350498	572561	63,36	2.101.900,0	2.570.800,0	22,31
Estonia	3.007	7.955	164,55	3185	9904	210,96	6.970,9	15.973,0	129,14
Ireland	59.371	52.985	-10,76	37766	33248	-11,96	118.121,9	156.438,0	32,44
Greece	8.241	11.348	37,70	23719	22700	-4,30	146.427,8	215.088,2	46,89
Spain	96.895	148.287	53,04	118586	154539	30,32	680.397,0	1.073.383,0	57,76
France	231.850	261.440	12,76	247801	346498	39,83	1.495.553,4	1.996.583,1	33,50
Italy	166.645	210.482	26,31	163279	213526	30,77	1.255.737,8	1.580.220,2	25,84
Cyprus	269	892	231,60	2205	4316	95,74	10.719,6	17.761,4	65,69
Latvia	1.755	6.212	253,96	2977	8952	200,71	9.216,2	20.049,6	117,55
Lithuania	3.506	12.386	253,28	3704	12647	241,44	13.644,7	30.705,4	125,04
Luxembourg	9.625	12.676	31,70	11213	16809	49,91	22.572,3	42.821,7	89,71
Hungary	28.462	61.205	115,04	24743	51155	106,75	58.863,9	100.513,0	70,75
Malta	1.068	1.086	1,69	1828	3206	75,38	4.374,9	6.393,2	46,13
Netherlands	210.003	368.114	75,29	125495	199905	59,29	447.731,0	602.105,0	34,48
Austria	59.157	90.159	52,41	67113	105370	57,00	214.200,9	300.241,3	40,17
Poland	32.632	104.734	220,95	39045	103558	165,23	212.293,8	370.013,8	74,29
Portugal	21.875	31.334	43,24	33830	42081	24,39	134.471,1	170.928,4	27,11
Romania	9.571	32.026	234,61	11664	39819	241,38	45.356,8	136.479,9	200,90
Slovenia	7.309	17.712	142,33	8768	17240	96,62	22.828,2	35.638,6	56,12
Slovakia	12.740	48.230	278,57	11868	40168	238,46	23.572,9	69.058,2	192,96
Finland	29.224	31.498	7,78	25283	37057	46,57	139.288,0	191.571,0	37,54
Sweden	49.793	75.338	51,30	49383	86203	74,56	253.743,2	386.771,7	52,43
United Kingdom	182.363	182.569	0,11	205743	233937	13,70	1.642.827,3	1.737.089,2	5,74

Table 19 Appendix exports, imports and GDP at market prices for EU countries 2001 and 2011 in Mio. € Resource [8]

Erklärung zur Verfassung der Arbeit

Martin Josef Pogatsch, Sackgasse 4 7203 Wiesen

„Hiermit erkläre ich, dass ich diese Arbeit selbständig verfasst habe, dass ich die verwendeten Quellen und Hilfsmittel vollständig angegeben habe und dass ich die Stellen der Arbeit – einschließlich Tabellen, Karten und Abbildungen –, die anderen Werken oder dem Internet im Wortlaut oder dem Sinn nach entnommen sind, auf jeden Fall unter Angabe der Quelle als Entlehnung kenntlich gemacht habe."

Wiesen, 30.03.2014, Unterschrift