Erasmus University Rotterdam

MSC in Maritime Economics and Logistics

2009 /2010

An analysis of the importance of container back haulage and its impact on freight rates

by

Astrid Wohlkönig

Acknowledgements

A lot of people have contributed to this paper, therefore I would like to thank everybody how supported me in finishing this paper one way or the other.

First of all, I would like to thank my interview partners Erin Halmton (Trade Analyst Maersk), Theo van Ravesteyn (Managing Director MSC, Netherlands), Aernoud Willemier (Port of Rotterdam), Shi Lei (Analyst, DVB Bank) and Roy Lenders (Vice President Capgemini) for the time and willingness to share their knowledge and experience with me.

Secondly, I would also like to thank Mr. Chris Bourne and Kate Townsend for supplying me with very valuable data for my quantitative analysis. Moreover, I would like to especially thank Prof. Dr. Joseph Francois and Dr. Koen Berden my supervisor for their continuous support and patience with all my questions.

I need to highlight especially my dear friends Elisabeth Friesacher, Judith Dittlbacher, Theresa Scharler, Stephanie Barth and Isabella Hirscher who spend a lot of time motivating and supporting me with data research! I can truly say that you were my white knights!

Finally my last and biggest thank you is dedicated to my parents, as they made it possible for me to finish my studies at the Erasmus University.

Abstract

It has been claimed from several sources (Lloyd's List, John Verschelden) that the containerized trade imbalances between Asia and the EU are going to decrease. Moreover, it is claimed that the imbalances have a significant impact on the value of the freight rates. Therefore this paper aims at answering the question of how the containerised trade flow imbalance between Asia and the EU may develop and how this will affect freight rates, both east- and westbound.

To answer the question on the development of the imbalances, first we look at the volumes of exports and imports and their main products. The main traded product categories turn out to be SITC 5, 6, 7 and 8. To determine the actual containerised imbalance on the seaway between Asia and the EU, it is necessary to estimate the degree of containerisation and the modal split. Taking those two factors under consideration, it becomes obvious that the degree of containerisation varies according to trade direction (westbound, eastbound). This difference of between the degree of containerisation eastbound and westbound also has an effect on the imbalances.

A broad trade- and economic potential analysis shows that especially China and India are projected to grow. To simulate different economic situations, a Global Simulation (GSIM) model is run with three different scenarios. The first scenario is dominated by a strong demand shock. If Asian countries are growing fast, purchasing power of Asian consumers could increase, which would stimulate Asian aggregate demand. The second scenario simulated a strong supply shock, assuming production increases – as is the case today – keep on developing faster than demand increases in Asia. The third scenario shows a substantial growth in both supply and demand. According to these three scenarios only in case of a very strong demand shock in Asia (especially China and India) – i.e. scenario one – a reduction of the imbalance between east- and westbound container flows can be expected. In both other scenarios, the imbalance is going to persist or grow even larger.

To determine the effects of the imbalances on the freight rate, a regression analysis has been used. Several variables, such as distance, container imbalances, economies of scale, imbalances of value of containers and competition have been taken into account. The results show that the imbalance has a small but significant positive effect on the freight rates. We find that a 1% increase in the imbalance will lead to a 0.2% increase in freight rates. The coefficient of the imbalances helps to determine a range of possible results of freight rates.

Table of Contents and Appendices

Figures

Tables

Chapter 1 Introduction

Production and consumption do quite frequently diverge in terms of location. This is most obvious taking for example oil as a commodity. It is produced mostly in the Middle East (e.g. Saudi Arabia, Iran, Iraq) but most of it is consumed in Europe and the United States. Lately also Asia's demand for commodities has risen drastically and is catching up fast with the one of Europe and the US. China has even recently surpassed Germany as the largest exporter and is at the same time the number one buyer of iron ore and copper (Bloomberg news, 16.8.2010).

Not only is the place of production and consumption of raw materials and commodities diverging, but also the production and consumption of finished goods (consumer and industrial goods) (Notteboom & Rodrigue, 2008). It can be seen from the past that Europe and the US are big consumers of finished goods which are often produced in Asia. When looking at the table below it becomes obvious that from the imported finished goods only a rather moderate percentage is imported from Asia.

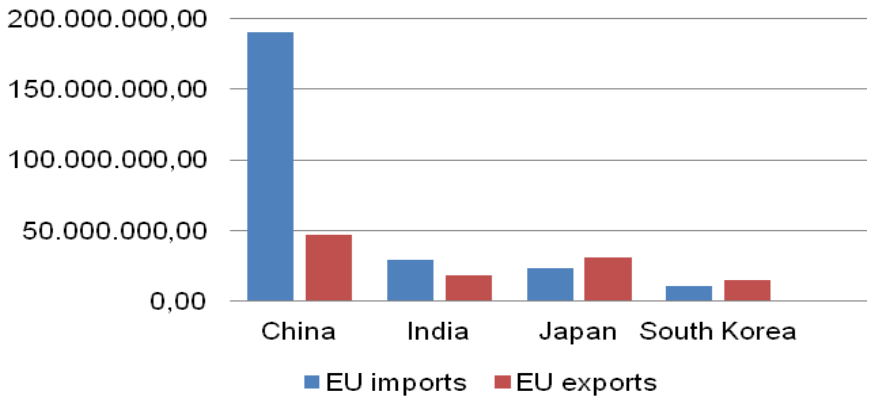
Table 1: EU Imports from Asian trade partners

	China	India	Japan	South Korea	World
Value	29,375,837.82	190,380,359.46	23,394,071.43	10,501,477.54	2,185,096,694.00
Percentage	1.34	8.71	1.07	0.40	100

Source: data WITS, edited by the author

A trend towards outsourcing of production facilities from Europe to Asia or from the US to Asia especially China is visible (The Economist, 1.10.2009). In particular China and India have the advantage of having low labour costs which incentives many manufacturing companies to outsource to China and India, to stay competitive in terms of prices.

Figure 1: EU imports and EU exports



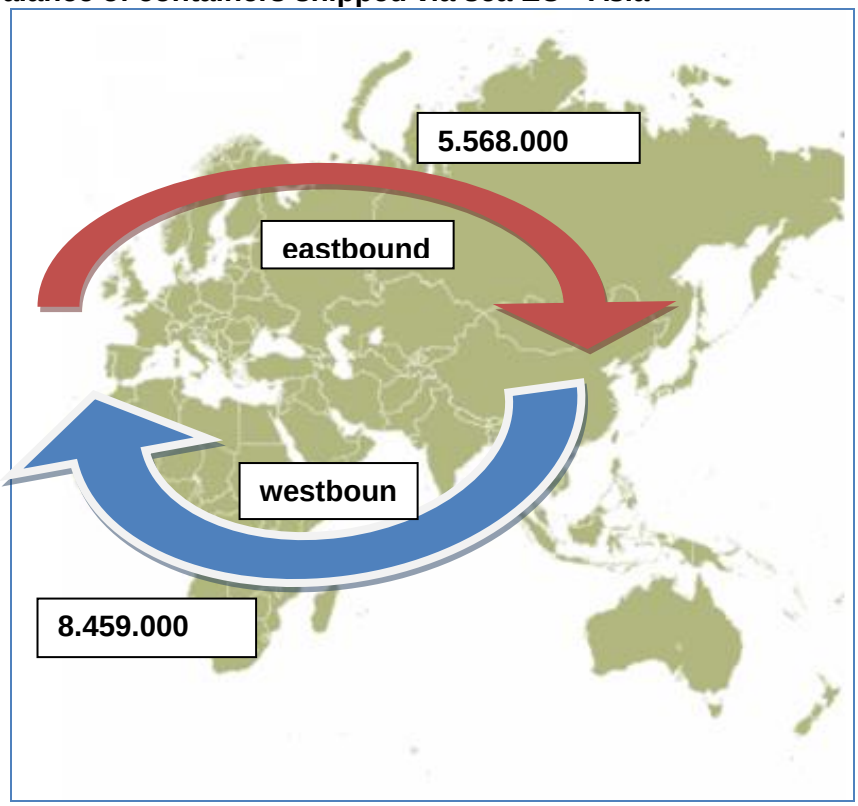
Source: data WITS, edited by the author

The divergence of production and consumption creates the need for transport. As can be seen from the bilateral trade statistics of the European Commission (2010), imports from China and

India to the European Union are bigger than the exports from the European Union to those countries resulting in a trade deficit for the EU with those countries.

In general it can be seen from Figure 2 that trade volumes from Asia to the EU and from the EU to Asia differ, which results in a trade imbalance.

Figure 2: Imbalance of containers shipped via sea EU - Asia



Source: Marquez Ramos et. al, 2004 (edited by the author)

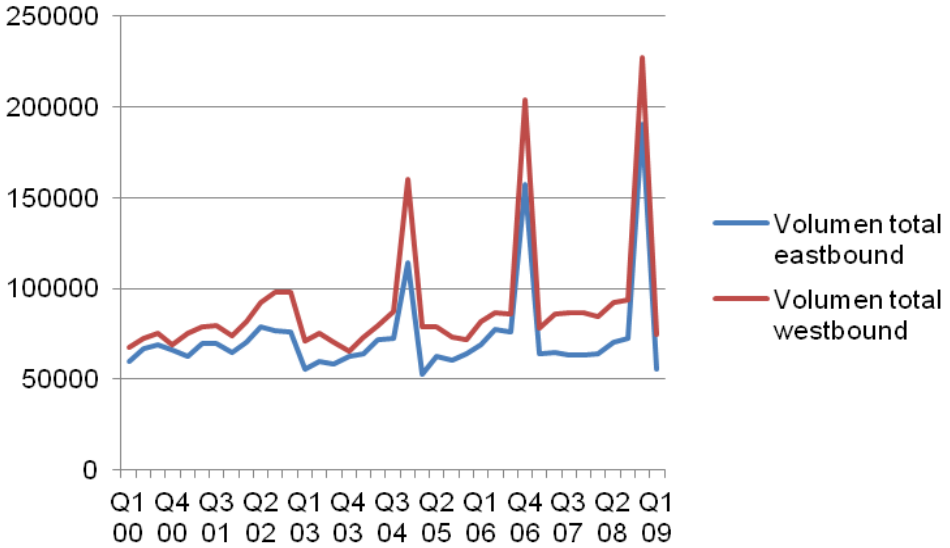
Therefore it should come as no surprise that transport volumes, being a derived demand of consumption and production patterns, transported from the EU to China, India, Japan and South Korea is smaller than the volume from China, India, Japan and South Korea to the EU.

The container was invented in the 60s by Mr. Malcolm Mclean. Since then the popularity of the container has constantly increased and is still rising. Today most finished goods, some bulky goods (e.g. coco beans) packed in sacks and also frozen goods are transported in containers as they offer protection from weather and theft and most importantly they increases the handling speed in ports (GDV, 2010).

Container shipping is a vital part of transportation from and to the EU. Liner shipping is bound to fixed schedules and routes. One of the most important global transport routes is the route Asia - EU west bound. If a 10.000 TEU vessels sails from Asia to the EU, it has to go back from Europe to Asia afterwards. The trip from Europe to Asia is known as “back haulage Europe –Asia east bound”. The carrying capacity of the 10.000 TEU vessel is 10.000 TEU from Asia to Europe and 10.000 TEU from Europe to Asia since the capacity of the vessel is fixed. The above mentioned trade imbalance makes it difficult though to fill the ship on each trip with 10.000 TEU both ways, but especially eastbound. This represents a major problem

because by not using full capacity of a vessel, the liner company has unused – and therefore non-revenue generating – capacity and thus cannot further increase its profitability.

Figure 3: Volume imbalance Eastbound and Westbound



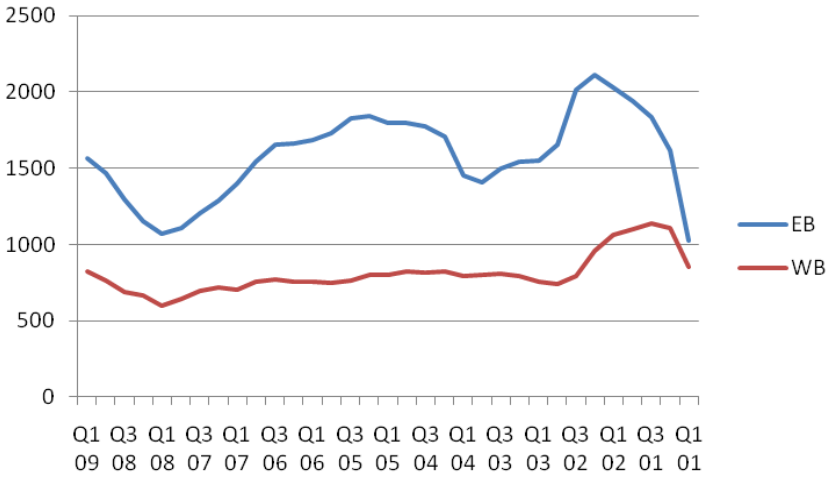
Source: Containerisation International, edited by the author

The high demand for transport capacity from Asia to Europe and lower demand for transport capacity from Europe to Asia may have an impact on the freight rates.

Research question

As can be seen from the graph below, freight rates for one TEU from Asia to Europe have been traditionally higher than freight rates for the back haulage.

Figure 4: Freight rate development eastbound and westbound from 1994 to 2009



Source: edited by the author, data from Containerisation international

Mr. John Verschelden, Managing Director APM Terminal in Rotterdam mentioned during his presentation that, the imbalance of trade and therefore also the imbalance for transport capacity is likely to decline due to different economic factors affecting Asia. This statement was additionally supported by an article in Lloyds List (18.5.2010), which dealt with exactly the same issue. Personally I got interested after the presentation of Mr. Verschelden. During the process of choosing a topic and researching a bit the background, I found out that even though this topic might have big effects on the container shipping world, liner companies have not put a lot of thought in it yet. Consequently I chose the topic as it represented a personal challenge for me as not much research on the topic had been done yet and I had the opportunity to start from scratch.

Therefore this paper aims at answering the following main research question:

What are the factors that affect the imbalance between east- and westbound container traffic between the EU and Asia, how will the imbalance of container traffic between the EU and Asia likely develop and what will be the impact on EU-Asia and Asia-EU freight rates?

Sub-questions to be answered in this paper are:

- Which factors affect the trade imbalance between the EU and Asia?
- How is the current imbalance of transported containerized goods between the EU and Asia going to develop from 2010 to 2020?
- What kind of impact will potential changes in imbalances have on both eastbound and westbound freight rates eastbound and westbound?

Structure of the thesis

The thesis is divided into two parts. In the first part aims at answering the first half of the research question: What are the factors that affect the imbalance between east- and westbound container traffic between the EU and Asia, and how will the container traffic between the EU and Asia develop? (chapter 2 – chapter 5). The second part deals with the impact of container trade imbalance on EU-Asia and Asia-EU freight rates (chapter 6 -7).

The second chapter gives an overview of the literature dealing with future developments of the imbalances. The main focus is on the article of Lloyd's list and the Capgemini report which gave the starting point for this thesis. It also provides the literature overview on the factors affecting trade imbalances and their impact on freight rates. Chapter 3 provides the reader with a background about the theory of back haulage, the purpose of back haulage, the current situation of back haulage and the trends in liner shipping affecting back haulage. Chapter 4 deals with the macro economic situation of the EU 27 and China, India, Japan and South Korea, representing Asia. To get a good idea about the trade structure and volumes first an overview of the export and import flows between Asia and the EU is provided. Afterwards the composition of the trade flows in terms of goods is analysed. As only the imbalances in terms of containerised goods are relevant for this paper, the degree of containerization will be evaluated on both sides of the trade route (eastbound and westbound). Afterwards, as only the trade imbalances relevant for the *maritime* transport are of interest, the modal split is shown. This gives the reader an idea about the containerized goods and the imbalances in the maritime container transportation. Chapter 4 also contains an analysis of the economical potential of the EU27, China, India, Japan and South Korea (representing Asia). Chapter 4 is a qualitative analysis of economic factors of the relevant countries, to be able to estimate an

eventual growth potential of their economy in the future. In chapter 5 the GSIM Model is explained and used to compute how the trade imbalances will develop over the next 10 years until 2020. The model is used with 5 different input variations and computed with 4 different scenarios. The model is run for total trade developments and for SITC 5, SITC 6, SITC 7 and SITC 8 product group developments. The scenarios provide a likely scenario as well as a sensitivity analysis which shows different outcomes for the various product groups. In chapter 6 a regression analysis over the period 2000 – 2009 is carried out, to determine the relative importance of trade flows and the trade (im)balance between the EU and Asia for determining freight rates. From those results a potential change of freight rates due to the development of imbalances can be estimated.

Chapter 2 Literature review

Literature review on the trend of trade imbalances Europe - Asia

In the early 1990s, import and export volumes between Europe and Asia were more or less in balance, but since the Asian crisis in 1997, trade flows between EU and Asia have become more skewed and therefore imbalanced (United Nations – ESCAPE, 2007). Before the economic crisis, in 2007, container traffic forecasts by the United Nations ESCAPE (2007) predicted the persistence of the trade imbalance until at least 2015. Westbound volumes were expected to increase by 10.5 million TEU to 26.1 million TEU at an average growth of 9.2 percent per year whereas eastbound volumes were forecasted to grow from 7.4 million to 17.7 million TEU (United Nations – ESCAPE, 2007), an increase of only 7.6 percent.

Following the global economic crisis in 2008–2009, predictions have been made that the imbalance of trade flows between the EU and Asia would decline. An article in Lloyds list (May 18, 2010), addresses the issue of declining imbalances. It is based on a study by Capgemini, the Global Trade Flow Index, which shows that exports from the EU to Asia have been growing faster than imports from Asia to Europe in the end of 2009 and the beginning of 2010. Although it has to be mentioned that China recorded its highest-ever level of exports in June 2010 which grew by 44 percent year on year whereas the imports grew only by 34 percent year on year (Brett, 2010). Therefore this record does not fit into predictions of declining imbalances of Mr. Roy Lenders and Mr. Theo van Ravesteyn (Managing Director of MSC Netherlands). Mr. Roy Lenders, Vice President of Capgemini Consulting Netherlands, is of the opinion that the increasing financial power of Asian countries pulls the cargo flow towards Asia. He expects this shift to continue and points out that this might have major consequences for carriers and freight rates. Also Mr. Theo van Ravesteyn observes this trend of rising exports from Europe to Asia, and hopes that it will continue. Therefore one of the aims of this thesis is to forecast the trend in container volumes shipped from Europe to Asia in the next 10 years, from 2010 to 2020, keeping in mind supply and demand elasticities, economic growth projections as well as likely international trade agreements affecting relative levels of openness of economies.

Literature review of the impact of trade imbalances on freight rates

Various authors have already tried to determine the factors that influence transport costs, most of them in connection with effects on trade levels. Many of them name trade imbalances as a factor that influences transport costs (Jonker et. al, 2008), (Comtois et. al, 2010), (Raballand et. al, 2005), (Micco /Pérez, 2002), (Clark et. al, 2004), (Márquez Ramos et. al, 2006) and (Wilmsmeier / Hoffmann, 2008). Wilmsmeier and Hoffmann determine the freight rates in the Caribbean and find in general five factors influencing freight rates: distance, liner shipping connectivity, trade balance of containerised goods, port infrastructure and general level of deployments. All factors prove to be significant.

Márquez Ramos et. al. (2006) aims at identifying the determinant variables of the maritime transport costs of Spanish exports. There they find five factors that are of importance: infrastructure of the origin, destination and transit locations, characteristics of the commodity, degree of competition, distance and imbalances. This study also emphasises the impact of the trade imbalances on the freight rates, which are supposed to be higher on heavy leg to compensate for the reduced income partly due to the necessary repositioning. So far those studies have only taken into consideration the maritime transport costs excluding loading charges and insurance premiums.

Clark & Dollar & Micco (2004) and Micco &Pérez (2002) include those charges as well in when trying to determine the maritime transport costs. Both find seven factors that affect the transport price: distance, port efficiency, regulation, economies of scale, containerisation, competition and imbalances. Both support the argument of Marquez Ramos et. al. (2006) that the front haul has to be more expensive to compensate for the back haulage which has a lower freight rate due to repositioning of empties. It has to be mentioned that the main focus of those two papers lies on port efficiency and the impact on the freight rates.

A very interesting paper is the paper of Raballand & Kunth & Auty (2005). as it tries to determine factors that influence transport costs and consequently the level of trade but it takes only land modes of transport into consideration – rail and road. From this paper it can be seen that imbalance of goods transported from the EU to central Asia also exist but the heavy leg is the eastbound leg. Rabballand et. al. (2005) consider four aspects to explain transport costs: geography, corruption, low trade volumes and imbalances. It has to be highlighted that especially being a landlocked country increases transport costs a lot, which imposes a major disadvantage to those countries.

Comtois & Rodrique & Kuby(2010) is one of the very few who distinguishes in his paper between freight rates and transport costs. Freight rates are determined by supply and demand where as transport costs are affected according to his paper by geography (distance and accessibility), type of product, economies of scale, energy consumption, trade imbalances, infrastructure, modes, competition and regulation. With all those factors he basically covers all factors named by the other authors.

Finally Jonkeren & Demirel & van Ommeren & Rietveld(2008) probably wrote the most relevant paper concerning the imbalances of trade and the impact on freight rates. They analysed the transport volume imbalances on the river Rhine. As most of the harbours located close to the river Rhine are import ports, transport volume imbalances are a major issue. In this study two different systems were looked at: First a 2 region network and second a multi region network. Most parallels with the trade imbalances of the EU and Asia can be found in

the two region network as due to the hub and spoke port network the two continents can be seen as two regions. The study found out that route imbalances are of limited significance where as regional imbalances are of high significant.

From the past research it can be seen that various factors determine the transport costs. Trade imbalances have been recognized as an important factor as they are prevalently mentioned. In this paper to determine the factors influencing the freight rates the following variable have been chosen: economies of scale, distance, imbalances of containers, imbalances of container values, competition etc... A detailed analysis can be found in chapter 6.

Chapter 3 Back haulage

Purpose of back haulage

Back haulage from Europe to Asia is sometimes seen as a by-product from the volume-wise more important route Asia to Europe (westbound). Though if the imbalance decreases or even disappears, it will no longer be seen as a by- product. The main purpose of the vessel is to provide transport capacity. Therefore even if the vessel is not totally loaded with full containers, the main purpose of back haulage is to *offer transport capacity*.

Secondly as already mentioned in the introduction of the paper, carriers offer fixed itineraries. Even if the vessel is not fully loaded, it is important that the ship leaves in time to stay on time with its schedule. It can be said that the ship operates in a timed loop. The service of a liner company can be compared to the service of a public bus, not to the service of a taxi, as the route cannot be changed according to demand at any specific sudden moment in time. Therefore another purpose of back haulage is to *return the ship* to its starting point or to complete its loop.

Moreover the vessel does not only transport full containers, but also empty containers. Especially if there is a huge imbalance of trade, more containers are needed in Asia than in Europe. Therefore another very important aspect of the back haulage is the distribution of empty containers according to where they are needed. A container vessel which is not fully loaded can be topped up with empty containers to provide them for re-use in Asia. A major issue for liner shipping companies is the delivery of empty containers to a port where they are needed. This issue arises do to trade imbalances. Feng and Chang (2008) estimated that the costs arising from the repositioning of empty containers on the transpacific service (250 $ per TEU) were USD 1.98 billion in 2006 and will rise to USD 2.58 billion in 2010. In 2004, about 50 percent of the containers moving to northern Europe from Asia were sent back empty, leading to high repositioning costs for the carriers (Song & Carter, 2009). Here it becomes clear that trade imbalances impose major costs on the liner shipping companies and in an ideal world for carriers where trade flows are balanced, the function of repositioning empty containers would not exist and would therefore also not impose any costs on the carriers.

Current situation of back haulage

Currently, trade flows between Europe and Asia are still imbalanced therefore repositioning of empty containers is still a concern for carriers. Also the kinds of goods that come in a container from Asia to Europe differ from the kinds of goods sent from Europe to Asia in a container. Europe imports mostly from Asia (as representative countries China, India, Japan and South Korea are taken because they are the EU's most important trading partners and they together constitute around 40 percent of EU imports) manufactured goods, miscellaneous manufactured articles, machinery and transport equipment, textiles and clothing (Eurostat, 2009). These products are rather light and do usually not use the total carrying capacity of a container (24 tons). As there is enough demand for transport capacity from Asia to Europe, the ship is consequently full in terms of number of full containers but not in terms of weight.

Due to trade flow imbalances the vessels have empty container slots available from Europe to Asia. On this route mostly chemicals, raw materials, half fabricates and very few finished products and waste fill the containers (Interview Van Ravesteyn, 2010). The biggest export commodity shipped in containers is waste (e.g. waste paper) (Interview Van Ravesteyn, 2010). This kind of cargo is very heavy and uses frequently the total transport capacity of a container. Therefore the ship is not full in terms of container slots but in terms of weight (Fraser, 1994) (Statny, 2004). As there is such lack of export cargo from Europe, container lines accept this kind of cargo to fill up their ship even though it does not contribute much to their profit.

As already mentioned the trade imbalances facilitate the need for container redistribution. Especially in the past, during 2005-2007, there was an extreme container shortage in Asia (Song & Carter, 2009) due to strong export growth. Mr. Saratini CMA CGM Senior VP Asia – Europe, expects demand to remain strong and warns for a shortage of containers. Moreover reduced investments into containers during the crisis in 2009 also may contribute to the expected shortage of containers. According to Erin Haltom (Interview, 2010) there is already a shortage of 20 foot dry containers in Asia. Another factor that contributes to an expected container supply shortage is slow steaming. As due to slow steaming, vessels need more time to complete the loop from Asia to Europe and back, the containers are employed longer, and therefore not available (Brett, 2010). This shortage of containers may lead to a rise in freight rates.

Trends in liner shipping and their effects on the trade imbalances

Several trends in the liner industry can be identified and some of them are related to trade imbalances. Here we try to give an overview of trends that are connected or affected by trade flow imbalances.

Globalization - global carriers

Globalisation is an economic trend that facilitates the increase in transportation. As already mentioned, production and consumption are frequently not at the same location which leads to transportation of produced goods. To cope effectively with the increasing complexity due to globalisation, global carriers are becoming more and more important. Even though carriers

cannot “create” cargo, global carriers are able to deal better with imbalances than carriers that are specialized in niche markets (Interview Ravesteyn, 2010).

Alliances

To cope with the increasing cost pressure, carriers decided to form alliances to increase their size and therefore bargaining powers. The purpose of an alliance is not price setting but cooperation in a way that enables the alliance members to reduce costs (Sheppard & Seidmann, 2001). One of the benefits of an alliance is that carriers may access a market without actually employing vessels by chartering slots from another alliance member (Midoro & Pitto, 2000). This will also have an impact on the capacity used and as a result on the degree of emptiness on the back haulage from the EU to Asia. If a carrier wants to offer a service from Asia to the EU and back, the carrier will not have to set up a new route but will just charter a certain amount of slots. In that way the carrier will use capacity of his alliance partner. If every carrier would set up an own service, the already scarce cargo from the EU to Asia would have to be shared by even more carriers. Alliances are not a solution for trade flow imbalances but they are an attempt to deal effectively with trade flow imbalances.

Increasing Containerisation

In the early years of the container, only very few pure container ship existed. Mostly general cargo ships were used to transport containers and general cargo. This approach offered more flexibility and made it easier to find cargo. Nowadays almost only pure container ships are employed especially on the east – west routes (McLellan, 2006). Being able to transport only containers, reduces the flexibility and makes the carriers dependent on cargo that can be transported in a container. [1]Therefore carriers made an effort to make as many different cargo types as possible “containerizeable”. Mr. van Ravesteyn (Interview, 2010) stated that more and more kinds of goods can be transported in a container now. A good example for this ongoing containerization is the product coco-beans. In the past they were shipped by bulk ships, nowadays they are packed in sacks and stuffed in a container to be shipped. The reason of the ongoing containerization is the convenience and safety of the container.

The increasing degree of containerizeability helps carriers to cope with trade flow imbalances. Carriers cannot, as already mentioned, create cargo but they can make cargo containeriseable which may increase the volume of goods shipped from the EU to Asia. A successful example of making cargo fit into a container is waste. Cargo like scrap and paper has traditionally been shipped with bulk carriers but is nowadays shipped in containers which contributes to fill the ship towards Asia.

Increasing vessel size

The Asia – EU route is one of the routes where super-post panamax ships can be employed due to big cargo volumes and sufficient draught in certain ports. Currently one of the biggest container ships employed on this route is the Emma Maersk which has an official capacity of

[1] An advantage are the reduced handling times, which leads to lower costs. Moreover the specialisation on just container transport with container ships, offers the possibility to benefit from economies of scale, which leads to a reduction of unit costs.

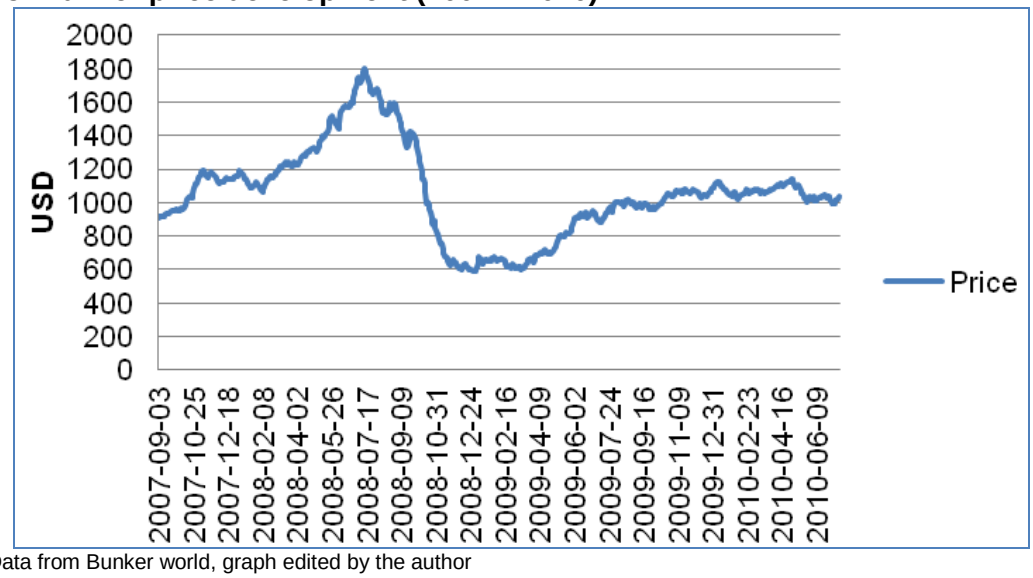
11.000 TEU. The increasing ship size makes it possible to exploit economies of scale and therefore reduce the unit cost per container slot. As mentioned in the Interview with Mr. Willeumier (2010) and also in the article of marine carriers “made in China” (2004), shipping companies are always facing the dilemma of either waiting for eastbound cargo or sailing back empty. This does not very much apply to liner shipping though, as they operate on a fixed schedule. By employing even larger ships like the Emma Maersk, the challenge of filling their vessels on the eastbound route every week, gets bigger. One could argue that the size of the ship does not matter due to the imbalances as the ship will anyway always go back empty to a certain degree. This is not entirely true if the carrier would adjust its shipping capacity to the volume that it is able to generate on the back haulage. In that case the ship would be on both legs totally filled but the carrier would lose potential earnings on the strong transportation leg (Asia-EU westbound) where the freight rates are higher. If the carrier would adjust capacity to the weak leg, the usage of super post panamax ship would not be necessary due to the rather small volumes and the need to provide regular rather than frequent services.

Slow steaming

Bunker oil prices play an important role for shipping companies. They represent up to 50 percent (Stopford, 2009) of the voyage cost for the liner shipping companies. As can be seen from the bunker oil price development presented in Figure 5, there has been a peak in 2008.

The high bunker costs and the economic crisis where volumes to be shipped were low led to a reduction of operational speed, so called slow steaming, to reduce the consumption of bunker oil. As the vessels reduce their operational speed, it takes longer to transport cargo from its origin to its destination (e.g. Asia to the EU). Slow steaming itself does not have any effect on the imbalances of trade but the containers are longer employed as the journey takes longer. If export volumes from Asia will continue to grow strongly, there will be a strong demand for containers to transport the goods to the EU. Due to slow steaming a shortage of containers in Asia may arise (Brett, 9 June 2010). Which may have an impact on the freight rates.

Figure 5: Bunker price development (2007 – 2010)

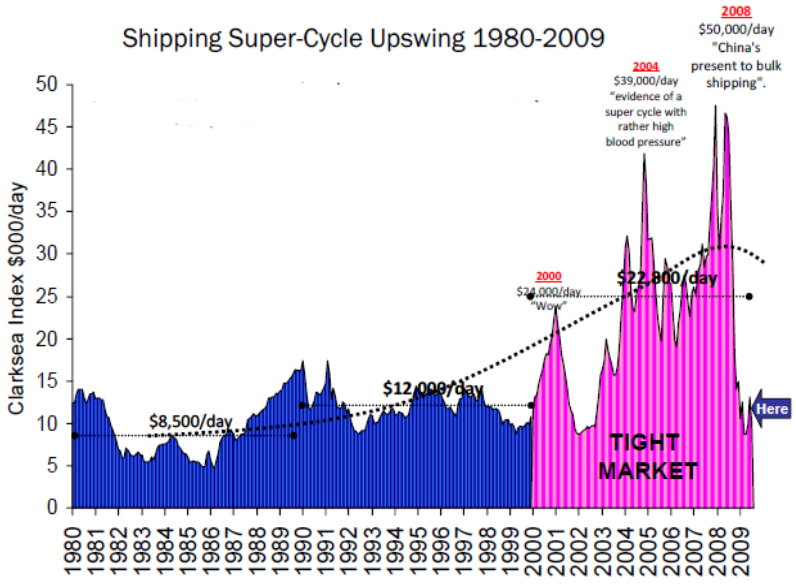


Source: Data from Bunker world, graph edited by the author

Oversupply of capacity

According to Stopford (2010), shipping markets are determined by cycles. As can be seen from Figure 6 below, freight rates from 2003 to the middle of 2008 were at a high level. This inspired many shipping companies to order new capacity, as during that time the demand for extra capacity was very high. There is a time lag between ordering and delivering new shipping capacity of 1.5 - 3 years. Therefore vessels that were ordered in 2007 might have been delivered in 2009 or 2010. As the market is now low due to the impacts of the economic crisis, there is an oversupply of shipping capacity.

Figure 6: Shipping Super-Cycles from 1980 - 2009



Source: Clarkson Research Services Ltd.

The oversupply of capacity does not affect the trade flow imbalance between the EU and Asia. No matter how many ships you employ on one route, the cargo volumes will not change according to the shipping capacity in a situation of oversupply. It does though have an impact on the freight rates. Oversupply makes freight rates go down. To counter this situation of low freight rates, shipping companies have laid up vessels until the market will go up again (Lloyds List, 2 July 2010)

Chapter 4 Macro economic situation and trade analysis

The macro economic situation and trade analysis should give an indication of the market conditions and policies that may have an impact on the future development of the imbalances of the trade flows between the EU and Asia. To be able to see a trend in the trade imbalances, four countries in Asia and the European Union as a conglomerate have been selected. Those four countries are: China, India, Japan and South Korea.

China has been selected as it is the second most important partner in terms of trade volume of the European Union (Eurostat, 2006). Furthermore all interview partners have named China as the country with the biggest consumer market potential and economic growth potential in Asia. India is the tenth biggest trading partner of the European Union (European Commission, 2010). It is expected that India will – due to its high level of education and its huge size of population - represent a consumer market with a lot of potential growth. Japan, in comparison to China and India, is a rather mature market. The growth rates of trade between the European Union and Japan have not risen sharply in the last years (Eurostat, 2009). Nevertheless Japan is the sixth most important trading partner of the European Union and is therefore included into this study. The final country that has been selected for this study is South Korea. It is the eighth most important trading partner of the European Union and it shows the biggest trade imbalance in terms of rankings of countries between import and export values (South Korea: import = rank 8 and export rank 12) (Eurostat, 2009). South Koreas is, like Japan, also a mature market and its growth rates are not expected to be as high as those of China or India. Nevertheless it is an important trade partner of the EU and is therefore also included as one of the Asian countries

Total export and import flows Asia – the EU in percent of imports / exports

In this section we will be looking at the total trade flows between the EU and the four countries that have been selected in representation of the whole of Asia (China, India, Japan and South Korea).

European Union (27)

Looking at the trade partners of the European Union (EU 27), it becomes clear that Asia plays a major role in trade with the European Union. In 2008 China was the most important import partner for the European Union after the United States of America. Japan, South Korea and India follow on sixth, eighth and eleventh ranks. 16 percent, in terms of value of the imports into the European Union, come from China, 4,8 percent from Japan, 2,5 percent from South Korea and 1,9 percent from India (Eurostat, 2009).

Less important than the import role is the role of China, Japan, South Korea and India as a destination for European exports. Here China is only the fourth most important partner followed by Japan, India and South Korea on the seventh, ninth and twelfth ranks. The most important export partners of the EU are the United States (rank 1), Russia (rank 2) and Switzerland (rank 3). China receives 6,0 percent in terms of value of the exports, Japan 3,2 percent, India 2,4 percent and South Korea receives 2,0 percent (Eurostat, 2009).

Asian (China, Japan, India, South Korea)

China
As can be seen from the **Table 2** the EU is only the third most important import partner after the Japan and South Korea. Imports have further increased from 2005 till 2009 from 4,9 percent to 7,5 percent of total European exports. Exports to the EU have been increasing from 2005 till 2009 from 13,6 to 17,9 percent of total European imports. Taking import and export rankings in terms of value of the European Union together, i.e. total trade, the European Union is the most important trading partner of China.

Table 2 Asia export and import flows with the EU

Country	Export / Import	Rank of EU	Percent of total Export or Import
China[2]	Import	3	4.9
	Export	2	19.3
India	Import	1	17.1
	Export	1	21.1
Japan	Import	3	9.5
	Export	3	15
South Korea	Import		11.1
	Export		7.7

Source: Eurostat

India
The European Union is in total (exports and imports) the most important trade partner of the EU. Also here a slight imbalance between the imports and the exports can be seen here.

Japan
The European Union is Japans third most important import partner, only China (rank first) and the US (rank 2) import even more. Even though the European Union is coming in only third, it has to be said that the absolute value of the goods imported by Japan (48,0 billion Euro) is much higher than the absolute value of the goods imported to India (34.9 billion Euro) (Eurostat, 2009), where the European Union is ranked first.
Also in terms of exports the European Union is coming in third and is again overtaken by the US (rank 1) and China (rank 2). (Eurostat, 2009).

South Korea
Unfortunately there is not a lot of information about South Korea available but looking at 2006 to 2008, it becomes apparent that the importance of imports from the European Union has been declining. In 2006 the European Union had a share of 17, 4 percent of the total South Korean imports. By 2008 imports from the EU declined to 11,1 percent of total import volumes (Eurostat, 2010). Whereas the overall exports of South Korea have been increasing, a declining trend can be seen for the export share from South Korea to the EU. From 2006 to 2008, the share of the EU exports from South Korea declined from 10 percent to 7,7 percent (Eurostat, 2009). Therefore it can be assumed that in general the importance of the European Union as a trade partner of South Korea is decreasing. These values of the trade flows include goods **and** services. As only goods can be containerized, we will only be looking at the physical goods trade flows.

[2] Unfortunately there is currently only data from 2005 available; The data for the other countries is from 2009 Eurostat

Major export and import goods

Goods can be classified into SITC (Standard International Trade Classification), HS (Harmonized System Codes) or NACE (Nomenclature generale des Activites economiques dans les Communautes europeennes) categories to enable a better and easier comparison. We have chosen the SITC standard, because of the wide used in the WITS data bank of the World Bank and UNCTAD, which does not provide the option of using NACE as a product category. Even though HS standard is also well supported in the WITS data bank, but it is not aggregated enough anymore as it distinguishes between 21 categories. To estimate whether imbalances are going to change using the HS standard it would be necessary to work with a lot more different categories than using the SITC standard. Moreover this category is also commonly used by Eurostat and the European Commission and therefore a better compatibility with other publications is given. Consequently for the purpose of this paper the SITC standard seems to be best.
This section below offers a description of major export and import goods between the EU and Asia. Even though this paper aims at predicting future developments of the imbalances of containerized goods, in this section all goods whether containerized or not are included.

European Union (EU 27)

The most important import category from the world for the EU is SITC 3 – Mineral fuels, lubricants and related materials. This category represents 28,6 percent of the imports of the EU27. Followed by SITC 7 – Machinery and transport equipment with 26,7 percent. These two categories together with miscellaneous manufactured articles (SITC 8)[3], manufactured goods classified chiefly by material (SITC 6)[4] and chemicals and related products (SITC 5) make up around 85 percent of the European Union's imports (Eurostat, 2009). Export goods from the European Union differ in terms of volume from the imported goods. The most important category is machinery and transport equipment (SITC 7) representing 43,5 percent of the total exports.

Table 3: Major product categories

EU – China[5]	SITC 7, SITC 8, SITC 6, SITC 5	China – EU	SITC 7, SITC 6, SITC 5, SITC 2, SITC 8
EU – India	SITC 6, SITC 8, SITC 7, SITC 5	India – EU	SITC 7, SITC 6, SITC 5
EU – Japan	SITC 7, SITC 8, SITC 5	Japan – EU	SITC 7, SITC 5, SITC 8, SITC 6, SITC 0
EU – South Korea	SITC 7, SITC8, SITC 5	South Korea EU	SITC 7, SITC 8, SITC 5

Source: Eurostat, edited by the author

Other important export goods are Chemicals and related products (SITC 5), Manufactured goods classified chiefly by material (SITC 6) and miscellaneous manufactured articles. All

[3] Miscellaneous manufactured articles (SITC 8) include for example furniture, travel equipment like bags, articles of apparel, prefabricated buildings, plumbing, sanitary etc.
[4] Manufactured goods classified chiefly by material (SITC 6): examples are leather, paper, rubber, cork and wood manufactures excluding furniture.
[5] The first country to be named in any cell in Table 3 is the importing country

those product chategories together make up 82,9 percent of the total export of the European Union (Eurostat, 2009).

China

China is an export oriented economy these days[6]. China has been very successful in pursuing the export focus. Currently they have trade surplus of USD 20.3 billion (Dyer – Financial Times, 2010) as their exports exceed their imports. The trade surplus arises especially due to trade surplus with the United States and the European Union. The most important import and export good categories for China are:

Table 4: Most important import and export product categories China

SITC group[7]	Percent of total import	Percent of total export
SITC 7	40,6	49,2
SITC 2+4	14,8	0,7
SITC 3	12,3	1,7
SITC 5	11,1	5,2
SITC 6	10,7	15,4
SITC 8	8,4	24,9
SITC 0+1	1,7	2,8
SITC 9	0,3	0,1

Source: Comtrade 2008-2009, edited by the author

As can be seen from Table 4 above, machinery and transport equipment are the most important import goods but also export goods. Therefore it can be assumed that the European Union and China trade machinery and transport equipment with each other. Another important export good for China are miscellaneous manufactured articles which are almost 25 percent of their total exports. From 2007 to 2009 the top import products were electronic integrated circuits, petroleum oils, crude and iron ores (UN Comtrade, 2009). It becomes apparent that especially food and live animals, commodities and transactions, crude materials, inedible, except fuels, mineral fuels, lubricants and related materials are of little importance in the export patterns of China. This is due to the fact that China needs crude materials and mineral fuels for its own industry (which is why those materials are in the top import goods list) and does not have sufficient quantities to also export them. Therefore the share of imports of those commodities is higher than the share of exports. The top exports goods from 2007 to 2009 were automatic data processing machines, electrical apparatus for line telephony and reception apparatus for television (UN Comtrade, 2009). Those products fall into the category of miscellaneous manufactured articles. China mainly imports machinery and transport equipment, manufactured goods classified chiefly by their material and chemicals and related materials from the EU and exports machinery and transport equipment, miscellaneous manufactured articles and manufactured goods classified chiefly by material. In terms of volume and value goods exported to the EU exceed the imports from the EU (Eurostat, 2009)

[6] This has not been always the case, especially during the time of the Maoist introverted development strategy export was a major goal (Berden MEL Lecture, 17. March 2010)

[7] SITC 0 = Food and live animals; SITC 1 = Beverages and tobacco; SITC 2 = Crude materials, inedible, except fuels; SITC 3 = Mineral fuels, lubricants and related materials; SITC 4 = Animal and vegetable oils, fats and waxes; SITC 5 = Chemicals and related products; SITC 6 = Manufactured goods classified chiefly by material; SITC = 7 Machinery and transport equipment; SITC 8 = Miscellaneous manufactured articles; SITC 9 = Commodities and transactions;

India

India is a rather import oriented country in terms of products (though not in services) therefore it has a trade deficit. All trading partners contribute to the trade deficit as all trade partner export more to India than they import from it. Especially Western Asia, Eastern Asia and the European Union contribute to this trade deficit of India (Comtrade, 2009).

Table 5: Most important import and export product categories India

SITC group[8]	Percent of total import	Percent of total export
SITC 0+1	1,2	9,1
SITC 2+4	6,2	7,1
SITC 3	36,7	18,1
SITC 5	10,9	11,2
SITC 6	12,1	27,4
SITC 7	20,5	13,6
SITC 8	2,5	12,0
SITC 9	9,9	1,6

Source: Comtrade 2008, edited by the author

As can be seen from Table 5 the most important import good category are mineral fuels, lubricants and related materials and machinery and transport equipment. Even though industrial sector production is decreasing as a share of its contribution to GDP (Eurostat, 2009), the most important import goods category are goods that facilitate industrial activity. The top import goods from 2006 to 2008 were petroleum oils, gold and diamonds (Comtrade, 2009). The most important export categories in 2008 for India were manufactured goods mainly classified by their material and lubricants and related materials. The most frequently exported goods were petroleum oils, diamonds and articles of jewellery (Comtrade, 2009). The high importance of diamonds and articles of jewellery is due to its high value, noting that exports and imports are measured in terms of their value terms. As the measure of importance is value, those products score relatively high. As their size is rather small so that they will not fill numerous containers, these products can be neglected as this paper is aiming at predicting a growth of container shipments. India imports mainly machinery and transport equipment, manufactured goods classified chiefly by material and chemicals and related products and exports manufacture goods classified chiefly by material, miscellaneous manufactured articles and machinery and transport equipment, from the European Union. As already mentioned India has got a trade deficit which is also nurtured by the European Union which means that India imports more then it exports from the European Union in terms of value.

[8] SITC 0 = Food and live animals; SITC 1 = Beverages and tobacco; SITC 2 = Crude materials, inedible, except fuels; SITC 3 = Mineral fuels, lubricants and related materials; SITC 4 = Animal and vegetable oils, fats and waxes; SITC 5 = Chemicals and related products; SITC 6 = Manufactured goods classified chiefly by material; SITC = 7 Machinery and transport equipment; SITC 8 = Miscellaneous manufactured articles; SITC 9 = Commodities and transactions;

Japan

Japan has a slight trade surplus which continued to be stable during the last 15 years. This surplus is comprised of trade surpluses with mainly the EU, the United States and Eastern Asia. The surplus is reduced by a big trade deficit with western Asia (Comtrade, 2008).

Table 6: Most important import and export product categories Japan

SITC group[9]	Percent of total import	Percent of total export
SITC 0+1	7,9	0,5
SITC 2+4	7,4	1,3
SITC 3	35,1	2,4
SITC 5	7,2	8,8
SITC 6	8,9	12,5
SITC 7	20,8	62,0
SITC 8	11,0	7,1
SITC 9	1,7	5,4

Source: Comtrade 2008, edited by the author

The most important import goods are mineral fuels, lubricants and related materials and machinery and transport equipment. The top import goods in 2008 were petroleum gases and other gaseous hydrocarbons and electronic integrated circuits. Those 2 products fit perfectly into the two most important import categories. Japan's industry in terms of contribution to the GDP has been declining continuously since 1988 (Eurostat, 2009). Nevertheless the two most important import product categories support the industrial sector in Japan and are not consumer goods. When looking at the percentage of total exports of Japan, the percentage of total machinery and transports exported from Japan is eye-catching with 62 percent. This is by far the most important export product category of Japan. The big share of this product category can probably be explained by a well developed car industry and large multinational trade in car parts and components (e.g. by Mitsubishi, Toyota, Mitsui, Honda) and shipbuilding industry (e.g. Kawaski, Mitsubishi H.I., Mitsui S. B.) All other product categories are below 10 percent of total exports of Japan. The top export goods in 2008 were motor cars and other motor vehicles, electronic integrated circuits and micro assemblies and parts and accessories of the motor vehicles of headings (Comtrade, 2009) which fall into the category of machinery and transport equipment. Japanese imports from the EU mainly machinery and transport equipment (34,5 percent), chemicals and related products and miscellaneous manufactured articles. Exports from Japan to the European Union are determined by machinery and transport equipment (71,1 percent), miscellaneous manufactured articles and chemical related products. Japan and the European Union have their comparative advantages in similar products but nevertheless trade also in those product categories. The theory of David Ricardo on the comparative advantage and how it creates trade does not explain the phenomena of intra industry trade. Paul Krugman et. al (1991) argued that intra industry trade offers countries the advantage to benefit from economies of scale as they focus on certain industries but at the same time enlarge product variety by importing goods from the same industry from another country.
The volume of trade in terms of value grew marginally from 2004 to 2007 but dropped in 2008. This dip can probably be attributed to the economic crisis in 2008 as no shifts in traded products traded can be observed.

South Korea

South Korea had a small trade deficit from 1994 – 1997, and from 1998 onwards a small trade surplus until the year 2008 where South Korea had again a small trade deficit. The change from trade deficit to surplus in 2008 can be attributed to the Asian Crisis of 1997 that caused large balance of payments corrections and income reductions combined with an exchange rate depreciation, leading to a surge in exports and drops in imports. This small trade deficit is mainly due to two big trade deficits with western Asia and the developed Asian–Pacific countries. This huge deficit is compensated by some trade surpluses with the European Union, the United States, Latin America and the Caribbean and Eastern Asia (Comtrade, 2009).

Table 7: Most important import and export product categories South Korea

SITC group[10]	Percent of total import	Percent of total export
SITC 0+1	4,0	0,9
SITC 2+4	6,8	1,2
SITC 3	32,7	9,1
SITC 5	8,4	10,1
SITC 6	14,9	14,1
SITC 7	26,3	55,4
SITC 8	6,6	8,8
SITC 9	0,3	0,3

Source: Comtrade 2008, edited by the author

The two most important import goods categories are mineral fuels, lubricants and related materials and machinery and transport equipment. The distribution of the importance of import goods looks very similar to the distribution of the Japanese imports as also all the other product categories have a share of the total imports smaller than 10 percent. The top import goods from 2006 to 2008 were petroleum oils, electronic integrated circuits and micro-.assemblies and petroleum gases (Comtrade, 2009). Those products are obviously used for the industrial sector its productions. The most important export product category is machinery and transport equipment. South Korea has a strong brand name in shipbuilding and until the middle of 2008, the demand for ship capacity was very high. Furthermore also the car industry (e.g. Kia, Hyundai, Daewoo) in South Korea is well developed and contributes to the large export volumes. This argument is supported by the ranking of the top export products from 2006 to 2008. Most important were motor cars and other vehicles designed for transport, electronic integrated circuits and micro-assemblies and petroleum oils.

South Korea imports from the EU mostly machinery, transport equipment and chemical products, though the European Union imports almost twice as much machinery from South Korea than South Korea from the European Union. South Korea exports more than three times as much transport equipment to the European Union as the European Union to South Korea. As those are the most important trading goods it becomes apparent that there is a trade imbalance between the European Union and South Korea. Only the product category chemicals and chemical products counteracts this trend. The European Union exports more than twice as much chemicals to South Korea than South Korea to the European Union. In

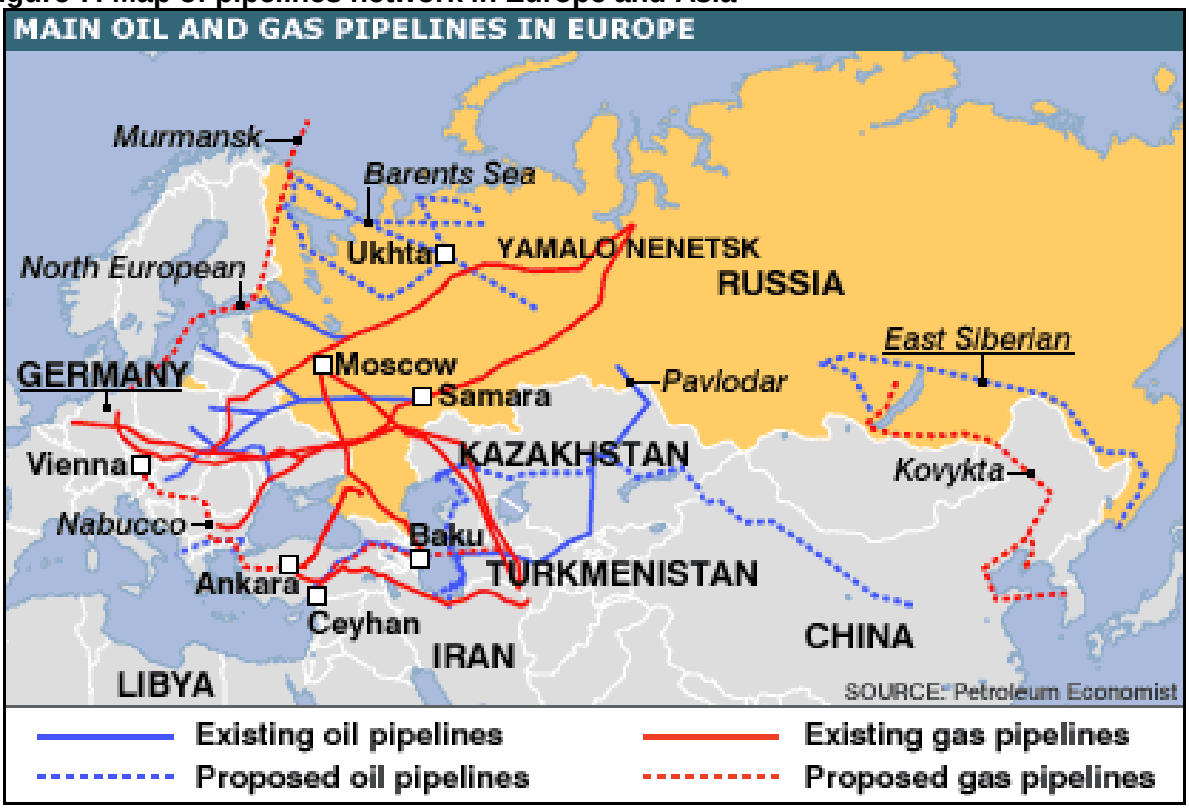
[10] SITC 0 = Food and live animals; SITC 1 = Beverages and tobacco; SITC 2 = Crude materials, inedible, except fuels; SITC 3 = Mineral fuels, lubricants and related materials; SITC 4 = Animal and vegetable oils, fats and waxes; SITC 5 = Chemicals and related products; SITC 6 = Manufactured goods classified chiefly by material; SITC = 7 Machinery and transport equipment; SITC 8 = Miscellaneous manufactured articles; SITC 9 = Commodities and transactions;

absolute terms, however, chemicals do only slightly leverage the trade imbalance between South Korea and the European Union.

Modal Split EU – Asia

To find out which percentage of the goods is actually shipped by seagoing vessel between Asia and the EU, it is necessary to determine the modal split, to be able to exclude the percentage of those goods that transported by any other mode, as those contribute only partly to the imbalance. Other modes contribute only partly to the imbalance of goods shipped via sea between Asia and Europe because other modes of transport represent an alternative to the sea route. In theory if the usage of alternative modes eastbound (EU – Asia) would stop, this could lead to a reduction of the imbalance on the sea rout EU – Asia.

Figure 7: Map of pipelines network in Europe and Asia



Source: BBC

The modal split is the distribution of the total traffic to its modes of transportation (Schnieder, 2007). The relevant modes of transport between EU and Asia are: rail, road, air, sea, pipeline and telecommunication. Telecommunication (including the internet) is used to transport information but not physical goods. Therefore it will not be of relevance to this study as it does not affect container flows. Pipelines mainly transport crude oil, natural gas and other oil products in large quantities. As could be seen from the analysis of the main goods transported above, crude oil, natural gas and other oil products in large quantities do not play an important role in the trade between Asia and the EU, let alone in containerised trade, since these are typically bulk products. This is mainly due to the fact that none of the countries representing Asia or the European Union are large producers of natural gas or crude oil. Oil products and chemicals play a role in the trade between Asia and the EU but the products are rather

specialized and are therefore not traded in large quantities that would support the use of a pipeline. Furthermore as can be seen from the map of pipelines above, there is no existing pipeline for natural gas or oil yet connecting the EU and Asia directly.

Furthermore it is not clear how much of the oil products and chemicals transported from the EU to Asia are shipped in containers and not in chemical tankers. The lack of sufficient volume to justify the transport via pipeline and the lack of a directly connecting pipeline, does not support the usage of a pipeline as a transport mode and leads to the conclusion that this mode of transport is not of great importance to this study.

Factors affecting the choice of the mode of transportation

Various factors affect the decision which mode of transport to use. The most important are characteristics of the good, volume to be shipped, transit time, cost of product and cost of transportation (McKinnon, 1989).

Characteristics of the goods: The characteristics of goods determine the transport mode. Characteristics to be taken into consideration are: value, urgency, perishableness and size. High value goods, goods that are urgently needed or can only survive a short transit time will be probably transported by plane. Though there have been some technical developments that provide transport companies with the opportunities to transport certain perishable goods also via containers. An example are flowers that used to be shipped by air but are now being able to be sent in refrigerated containers. Furthermore, size also plays an important role. Especially oversized goods, independent of their urgency and costliness cannot be transported by plane and need to be transported via sea or land.

Volume to be shipped: Volume to be shipped goes hand in hand with size and cost of transportation, because when big volumes have to be shipped they do not fit into a single plane or truck anymore which increases costs drastically. As a result, for large volumes the train or vessel is more suitable if the length of the transit time does not play a dominant role.

Transit time: Transit time plays a vital role, because the longer it takes to deliver the goods, the more goods have to be on stock which increases inventory costs. Secondly also the stability of the transit time has an effect, as a high variability of the transit time leads to higher inventory costs. Therefore, goods where the delivery needs to be on schedule will be either delivered by train or plane as those have least variability in transit times.

Value of product: The value of the product is important because of its inventory costs. The higher the value of the product, the fewer products a company would like to have on stock, as the stock represents capital that is tied. Furthermore products on stock run the risk of getting outdated, stolen or out of order.

Cost of transportation: In general the cost part of transportation in the final product has been continuously declining and is estimated to be around 3 percent (Chopra & Meindl, 2007). Nevertheless, transport by plane costs around 5 times as much as transport by sea (Chamber of Commerce of the United States, 2006) and is therefore worth being taken into consideration.

Obviously air transportation distinguishes itself, especially by short transit times, transport costs and volumes to be transported. A study of the Chamber of Commerce of the United States (2006) says that the average transit time from Shanghai to Western Europe is 5 days by plane whereas the transit time by vessel takes 28 days. Transport costs may be directly

related to the transit times, because according to this study air transportation is five times as expensive as sea transportation.

Therefore it can be assumed that air freight and sea freight operate in different transport markets as they are highly imperfect substitutes and only in exceptional cases one transport mode might be able to capture cargo from the other transport mode. As a result in this research, air transportation will not be included in the modal split analysis of the cargo transported to Asia from the EU and the other way round.

Characteristics and Routes

Road

Transportation by truck offers flexibility as it is not bound to a certain schedule. Furthermore it is the only mode that is able to offer door to door transportation without a change of transport mode. The transit time of trucks is on average one week shorter than the transit time of seaborne transportation between Asia and EU but the freight rates are 3-4 times higher than the freight rates of a vessel (US Chamber of Commerce, 2006). The option of transporting goods by truck to and from China exists for several years as the border between Kazakhstan and China has been opened for commercial trade. This kind of transport has gained more viability as infrastructure has improved and customs procedures have been streamlined (US Chamber of Commerce, 2006). A drawback though is that the usage of foreign trucks in China is not allowed, therefore containers have to change the vehicle at the Kazakh border to a Chinese vehicle.

Table 8: Relevant routes for road transport for Euro-Asian cargo

1. Route E-106, E-22: St. Petersburg (port) – Moscow – Nizhny Novgorod – Ekaterinburg – Omsk – Vladivostock (Port)
2. Route E – 85, E – 30, E – 125: Brest – Moscow – Nizhny Novgorod – Ufa – Chelyabinbsk – Kurga – Petropavlovsk – Astana – Almaty (connects with route 1 and 3)
3. Route E – 40, E – 013, E – 012: Almaty – Sary-Ozek – Khorgos – Urumqi – Xi'an – Lianyungang (port) / Shanghai (connects with route 2)

Source: US Chamber of Commerce, 2006

Rail

Transport by rail is less flexible as trains operate according to schedules. Furthermore rail requires prehaulage from the shipper to the train and onhaulage to the receiver by truck. On average it is twice as expensive as sea transportation and requires around 35 days transit time, which is approximately one week longer than sea transportation according to the US Chamber of Commerce (2006).

The main rail connection between the EU and Asia is the Transmongolian Railway (TMR). The TMR connects the EU with China. Several sources have reported that the number of containers transported on the TSR is rising (US Chamber of Commerce, 2006). The TMR is mainly used by Korean shippers and a few Chinese shippers which mainly ship home appliances such as vacuum cleaners and refrigerators. Furthermore, also automobile parts

and chemical products are shipped. In principal, containers can be transported from China to Western Europe within 15 days. In practice it usually takes longer due to customs procedures and the change of gauge width in Russia and some other former Soviet Union countries (e.g. Belarus) and the change of gauge width from Mongolia to China. Harmonisation of these route specifications, like the gauge width change, are very difficult and costly. This will therefore probably not happen in the near future, implying that a reduction of the transit time can – in the short run – only be achieved by an improvement of the customs procedures.

Sea

Seaborne transportation can be flexible or inflexible depending on whether goods are shipped in bulk or in containers. Bulk ships are quite flexible as they can be chartered for a voyage like a taxi. Containers are transported by liner shipping companies which operate according to schedules, therefore they are rather inflexible. Like the rail transportation, seaborne transportation also requires pre- and onhaulage by truck. The major advantage of seaborne transportation is its low freight rate. The transit time from the EU to Asia is around 27 to 30 days (Maersk Line, 2010)[11].

The sea route Asia – Europe is one of the main three sea routes in the world. The other two are the transatlantic and transpacific routes. The ports that are called on this route depend on the arrangements of the relevant liner company. The biggest carrier in the world Maersk calls for example in the ports specified in Table 9:

Table 9: Asia - Europe routes Maersk

Route AE1:	Felixstowe – Port Said East – Rotterdam – Hamburg – Bremerhaven – Port Tangier – Suez Canal – Jeddah – Jebel Ali Dubai – Da Chan Bay – Ningbo – Shanghai – Kaohsiung – Yantian - Hong Kong
Route AE2:	Bremerhaven – Hamburg – Rotterdam – Felixstowe - Suez Canal - Tanjung Pelepas – Singapore – Busan – Xingang – Dalian – Qingdao – Kwangyang – Shanghai
Route AE3:	Izmit Korefezi – Ambarli Port (Istanbul) – Constanta – Ilyicheysk – Odessa – Bosporus – Damietta – Port Said East – Suez Canal – Port Klang - Tanjung Pelepas – Dalian – Xingang – Busan – Shanghai – Ningbo – Taipei – Chiwan - Yantian
Route AE6:	Barcelona – Valencia – Algeciras – Port Tangier – Malaga – Suez Canal – Tanjung Pelepas – Vung tau – Yantian – Hong Kong – Los Angeles
Route AE7:	Rotterdam – Felixstowe – Bremerhaven – Algeciras – Malaga – Dunkerque – Suez Canal – Yantian – Hong Kong – Shanghai – Ningbo – Xiamen
Route AE8:	Le Havre – Hamburg – Rotterdam – Zeebrugge – Suez Canal – Port Klang – Singapore – Ningbo – Shanghai – Yantian
Route AE9:	Felixstowe – Bremerhaven – Rotterdam – Le Havre – Port Tangier – Suez Canal – Salalah – Colombo – Port Klang – Singapore – Laem Chabang - Tanjung Pelepas
Route AE10:	Zeebrugge – Hamburg – Gdansk – Gothenburg – Aarhus – Bremerhaven – Rotterdam – Suez Canal – Singapore – Hong Kong – Kobe – Nagoya – Yokohama

[11] Maersk Homepage: http://www.maerskline.com/appmanager/maerskline/public?_nfpb=true&portlet_schedules_byLocation_1_actionOverride=%2Fportlets%2Fschedules%2FschedulesByLocation%2FrouteLookup%2FsaveRouteLookup&_windowLabel=portlet_schedules_byLocation_1&_pageLabel=page_schedules_location

Route AE11:	Genoa – Fos sur Mer – Gioia Tauro – Damietta – Port Said East – Suez Canal – Salalah – Port Klang – Singapore – Lianyungang – Qingdao – Shanghai – Fuzhou – Hong Kong – Chiwan – Yantian
Route AE12:	Piraeus – Koper – Rijeka – Trieste – Damietta – Port Said East – Suez Canal – Jeddah – Port Klang – Singapore – Shanghai – Busan – Hong Kong - Chiwan
Route AE21:	Hamburg – Rotterdam – Zeebrugge – Le Havre – Marsaxlokk – Suez Canal – Khor Fakkan – Port Klang – Yantian – Dalian – Xingang – Shanghai – Xiamen – Hong Kong
Route ME1:	Felixstowe – Zeebrugge – Bremerhaven – Rotterdam – Algeciras – Suez Canal – Aqaba Joran – Jeddah – Jebel Ali Dubai – Jawaharlal Nehru – Pipavav

Source: Maersk, 18 July 2010

Share of volume transported by transport mode

As already mentioned, only three modes of transport (sea, road and rail) will be taken under consideration here, because as already argued only those modes can substitute each other quite well in comparison to the other modes of transportation which therefore operate in other market segments (e.g. air, pipeline).

Table 10: Modal split of full containers between China and EU (Mio full TEUs)

	Westbound	Percent	Eastbound	Percent	Total
Sea Transportation	4,5	95,24	2,5	95,06	7
Rail	< 0,2	4,2	< 0,1	3,8	< 0,3
Road	< 0,03	0,006	< 0,03	1,1	< 0,06

Source: U.S. Chamber of Commerce, 2006

The study of the US Chamber of Commerce finds an overwhelming prevalence of the seaborne transportation container transportation. Even though the data used is from 2006, it can be assumed that the overall model split has not changed much.[12] There have been no trends indicating that a dramatic shift of cargo towards another transport mode has taken place. The modal split does not vary across directions which can be seen from almost the same percentages east- and westbound. This high prevalence of seaborne container transport can be explained by the low freight rates, its reliability and its ability to transport large volumes.

Degree of Containerization

To find out about the future of imbalances in the container trade between the EU and Asia, it is a necessity to include also the degree of containerisation on this trade route. Unfortunately there is not data available of the degree of containerisation related to single trade routes. Not all goods can be put into a container because of their physical limitations, related to, for example, weight, size or special needs. According to Notteboom and Rodrique (2009) containerisation worldwide is still increasing and can probably reach a maximum of 75 percent

[12] According to the Russian railway authorities the current capacity of the TMR in the Russian part is 0.9 Mio TEU per year of which 0.4 Mio TEU can be international transit. As can be seen from Table 10 currently less than 100.000 TEUs eastbound and less than 200.000 TEUs westbound are transported every year. Therefore in the westbound direction volumes could at maximum double and westbound quadruple until they reach the capacity limit. The capacity limit in comparison to the total container volume transported between the EU and Asia that is so low that no major shift from sea to rail is feasible. There have been plans to enlarge the railway connection to Vienna with the Russian gauge width but so far no steps towards implementation have been taken. The capacity limitations do not really play an important role in road transport but as long as the freight rates for trucking are 6-7 times higher than for transport by vessel, there will not be a drastic shift towards trucking.

of total trade. Haralambides (MEL Lecture, Shipping Economic and Policy, 2010) mentioned that the current degree of worldwide containerisation is probably around 60 percent, which means that a further increase is to be expected.

Especially less developed ports are not yet able to handle container trade (e.g. Port of Pepel in Sierra Leon, Port Aseba Eritrea). This absence of container trade decreases the worldwide rate of containerisation. The route Asia – Europe is one of the three most important trade routes and main ports on both sides are known for their levels of technology, efficiency and professionalism. Moreover as has been shown in the section before, the major export products from the EU are products classified as SITC 5, 6, 7, and 8. As most of them can physically be transported in containers, containerisation is an ongoing trend and as container transport adds to an increase in efficiency and therefore lower costs, it can be assumed that the degree of containerisation is quite high. To quantify the degree of containerisation, the author will provide some calculations a little later on.

The study from Notteboom and Rodrigue (2009) also shows the degree of containerisation of certain ports in the EU. Three ports in Northern Europe have been selected for this research: Antwerp, Hamburg and Rotterdam. According to this study Hamburg, in 2005, had the highest degree of containerisation of 96,4 percent. Second of these three ports was Rotterdam with 83, 1 percent and third was Antwerp with 77,6 percent containerisation. Unfortunately there is no data available on the degree of containerisation of Asian ports. But based on own calculations with some assumptions below, I attempt to calculate the degree of containerisation both east- and westbound, between Asia and the European Union.
As the kinds of goods shipped eastbound and westbound differ, it would be possible that the degree of containerisation is varying between the two sides. This argument was highlighted by Mr. Willeumier (2010) from the Port of Rotterdam. He could though not give any certain percentages of the degree of containerisation of the trade route between the EU and Asia but he assumed that the degree of containerisation differs between Asia – the EU westbound and the EU – Asia eastbound. Furthermore he assumed that the degree of containerisation could be 60-70 percent westbound and less on the eastbound side. Additionally looking at the main products that are traded between the EU and Asia (machinery and transport equipment, miscellaneous manufactured products, chemicals and other related products and manufactured goods classified chiefly by material) it becomes obvious that in certain product categories there has to be a high degree of containerisation as a lot of those products can already be containerised today.

To really receive a precise degree of containerisation for the SITC groups 5,6,7 and 8 it would be necessary to know, what exactly is in the container, to be able to classify it into one of those product categories. Even the ports themselves do not have this information. Only the customs have detailed information on the content of every container that passes through a port. Unfortunately the customs are not authorized to pass on this information. Therefore we will make an attempt to roughly estimate the degree of containerisation for each product category.

SITC 5: It is in particular hard to estimate the degree of containerisation among chemical products, as some chemicals need special treatment (cooling, pressure etc...). Moreover shipment of chemicals in container is only suitable if they have to be shipped in small quantities and if they are packed in barrels or drums. Moreover all those chemicals that are shipped in tank containers or in reefer containers need to be excluded from this study because even though they contribute to an imbalance of containers shipped between Asia and the EU, they have different freight rates. Moreover the supply (TEU capacity available) is also

restricted as tank containers cannot be stored everywhere in the vessel and some reefer containers a power supply which is not available for every container on the ship.
As already mentioned the degree of containerisation may vary between eastbound and westbound Asia – EU. As there is a greater need to fill up containers in the EU, to balance the container flows with Asia, it can be assumed that the degree of containerisation is higher on the eastbound route than on the westbound route. Larger quantities are shipped via chemical carrier; therefore it can be assumed that the percentage of containerised chemicals of total chemicals shipped is rather small. Therefore a crude estimate of the degree of containerisation eastbound is around 20 percent and on the westbound side 14 percent.

SITC 6: SITC 6 are products classified by their material. Those can be leather bags, metal items (cutlery), wooden craft or glass items. These things fit physically in terms of size and environment requirements perfectly into a container. There are only two other alternatives to transport them: either by general cargo ship, which is not commonly in use anymore on the Asia – EU route, or by plane. Goods chiefly classified by their material could also be jewellery or gemstones which are of high value and therefore need to be transported fast. Taken these factors into account it can be assumed that the degree of containerisation on both routes is high. The author does not see any reason why the degree of containerisation for those products could differ according to trade route (eastbound, westbound). A crude estimate of the containerisation rate is 80 percent.

SITC 7: This product category includes machinery and transport equipment. This is quite a wide field. Example for products are: nuclear reactors, freezers, agricultural machines, air condition machines, cars, airplanes and rail equipment. Most of the goods names are not containerisable due to their size. But the product category includes many more goods which are of smaller size and could be transported in a container. As cars are for both Asia and the EU a major export good and they are not transported in containers but in car carriers it can be assumed that the degree of containerisation is lower than those of the product categories 6 and 8. Moreover a middle sized machinery without special requirements also has the option to be transported by a general cargo vessel. Even though they are not commonly in use on the Asia – EU route they might catch some cargo which reduces the rate of containerisation. As already said, the eastbound route is expected to have a higher degree of containerisation to make up for the imbalances of trade. Therefore it can be assumed that more goods classified as SITC 7 are shipped in a container from the EU to Asia than the other way round. A crude estimate for the westbound route is a level of 58 percent of containerisation and 64 for the eastbound route.

SITC 8: This product category (miscellaneous manufactures) includes any kind of manufactured goods that is not included in any other product category. Examples for this product category are toys, sports equipment, furniture, shoes and umbrellas. As all of these products fit into a container it can be assumed that also here the level of containerisation is high. Therefore the degree of containerisation is estimated to be around 80 percent on both trade routes (eastbound and westbound) for the SITC 8 product category.

Total trade – degree of containerisation

To find out about the degree of containerisation between Northern Europe and Asia for total trade on both legs, I used to data sets to calculate 3 scenarios for this research. The central agency for statistics of the Netherlands (CBS) provides the first data set about the amount of goods that are shipped from Antwerp, Hamburg and Rotterdam to China, India, Japan and

South Korea and also in the other direction. Moreover the goods volume is divided into different goods categories (e.g. liquid bulk, container, break bulk etc...). To find the degree of containerisation on the route EU – Asia east and westbound I aggregated the volumes, so that the result is the trade flows of goods transported by vessels from EU to Asia and back divided into container and non – container shipments. CBS offers data from 1997 to 2008. Especially in the 90s data points for non-containerized goods are missing. This though does not affect the calculations about the degree of containerisation negatively, as only total volume handled and containerized volume handled are necessary for these calculations. Therefore the result is not influenced by the lack of data in other cargo categories.

Table 11: Scenario 1: Total cargo and containerized cargo WB in 1.000 tons

CARGO	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Cont. WB	5.353	5.859	7.040	10.341	10.846	12.435	15.734	19.193	22.408	26.231	30.912	31.156
Total WB	11.197	14.606	14.869	15.678	15.724	16.238	19.717	23.376	28.291	32.913	39.429	39.161

Source: data CBS, calculated by the author

Table 12: Scenario 1: Total cargo and containerized cargo EB in 1.000 tons

CARGO	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Cont. EB	5.186	5.053	6.783	10.870	11.655	12.755	14.040	17.194	18.529	20.487	20.863	20.324
Total EB	13.392	12.255	15.489	14.579	14.770	16.901	18.904	21.410	22.234	23.904	24.264	24.801

Source: data CBS, calculated by the author

Table 13: Scenario 1: Degree of containerisation in percentage

Cargo	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Cont. EB	38,72	41,23	43,79	74,56	78,91	75,47	74,27	80,31	83,34	85,71	85,98	81,95
Cont. WB	47,81	40,11	47,35	65,96	68,98	76,58	79,80	82,11	79,21	79,70	78,40	79,56

Source: data CBS, calculated by the author

The containerisation increase from 1997 to 2000 is very sharp, as it almost doubled. This steep increase can be explained by the ongoing containerisation and further development in terms of capacity and efficiency of container terminal. A good example is the port of Hamburg as in 1999 the container terminal Eurogate and in 2002 the container terminal Altenwerder started to work which of course increased the handling capacity for containers. By offering more and more capacity for container handling, container handling became the most dominant sector in all three ports (Hamburg, Rotterdam and Antwerp).

Surprisingly according to these calculations the overall degree of containerisation eastbound is higher than the degree of containerisation westbound. This is exactly the opposite of the assumptions of Mr. Willeumier that the degree of containerisation differs between eastbound and westbound EU - Asia. This tendency can maybe be explained with the imbalances of containers. As there is an ongoing lack of cargo eastbound, liner shipping companies make a bigger attempt to containerise cargo. A good example is waste paper and coffee beans. In the past it used to be shipped in bulk but as the freight rate were (and are) very low and the container offers better and easier handling of the cargo, those commodities started to be shipped in containers (interview Mr. van Ravesteyn, 2010). As there is this motivation to make goods shipped from the EU to Asia containerisable to balance the imbalances of goods

shipped between Asia and the EU a little bit more, the consequence is that the percentage of containerisation eastbound is slightly higher than the containerisation westbound.

The second data set is provided by the biggest liner shipping company, Maersk. It shows data on the total import volume in metric tons and the total import volume of TEUs into the Netherlands by 7 different regions of the world (Europe, Latin America, Unidentified, Middle East and South Asia, North America, Asia Pasific and Africa). None of those regions fits perfectly the four Asian countries looked at. Therefore second scenario is conducted with the volumes of "Pacific Asia" which does not include India and the third scenario is conducted with "Pacific Asia and Middle East and South Asia" which also includes India.

To calculate the degree of containerisation a vital variable is the weight of the container as the weight (metric tons) of the total imports and exports has to be transferred into containers (TEUs). According to Mrs. Halmton (Interview, Maersk) an average container eastbound is between 24 and 25 tons where as an average TEU westbound is between 16 and 18 tons. To include the trend of increasing containerisation on the eastbound EU – Asia route, in 2000 an average weight of 19 metric tons was used and increased than gradually to 24 metric tons in 2009. This increasing containerisation contributes to heavier containers, as former bulk products with a high weight are now sent in containers as well (e.g. waste paper). To transfer metric tons into TEUs on the westbound route, an average weight of 18 tons is used.

Table 14: Scenario 2 Degree of Containerisation (Asia Pacific)

Eastbound	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Mio TEU	0.343	0.343	0.394	0.441	0.444	0.473	0.490	0.590	0.556	0.633
Percentage	61.09	64.00	76.12	72.53	85.50	84.44	87.76	84.65	89.84	90.00
Westbound										
Mio TEU	1,388	1,388	1,361	1,444	1,388	1,444	1,388	1,500	1,388	1,111
Percentage	36.00	39.60	42.61	48.46	58.32	67.85	71.28	73.33	79.20	81.00

Source: Maersk Line, Trade and Marketing NLC, edited by the author

As can be seen from Table 14 the eastbound route Asia – EU has again like in scenario 1 a higher degree of containerisation. It starts though at a higher level (61 percent) and goes up to 90 percent containerisation. A containerisation degree of more than 90 percent seems to be though a little too high.
The degree of containerisation and its development in the route Asia – EU westbound is very similar to scenario 1. It starts again at a rather low level (36 percent) and increased to more than 80 percent.

In the third scenario the region "Middle East and South Asia" was included, to also cover India which was not included in the second scenario. The weight eastbound rose again from 19 metric tons in 2000 to 24 tons in 2009 and for the westbound route 18 metric tons were used to convert the weight of the import into the Netherlands into TEUs.

Table 15: Scenario 3 Degree of Containerisation (Asia Pacific, Middle East and South Asia)

Eastbound	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Mio TEU	0.447	0.447	0.510	0.550	0.522	0.590	0.600	0.726	0.743	0.812
Percentage	71.53	82.71	78.43	74.55	95.65	96.46	98.33	83.32	83.39	92.31
Westbound										
Mio TEU	3.529	3.529	3.205	3.470	3.235	3.352	3.352	3.000	2.882	2.470
Percentage	17.00	17.57	21.83	23.05	30.91	33.25	35.19	45.00	46.84	44.52

Source: Maersk Line, Trade and Marketing NLC, edited by the author

As can be seen the degree of containerisation eastbound is like in the other two sencarios very high up to 98 percent. 98 percent seem to be too high in reality. The high degree of containerisation might be due to the usage of a weight factor of 23 metric tons. Very interesting is the degree of containerisation westbound. It is much lower than in the other two scenarios. This rather low degree of containerisation is probably caused by the other countries of the Middle East and South Asia. Some of those countries (e.g. Saudia Arabia, United Arab Emirates, Qatar etc...) are major oil exporting countries. As their major export product is oil which is shipped in large quantities and cannot not be transported in containers, the degree of containerisation is rather low. As probably the degree of containerisation westbound in scenario three is biased by the oil exporting countries, and India is not a major oil exporting country, the degree of containerisation is not likely to be representative for India representing.

Table 16: Degree of containers shipped via sea

Modal split	Westbound	95,24 %	Eastbound	95.06 %
Containerisation Scenario 1	Westbound	79.59 %	Eastbound	81.95 %
Containerisation Scenario 2	Westbound	81.00 %	Eastbound	90.00 %
Containerisation Scenario 3	Westbound	44.52 %	Eastbound	92.31 %

Source: own calculations based on Maersk and CBS data

The idea of Mr. Willeumier (Port of Rotterdam) that the westbound route Asia – EU has a higher degree of containerisation is not supported by any of the three scenarios. According to all three scenarios it is actually the other way round (eastbound route has a higher degree of containerisation). The result of scenario three for the westbound route will be excluded as already explained above as it is probably strongly influenced by the oil exporting countries in the Middle East and is therefore not very representative for the four Asian countries Japan, South Korea, China and India. There is evidence that the degree of containerisation on the westbound route is around 80 percent. Therefore together with the result from the modal split of 95,24 percent of sea transport, a total of 76.19 percent of the goods are shipped via seagoing container vessel westbound.
It is obvious that the eastbound route has a higher degree of containerisation. Although a degree of 90 percent seems to be a bit high. As the results of all three scenarios are quite close within a range of 10.36 percent points, their mean of 88.07 percent will be used. Together with the result of the modal split of 95.06 percent, 83,74 percent of the total amount of goods transported in a container via a seagoing vessel.

Table 17: Result modal split and degree of containerisation

Westbound		Eastbound	
95.24 %	80 %	95.06	88.07
76.19 %		83.74 %	

Source: edited by the author

For the further proceedings in this paper a percentage of 76.19 westbound and 83.74 percent eastbound will be used.

Degree containerisation SITC category

Table 18: Result modal split and degree of containerisation per SITC category

SITC group	Westbound		Eastbound	
SITC 5	95.24 %	14 %	95.06 %	20 %
	13.33 %		19.01 %	
SITC 6	95.24 %	80 %	95.06 %	80 %
	76.19 %		76.05 %	
SITC 7	95.24 %	58 %	95.06 %	64 %
	55.24 %		60.84 %	
SITC 8	95.24 %	80 %	95.06 %	80 %
	76.19 %		76.05 %	

Source: edited by the author

In this table can be seen as a result of the modal split and the crude estimations of containerisation per SITC category, the total degree of containerisation per SITC category. Due to the low estimated degrees of containerisation in chemicals (SITC 5) and machinery and transport equipment (SITC 7) the overall degree of containerisation is in those categories rather low. Those product groups shown here are the major product categories traded between the EU and Asia. The degrees of containerisation of all product categories (SITC 0-9) amount to the total degree of containerisation, which will be used for further proceedings, as it seems to be more reliable than the individual SITC degrees of containerisation.

Assessment of the economical potential of EU27 and Asia

In this part, we aim to give an overview of selected macroeconomic parameters that should give an indication about the future potential of trade flows. The parameters have been selected according to availability of data, ability of indicating trade developments and are adjusted according to the country specifications and situations. Short term parameters have been excluded on purpose (e.g. inventory levels, and sales to inventory ratio) as this thesis aims at forecasting long term trends in trade flows. The ambition of this part is to be able to see a trend in trade flows in each country which derives its importance from the close correlation between trade and container volumes shipped.

To assess the openness to trade two publications are used: The “Doing Business” index of the World Bank (2010) and the “Enabling Trade Index” of the Economic Forum (2010). The Doing Business Index consists of 10 different categories but only two have been chosen to evaluate the potential international trade of China, India, Japan and India. Those categories are “trade across borders” and “enforcing contracts” as those seem to be good indicators of openness of the market and whether the legal circumstances may support international trade. The second index (Enabling Business) consists of 4 subcategories: market access, border administration, transport and communication infrastructure and business environment. Here the main focus will lie on the indicator market access.

Japan

Japans GDP is mainly dominated by the contributions of the service sector. From 1988 to 2005 the service sector increased from 57,8 percent to 68,6 percent. The industrial sector has seen an opposite trend since 1988. Its contributions to the GDP declined from 39,4 percent to 29,9 percent. This could be an indication that the level of exports of goods and material of Japan might go down. Though when looking at its good exports to the world from 2006 to 2008 an increase from 478,3 to 500,6 Billion Euro (Eurostat, 2009) can be observed. A similar trend can be seen in the level of imports of Japan from the world.

When looking at the volume of the GDP a constant rise can be seen. From 2002 to 2008 its GDP rose from 3.417,2 to 4.316,3 Billion USD (OECD, 2010). It has been forecasted that there should have been a dip of the GDP in 2008 (OECD, 2010) due to the economic crisis, though this dip did not occur and the GDP continued to grow. A growth in the GDP can be an indication for a growth of trade. We do not know which factor of the GDP (consumer spending, investments, government spending or exports – imports) is mainly responsible for the growth of GDP but as the percentage of international trade in goods and services of the GDP is rising from 2000 till 2008 (OECD, 2010) we can assume that trade of goods might be impacted positively.

A good indirect indicator for trade is the disposable income of a household. If it grows the level of consumption might increase which may lead to an increase of imports as demand is rising. The disposable household income in Japan showed a slight growth from 2004 to 2007 (from 0,8 to 1,7 percent) (OECD, 2010). Before that the disposable income faced twice in 2001 and in 2003 a reduction. Another important aspect is the average saving rate. The household saving rate is measured as a percentage of the household disposable income. From 2000 till 2005 it decreased from 8,86 percent to 3,85 percent (OECD, 2010). This represents a quite drastic reduction and might have had a positive impact on consumption and therefore also on imports. From 2005 till 2006 the savings rate went down but increase again in 2007 (OECD, 2010) In total the savings rate went down but the economical crisis might have increased the savings rate again as people feel insecure during crisis and start saving more which would harm consumption and the level of imports. This trend is supported by the fact that the household spendings from 2002 till 2007 increased constantly but dropped in 2008 (OECD, 2010).

Other factors of the future trend of trade are the previous import and export of goods developments. It can be seen that from 2000 till 2008 both increased. In absolute terms imports of goods increased from 379,67 billion USD in 2000 to 762,53 billion in 2008 (OECD, 2010). On a year to year basis it can be seen that the increases have been quite substantial ranging from 8,1 to 15 percent from 2004 till 2008 (Eurostat, 2009). Exports of goods increased from 479,22 billion USD in 2000 to 781,41 in 2008 (OECD, 2010). On a year to year

basis it can be seen that from 2004 till 2006 there have been relatively high growth rates ranging from 5,3 to 8,3 percent. Though since 2007 these growth rates have declined to only 1,7 percent in 2007 and 2,7 percent in 2008 (Eurostat, 2009) Obviously when looking at the year to year increase it can be seen that the economic crisis had an impact on the growth rate of exports but not at the level of imports. The trade between the European Union and Japan is declining. Especially the export rate from the EU to Japan is falling due to several reasons. Firstly the low economic growth rate of Japan in comparison to other emerging countries affects the export level of EU27 to Japan. Secondly the intra-Asia economic integration has been fostered during the last years. This leads to an increase in intra-Asia trade and has a negative effect on the level of trade with the EU. This increase of importance of intra-Asia trade can be seen in the rising number of free trade agreements (FTAs) between Asian countries. Finally multinational companies have built their supply chains in Asia not taking borders much taking into account (Francois, 2010). This has the effect that even though goods or parts of goods are produced in Japan they are shipped first to another Asian country to be modified or assembled and then shipped to the European Union. As a result this is not seen as a Japanese export which reduces the export rate from Japan to the EU27.

Assessment of openness to trade

- Doing Business Index (World Bank, 2010)

In total Japan was ranked 15th from 183 countries in its ease of doing business. The index consists of 10 different categories. In the category "Closing business" Japan is the world leader and is therefore ranked first. Ironically Japan is only ranked 91st in the category "Starting a business" and is as a result just within the best 50 percent. Negatively outstanding is Japan in terms of paying taxes as it is ranked 123rd. Here it can be seen that there is still enough potential to increase the ease of doing business in Japan. Two categories will be looked at more closely:

Trading across borders: In this category Japan is ranked 17th of 183 participating countries. One can assume that this is a good result and that this would indicate an easy market access.

Table 19: Japan Doing Business Trade across borders results

Japan	Doing Business 2008	Doing Business 2009	Doing Business 2010
Rank		20	17
Costs to export (USD / container)	989	989	989
Cost to import (USD / container)	1.047	1.047	1.047
Documents to export (number)	4	4	4
Documents to import (number)	5	5	5
Time to export (days)	10	10	10
Time to import days	11	11	11

Source: Doing Business Index (2010) World Bank

This though is not necessarily the case. From the table above it is apparent which criteria have been chosen to quantify "Trading across borders". These categories takes under consideration the number of documents necessary to export and import goods, the time to export and import goods and the costs to export and import goods. Important to notice is that no tariffs, quotas or non-tariff measures have been taken into consideration. Therefore even though Japan scores high in "trade across borders" it does not indicate the degree of market openness. Nevertheless it gives an indication that the trade that already exists is facilitated with good conditions. In a world without tariffs, quotas and non-tariff measures this situation would lead to more trade between Japan and the world.

Enforcing contracts: Enforcing contracts should give an indication how easy it is to sue a business partner in case of a dispute. This is very important to know before entering a new market. Inexpensive and reliable economies will be involved in more trade then instable economies. Japan was ranked 20th in the issue of "enforcing contracts". The criteria to evaluate "Enforcing contracts" were: days to resolve commercial sale dispute before court, attorney, court and enforcement costs as percent of claim value and steps to file claim, file judgement and enforce it.

Table 20: Japan Doing Business Enforcing Contracts results

Japan	Doing Business 2008	Doing Business 2009	Doing Business 2010
Rank		22	20
Number of procedures	30	30	30
Time (days)	360	360	360
Cost (percent of claim)	22,7	22,7	22,7

Source: Doing Business Index (2010) World Bank

Even though Japan is ranked high, it has still a lot to catch up with the good practice economies. In Ireland only 20 procedures are needed, in Singapore commercial disputes can be solved in 150 days. To catch up Japan would have to reduce the settlement time by around 60 percent. Finally also in terms of costs is Japan far away from the best performer Buthan which settlement costs of 0,1 percent of the total claim costs. Legal circumstances in Japan are supporting trade though. By reducing all three factors named Japan could increase its attractiveness and as a result also increase its level of trade.

To summarize in a world without tariffs, quotas and non-tariff measures Japan would be an easily accessible market according to this index. The factor "enforcing contracts" supports trade but still has room for improvement. It does not directly evaluate the degree of openness of the Japanese market but though may indicate the influence of non-tariff measure in the legal sector.

- Enabling Trade Index (World Economic Forum, 2010)

In this index Japan was ranked 25th of 125 countries. Among those 4 Asian countries that are looked at here, Japan was ranked best.

Table 21: Japan's ranking Enabling Trade Index

Total ranking	Market access	Border administration	Transport and Communication Infrastructure	Business environment
25	121	16	14	34

Source: Economic Forum 2010 – Trade Enabling Index

This index gives a clear indication of the openness of the Japanese market. As can be seen market access has been ranked 121st. This is due to the high level of non – tariff measures (rank 84), the complexity of tariffs (rank 93), the tariff dispersion (rank 118) and the tariffs faced (rank 123). The complexity of tariffs makes it more difficult for companies to do business in Japan especially due to the large number of distinct tariffs. All this clearly shows that Japan is one of the most protected markets in the whole selection of countries.

Border administration is ranked 16th among 125 countries. This result is quite similar to the result in the "Doing Business Index" in the "Cross border trade" category. This does not come as a surprise as the indices use similar parameters (e.g. Time to import, number of documents to import, costs to import etc...)

From this index it becomes obvious that the Japan is not an open economy. As already stated tariffs and non-tariff measures are significantly reducing the accessibility of the Japanese market even though the trade condition provided are of good quality as shown by the Doing business Index.

Tariffs and non-tariff measures in Japan

Here the author will look at tariffs and non-tariff measures in the Japan – EU 27 trade. A study of Copenhagen Economics (Sunesen et. al., 2010) shows that the trade level between the European Union and Japan is in general low. The level of trade is restricted by various factors:

The remoteness of the market
Distance between markets plays a vital role in trade. The level of trade decreases with increasing distances between markets. As the EU27 and Japan face naturally a long distance, trade between those two regions is hampered.

Size of the market
The size of the market also determines the level of trade. The bigger the market, the higher the chances that the market can supply itself with goods and services. Small regions with a rather small population are not able to produce most of the goods for themselves. As a result the trade level of Japan and the EU is reduced by their comparatively big size in terms of area and population.

Cultural and linguistic barriers.
Another important aspects are differences in culture and linguistic barriers. Countries with the same language and a similar culture tend to trade more with each other. In a survey conducted for the study of Francois (2010), three quarters of the interviewed European firms see the Japanese market as a difficult market. One of the most commonly named factors was the language barriers. Therefore it is obvious that differences in culture and language barriers reduce the level of trade. Those factors that have been named so far are natural factors which cannot be changed. Therefore trade between the European Union and Japan will always face these obstacles to trade. Nevertheless the level of trade is still considerably low (OECD, 2006) which might be due to the presence of tariffs and non-tariff measures.

Tariffs
Francois (2010) finds that the level of tariffs is rather low in the European Union and Japan. Both have simple average MFN tariffs rates of 3,8 percent. Japan has more duty-free tariff lines. A good indicator is the trade weighted tariff protection for Japan and the European Union. The trade weighted tariff rate for European export in Japan is 1,7 percent whereas it is 3,8 percent of Japanese exports in the European Union. The difference between Japan and the EU27 result from the kind of products that are protected by the European Union. Those products have a higher trade volume than the products that are protected in Japan.
Japan has high tariffs on agricultural products, petroleum, textiles, clothing and leather. The EU27 has tariff peaks in agricultural and food products, cars and electronics. Though the tariff peaks of the European Union are not as high as the tariff peaks of Japan.

According to the trade simulation of Francois (2010) exports from the European Union to Japan would increase by 23 percent in case all tariffs were to be abolished (not including the outcome of the Doha round). Conversely also Japan's export rate to the European Union would increase by 30 percent mostly caused by the motor vehicle industry.
To summarize Japan and the European Union have on average low tariffs with a few exceptions (e.g. agricultural products) which anyway can be reduced and would result in a welfare increase. Nevertheless those tariffs do not explain though the low level of imports into Japan.

Non-Tariff measures (NTMs)
Non-Tariff measures are defined by ECORYS (2009) as "*all non-price and non-quality restrictions on trade in goods and services. This includes border measures (customs procedures etc...) as well as behind-the border measures flowing from domestic laws, regulations and practices.*" Non-Tariff measures can be welfare improving as well as they might be there to protect the citizens by setting quality standards and hygiene regulations. Even though those regulations might hamper trade, they also increase the welfare. Therefore not all NTMs are supposed to be removed to facilitate trade.

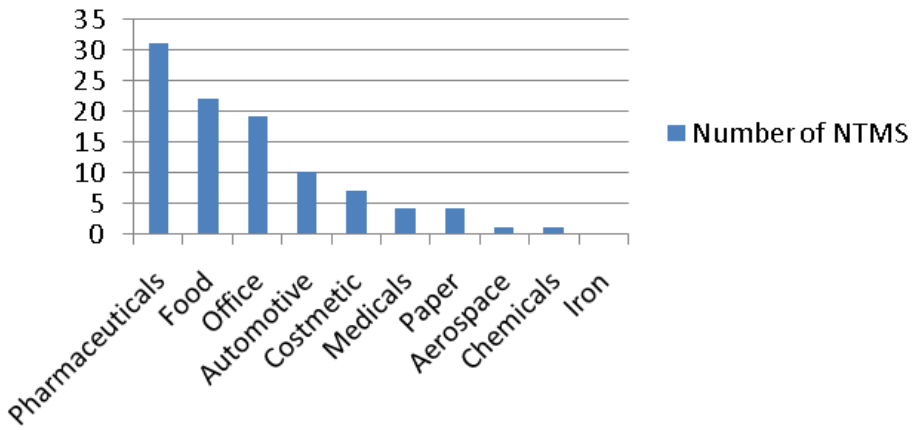
Keel et al (2008) estimated the overall trade restrictiveness with different indices. One of them included NTMs. Via those indices it become obvious that NTMs are a major factor that reduces the accessibility of a market. Francois (2010) identified 194 NTMs in relation with the Japanese market. The majority of them were found in the manufacturing sector (99), followed by the service sector (62). 29 NTMs are not related to any specific sector but concern imports into Japan in general (cross-cutting = 29). An example for cross-cutting NTMs are customs procedure, which affect all sectors. Agricultural products are found to have the least amount of NTMs (4).

Comparing the number of NTMs found and the tariffs imposed it is eye catching that those sectors with high tariffs have very few NTMs whereas sectors with low tariffs face barriers via numerous NTMs (e.g. manufacturing).

As the manufacturing industry faces the highest number of NTMs and as machinery and electronics are a major export good from the European Union, we will focus on this area and rather neglect agricultural products, and cross cutting NTMs. Services are also to be excluded as for this topic, the container volume development, they are not of relevance.

As can be seen from the graph below the highest number of NTMs was found in the pharmaceutical sector (31) followed by the food, office and automotive industries. Those industries are relevant industries for the European Union as the most important export volumes into Japan are machinery and transport equipment, miscellaneous manufactured articles and chemical. Only a small number of NTMs could be identified in the chemical sector. Furthermore NTMs in the paper industry concern the export of the European Union as waste paper is a major export good (interview Erin Haltom, 2010). The second highest number of NTMs can be found in the food industry. In terms of volumes the European Union does not export a lot of food stuff. Therefore one may assume that the European Union is not strongly affected by those NTMs. Though those NTMs could be such a strong barrier that food stuff exports are strongly hampered which would lead to the low volume of food stuff exports.

Figure 8: Numbers of NTMs across industrial sectors



Source: Copenhagen Economics inventory of Japanese NTMs, modified by the author

To conclude it can be said that the European Union faces a great number of NTMs especially in the manufacturing industry. According to Ecorys (Berden et. al., 2009) if the NTMs would be reduced to the very possible export from the European Union into Japan could increase by 50 percent. The greatest trade gains could be achieved in the chemical sector (including the pharmaceutical sector). Furthermore also the motor vehicle and the medical equipment sector would benefit greatly. Looking at the other side also Japan would benefit greatly from reducing the European barrier of the NTMs. Japan's exports would increase by 32 percent. The largest gains would occur in the motor vehicle exports followed by chemicals and electronics. Consequently a reduction of NTMs would lead on both sides to a drastic increase in welfare.

Inference about future Japanese trade potential

It can be expected that after the economic crises the level of trade will pick up again and the GDP will grow a little faster. As Japan is a rather mature industry, it cannot be expected that trade (import and export) will exhibit sharp growth rates like those of other emerging economies. The level of trade could increase drastically if NTMs and tariff barriers would be removed as far as possible but there have been no sign in this direction neither by the European Union nor Japan. As a result it can be said that Japan future economical development does not indicate a reduction of trade imbalances between Japan and the European Union. Even if tariffs and NTMs would be abolished, this would not lead to a balanced trade situation between the EU27 and Japan.

India

India is characterized by a very large population of 1.192 Million people. This makes India a huge potential consumer market provided that the inhabitants are wealthy enough to afford imported products.
India's GDP has seen a strong growth in the recent years. It grew from 1.523,13 billion USD in 2000 to 3.297,84 billion USD in 2008 (OECD, 2010). In terms of real GDP growth it was a little bit more than nine percent but fell to 7,35 percent in 2008 due to the financial and economic crisis (OECD, 2010). The GDP per capita continued to increase from 1.454,70 USD / year in 2000 to 2.779,91 USD in 2008. Even though it seems that the population is getting wealthier, this is only true for a part of the Indians as the increase in wealth is not evenly distributed. 28 percent of the population have less than 1 USD per person / day and more than 50 percent live on less than 2 USD / person / day (Auswärtiges Amt Deutschland, 2009). The strong growth during the last years has made the regional development differences even worse. The income gap between people living in a city and on the country side is widening. Moreover the expected impact of the economic growth on the employment level and the structure of the Indian economy did not happen to the expected extend.

One of the main characteristics of the Indian economy is the disparity between GDP and the share of employment per sector. In 2008 53,38 percent of the GDP was contributed by the service sector but only around 25 percent of the total work force works in that sector. The majority of the Indians lives in a rural agricultural structure and is hardly economically integrated (Auswärtiges Amt Deutschland, 2009).

From 1988 to 2008 the GDP contribution of the industrial sector grew slightly from 26,2 percent to 27,9 percent. Currently the unemployment rate of India officially is around 10,7 percent (CIA World Factbook, 2010). It might though be much higher as only a minority of the Indian workforce is employed with a social insurance, therefore the government has got difficulties to evaluate how many people are actually unemployed. To reduce the unemployment rate and increase the average income especially low educational jobs have to be created. According to the Indian government this can be achieved at best in the industrial sector. Consequently it can be assumed that the Indian government will invest to expand the industrial sector and as a result attract a lot of manufacturing business.

In the long run it can be expected that some of the manufacturing business of China may shift to India. As a result the industrial sector will start to grow faster.

Exports and imports of India have increased drastically from 2000 to 2008. Exports of goods increased from 42,36 billion USD to 181,86 billion USD in 2008. Imports of goods rose even more from 52,94 billion USD to 315.71 billion USD. Therefore it can be seen that India faces a trade deficit as it has more imports than exports. This trade deficit is nurtured by all its major trade partners also by the EU27. Even though India has a trade deficit, more containers are sent from India to the EU27 than the other way round. This is due to the fact that the trade deficit includes services and the goods from the EU are of higher value than the export goods from India into the EU.

If India manages to improve its social and physical infrastructure for its inhabitants, it can be expected that general welfare increases and will be more equally distributed. The developments of the FDI inflow, which shows a drastic escalation from 3.584,22 million USD in 2000 to 41.168,6 million USD in 2008 (OECD, 2010), indicates that India is seen as a market with huge potential and the foreign direct investment will also help to improve the infrastructure. As the Indian government plans to expand the industrial sector and therefore

create many low-educational jobs, it can be assumed that in the short run (around 5-10 years) the trade imbalance between the EU and India will increase. The European Union will continue to be a consumer market and India will amplify its production of consumer goods. Even though the European Union is the most important import partner of India (Eurostat, 2009), in terms of total volume this might change in case India will be able to supply itself with goods like SITC 8, SITC 7, SITC 6 and SITC 5. Therefore in the short run the volumes exported from the European Union to India may decline or rise at a slower pace.
India's expansion of the industrial sector may lead to greater general wealth which will in the long run, when the production moves towards more sophisticated products lead to an increase in purchasing power. By then the demand for import products from the European Union may increase and the imbalance may start do reduce again.

Assessment of openness to trade

- Doing Business Index (World Bank, 2010)

In total India was ranked 133rd of 183 countries. It can be seen that there is a lot of room for improvement. Trade is considered to improve the overall wealth of those countries involved in trade. Thus for India it is highly important to get involved as much as possible in trade to increase the overall wealth in its country. Especially concerning are the result in the categories "Starting a business" (rank 169), "Dealing with construction permits" (rank 175), "Paying taxes" (rank 169) and "Enforcing contracts" (rank 182). As infrastructure is crucial for the development and the economy of a country, it is absolutely necessary for India to improve the aspects of "Dealing with construction permits", "Starting a business" and "Enforcing contracts". In particular those aspects hinder the growth and development of the country.
Positively emphasised have to be the categories "Getting credit" (rank 30) and "Protecting Investors" (rank 41). Those two categories vastly contribute to facilitate a climate of economic growth and investment.

Trading across borders: In this category India scored rather high (rank 94) in comparison to the other categories. Nevertheless there is still a lot of room for improvement as this result does not indicate a good facilitation of an easy market access.

Table 22: India Doing Business, Trading across borders results

India	Doing Business 2008	Doing Business 2009	Doing Business 2010
Rank		97	94
Costs to export (USD / container)	820	945	945
Cost to import (USD / container)	910	960	960
Documents to export (number)	8	8	8
Documents to import (number)	9	9	9
Time to export (days)	18	17	17
Time to import days	21	20	20

Source: Doing Business Index (2010) World Bank

Even though the total rank improved from 2009 to 2010 this development cannot be attributed to the performance of India as none of the factors changed positively but continued to be at the same level.

As can be seen from the table in the period of 2008 to 2009 some of the factors got either positively or negatively affected and from then on everything stayed at the same level. Comparing the results of India to the best practice countries a huge difference can be seen. The lowest number of import and export documents has got France with only 2 documents

necessary. Denmark and Singapore are the best in time to export and time to import with 5 and 3 days. Here it is obvious that India needs to make a huge effort to facilitate trade better to increase even further its cross-border trade level.

Enforcing contracts: "Enforcing contracts" scored the worst result for India in all categories of the "Doing business index". India was ranked 182nd of 183 countries. This lead to the conclusion that India faces the urgent need to improve its regulations in this aspect to facilitate trade.

Table 23: India Doing Business, Enforcing contracts results

India	Doing Business 2008	Doing Business 2009	Doing Business 2010
Rank		182	182
Number of procedures	46	46	46
Time (days)	1420	1420	1420
Cost (percent of claim)	39,6	39,6	39,6

Source: Doing Business Index (2010) World Bank

India already received in 2009 the same poor result. Nevertheless no measures have been taken to improve the situation and therefore India scored the same rank in 2010. In every aspect of "Enforcing contracts" India is far lagging behind the best practice countries. In particular the criterion of time is a disincentive to do business in India. With 1420 days on average it takes almost 9,5 times as much time as in Singapore the best practice country (150 days). Moreover India seems to be a very bureaucratic country where it takes more than twice as many procedures to resolve a commercial sale dispute before court than in Ireland (20 procedures).

This low ranking and the poor performance in all aspects should be a big indicator that reforms have to made to reduce the bureaucracy and therefore the time needed to resolve a dispute otherwise this situation will disincentive potential trade partners to do business in India.

To summarize according to this index India does not really facilitate trade. A lot of internal reforms have to be made to attract more investors and trade partner to develop the economy. Even though in this analysis no tariffs and non-tariff measures are included, it shows already that the conditions for trade are by far not satisfying yet and there is a lot to catch up for India.

- Enabling Trade Index (World Economic Forum, 2010)

In this index India was ranked 84th of 125 countries. In the year 2009 it was ranked 76th. The lower rank in 2010 is the result of poorer performance and the addition of 6 new countries. 5 of those 6 countries are ranked higher than India.

Table 24: India's rankings Enabling Trade

Total ranking	Market access	Border administration	Transport and Communication Infrastructure	Business environment
84	115	68	91	58

Source: Economic Forum 2010 – Trade Enabling Index

The category "Market access" is ranked much worse (rank 115) than the total result of India. This indicates that the market accessibility is restricted in India. The accessibility of the Indian market is impeded by high tariff rates (on average 13,2 percent) and the complexity of the tariffs which makes it difficult to navigate.

Moreover the high number of distinct tariffs increases the complexity and impedes the market accessibility even further. The ranking in terms of non-tariff measures can be positively remarked (rank 44th). Even though NTMs exist they obviously do not represent such a strong obstacle to the Indian market as for example in Japan.

As also pointed out in the "Doing business Index" customs procedures are very slow and bureaucratic. Furthermore corruption also seems to be an issue as it has been ranked 68th.
Moreover also the aspect of "Transport and communication infrastructure" is not well developed. Especially the quality of transportation infrastructure such as roads and port infrastructure seems to be of poor quality as ranked 83rd and 85th with the exception of the rail infrastructure which is obviously well developed (rank 20th).

This index shows that India as a market is not easily accessible. Major barriers to international trade are high and complex tariffs and the poor quality of port infrastructure. Moreover corruption makes India less attractive as a market and may prevent potential trade.

Tariffs and non-tariff measures
As already seen in the "Enabling trade index" non-tariff measures are of a smaller importance than tariffs as a barrier to trade. The minor importance of NTMs between India and the European Union is also supported by Francois, Norberg, Pelkmans-Balagoing (2008). Therefore the focus here will lie on the potential effect of the removal of tariffs.

India has in general a higher level of import protection. Even though import tariffs for products from the EU are lower than import tariffs from the rest of the world but are higher than the import tariffs for products from the US (Francois, Norberg, Pelkmans-Balagoing, 2008). The highest import tariffs for products from the EU in India can be found in the agricultural sector for products like vegetables and fruit, oil seeds, sugar, processed food and beverages and tobacco (GTAP version 7, 2008).
The highest tariffs for import products from India in the European Union can be also found in the agricultural sector for cerial grains, sugar, processed food and beverages and tobacco. Furthermore also textiles and wearing apparel come with a comparative high level of import tariffs.
It has to be mentioned that especially in the service sector India and the European Union have erected considerable trade barriers in the form of tariffs. Even though the author recognizes the importance of services as they may have considerable spill over effects towards the industrial sector and therefore may increase the level of output, trade barriers to services will not be included in this analysis of trade potential.

The study of (Francois, Norberg, Pelkmans-Balaoing, 2008) shows that the effects of trade liberalisation between India and the European Union are positive but rather small due to the low base level of bilateral trade. The results have to be distinguished between short term and long term results.

Short term:
Especially those sectors which are protected by high tariffs the output changes are higher than in those which are less protected in India and in the European Union. Visible reductions of output in the European Union would occur in the wearing apparel, leather products and electronic equipment whereas the transport equipment sector output would increase. In the Indian economy the output in processed food, beverages and tobacco products, paper products, transport equipment and motor vehicles and part would fall. On the other side the

output of wearing apparel and leather products would rise drastically. Moreover also an increase of electronic equipment output would occur.

As already mentioned reducing the unemployment rate in India will be a great challenge. Therefore the employment effects in the short and long run are of importance as it may give a big incentive to the Indian government to reduce or get rid of import tariffs on products from the European Union.
The employment structure of India will follow the output developments. Therefore it can be expected that employment in the agricultural sector will decrease but employment in the wearing apparel, leather products and electronic equipment will increase. The employment rate in the European Union will not be significantly affected. Small changes might be visible in the apparel sector. A similar trend can be seen in the wage development. The European wages will not change significantly due to the reduction of import tariffs though the Indian wages will rise independently from the level of education.

The trade flows are estimated to increase in all sectors for both India and the European Union. Especially manufactured goods exported from the European Union to India will increase.

Table 25: Changes in export quantities (percent change)

Product	India	EU27
Cereal grains	20,3	11,3
Vegetables and fruit	178,2	7,2
Sugar	473,9	7,3
Beverages and tobacco products	245	-1,1
Other agriculture	70,1	11,9
Processed food	357,1	17,4
Textiles	148,4	38,7
Wearing apparel	71,7	56,6
Leather products	98,8	43,7
Motor vehicles and parts	99,8	17,2
Electronic equipment	34,5	24,7
Machinery and equipment	124,5	9,0
Chemicals, rubber, plastic product	106,6	11,2

Source: Francois, Norber, Pelkmans-Balaoing, Institute for international development economics; modified by the author

These outcomes may seem a bit confusing as the agricultural output is expected to decline in India. The vast increase of 178, 2 percent vegetables and fruit, 473,9 percent for sugar and 245 percent for beverages and tobacco results from an increase in the export rates but not in the output. So far due to the high tariff barriers only very little in terms of absolute volume of agricultural products is exported. Even though the output of those products in percent of the total output will decline, the percentage of export products will increase.
From the current situation of a small trade deficit with the EU in India (Eurostat, 2009) it can be seen that after the trade barriers have been removed more goods will be exported from India into the European Union. This will contribute to an increase in the trade imbalance between the EU and Asia in the short run.

Long run:
The output effect in the European Union does not significantly differ between short term and long term. Though in India the impact of the liberalization in the long term is more visible

especially in the capital intensive sectors like agriculture, paper products and manufacturing. Especially in the chemical sector the output turns from negative to positive.
The wage development in the long run is obviously not so much influenced by the trade liberalization as the wage development is the same in the short and in the long run.
In the long term development of the export quantity it can be seen that in the European Union the long term results are stronger than the short term results (e.g. motor vehicles and parts 30,4 to 26 percent, electronic equipment 54,2 percent to 46,2 percent, machinery and other equipment 30,4 percent to 22 percent). This indicates that in the long term a specialisation towards sectors where the economy has a comparative advantage is going on.
India will experience a significant growth in all export sectors though the growth in the long run will be lower than in the short run in precisely those sectors where the European Union will experience an increase in exports.

Conclusion India
Due to an immediate need of India to increase its employment rate and to distribute growing wealth more evenly it is likely that India will expand its manufacturing sector. As the European Union will continue to be a consumer market the and India will try increase its export rates, it can be assumed that in the short term the trade imbalances in terms of container volumes will increase even further. Only in the long term, if the overall wealth of the Indian population increases, the imbalances might decrease again. It can be though assumed that even in the long term the trade imbalances will not disappear.
Currently trade is impeded by tariff rates in the European Union and India. The removal of those would in the short term lead to more trade. Due to the enormous potential growth rates of India in every sector the trade imbalances my increase even further. In the long run, both economies would benefit from the removal of those trade barriers. The imbalances would nevertheless also in the long run not disappear.
Finally it can be said that the imbalances will increase in the short term, in the long term they might decline slightly, independently whether trade barriers will be removed or not.

South Korea

Similarly like Japan also in South Korea the biggest contribution to the GDP is made by the service sector. From 1989 to 2008 the GDP contribution of the service sector increased from 49,1 percent to 60,3 percent (Eurostat, 2009). In contrast the agricultural sector and the industrial sector both decreased. The industrial sector decreased from 41 percent in 1989 to 37,1 percent (Eurostat, 2009). In comparison to the increase of the service industry the decrease of the industrial industry is rather small. As all developed countries with the advancement in the development stage the size of the industrial sector shrinks. This seems to be a normal development. This trend should normally lead to a reduction of exports of goods and an increase of import of goods.

The total volume of the GDP has constantly risen from 809,43 billon USD in 2000 to 1.344,36 billion USD in 2008 (OECD, 2009). This shows that the economy is constantly growing and can be an indication that trade is also constantly growing depending on which factor mostly influenced the constant rise of the GDP. A forecast made by the OECD (2010) shows that the GDP of Korea will continue to grow in 2011 but less then from 2009 to 2010. Furthermore also the GDP per capita has constantly risen from 2000 to 2008 from 17.218,95 to 27.657,87 USD (OECD, 2009). Whether the increase of the GDP per capita increases also the potential for more consumption (especially consumption of imports) can be seen from the development of the disposable income per household. Here can be seen that the development of the disposable household income does not increase as continuously as the GDP per capita. In

2001 a Korean average household experienced only an increase of 0,9 percent of disposable income. Afterwards from 2002 till 2003 the disposable income grew by 4,9 percent in 2003. In 2004 the disposable income grew slightly less (4,7 percent) and dropped to 2,3 annual growth in 2005 and continued to be at a similar level until 2008 where probably due to the economic crises the disposable income grew only by 0,8 percent. As the disposable household income grew so little recently it is very unlikely that there will be a big demand for imported goods.
Though the household saving rates do not indicated that the crisis led to an increase of the average saving rate due to uncertainty. The household saving rate continuously decreased from 9,26 percent in 2000 to 2,83 percent in 2008. A slight increase in the savings rate can be expected in 2009 as a crisis usually leads to a higher saving rate which would affect imports negatively.

Another important aspect is the development of the unemployment rate. Especially now shortly after the crisis is the employment rate a determining factor for the trade developments. In 2008 the unemployment rate in South Korea was rather low with 3,2 percent but rose in 2009 to 3,6 percent (OECD, 2009). In January 2010 it reached a peak with 4,8 percent but is since then constantly declining to the level of 2008. This might be a good sign that especially imports might pick up again, as the confidence of people is increasing with the reduction of unemployment.

Exports of goods have seen a steady increase from 2000 till 2008. In terms of value the exports more than doubled from 172,27 billion USD to 422.01 billion USD (OECD, 2009). Imports on the other side have increased even more from 160,48 billion USD in 2000 to 435,27 billion USD (OECD, 2009). It can be expected that trade in general did not grow as fast in 2009 as in the years before due to the economic crisis. Nevertheless an ongoing growth is to be expected. Exports and imports of South Korea are almost balanced but trade with the European Union is not balanced. Here the imports from the European Union outbalance the exports to the European Union by far which leads to a trade surplus with the EU (Comtrade, 2008)
The European Union though might lose its importance as a trade partner of South Korea, as the intra-Asia integration is advancing. As a result the intra-Asian trade is becoming more and more important for South Korea and other trade partners as the European Union are losing their supremacy.

Assessment of openness to trade

- Doing Business Index (World Bank, 2010)

In total South Korea was ranked 19th from 183 countries in its ease of doing business. This is the second best rank among those countries looked at (China, India, South Korea and Japan), shortly after Japan. The result in the different categories varies considerably. South Korea scored very low (150th rank) in the category of "Employing workers" which obviously hampers considerable outsourcing or relocation of companies to South Korea. Also the results in the categories "Registering Property" and "Protecting Investors" is not very satisfying (rank 73th and 71th). Therefore there are still considerable deficits in those categories.
Trading across borders: In this category South Korea received its second best result with rank eight. This indicates that the government of South Korea really makes an effort to provide a business environment that supports and fosters trade. Among the 4 Asian countries looked at in this study (India, China, South Korea and Japan) South Korea scored best in this category.

Table 26: South Korea Doing business, trading across borders results

South Korea	Doing Business 2008	Doing Business 2009	Doing Business 2010
Rank		12	8

Cost to export (USD / container)	745	767	742
Cost to import (USD / container)	745	747	742
Documents to export (number)	4	4	3
Documents to import (number)	6	6	3
Time to export (days)	11	8	8
Time to import (days)	10	8	8

Source: Doing Business Index (2010) World Bank

As can be seen from the table above there has been some effort by South Korea to improve the facilitation of trade. Especially the number of documents to import shall be highlighted as a reduction from 6 to 3 documents reduces significantly the complexity and therefore time and financial means needed. As already mentioned this index does not take into consideration tariffs, quotas and non-tariff measures. Therefore this ranking is of limited viability.
Regardless of its high ranking there is still room for improvement. A big difference is in the factors costs to import and export. Malaysia and Singapore are ranked first with costs of 450 USD per container and 439 USD per container (World Bank, 2010). The costs of export and import include all costs to complete the procedures to export or import the goods that are to be traded. Examples of those costs are: Costs for all documentation, inland transport and handling, costs of customs clearance. Most of those costs can be influenced by the government (e.g. cost of customs clearance) by trying to either introduce more competition if possible (e.g. inland transportation) or by try to improve efficiency.

Enforcing contracts: South Korea was ranked 5th in this category which is its best result among the ten categories. It also scores best out of the four Asian countries looked at.

Table 27: South Korea Doing Business, Enforcing contracts results

South Korea	Doing Business 2008	Doing Business 2009	Doing Business 2010
Rank		7	5
Number of procedures	35	35	35
Time (days)	230	230	230
Cost (percent of claim)	10,3	10,3	10,3

Source: doing Business Index (2010) World Bank

It can be seen that South Korea improved its ranking from 2009 to 2010 but this improvement does not have anything to do with its own effort but with the other countries getting worse. When comparing to the best practise economies it is obvious that there is enough room for improvement. In particular the number of procedures (35) is quite high in comparison to Ireland with only 20 procedures. Moreover the time needed for the enforcement should be further reduced as in the best ranked economy Singapore only 150 days a necessary.

To conclude South Korea attempts to provide an economic environment that facilitates trade (excluding tariffs and non-tariff measures). On the other side South Korea should not rest on its laurels and should continue to work on its trade facilitating measures.

- Enabling Trade Index (World Economic Forum, 2010)

In total South Korea was ranked 27th of 125 countries. This means that South Korea lost one rank from 2009 to 2010 but not because its performance got worse but because the ranking in 121 included only 121 countries. In 2010 the ranking was conducted for 125 countries and Iceland performed better than South Korea.

Table 28: South Korea's ranking Trade Enabling Index

Total ranking	Market access	Border administration	Transport and communication infrastructure	Business environment
27	111	24	15	44

Source: Economic Forum 2010 – Trade Enabling Index

A similar situation in South Korea like in Japan can be seen. South Korea clearly faces deficits in the category of market access. The criterion market access is divided into accessibility of domestic and foreign market. Especially the accessibility of foreign markets is lagging behind (rank 119).

The bad result for accessibility of domestic markets is mainly a result of the wide tariff dispersion (rank 123) as a uniform tariff is believed to be more economical friendly. South Korea imposes very high tariffs on agricultural products which results in a very high tariff dispersion.

Moreover the accessibility of foreign market (score 82) does not score much better than the accessibility of domestic markets. This result can be mainly attributed by the big number of tariffs faced (rank 110) and the margin of preference in destination markets (rank 121). Unfortunately there is no indication given about how non-tariff measures influence the accessibility which distorts the result of market accessibility considerably.

In the other categories of the "Enabling trade index" South Korea scores much better. Especially the excellent ranking in "Transport and communication infrastructure" has to be emphasised (rank 15). This score mainly results from excellent maritime connectivity, a very good railroad network and a world class ICT infrastructure (rank 6). Also "Border administration" achieved high marks (rank 24) which goes together with the results from the "Doing business Index" where border administration scored even higher.

To conclude it can be seen from this "Enabling Trade Index" that the communication and transport Infrastructure and the border administration support trade in general. A huge deficit can be seen in the accessibility of the market (foreign and domestic) where tariffs impose major obstacles to trade. As non-tariff barriers are not included for South Korea in this index the result is probably positively biased. It can be assumed that if the non-tariff measures would be taken under consideration as well that the degree of market accessibility would decline even further.

Tariff measures

Here the author will mainly look at tariffs between South Korea and the European Union. As already shown above South Korea is a highly protected market and also faces protection measures abroad.

Even so tariff measures are not evenly distributed. Tariffs imposed on grains, oil seeds and horticultures by South Korea are much than the tariffs imposed by the European Union on

those products. Also in manufacturing, textiles, clothing, chemicals and paper South Korea imposed higher tariffs than the European Union.
Only motor vehicles and iron and steel carry higher tariffs in the European Union than in South Korea (GTAP database version 7)
Therefore it is not surprising that in case of trade liberalisation via the removal of tariffs the benefits would be distributed unevenly as well. As South Korea is a more protected market than the European Union, South Korea would benefit more. According to a study of the Copenhagen Economics and Professor Francois (2007) South Korea would profit by two thirds of the trade liberalisation as competition would increase drastically.
This study also highlights the correlation between service liberalisation and the manufacturing industry. The increase in competition in the service industry in South Korea would positively affect the output generation of the manufacturing industry, particularly for electrical machinery, other machinery and motor vehicles. This production increase would be mainly supported by transport-, communication and business services.

A very important outcome of the study of Copenhagen Economics (2007) are the predicted contractions and expansion of different sectors in the European Union and South Korea. If the trade barriers in the form of tariffs are removed the service industry in the European Union is expected to expand where as the merchandise industry is supposed to contract. South Korea would experience exactly the opposite: a contraction of the service industry due to its former high level of protection and an expansion of the merchandise industry.

Currently it can be seen that South Korea actually tries to foster trade by signing new trade agreements with e.g. Chile (2004), EFTA, Singapore and the ASEAN countries (except Thailand). Further free trade agreements (FTAs) are

currently negotiated with Canada, the USA, India, Japan and Mexico. Thus a further trade liberalisation between South Korea and the European Union might happen as the European Union does not want to lose competitive edge towards its competitors.

If a FTA is signed between the European Union and South Korea this would impact the amount of containers shipped from South Korea to the European Union and back. As already mentioned the merchandise industry of the European Union is expected to contract whereas the merchandise industry of South Korea is expected to expand. Therefore this would lead to an increase of the imbalance of container trade between South Korea and the European Union.

Conclusion South Korea
South Korea currently has a trade surplus with the European Union. After the economic crisis it can be expected that both economies will grow a little stronger than from 2008 to 2009. Nevertheless no drastic changes in the aggregated demand or the production can be seen which would indicated a trade shift meaning a reduction of the imbalances. Even if the trade barriers (tariffs) would be reduced, it would even lead to an increase of the imbalances as South Korea would benefit more from the trade liberalisation.

China

China is one of the most populous countries in the world with 1.352,8 million inhabitants. Therefore China is seen as a huge future consumer market. Even though the average income per capita is 3.719 USD per year (Auswärtiges Amt, 2010) China is still seen as an emerging market. This is mainly due to the fact that there are huge regional differences in the distribution of income. 800 million people live on the countryside where half of them depend economically on their agricultural harvest (European Commission, 2008). The average income on the countryside is less than 50 USD per month per person (Auswärtiges Amt a, 2010). The contribution of the agricultural sector to the GDP is though decreasing whereas the contribution of the industrial sector is increasing from 45,9 percent in 2000 to 48,62 percent in 2008 (OECD, 2010). This increase of the importance of the industrial sector leads to the phenomenon of migratory workers. In particular those workers were badly affected by the economical crisis in 2008 as 20 million of 230 million migratory workers lost their jobs (Auswärtiges Amt a, 2010). Therefore a major challenge for the Chinese government will be increase of the per capita income and a better distribution among rural and urban areas.

China's GDP has constantly risen from 3.013,22 billion USD in 2000 to 7.926,50 billion USD in 2008 (OECD, 2010). That strong growth of the GDP is mainly facilitated by trade. China's economy is strongly export oriented and therefore the GDP growth is driven by its exports. Imports and export grew strongly from 2000 to 2008. Imports rose from 225,09 billion USD to 1.131,56 billion USD. Exports climbed from 249,20 to 1.430,69 billion USD (OECD, 2010). While both import and export rose, the gap grew larger and larger and fostered the GDP growth. During the economical crisis in 2008 the aggregate demand of Chinas major trading partners (EU, US, Japan, South Korea) slummed which led to a drastic decrease of exports. As a result China's GDP grew a little less than the years before (by 8,7 percent (Auswärtiges Amt a, 2010), whereas before China experienced a double digit growth. A continuous economical growth of around 8 percent per anno (Auswärtiges Amt a, 2010) is essential for China to maintain social stability. Officially China has an unemployment rate of 4,5 percent but the Asian development bank ADB (2008) estimates that the unemployment rate in urban is around 8,5 percent whereas in rural areas it amount up to 30 percent.
A major challenge will be for the Chinese government to maintain a strong growth to increase welfare, distribute it widely and reduce unemployment.

Assessment of openness to trade

- Doing Business Index (World Bank, 2010)

China has been ranked in total 89th. This looks like a rather bad result in particular as China is such an export oriented country which increases its wealth mainly via trade. Poor results achieved China in the categories "Dealing with construction permits" (rank 180), "Starting a business" (rank 151), "Employing workers" (rank 140) and "Paying taxes" (rank 125). To reduce the high unemployment rate, China urgently needs to reform its employment procedures and restrictions. By easing the process of employing people, it may become more attractive to hire additional employees.
Moreover China may have to deal with a real estate bubble like Japan in the eighties. Real estate prices are rising drastically in the major cities like Shanghai or Hong Kong (Barboza, 4 March 2010). A practical way of easing this tensed situation a bit would be a reform of the construction permits. By easing the procedure, supply of real estate may increase and prices would go down. Moreover as lower income families can barely afford an apartment in one of the major cities, slowly slum cities outside the major cities are developing (Economist, 29 July 2010). This may lead to social instability which would have a negative effect on the economical growth.

Besides the good performance in the category “Registering property” should be highlighted (rank 32). This could be the first step towards easing the tensed real estate situation.
Trading across borders: In this category China scored high in comparison to the other categories (rank 44). This result does not come as a surprise as China is an export oriented economy.

Table 29: China Doing Business, Trading across borders results

China	Doing Business 2008	Doing Business 2009	Doing Business 2010
Rank		49	44
Cost to export (USD / container)	390	460	500
Cost to import (USD / container)	430	545	545
Documents to export (number)	7	7	7
Documents to import (number)	6	6	5
Time to export (days)	21	21	21
Time to import (days)	24	24	24

Source: Doing Business Index (2010) World Bank

What comes as a surprise is that the necessary amount of documents to import is lower than the amount of documents to export. Obviously from 2009 till 2010 there even has been an efficiency reform to reduce the amount of documents necessary. This indicates that imports should be facilitated with better conditions and therefore could lead to an increase of imports.
A negative trend can be seen in the cost to export and import. Both costs have increased from 2008 till 2010. As those costs represent costs that can mostly be influenced by the government and are not subject to international supply and demand, the Chinese government should make an attempt to reduce those costs again to make trade even more attractive, to incentive slightly those trade partners which were badly hit by the economic crisis.
All together it can be said that even though China has improved its rank in the “Doing business index” it has not done much, to really improve trade conditions.

Enforcing Contracts: China achieved its best result of all categories in the “Doing business index” in the category “Enforcing contracts”, being ranked 18th. Therefore China is far better than its competitor India (rank 182) and also slightly better than Japan (rank 20), which is seen as a more developed economy.

Table 30: China Doing Business, Enforcing contracts result

China	Doing Business 2008	Doing Business 2009	Doing Business 2010
Rank		18	18
Number of procedures	35	34	34
Time (days)	406	406	406
Cost (percent of claim)	11,1	11,1	11,1

Source: doing Business Index (2010) World Bank

As can be seen from the table above no reforms have been going on from 2008 till 2010 except a small reduction in the number of procedures to obtain judgement and enforce it. As the result is so good, the Chinese government obviously does not see the necessity of improving even further in this category. Though especially the time it takes to resolve a dispute before court should be reduced even further, as it takes in the best practice country Singapore only 150 days.

- Enabling Trade Index (World Economic Forum, 2010)

Here China was ranked in total 48th. This result is much better than the result of its close competitor India (rank 84th) but there is a lot to catch up with South Korea (rank 27) and Japan (rank 25). China improved its ranking from 49th in 2009 to 48th in 2010. This is especially remarkable as further countries were added to the index from 2009 to 2010. Three of the additional countries (Iceland, Georgia and Montenegro) were ranked higher than China. Therefore it can be seen that China really made some progress in enabling trade from 2009 till 2010.

Table 31: China's ranking Enabling Trade Index

Total ranking	Market access	Border administration	Transport and communication infrastructure	Business environment
48	79	48	43	41

Source: Economic Forum 2010 – Trade Enabling Index

China achieved by far the best result in the category "Market access" being ranked 79th in comparison to India (rank 115), South Korea (rank 111) and Japan (rank 121). Here it is also remarkable that both domestic and foreign market accesses are similarly accessible (domestic access rank 81, foreign access rank 83).

Especially well scores China in the aspect of Non-tariff measures where its ranked 34th out of 125 countries. This could be an indicator why the market is more accessible than those of the other analysed countries. Rather poorly performs China in the aspect of duty-free imports, tariff rates in percentage and margin of preference in destination markets. To make foreign markets even more accessible the margin of preference in destination markets needs to be improved. This measure would foster even further the exports of China. Moreover an increase of the share of duty free imports together with a reduction of the tariff rate would support growth of imports into the Chinese market.

The results in the other categories are quite similar to the result in the accessibility of the market. Border administration was ranked 48th, where especially the efficiency of import export procedures should be highlighted as China scored high in this aspect. Especially aspects like transhipment connectivity, ease and affordability of shipments and logistics competences were ranked very high. In terms of liner shipping connectivity is China the best practice country.

It has to be said that this index distinguishes between China and Hong Kong as Hong Kong is a special administrative region. For this paper this separation is not of any value therefore Hong Kong will be treated as a normal part of the People's Republic of China. Hong Kong performs much better than China and all the other named countries in the trade enabling index. In particular the category market access, as it is ranked 16th out of 125 countries. Here it is interesting to see that in terms of domestic market accessibility Hong Kong is the best practice country. On the other side in terms of foreign market accessibility it is one of the worst (rank 123) which is due to the percentage of high tariffs faced (rank 125) and the margin of preferences in destination markets (rank 110).

Apart from that Hong Kong scores very high in all other categories and aspects. Its rankings range between rank 5 for business environment and transport and communication infrastructure to 16 in market access. It is obvious that the results of China and Hong Kong differ considerably.

Exchange rate and its impact

In the last couple of decades the Chinese Yuan was pegged to the US dollar. In 1980 when the Chinese economy started slowly to open, the Chinese Yuan was depreciated to foster the competitiveness of the Chinese export products. By 1994 the official Chinese Yuan / USD exchange rate was 8,62 Yuan per USD. The Chinese Yuan continued to be pegged against the USD until 2005 with a peg of 8,27 Yuan per USD (Poleg, 2005). Due to imminent pressure of the United Stated the peg to the US Dollar was removed. From 2005 till 2008 the Chinese Yuan appreciated by 21 percent against the dollar (Economist, 24th June 2010/ 1). In 2008 when the economic crisis hit, the Chinese government unofficially pegged the Chinese Yuan again against the USD. In 2010 on 19th of June China announced that it would increase the flexibility of the movement of the Yuan (Economist, 24th June 2010/ 2). Until the announcement of increase of flexibility the central bank set a central dollar parity for the Yuan each morning. From 2008 till 2010 the Central bank barely allowed the currency to move. Now the Central bank is prepared to let it move upt to 0,5 percent on any given day (Economist, 24th June 2010/ 1).

This change has mainly happened due to big pressure of the United States. Paul Krugman (Nobel price winner) and others have argued that in times of low worldwide aggregate demand, countries that continue to spend far less than they earn, contribute to global unemployment (Economist, 24th June 2010/ 1). Therefore the US hopes to reduce its level of unemployment (10 percent) with the appreciation of the Chinese Yuan as by then the huge capital reserves of China would decline.

Effects of a revaluation

- Fast appreciation

Recently President Barack Obama has declared to increase exports by a hundred percent (Economist, 11 March 2010) to reduce the current account deficit. This goal should be partly achieved by the appreciation of the Chinese Yuan. The United States expect that if the Yuan is drastically appreciated, this will lead to an increase of the purchasing power among Chinese people and eventually will push US exports into China. In that case the US trade deficit would decline.

Furthermore Chinese exports would not be as cheap anymore and would decrease or grow slower. This trend together with a rise in US exports into China would lead to a decrease of imbalances in trade flows between the US and China. Unfortunately this will probably not happen as a drastic appreciation of the Yuan will lead to a reduction of Chinese export products which will then lead to a rise of the unemployment rate. Increasing unemployment will lead to an rise of available workers and will as a result lead to a decline of wages. Moreover rising unemployment makes people feel insecure and consequently they start to save. In total this will harm the Chinese consumption and will maybe even lead to a decrease of consumption of imported products.

This sharp appreciation of the Chinese Yuan does not seem very likely. Shi Lei (Interview, DVB Bank) and the Economist (24th June 2010/ 2) do not see any sign of a rapid appreciation. It will rather be a slow and continuous process.

- Gradual appreciation

From 2005 till 2008 the Yuan appreciated already around 20 percent. This rapid appreciation cannot be expected this time. Since the policy has been announced the Yuan has appreciated by just 0,7 percent against the USD (Economist, 1 July 2010). The Yuan has not the flexibility to rise 0,5 percent at any given day but obviously not every day. On the first day the Yuan rose

by 0,4 percent which were compensated for the day after. The currency forwards market expects the Yuan to appreciate by only 2,2 percent over the next 12 months (Economist, 24th June 2010/ 1).
The gradual appreciation will not lead to a drastic increase for import products. Employment in the US and in China in the manufacturing will not really be affected. If in the long term the Yuan is will rise a lot, the market will adjust itself and as China is developing its economy more and more, China will move into different sectors, where the appreciation will not be of a significant consequence towards exports.

Euro – Dollar- Chinese Yuan and the impact on the imbalances
The Euro has currently fallen against the US Dollar. Therefore until 19th of June when the Chinese Yuan was still pegged to the US Dollar, the Yuan appreciated against the Euro as the Euro depreciated against the US Dollar due to financial difficulties of the member countries Greece, Spain and Portugal.
The Chinese Yuan has strengthened by 17 percent this year already against the Euro (Economist, 24th June 2010/ 1). Nevertheless even though this should push European exports to China, Erin Haltom (Interview, Maersk) could not see any increase in the volume of export goods shipped from the EU to China. This might be due to the fact that the current difficulties in the European Union make the rest of the world more careful and therefore they do not dare to buy more goods from the European Union.
On the other side it could also be an indication that a gradual strengthening of the Chinese Yuan will not have a big impact on the import volumes of China.
Among the interview partners Mr. Theo Ravesteyn (MSC) and Mr. Shi Lei (DVB Bank) were of the opinion that the appreciation of the Chinese Yuan could have a positive impact on the level of import goods into China. Both highlighted that this will not happen overnight but rather be a trend that will have to go on for several years until the positive consequences can be felt. On the other hand Mrs Erin Haltom (Maersk) and Mr. Roy Lenders do not see a real positive effect of the appreciation of the Yuan on the amount of goods exported from the European Union to China. Mr. Roy Lenders points out that in case that the Chinese export products get more expensive (maybe due to the appreciation of the Yuan) in the long term companies may relocate their production plants to the east of the European Union. Mr. Aernoud E. Willeumir (Port of Rotterdam) partly agrees with the idea of a relocation trend to the European Union but the relocation trend will not be that strong so that imbalances between the European Union and China will fade away. According to him even if the Yuan appreciated and Chinese export goods become more expensive, the companies will still continue to have many of their production plants in China as China is a huge potential market and they want to be close to big markets.

To conclude it cannot be really expected that due to the appreciation of the Chinese Yuan the trade imbalances between the European Union and China will fade away. Nevertheless if the Yuan gradually but constantly appreciates it may lead to a reduction of imbalances.

Conclusion China
The general opinion whether imports into China will grow or not is diverging. It is obvious that China needs to grow constantly at a certain percentage to maintain a social stability. It the aggregate demand of its trade partners picks up again, China will probably maintain export oriented focus. If China manages to increase the average wealth of its population imports also may increase. This though can only happen in the long term. Therefore the imbalances will probably continue to rise until the majority of the Chinese population benefits from the exports. Then also the demand for imports may increase. This increase of demand for import products will in the foreseeable future not be as big as the export growth. Therefore the imbalances might though decline slightly but will probably not disappear totally. Also appreciation of the

Chinese Yuan will probably not contribute greatly to balance the trade flows between the European Union and China.

European Union

The European Union includes by now 27 member countries. It goes without saying that there are differences in their growth potential especially as some countries are less developed than other member countries. The GDP of most of the European Union member has been gradually rising from 2000 till 2008. Even during the economic crisis in 2008 21 member state countries did not experience a decline in the GDP (OECD, 2010). Only 6 countries already faced a reduction in their GDP (Ireland, Portugal, Sweden, Italy, Denmark and Latvia) (OECD, 2010). The GDP growth rates on the other side dropped considerable from 2007 to 2008 in all the European member states. None of the member countries could maintain or even increase its GDP growth rate. Nevertheless Poland, Bulgaria and Romania should be highlighted as their GDP growth rates are far above average with at least 5- 6 percent in 2008 which contributed greatly to the total economic growth of the European Union. According to the CIA Factbook (2010) almost all European Union countries which were able to maintain a small economic growth rate faced a negative growth rate in 2009. From then on, economic growth should start to pick up again which should positively impact the import and export level.
The development of the disposable household income does not support extended future consumption. From 2000 till 2008 the annual growth of the disposable income fell from 2,5 percent to 1,53 percent (OECD, 2010). Unless the growth rate of disposable income does pick up after the economic crisis the total European Union does not show a tendency towards increased consumption. This trend is shown in almost all European countries except the United Kingdom, Germany and Portugal. Those countries experienced already in 2007 a drastic reduction in the growth of the disposable household income. In 2008 the growth rate of the disposable household income increased already again. This could be an indicator for the other European member states of the behaviour of the disposable income growth rates after the economic crisis.
In times of crisis when the disposable income goes down, one would expect the household savings rate to go up. This trend could only be seen in 7 out of 21 European member countries (the other six could not be analysed due to a lack of data). As the economic crisis hit hardest in the second half of the year 2008 it can be expected that the household savings rate went up in 2009 in all the other member countries as well. This increase of savings harms consumption and as a result also exports and imports.

From 2000 till 2008 only marginal changes in the contribution per economic sector to the GDP could be seen. The value added in the agricultural sector decreased from 2,4 percent to 1,8 percent and from 27,9 percent to 26,5 percent in the industrial sector. The decrease of the industrial sector is a trend in all EU member state countries without any exception (Eurostat, 2010). The service sector increased from 69,67 percent in 2000 till 71,73 percent in 2008 (OECD, 2010). As it can be seen the service sector is very dominant in the European Union and will probably increase in the future its contribution to the GDP.

The European Union is an import oriented country conglomerate. From 2000 till 2008 its trade deficit in goods has been increasing drastically from 15,9 to 270,11 billion USD (OECD, 2010). This goes perfectly hand in hand with the trade flow imbalances between the European Union and Asia even though the Asian countries are not the only trade partner of the European Union. Only 7 out of 27 countries have a trade surplus. Belgium, Denmark, Finland, Czech

Republic, Ireland, the Netherlands and Germany contribute to the reduction of the trade deficit of the European Union. It has to be said that the only Germany has a substantial trade surplus in comparison to the other countries.

Assessment of openness to trade

- Doing Business Index (World Bank, 2010)

The "Doing business Index" does not include the European Union (27 member states) as a participant as only countries are ranked. This would anyway be rather difficult as the overall performance of the member states (excluding Malta as it is not listed in this index) is quite diverse. The best result achieved the United Kingdom (rank 5) followed by Denmark and Ireland (rank 6 and 7). The worst result achieved by far Greece being ranked 109th. Consequently all countries are among the best 66,66 percent.

Table 32: Ranking Doing Business of the EU countries (excl. Malta)

Country	Total ranking	Trading across borders	Enforcing contracts
United Kingdom	5	16	23
Denmark	6	6	28
Ireland	7	21	37
Finland	16	4	8
Sweden	18	7	51
Belgium	22	43	21
Estonia	24	3	49
Germany	25	14	7
Lithuania	26	28	17
Latvia	27	22	15
Austria	28	24	11
Netherlands	30	13	30
France	31	25	6
Cyprus	40	15	107
Slovakia	42	113	61
Bulgaria	44	106	87
Hungary	47	70	14
Portugal	48	19	25
Slovenia	53	84	60
Romania	55	46	55
Spain	62	59	52
Luxembourg	64	31	1
Poland	72	42	75
Czech Republic	74	53	82
Italy	78	50	156
Greece	109	80	89
Average rank EU26	**41**	**38**	**45**

Source: Doing Business Index (2010), World Bank

Trading across borders: The results in this category vary from the third rank of Estonia to 113th rank of Slovakia. The main reason for Estonia's good result is the small number of documents necessary to export (3 documents) and import goods (4 documents) and the short time to export and import (5 days). Since 2007 no reforms to improve Estonia's ranking even further have been made and consequently Estonia's ranking did not change. Slovakia's poor rankings is mainly due to its high export and import costs and the time to export and import a container (22 days). As the costs which are measured in this index can be influenced by the country itself, Slovakia faces the urgent need to reform its pricing for documentation and customs procedures. On average the European Union is ranked 38th in the category "Trading across borders". This result is especially negative affected by the results of Greece, Slovenia, Bulgaria and Slovakia. The European Union should support those countries to improve their trade support conditions as due to further integration among the European Union, such circumstances affect all member states. Another aim of the European Union should be to standardise the number of documents necessary to export and import. This makes trade much easier as it reduces the complexity of bureaucracy.

Enforcing contracts: In this category the degree of variation is even bigger than in "Trading across borders". It reaches from the best practice country Luxembourg to the worst performer in the European Union Italy (rank 156). It has to be said that in all aspects of "Enforcing contracts" Luxembourg performs well but never best. Therefore even though Luxemburg is the winner in this category it should aim to even further improve its performance to increase its level of imports and outsourced business even further. Italy improved its ranking from 158 in 2009 to 156 to 2010 by reducing the number of procedures necessary for a legal dispute from 41 to 40. Apart from this step forward nothing has been done. The costs and the time taken to solve a commercial dispute in front of court are still far too long (high). On average the European Union (excluding Malta) is ranked 45th. This actually represents quite well the average performance of the European Union as only very few countries are ranked high or very poor. Here again the European Union should try to proceed with standardisation of the court procedures and the maximum days a dispute may take. This would also reduce the number of cases of "Forum-shopping" with the European Union.
Concluding it can be said, that some European countries already foster trade by providing good export and import conditions. Some other countries have still a lot to catch up, by which they should be supported by the European Union. Moreover the European Union should also aim for a higher degree of standardisation in all those aspects of customs procedures, procedures necessary for a legal dispute etc...to reduce the complexity of procedures and therefore foster trade.

- Enabling Trade Index (Economic Forum, 2010)

The "Enabling Trade Index" does not include the EU27 as a participant in the Index as only countries are ranked in this index. Unfortunately Malta is not among the 125 countries in this index. Nevertheless this index should give an indication of the general openness to trade of the European Union.

Table 33: Ranking Enabling Trade Index of EU countries (excl. Malta)

Country	Total rank	Market access total	Domestic market access
Denmark	3	95	80
Sweden	4	96	83
Luxembourg	9	73	62
Netherlands	10	85	73
Finland	12	90	76
Germany	13	101	87
Austria	14	94	79
United Kingdom	17	91	77
France	20	97	84
Ireland	21	109	94
Estonia	23	83	72
Belgium	24	99	85
Cyprus	31	86	74
Spain	32	102	88
Slovenia	35	88	75
Portugal	36	77	66
Lithuania	41	70	56
Czech Republic	42	105	90
Latvia	46	80	69
Slovakia	47	103	89
Hungary	49	108	92
Italy	51	78	68
Romania	54	82	71
Greece	55	75	63
Poland	58	93	78
Bulgaria	78	76	65
Average rank EU 26	**32**	**90**	**77**

Source: Enabling Trade Index, Economic Forum 2010

The aspect of market access is divided into two categories: foreign market access and domestic market access. As all those countries belong to the European Union, they all face the same tariff rates and have the same margin of preference in destination markets. Therefore they are all ranked 90th.

As can be seen from the table above the best result scores Denmark with rank 3 and the worst Bulgaria (rank 78). Especially those European countries with a high ranking owe their ranking not to their accessibility of their markets. Denmark as the best listed European country scores very well in all other categories then market accessibility. Actually the total result in market accessibility doe not vary that much from the best to the worst country as they vary in rank.

Ireland achieved by far the worst results in terms of market accessibility. Important is here on the country level only the domestic accessibility as the foreign market accessibility is the same for all European countries. The only factor that varies among the European Union countries for the domestic market accessibility are the non-tariff measures. Therefore Lithuania is the

country where the domestic market access is least impeded by NTMs whereas in Ireland NTMs restrict the market access most.

As can be seen from the average ranking the European Union is well placed in all the other categories (border administration, transport and communication infrastructure and business environment). In terms of market accessibility the European Union is really lagging behind. With an average rank for market accessibility of 90th, it can be said that there are obviously great obstacles throughout the European Union to trade.
Especially low scores the European Union in the complexity of tariffs, tariff peaks, percentage of specific tariffs and number of distinct tariffs. It follows the conclusion that the European Union needs to reduce the complexity of the tariff system and especially reduce the number of distinct tariffs. This would probably greatly facilitate trade and introduce more competition to the market which would have positive effects on the consumer.

Conclusion European Union
In the economic crisis the European Union experienced a reduction in growth of the GDP. Also imports and exports were negatively affected. Though it can be expected that after the economic crisis the level of exports will go up again and imports may also increase as people will feel more secure again which will be seen in a lower saving rate. Overall decent economic growth of the European Union can be expected. On the other side there are no visible indicators that show that the European exports to Asia will grow drastically. Therefore a reduction of trade flow imbalances seem unlikely if the Asian economies continue to grow as in the past. Trade seems to be strongly hampered by tariffs and NTMs. As only China is ranked higher in market access, it can be assumed that the other Asian economies are even more protected. Therefore in case the barriers to trade would be removed the stronger protected economies would benefit even more which means that the imbalance of trade flows might even increase but definitely not decrease.

Chapter 5 – Model and trade flow projection results

In practice in the shipping and transport industry rather rarely economical models are used that predict trade flows to forecast cargo volume developments. The biggest carrier Maersk does use a model but it looks mostly at external publications (e.g. Dina Liners and CBS), and studies feedback from customers and their businesses from their sales force, watching the development of certain important markets (interview Halmton, 2010).

On the other side, the DVB Bank which finances transport assets as ships (Interview Shi Lei, 2010) uses a model to forecast vessel demand which is basically driven by front haul cargo volumes. Therefore the bank also needs to find out about potential future cargo volumes. DVB uses similar macroeconomic input factors like presented in the qualitative analysis of the potential of trade in this research (GDP growth, trade volumes, consumer spending, unemployment rates, earning levels and disposable income levels). Moreover DVB also uses a few short term indicators like sales to inventory ratio and inventory levels. Those factors are not of relevance in the GSIM model as we aim at predicting long-term (10 years) trade flow changes. Factors like international trade developments and policy changes such as the potential outcome of the Doha round or bilateral Free Trade Agreements are regional levels are not included in the model of DVB.

Methodology of the GSIM model

In this research we employ the Global Simulation (GSIM) Model to add a quantitative analysis of potential trade volumes to the qualitative analysis presented before. Based on this quantitative analysis, we can infer conclusions about potential developments in balances and imbalances in Asia-EU container trade flows. The GSIM Model (Francois and Hall, 2003) is used in this research to show how export and import flows from the EU to Asia are likely to develop over the next 10 years. This model is also frequently used to show the impact of changes in tariffs, quotas or subsidies following policy initiatives (Holzner, 2004; Kamphuis, 2010). In this research, we combine growth projections with likely trade developments (such as tariff reductions) – an addition to the work done by the DVB bank – to give a picture of future trade flows as accurate as possible. That is, we include potential tariff measure changes and look also at how trade patterns may shift due to increasing economic growth and power of the Asian countries. Changes of non-tariff measures will though be not included.

To show the trade developments between Asia and the EU 6 regions/countries have been chosen in the model. These are the following:

- European Union with 27 member states;
- China
- India;
- South Korea;
- Japan; and
- Rest of the World (ROW) as one region.

Four countries have been chosen to represent Asia: China, India, Japan and South Korea. Those countries have been chosen as they represent a mix of developed and developing countries, because they are important trading partners for the EU and because they together

constitute the bulk of Westbound trade origin. This is important as developed and developing countries have usually a different growth potential.

In particular China has been selected as it is the second biggest import partner of the EU (Eurostat, 2006) and is growing very fast and might represent therefore a huge potential future consumer market. Therefore China could also become one of the most important export partners of the EU as currently the US, Russia and Switzerland are the most important export partners (Eurostat, 2009). Moreover China's growing financial power has been named by the Capgemini study as the major reason why trade imbalance could change. India is the second developing country selected and with a population of 1,2 billion people it might be a future huge consumer market, which might attract trade flows from the EU. As the EU is already the most important trade partner of India, the EU might use its strong position and expand its share of exports into India which might influence the trade imbalance between the EU and Asia. As developed countries Japan and South Korea have been chosen. The growth rates of trade between the EU and Japan have rather stagnated in the recent years. The percentage of total exports and import of Japan from and to the EU have even declined. Never the less Japan is the 6th most important trade partner of the EU (Eurostat, 2009) and can therefore not be neglected. As the final Asian country, South Korea has been selected. It is the eighth most important trade partner of the EU. South Korea is like Japan, also a mature market and its growth rates are not expected to be as high as those of China or India. Nevertheless it is an important trade partner of the EU and is therefore also included as one of the Asian countries.

The European Union (27 member states) has been chosen as one of the aims of the paper is to show how the trade imbalances between Asia and the EU will develop. Consequently the EU has been chosen as one of the 6 regions. The EU 27 is treated as one conglomerate, even though the growth potential between west and the east of the European Union differs.

The final region to be included in the model is the "Rest of the World". This is necessary to ensure full closure of the model.

To show the change in trade flows, the *total* trade between those regions as well as four product categories have been modelled. The product categories are part of the Standard International Trade Classification (SITC) and were chosen as they represent so far the most important export and import product categories for the concerned countries. Those categories are:

- Machinery and transport equipment (SITC 7);
- Miscellaneous manufactured articles (SITC 8);
- Manufactured goods classified chiefly by material (SITC 6); and
- Chemicals and related products (SITC 5).

Advantages of the GSIM Model

The GSIM model is a partial equilibrium model. This means that the model deals with the conditions of equilibrium in individual markets or in parts of a national economy. This offers the advantages that even as the model is industry focused, the scope is multiregional. Moreover, the model is able to disaggregate welfare effects into consumer, producer, government and total effects which is essential to see who actually benefits and loses from the modelled developments. Additionally the model provides us with the opportunity to analyse simultaneous policy changes as well as growth projections. Finally – last but certainly not least

– it has to be said that the model is very user friendly, has limited data requirements, and is rather easy to implement.

A full-fledged CGE model (computational general equilibrium model) would be a too ambitious model for this analysis and is also not necessary as the GSIM model gives a good indication about the future approximate developments keeping in mind its limitations. A major advantage – as said – of GSIM over CGE models, is the much lower amount of data and computational requirements that are needed. The model requires the input of trade flow values between the different regions, data on initial bilateral import tariffs and final bilateral ad valorem import tariffs. Moreover the model requires the input of export supply elasticities, aggregate import demand elasticities and elasticities of substitution.

To predict future developments of trade flows, growth projections are incorporated into the model. Moreover the future tariff changes as a result of the outcome of the Doha round will be included in the model. Even though NTMs are nowadays seen as the major obstacle to trade (Copenhagen Economics, 2009), their future development is not going to be included in the model as this would be too ambitious for this study to also estimate the degree of reduction of NTMs.

Assumptions and limitations of the GSIM model

The model is based on several assumptions and has various limitations.

First of all it is assumed in the GSIM model that products from different sources are not homogeneous which means that products from different regions/countries are imperfect substitutes (this is called the Armington assumption). This is important as tariffs are different from country to country and tariffs determine partly the price of goods and their elasticities of substitution.

Moreover, the model has some limitations which have to be taken into account that stem from the fact that the GSIM model is a partial equilibrium model. This means that it focuses on a specific sector. Therefore changes from interlinkages with other sectors and secondary national income effects that might have an effect on the sector dealt with will not be included.

Finally, the model assumes that price responsiveness among different customer groups is the same. That means that differences in geographical location, demographic difference in age, and income category are not taken into account but do have some influence on the actual result.

Choice for the GSIM model

The GSIM model has been chosen over the CGE model for several reasons. First of all as the GSIM model is a static model it compares to points in time. The period under consideration is 2009 till 2020. Therefore it is perfectly enough to have only two situations as the aim of the paper is to find out how the trade imbalances develop until 2020. It is not necessary for our purpose to take the transit period under consideration

Moreover the GSIM model allows incorporating several changes at the same time, which is very important as not only trade developments need to be taken under consideration but also changes in tariffs.
As already mentioned the GSIM model is a partial equilibrium model which means in contrast to the CGE model it does not take interlinkages between different sectors into account which means that resource allocation between different sectors does not happen in the model. Finally the GSIM model requires, in contrast to the CGE model, a lot less data and computational effort. With only the value of the trade flows between the various regions, the initial import tariffs, the final import tariffs and demand and supply shocks it is able to derive the future developments of trade flows.

The GSIM Model Mathematical Composition

The mathematical structure of the model is based on export and import demand equations. The model can be described with a number of equations to determine market clearing condition in order to see the changes in trade flows. The mathematical structure and explanations below are a representation of GSIM model technical report of Francois and Hall (2003). An explanation of the variables can be found in the annex.

The model includes own- and cross price elasticities. To find out the own- and cross price elasticities it is necessary to look at the exporting regions, importing regions, and industry designation. The model assumes that within each importing country, import demand with product category of goods from country is a function of industry prices and total expenditure on the category. This assumption is shown in the first equation.

Equation 1: $$\theta_{(i,v),r} = M_{(i,v),r} T_{(i,v),r} / \sum_{s} M_{(i,v),s} T_{(i,v),s}$$

The demand expenditure share is a function of quantity of imports and the influence of the tariffs.

Equation 2: $$\phi_{(i,v),r} = M_{(i,v),r} / \sum_{w} M_{(i,w).r}$$

Equation 3: $$M_{(i,v),r} = f(P_{(i,v),r}, P_{(i,v)s\neq r}, Y_{i,v})$$

The combination of equation one and two shows the demand for imports, of product category in country or region from country or region. It is a function of the internal price of the product category from country within country, the external price of the product category from other sources and the total expenditure on imports of commodity in country.

Equation 3 is then differentiated and Francois and Hall (2003) to derive equation 4 and 5. While doing so Francois and Hall applied the Slutsky decomposition of partial demand and took advantage of the zero homogeneity property of Hicksian.

Equation 4: $$N_{(i,v),(r,s)} = \theta_{(i,v)s}(E_m + E_s)$$

Equation 5: $$N_{(i,v),(r,r)} = \theta_{(i,v),r} E_m - \sum_{s \neq r} \theta_{(i,v),s} E_s = \theta_{(i,v),r} E_m - (1 - \theta_{(i,v),r}) E_s$$

Equation 4 defines the cross-price elasticity and equation 5 the own- price demand elasticity. Next it is necessary to define the demand for national product varieties and national supply functions to achieve full market clearing conditions. In equation 6 the export price received by the exporter and the internal price for the same product are linked to define the demand for national product varieties.

Equation 6: $$P_{(i,v),r} = (1 + t_{(i,v),r}) P_{i,r}^* = T_{(i,v),r} P_{i,r}^*$$

The export supply to world markets is defined to be a function of world prices (P*) (equation 7).

Equation 7: $$X_{i,r} = f(P_{i,r}^*)$$

Now the equations 3, 6 and 7 are differentiated and result in the following:

Equation 8: $$\hat{P}_{(i,v),r} = \hat{P}_{i,r}^* + \hat{T}_{(i,v),r}$$

Equation 9: $$\hat{X}_{i,r} = E_{x(i,r)} \hat{P}_{i,r}^*$$

Equation 10: $$\hat{M}_{(i,v),r} = N_{(i,v),(r,r)} \hat{P}_{(i,v),r} + \sum_{s \neq r} N_{(i,v),(r,s)} \hat{P}_{(i,v),s}$$

The equations above (4, 5 and 8) are now substituted into equation 10 and summed over import markets which leads to equation 11.

Equation 11: $$\hat{M}_{i,r} = \sum_v \hat{M}_{(i,v),r} = \sum_v N_{(i,v),(r,r)} \hat{P}_{(i,v),r} + \sum_v \sum_{sr} N_{(i,v),(r,s)} \hat{P}_{(i,v),s}$$ (substitution)

$$= \sum_v^v N_{(i,v),(r,r)} [P_r^* + \hat{T}_{(i,v),r}] + \sum_v \sum_{sr} N_{(i,v),(r,s)} [\hat{P}_s^* + \hat{T}_{(i,v),s}]$$ (summed over import market

By setting equation 11 equal to the adjusted equation 9 global market clearing condition is achieved:

Equation 12: $$\hat{M}_{i,r} = \hat{X}_{i,r} \Rightarrow \quad E_{X(i,r)} \hat{P}_{i,r} = \sum_v N_{(i,v),(r,r)} \hat{P}_{(i,v),r} + \sum_v \sum_{s \neq r} N_{(i,v),(r,s)} \hat{P}_{(i,v),s}$$

$$= \sum_v N_{(i,v),(r,r)} [P_r^* + \hat{T}_{(i,v),r}] + \sum_v \sum_{s \neq r} N_{(i,v),(r,s)} [\hat{P}_s^* + \hat{T}_{(i,v),s}]$$

For the number of trading countries, equation 12 is used to enforce global market clearing conditions. If we would also model domestic production we would have exactly as many market clearing conditions as we have exports. In the model used in this paper, domestic production is though not modelled and therefore this does not apply.

Data

The GSIM model used in this paper requires different input factors: bilateral trade flows between all specified countries / regions, ad valorem equivalents of trade barriers, elasticities of supply, demand and substitution, and demand- and supply shocks (Francois & Hall, 2003).

The bilateral trade flows and the bilateral import tariffs were obtained from WITS (World Integrated Trade System database). This database contains dataset from various sources like the World Bank, the United Nations Conference of Trade, WTO etc...

The bilateral trade flows were obtained for the total trade and for the SITC categories 5,6,7 and 8. The bilateral import tariffs were also obtained for the four SITC categories and total trade. The different import tariffs were then trade weighted and summed up to receive a representative import tariff for each country and category. The bilateral import tariffs are the only trade barriers included in this GSIM model as NTMs were not included by the author.
In some of the scenarios a reduction of the tariffs is simulated. These reductions stems from the potential outcomes of the Doha round. The potential tariff reduction is calculated with a formula used by Prof. Francois:

Equation 13: *New tariff = old tariff * coefficient / (old tariff + coefficient)*

The coefficient for industrial countries is 8 and for developing countries it lies between 20 and 25. According to the advice of Prof. Francois, 22 has been chosen as a coefficient for the developing countries. Industrial countries in this model are: Japan, South Korea and the EU. As developing countries were China, India and Rest of the World classified. As the ROW is a mixture of developing and industrial countries, the tariff reduction results might be a little bit too small.

The elasticities of demand and substitution are estimates of Prof. Francois. Those elasticities have not been classified according to SITC group but by products. Therefore the given elasticities were assigned to the relevant SITC categories and trade weighted as well to receive individual elasticities for every single country or region. After a review of the scarce literature on supply elasticities (Kang et. al., 1988; Vinod, 1994; Edgerton, 2009; Martin, 1993) we decided to use 5 as the general supply elasticity. Martin suggest to use a supply elasticity between 2 and 4.5 but rather on the upper edge, Edgerton suggest to select a supply elasticity between 5,0 and 8.3 and Vinod recommends a supply elasticity of around 2.77. To our knowledge the paper of Edgerton seemed to be of the highest quality moreover by selecting 5 as supply elasticity I am close to Martins suggestion of 4.5.

The final input factor for the GSIM model are the estimates of supply and demand shocks. We used, to come up with supply and demand shocks, forecasts of the IMF (International Monetary Fund) and the World Bank. Unfortunately both do not offer forecasts till 2020. The IMF provides forecast until 2015 and the World Bank until 2012. To come up with projections until 2020, we took the geometric mean of the given growth rates and used the geometric mean as annual growth factor until 2020. For regions like the EU27 and “Rest of the World” also the geometric mean of every country was used as a growth factor until 2020. The total growth from 2010 till 2020 per country was then trade weighted and summed up to get a total growth for the whole region. Those projections are the basis for the estimates of supply and demand shocks for all 3 scenarios.

Scenarios

For the projection of total trade flows, 3 scenarios have been developed. The scenarios incorporate a different total percentage of demand (supply) increase for every region/country included in the model. The total demand (supply) increase from 2010 till 2020 is computed by using an average annual demand (supply) growth rate percentage for every country. This total demand (supply) increase is influenced by the country's growth expectations (growth forecasts of the IMF and World Bank are in Annex XXX). This average annual demand (supply) growth percentage is taken to the power of 10 to come up with the total demand (supply) increase in 2020.

Scenario 1: The Asian demand boom

Pink represents the simulated demand increase and light blue the supply increase. The net effect is the difference between the demand and the supply boom. Therefore the net effect can be either a demand shock or a supply shock depending on which one of the two is growing faster.

Table 34: Scenario 1 – The Asian demand boom

Demand Increase						
	EU	China	India	Japan	S.Korea	Row
Percent	16	304	159	22	71	48
Growth/year	1.5%	15.0%	10.0%	2.0%	5.5%	4.0%
Supply Increase						
	EU	China	India	Japan	S.Korea	Row
Percent	22	137	79	10	34	80
growth/year	2.0%	9.0%	6.0%	1.0%	3.0%	6.0%
net effect %	-5.8	168.0	80.0	11.4	36.4	-31.1

Source: own estimates based on projections of IMF and World Bank

Scenario one is a simulation whereby we assume that China, India, Japan and South Korea will experience a positive demand increase from increasing levels of consumer demand and consumer spending that outpaces growth in production; i.e. supply. For the EU and the Rest of the World we simulate a small net supply increase.

China and India are predicted to experience drastic demand increases of 304 and 159 percent up to 2020, and strong – but not as strong as the demand increases – supply increases of 137 and 79 percent respectively. Those large demand and supply increases are derived from the growth forecast of IMF and World Banks which indicates a huge growth potential for both countries.

This scenario could be true in case China keeps production growth at a similar level and does not aim for higher growth rates of supply. A high growth rate could lead to an increase in general wealth which would lead to a large demand increase, especially if Chinese start to – and are encouraged domestically – consume much more. The demand of South Korea and Japan is also expected to increase but not as drastically as the demand of China and India. The increase in demand could arise from further post-crisis consumption spending and need for intermediate products by Japanese and South-Korean industries. We assume further low growth rates in supply; production in real terms.

The general growth forecast of the EU and the ROW does not show a huge growth potential for the next 10 years. Therefore the demand and supply increase predictions are rather low. If the demand of China, India, Japan and South Korea is to increase somebody will have to supply them. The suppliers could be the EU and the "Rest of the World (ROW)". Therefore their supply growth projections are more optimistic than their demand growth projections.

Scenario 2: The Asian supply boom

In this scenario the net effects of the countries and regions involved are mostly driven by supply (i.e. production) increases.

According to the net effects of this scenario only the EU and the rest of the world experience a small demand increase. The others, Japan, South Korea, India and China, are expected to experience much faster production growth than increases in consumer spending. The net effect will be that output in the Asian economies increases much faster than domestic demand.

Due to China's and India's high growth expectations, the demand growth will be substantial as people become wealthier and demand for consumer products rises. In this scenario, however, the growth rate of supply; i.e. of domestic production, of China and India is expected to be even larger than growth in demand. This could be the case if China continuous to push production to be able to increase their share of exports to the world, while keeping its currency at a low value level compared to the US dollar and Japanese Yen. Moreover as India wants to increase its industrial sector to be able to offer employment to more people, their supply should grow fast. South Korea and Japan are also simulated to experience a higher increase in supply than demand. Growth rates of supply and demand are derived from the growth rates of their GDP. A higher supply growth rate could happen as the production of Japan and South Korea experiences technical advancements or they enter other market segments.

Table 35: Scenario 2 – The Asian supply increase

Demand Increase						
	EU	China	India	Japan	S.Korea	Row
Percent	22	139	79	11	48	56
growth / year	2.0 %	9.0%	6.0 %	1.0%	3.0%	4.6 %
Supply Increase						
	EU	China	India	Japan	S.Korea	Row
Percent	16	305	159	22	71	51
Growth / year	1.5 %	15.0%	10.0%	10.0%	5.50%	4.20%
net effect	6	116	80	11	23	5

Source: own estimates based on projections of IMF and World Bank

As China, India, Japan and South Korea grow predominantly because of increases in production (i.e. supply increases) rather than via higher rates of consumer spending (i.e. demand growth), they need partners to supply those products to: the EU and ROW.

Scenario 3: Neutral Growth

Third scenario is basically a scenario that lies in between scenarios 1 and 2. As can be seen also here, like in scenario 2, the supply increases in the net effects are prevalent but they are

on average much smaller than those of in scenario 2. For South-Korea and Japan, the demand change dominates.

As the EU and Japan are both expected to only grow marginally, their total supply and demand growth rates are rather small. The EU's supply rate could be slightly higher than its demand rate as the eastern part of the EU has a substantial industrial sector, which is increasing in efficiency rapidly (e.g. the automotive industry in Czech Republic and Slovakia). Japan may grow according to this scenario slightly more in demand than in supply. Japan's industrial sector is rather stagnant but the service sector is growing. Therefore the growth of the service sector together with the diminishing industrial sector could lead to a small demand increase. China and India experience both supply and demand effects and through those, substantial rates of growth. China will continue to push production and India is starting to do so. Meanwhile, general wealth will increase and lead to an increase in demand. Never the less in this scenario the supply increase is slightly bigger than the demand growth. Finally the ROW is expected to experience a supply increase and South Korea a slight demand increase. It has to be said that the growth rates of South Korea (supply and demand) are rather conservative, but the growth rates of South Korea seem to be a little bit optimistic as South Korea is also a rather mature market for whom it will be difficult to achieve them persistently. This could be though the case if South Korea continues to be such an important trade partner of China. If China continuous to grow sharply, South Korea will benefit.

Table 36: Scenario 3 - Neutral Growth

Demand Increase						
	EU	China	India	Japan	S.Korea	Row
percent	13	197	126	18	60	47
	1.24%	11.50%	8.5%	1.7%	4.8%	3.9%
Supply Increase						
	EU	China	India	Japan	S.Korea	Row
percent	15	211	179	14	45	76
	1.4%	12.0%	10.8%	1.3%	3.8%	5.8%
net effect	2	14	53	4	15	29

These are the basic 3 scenarios that are used for total trade flows. Moreover all three scenarios will be run once with a tariff reduction and once without a tariff reduction. The potential tariff reduction results from the future outcome of the Doha round.

For the SITC categories 5,6,7 and 8 only the scenario 3 will be run once including the tariff reductions of the Doha round and once without tariff reductions.

Result and Analysis

As already mentioned for the total trade flows, 3 scenarios have been used to estimate the impact on the trade imbalances. The result of the model shows all changes of trade flows, including the intra Asian Trade flows. As topic of this paper is the development of the

imbalances between the EU and Asia, the analysis will not be about changes in intra Asian trade flows.

Table 37: Total growth effects (no tariff rate reductions)

	Scenario 1		Scenario 2		Scenario 3	
	westbound	**eastbound**	**westbound**	**eastbound**	**westbound**	**eastbound**
China	-4.3	1.9	9.3	-1.4	-1.3	0.3
Japan	-19.2	-4.2	3.7	-2.7	-8.4	-9.1
South Korea	-3.4	-0.4	8.4	-0.9	2.9	-3.7
India	3.8	14.5	19.3	13.2	24.6	-1.4
ROW	0.8	5.7	-1.4	5.1	11.6	1.8

Source: outcome of the GSIM model, by the author

The first scenario is characterised by a strong increase in domestic demand. Consequently as the demand increases are stronger than the increases in supply of China's, Japan's and South Korea's exports into the EU are shrinking, because more of domestic production is also consumed domestically. Essentially, this scenario mimics a possible demand surge from Asian consumers.

India also experiences a strong demand increase but nevertheless its exports into the EU are going to grow slightly according to the projection of scenario 1. The eastbound volumes from the EU into Asia (except Japan and South Korea) are going to grow. Eye catching is especially the strong projected import growth rate of India which is of course due to the simulated strong demand caused by the Doha tariff reductions. Because China experiences a strong demand increase, its import volumes are projected to increase by a lot.

The second scenario is characterised by strong supply increases. Therefore the expected outcomes are volume increases on the westbound route. This theory is supported by the results of the GSIM model of scenario 2. All countries which experienced a stronger supply increase than demand increase (all Asian countries) show a growth of Asian exports into the EU. Again the growth rate of India has to be highlighted (19,2 percent) caused by the tariff reductions of Doha, but also China and South Korea show healthy growth rates.

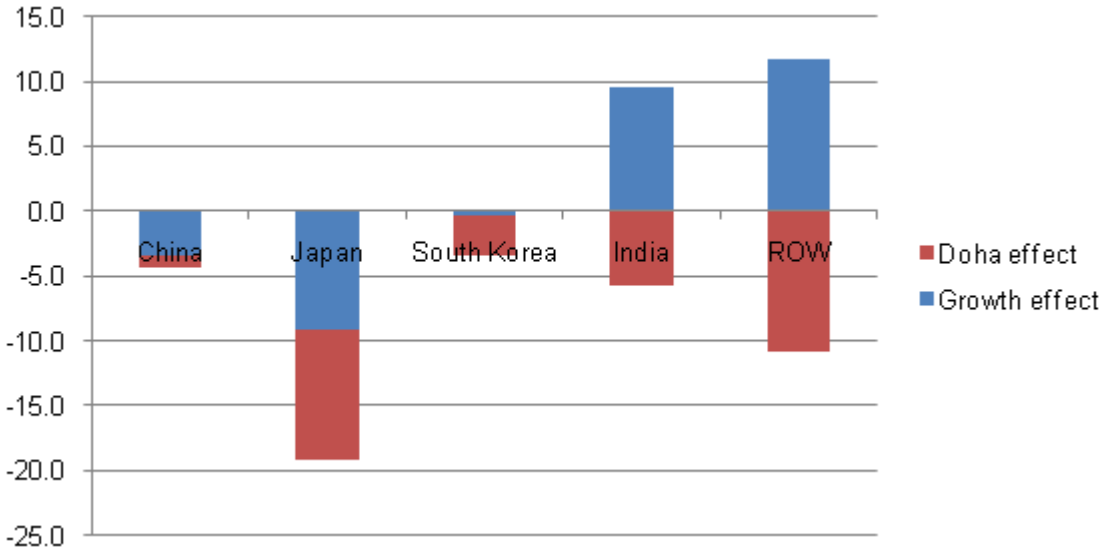
The eastbound side is experiencing declining volumes from the EU to China, Japan and South Korea. In this scenario, India experienced a huge supply increase which is by far larger than its demand increase. This means we expect Indian exports into the EU to grow significantly, by 13.2 percent. This could make up for the import reductions of the other Asian countries in absolute terms.

Scenario 3 represents the middle way of scenario 1 and 2 and is supposed to be the most realistic one, because it is neither by extremely strong demand nor supply shocks characterised but keeps a balance between both. Only in this scenario, India experiences a reduction of volumes. This reduction is simulated to be in imports from the European Union. This seems to be the consequence of the Indian net supply increase (supply increase – demand increase). As India increases its own production, the demand for import products from the EU decreases. On the other side, India experiences a very strong demand for Indian exports from the EU which does not contribute to balance the imbalances of the trade flows between Asia and the EU.

Also Japan and South Korea do not seem to contribute to balance the imbalances between Asia and the EU. China has a decreasing impact on the imbalances as its export volumes go

down and its import volumes from the EU move up slightly. This can be explained by the small net supply increase of China. This small net supply increase is obviously too small to result in negative import growth as the demand increase is very strong as well.

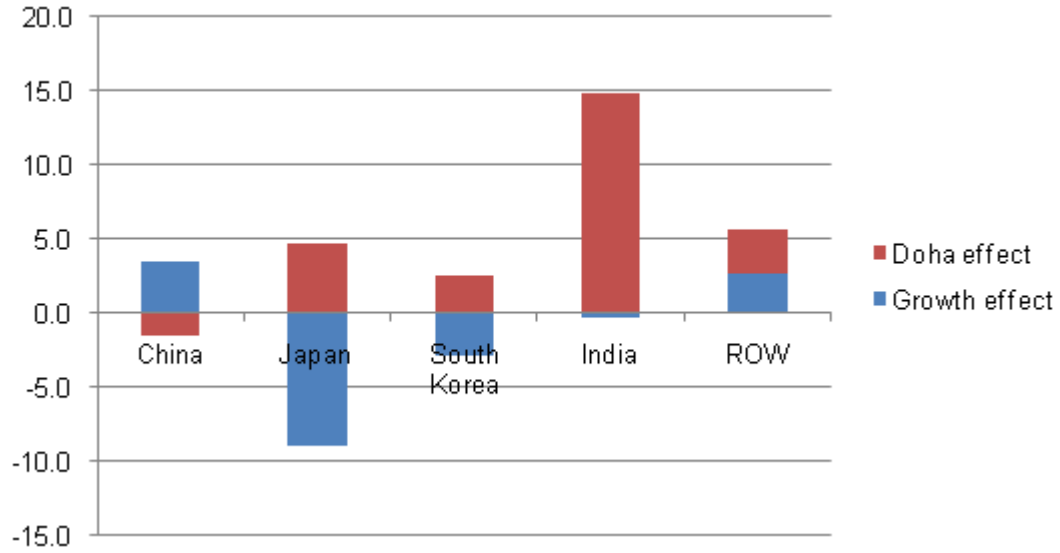
Figure 9: Trade flow changes WB Scenario 1



Source: outcome form the GSIM model, edited by the author

Figure 10 shows that the tariff reductions caused by assumption that the Doha round will be successfully completed before 2020, reduce the trade volume from all Asian countries (included in the study) to the EU. A positive effect on the westbound volumes is exerted by the economic growth of India.

Figure 10: Trade flow changes EB Scenario 1



Source: outcome form the GSIM model, edited by the author

The Doha impact is quite the opposite for the eastbound trade flows. The tariff reductions contribute vastly to an increase in eastbound volumes. Only the economic growth (results in an increase in demand) of China is also supporting a rise of eastbound volumes. In particular

the weak economic growth projections for Japan influence the growth rate of eastbound volumes negatively.

Figure 11: Development of the Imbalances / Scenarios

Scenario 1		**Scenario 2**		**Scenario 3**	
Trade flow WB	Trade flow EB	Trade flow WB	Trade flow EB	Trade flow WB	Trade flow EB
595.2	295.7	694.5	291.1	635.0	281.8
299.5		403.3		353.2	

Source: outcome form the GSIM model, edited by the author

Figure 12: current trade imbalance between Asia / EU

WB	**EB**
638.8	289.0
349.9	

Source: data WITS, edited by the author

As expected, scenario 1 with the strongest demand increases in Asia shows the smallest imbalances of trade flows. We see that in comparison to the current trade imbalance, the trade imbalance declined in scenario 1 by almost 15 percent. Expected is also that the second scenario which is dominated by supply increases, shows the greatest imbalance of trade. This is due to the fact that if the supply in Asia increases, without being outpaced by domestic demand, goods are exported to the EU. The EU is assumed to have a slight net demand increase. Comparing the current levels of imbalance and the level of imbalance of scenario 2, we see that the imbalance increases by over 15 percent. The third scenario is supposed to be the most realistic one. As can be seen the imbalance in scenario 3 has barely changed.

Containerised Imbalances

As already shown the degree of containerisation between trade routes (east- or westbound) varies. As the paper is looking at imbalances of containerised goods it is vital to see whether the imbalances of containerised goods are going to persist.

Table 38: Containerised imbalances

Scenario 1		**Scenario 2**		**Scenario 3**		**Current Situation**	
Trade flow WB	Trade flow EB	Trade flow WB	Trade flow EB	Trade flow WB	Trade flow EB	**WB**	**EB**
453.5	247.6	529.1	243.8	483.8	236.0	486.7	235.2
[13]205.9		285.3		247.8		244.7	

Source: outcome form the GSIM model, edited by the author

[13] Imbalance = westbound – eastbound volumes

The trade flows have been multiplied by the estimated degree of containerisation 83.74 percent eastbound and 76.19 percent westbound. This results in a reduction of imbalances. It can be seen from Table 38 that the imbalances of the scenarios are more similar than those of total trade flows. This is due to the different degrees of containerisation on the east- and westbound route.
It has to be said, that the author used the estimated degree of containerisation of 2009. By 2020 the degree of containerisation could have risen even further. It might also be that there are no differences in the degree of containerisation in 2020 anymore. On the other side it has to be said, that a degree of containerisation of around 80 percent is very high. Certain goods can never be containerised and therefore, there will never be a 100 percent degree of containerisation. As a consequence it does not seem very likely that the degree of containerisation will rise much further.

SITC Groups

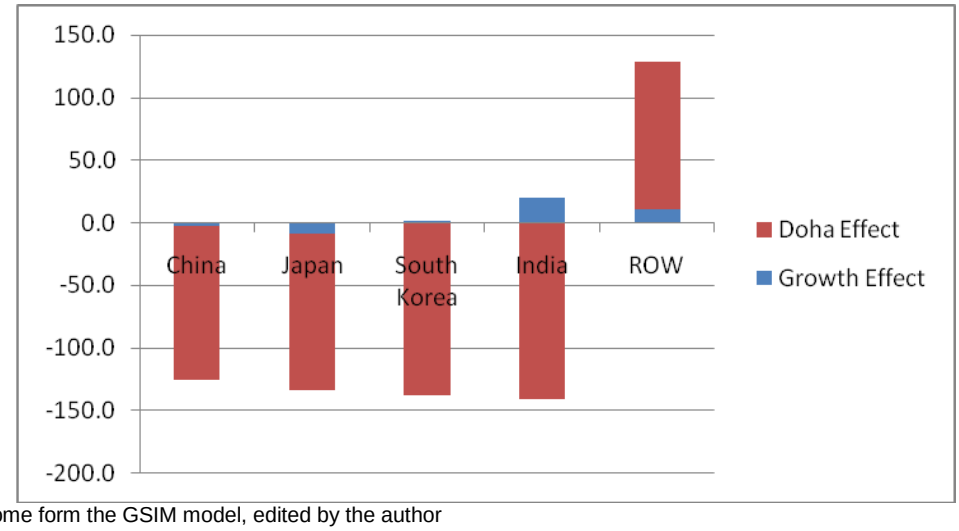
Table 39: Trade flow changes SITC groups

	SITC 5		SITC 6		SITC 7		SITC 8	
	WB	EB	WB	EB	WB	EB	WB	EB
China	-125.4	40.6	14.0	2.8	-1.6	-1.3	0.7	-11.0
Japan	-133.1	38.0	-0.5	2.2	-8.4	0.5	-6.1	-1.8
South Korea	-136.0	33.7	-0.3	5.9	2.9	2.5	3.5	-2.0
India	-120.3	61.2	3.7	26.2	24.4	19.1	24.5	21.9

Source: outcome form the GSIM model, edited by the author

In particular eye catching is the tremendous change of trade flows in the SITC 5 category (chemicals). The minus expresses a very sharp shift, which means that the chemical exports from Asia to the EU will basically disappear and it will even lead to more imports of chemicals. The EU obviously has a comparative edge in chemicals and according to scenario 3 this will lead to a double digit increase of chemical eastbound volume.

Figure 13: Trade flow Westbound effect SITC 5



Source: outcome form the GSIM model, edited by the author

SITC 6 (manufactured goods mainly classified by their material) experiences an increase in volumes westbound due to the exports of China. These products are mostly low-tech products where China (has already) substantial market share. India is predicted to experience a drastic demand for SITC 6 goods from the EU which might lead to an ease of the imbalances.

Japan and China are going to export less SITC 7 goods (machinery and transport equipment). The Japanese reduction of SITC 7 exports is mainly due to a slight net demand increase. This is also supported by Japan's slight growth of SITC 7 imports from the EU. India's exports and imports grow vastly but as there is not much difference between them, the imbalance of the SICT 7 will not be affected greatly.

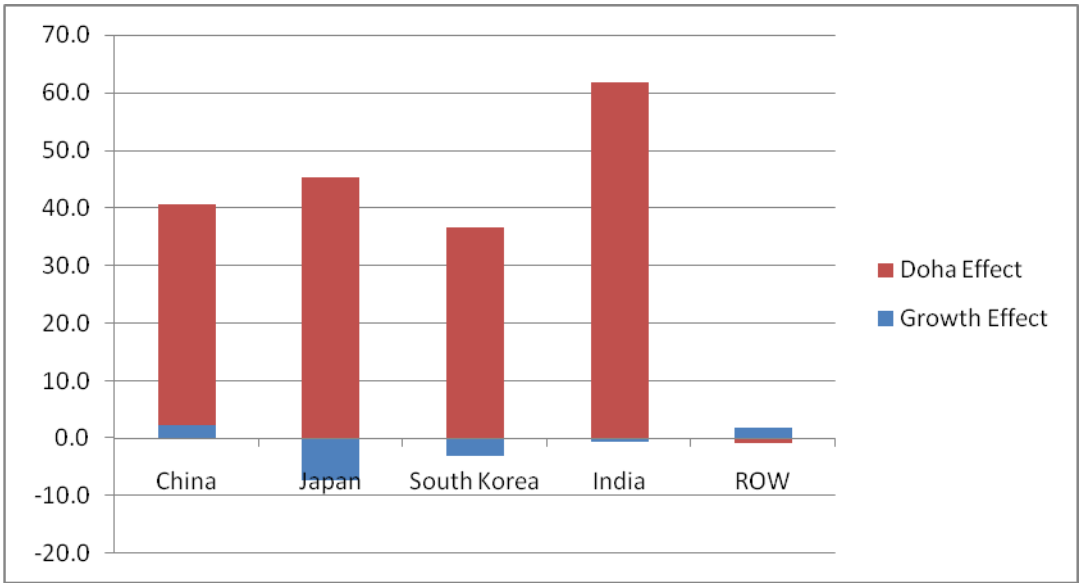
The SITC 8 goods (Miscellaneous manufactured articles) show a huge decline in eastbound volumes, mostly caused by China and South Korea. Even though the import volumes of India a high, it will not change much on the imbalance of SITC 8 goods, as its exports rates are even slightly higher. All countries (except) Japan show a growth of export SITC 8 goods to the EU. This could lead to an increase of imbalances.

From Figure 13 can be seen that the Doha round tariff changes have the greatest effect on the trade flow changes of the SITC product category. It can be seen that the Asian countries have a decline rate in SITC 5 products of more than 100 percent which indicates a dramatic shift towards imports.

From

Figure 14a dramatic increase of the import volumes from the EU can be seen in the Asian countries, not though in the Rest of the World.

Figure 14: Trade flow Eastbound effect SITC 5



Source: outcome form the GSIM model, edited by the author

Table 40: Trade flow imbalances SITC categories

	SITC 5		SITC 6		SITC 7		SITC 8	
	WB	EB	WB	EB	WB	EB	WB	EB
Trade flows	-8.00	54.84	94.97	48.50	140.91	46.45	170.81	30.24
imbalance new	-62.83		46.47		94.46		140.57	
imbalance old	-9.94		42.30		94.70		136.16	

Source: outcome form the GSIM model, edited by the author

The negative imbalances indicate a higher eastbound volume. A higher eastbound volume in single SITC groups contributes to the reduction of imbalances of total trade flows which have a higher westbound trade flow volume. As can be seen from above only one product category (SITC 5) has a higher eastbound level, which is due to the level of EU competitiveness vis-à-vis third countries in chemicals. According to the projections of the GSIM model, the product trade flow imbalances (eastbound) are going to increase. It seems that that the EU focuses on its comparative advantages and exports more of those products to Asia. The product categories SITC 6, 7 and 8 have a traditional westbound – imbalance (more trade volume on the westbound side). The imbalances of SITC 6 and 8 are projected to increase further. Only product category SITC 7 is projected to experience a marginal imbalance reduction. Looking just at those 4 product categories it seems as if the total trade imbalance would be declining (mostly due to the product category SITC 5). Looking at the total containerized imbalance projection, it can be seen that the impression of those SITC categories is misleading.

Containerised SITC Imbalances

As already estimated in this paper, the degree of containerisation varies strongly between those product categories. Nevertheless, they do not differ strongly between east and westbound. Therefore a stronger reduction of imbalances cannot be expected.

Table 41: Containerised imbalances SITC categories

	SITC 5		SITC 6		SITC 7		SITC 8	
	WB	EB	WB	EB	WB	EB	WB	EB
Trade flows	-1.1	10.4	72.4	36.9	77.8	28.3	130.1	23.0
imbalance new	-11.5		35.5		49.6		107.1	
imbalance old	-3.5		32.3		59.3		103.8	

Source: outcome GSIM model, edited by the author

As can be seen from Table 41, all imbalances are projected to increase except the imbalance of category SITC 6. This goes exactly in hand with the developments of the imbalances of the total trade volumes.

To conclude, we can say that none of the three scenarios lead to fully balanced trade flows. Scenario 1 shows as expected a reduction of imbalances as it is characterised by strong demand increases. It follows that the scenario 2 determined by strong supply increases shows the highest imbalance between containerised and total trade flows. Finally scenario 3 is shown to be very close in terms of imbalances to the current situation. Consequently it can be said

that none of the scenarios supports the theory of balanced trade flows or even a trade flow volume reversal.

Chapter 6 – Estimating effects of trade flow changes on freight rates

Factors determining freight rates

General

Part of the aspects named here have been already highlighted in chapter one but to provide a clear picture, they are repeated here. It has been highlighted during the interviews with Mr Ravesteyn (Managing Director MSC Netherlands), Mrs. Halmton (Trade analyst Maersk) and Mr. Willeumier (Manager Business Analysis and Intelligence, Containers, breakbulk and logistics, Port of Rotterdam) that freight rates are determined by supply and demand. Since the abolishment of the Far East Freight conference in the EU in 2008 (Wong, 2009), freight rates are not fixed by a cartel (conference) anymore but are only determined by supply and demand.

Supply in the sea shipping industry is quite sticky, as new capacity in case of a worldwide demand increase cannot be quickly introduced. It takes between 1.5 to 3 years from the time a vessel is ordered until it is delivered and can be used for transport (Stopford, 2009). Therefore if the world economy is booming, the demand for transportation capacity worldwide is rising as well as the transport demand is a derived demand. As supply is rather sticky and cannot be immediately adjusted to the rising demand, transport capacity becomes tight which leads to an increase in freight rates. It has to be highlighted that this only happens in case of a worldwide demand increase. If demand for transport capacity on just one route (e.g. Asia (Shanghai) – EU (Rotterdam)) increases, the increased demand can be covered by using capacity from another route which does not experience a rise of demand or even has a certain oversupply.

The shipping market is a cyclical market as can be seen from

Figure 6 (Stopford, 2007). Therefore when the demand is high, ship owners tend to order more capacity. Mr. Willemeur (interview, Port of Rotterdam) mentioned that ship owners usually order at a wrong time by ordering in high times and due to the time lag they receive the vessel 3 years later, where the markets might be already down again. Precisely this situation happened from 2004 to 2007. Therefore, when the first financial difficulties appeared in the middle of 2007, there was an oversupply of capacity (Lloyds List, 10 March 2010). As vessels had been ordered and the time to deliver was around 2-3 years, more and more vessel started coming into the market. Consequently as the world economy in 2008 experienced a downturn, the newly built vessels added extra capacity to the oversupply which resulted in a sharp drop of freight rates. During this time, demand for transport was low but supply was high, therefore freight rates went down. As supply is driven and managed by shipping companies, they are able to influence the supply. During the time of oversupply many ships were laid up, to reduce supply and therefore to push the freight rates up again. This measure though requires discipline of all shipping companies, as all shipping lines need to limit the supply to actually push freight rates up again.[14]

As already mentioned, transport demand is a derived demand. It is derived from trade as trade creates the need for transportation. Consequently shipping is closely linked to the world economy. As a result the demand for transport capacity is high during an economic boom and

[14] This situation is actually a prisoner dilemma with a suboptimal Nash - Equilibrium

low during a recession. The demand for transport cannot be influenced by shipping companies.

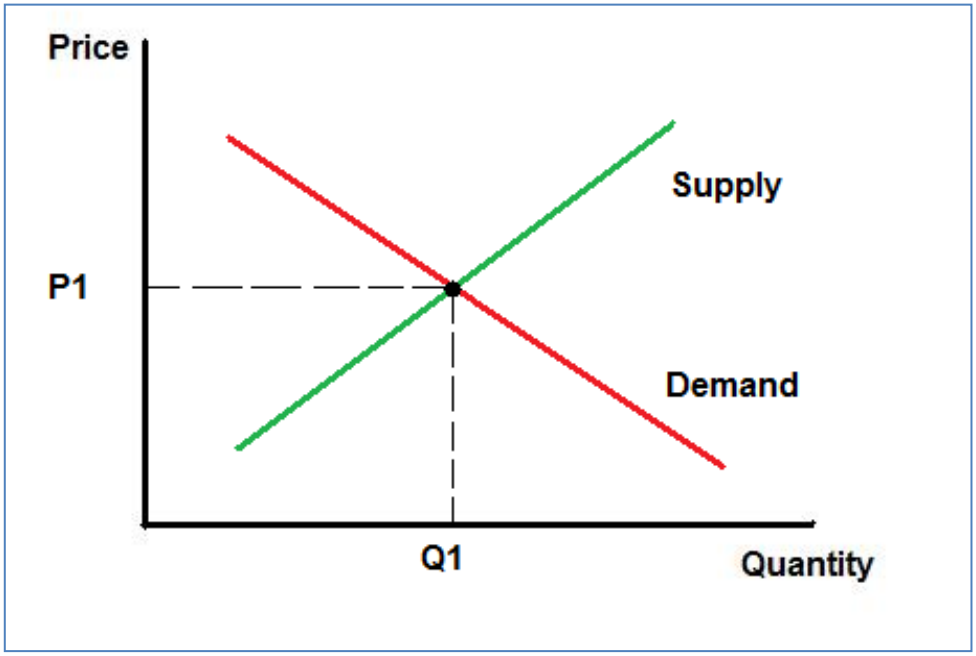
To conclude, we can say that the freight rates are determined by supply and demand whereas demand depends on the world economy and cannot be influenced by shipping companies; the supply of vessel capacity can be manipulated by the shipping companies themselves but requires discipline of all shipping companies. Therefore container shipping lines can exert some influence on the freight rate by regulating the supply.

Back haulage

The back haulage is always the weaker (less demand) leg of a route. Even though liner companies operate their routes in loops, for example from Asia to the EU and back, the back haulage can be seen as a separate product from the front haulage as goods are usually not sent an entire loop. Nevertheless both “products” front- and back haulage influence the freight rates of each other.

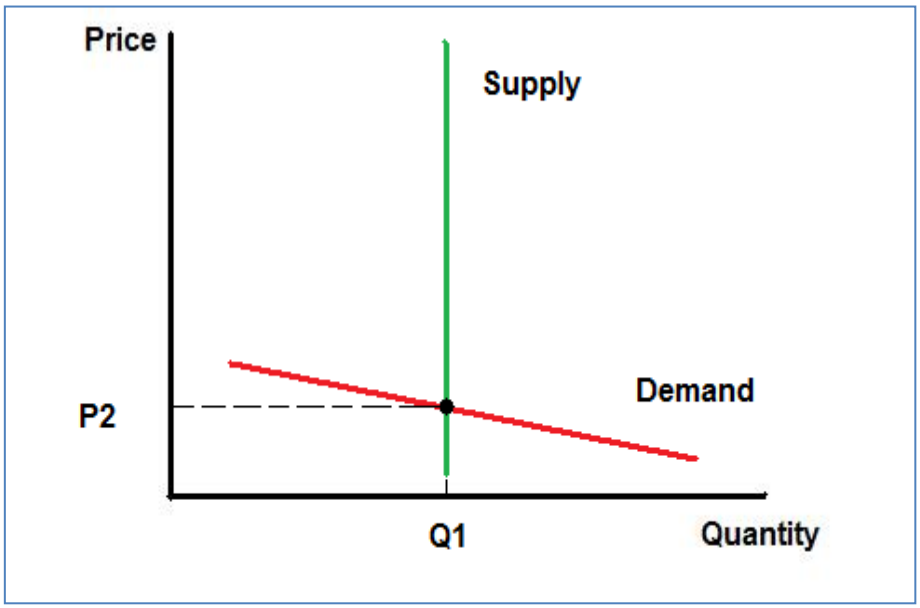
The freight rate of the front haulage is determined by supply and demand. According to the demand a certain transport capacity will be supplied for the front haulage. As already explained in the first chapter, the container vessel has to return, as it operates in loops. Therefore the capacity provided for the back haulage is determined by the demand for the front haulage. Hence the supply of the back haulage is perfectly inelastic.

Figure 15: Demand and supply front haulage



Source: Edited by the author

Figure 16: Demand and supply back haulage



Source: Edited by the author

As the backhaulage is the weaker leg, as there is less demand, there will always be overcapacity. Overcapacity leads to lower freight rates on the backhaulage. Consequently the greater the trade imbalances between two regions, the greater will be the difference between the freight rates of front haulage and backhaulage. Jonkeren et. al. (2008) shows in his paper the mathematical relationship and formalizes by that the idea of *"given joint costs of transport between regions, transport prices are not equal to one-way transport costs, but demand on the relative demand for transport between regions."* This means that even though transport costs on both sides can be the same, the freight rates (prices) will not be due to the trade imbalance. Based on this, we would expect freight rates to go up, when the imbalance increases.

Methodology: Econometric Analysis

Description of the econometric approach

The aim of this chapter is to find out whether the imbalance of container volumes has a significant effect on the freight rates. Therefore, we have set up a regression analysis. This approach has also been used by other papers which tried to determine what factors have influenced or do influence freight rates (Wilmsmeier & Hoffmann, 2008). Based on the literature description in chapter 2, the following explanatory variables have been selected as potential determinants for the freight rate:

- X1: Number of containers shipped eastbound;
- X2: Number of containers shipped westbound;
- X3: The imbalance of containers shipped (eastbound -/- westbound);
- X4: The value of containerised goods shipped eastbound;
- X5: The value of containerised goods shipped westbound;
- X6: The imbalance of the value of containerised goods;
- X7: Economies of scale on a route;

- X8: The amount of TEU employed on the route (supply capacity);
- X9: The oil price in USD per barrel;
- X10: The physical distance between capitals in kilometers;
- X11: Level of competition.

Consequently the regression equation looks as follows:

Equation 14 *Freight rates (Y) = a0 +a1*X1 + a2*X2 + a7*X7 + a8*X8 + a9*X9 + a10*X10 + a11*X11*

We then change X1 and X2 for X3, or for X4 and X5 or for X6, in order to run different specifications. As we are trying to find out in particular whether the imbalance of containerised trade flows has an impact on the freight rates, we included first the separate east- and westbound measurements (either X1 and X2 or X4 and X5), and then also net imbalance (either X3 or X6). Next to the variables measuring imbalance, we have selected various other variables that have been mentioned in the literature (chapter 2) as control variables (e.g. economies of scale, competition, oil price, capacity).

Data

To run the regression analysis not only data on EU – Asia is needed but also on intra Asian trade routes.

The trade values from country i to country j, we have taken from the WITS database (World Bank). We have estimated the degree of containerisation of these trade flows and thus calculated for the bilateral country pairs in our dataset (the EU, China, India, South-Korea, Japan) the value of containerised goods eastbound and westbound. These are variables X4 and X5. The imbalance is calculated as X5 -/- X4 – imbalance measured as the net value of containerised goods. We expect the coefficient a6 to be positive, because – as discussed above – the higher the imbalance, the higher the freight rates (compensating for empty container back haulage).

Another way to measure imbalance is to look at containerised trade flows. To show the containerized trade flows between the EU and China, S. Korea, Japan and India, we have used data from Eurostat. This data bank offers data on total containerized trade flows and empty container trade flows, by subtracting one from the other. This way, the amount of full containers shipped is calculated. Unfortunately Eurostat does not provide data on intra-Asian container transport, therefore the amount of containers within Asia had to be derived from the relation of China – EU containers sent eastbound and westbound times the total trade volume (X1 and X2). The imbalance is then defined as X2 -/- X1; i.e. as the net number of containers flowing westbound. Also for a3, we therefore expect the coefficient to be positive; i.e. an increase in the imbalance leads to higher freight rates. Because of data limitations, this second approach is a rather rough one. Nonetheless, we hope that our approach with X1, X2 and X3 is corroborated by the different measure of X4, X5 and X6.

For the variable “Economies of Scale” data from Containerisation international on TEU and the number of vessels deployed on a route has been used. The route categories in containerisation international used to find out the TEU and ships deployed are: Europe – Far East (this includes China, S. Korea and Japan), Europe – Sub-Indian continent, East Asia costal and Far East – Sub-Indian continent. The relation between TEU and vessels deployed shows the average size of a vessel, which represents potential economies of scale. We expect that the larger the economies of scale (i.e. the higher the average number of containers per vessel), the lower the freight rates would be. Therefore a7 should be negative.

The supply capacity is the total amount of containers deployed on a loop (e.g. Asia – Europe – Asia). As a total loop consists of front- and back haulage a 10.000 TEU ship has a supply capacity of 20.000 TEU. The number of TEU deployed on a loop has been taken from Containerisation International and has been divided by 2, to receive the number of TEU deployed on one side. The higher the supply capacity, the more space is available, so the lower we expect the freight rates to be. That implies that we expect the supply capacity coefficient, a8, to be negative.

Oil price developments are collected from internet source "Goyax" (2010) which shows the developments of the oil price for "Brent" and not for bunker oil. The oil price for Brent has been used, as there is no data from 2000 till the end of 2006 available on bunker oil prices free of charge. Looking at the bunker oil prices and the "Brent" oil prices, we note a high correlation between 2007 and 2010 (higher than .90, own calculations). Therefore it a substitution of bunker oil prices by Brent oil prices can be justified. Because oil is one of the most important input costs for the maritime transport sector, we expect oil to have a significant impact on the freight rates. The higher the price for oil, the higher the freight rates are expected to be; i.e. a9 is expected to be positive.

Distance in kilometres is a very crude measure in the field of transport economics, but we add the variable to see if countries further away also exhibit higher freight rates. The further away two countries are (in km), the higher we expect the freight rates charged to be. That implies, we expect a10 to be positive.

The data for the variable "competition" has been retrieved from Containerisation International. The degree of competition has been derived from all shipping lines offering shipping routes from all ports of one country to all ports to another country. This has been done using the data for 2009 for all years since 2000, as no other historical data were available. Because competition reduces the price and margins firms can ask, we expect competition to have a negative effect on freight rates; i.e. a11 is expected to be negative.

Finally the freight rates – the dependent variable – are from the Containerisation International index on freight rates Europe – Asia Eastbound and Asia – Europe Westbound. They have been approximated by fixing the percentage changes for the Asia-EU and EU-Asia lines also for the bilateral country pairs.

Regression analysis of factors that affect freight rates

We then continue to run the regression analyses, each time with slightly different specifications as shown in Table 42, and every time with time-specific fixed effects to capture variation in freight rate changes over time. We first of all hope that all variables are significant with the right sign. Our special focus is on coefficients a3 and a6 that measure the effect of imbalance on the freight rates – and whether this effect is statistically significant. The regression specifications and results are presented in Table 42. The coefficients are presented first, with underneath p-values in parentheses.

Table 42: Result regression analysis

	Variable	**Total trade**				**Westbound trade**				**Eastbound trade**			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
a1	Constant	842.4 (0.00)	855.4 (0.00)	849,2 (.00)	896.5 (.00)	544.1 (0.00)	517.6 (0.00)	577.1 (0.00)	551.7 (0.00)	1158. 7 (0.00)	1186. 8 (0.00)	1214. 5 (0.00)	1201. 3 (0.00)
a2	Trade volume	.003				.001				.000			

	Variable	Total trade				Westbound trade				Eastbound trade			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	westbound (nr of containers)	(0.00)				(0.01)				(0.79)			
a3	Trade volume eastbound (nr of containers)		-.001 (0.15)				.000 (0.89)				.001 (0.16)		
a4	Imbalance (net nr of containers)			.002 (.00)				.001 (0.01)				-.001 (0.16)	
a5	Imbalance (net value of containerized goods)				.000 (.17)				0.000 (0.29)				0.000 (0.00)
a6	Economies of scale (av vessel size)	.019 (0.59)	.051 (0.17)	.041 (.24)	.038 (.30)	.116 (0.00)	.134 (0.00)	.119 (0.00)	.131 (0.00)	-.025 (0.52)	-.035 (0.37)	-.031 (0.42)	-.026 (0.49)
a7	Supply capacity (TEU capacity)	-.000 (0.03)	-.000 (0.01)	-.000 (.01)	-.000 (.02)	-.000 (0.00)	-.000 (0.00)	-.000 (0.00)	-.000 (0.00)	-.000 (0.59)	-.000 (0.66)	-.000 (0.61)	-.000 (0.54)
a8	Oil price (current $)												
a9	Distance (km between capitals)	.046 (0.01)	.060 (0.00)	.056 (.00)	.050 (.00)	.092 (0.00)	.097 (0.00)	.095 (0.00)	.093 (0.00)	.003 (0.89)	-.003 (0.89)	-.001 (0.96)	-.000 (0.99)
a10	Competition (nr of ship-ping lines between countries)	-1.884 (0.00)	-1.532 (0.00)	-1.614 (.00)	-1.725 (.00)	-1.268 (0.00)	-1.100 (0.00)	-1.211 (0.00)	-1.161 (0.00)	-2.200 (0.00)	-2.323 (0.00)	-2.292 (0.00)	-2.242 (0.00)

Source: own calculations

From Table 42, we see that – when focusing on columns (3) and (4), that the imbalance based on the net number of containers show a significant and positive effect on freight rates (X3). The other measure (X6) also shows a positive effect of the net value of containerised goods, but this effect is not statistically significant. This implies that we have found evidence (one of the two measures statistically significant) that the degree of imbalance has a small but positive effect on the freight rates; i.e. a one percent increase in the imbalance (net number of containers) leads to a 0.2 percent increase in freight rates. We also observe that for both regressions, all variables have the expected signs, except for scale economies – but this variable is not statistically significant. We find a negative coefficient for supply capacity, providing evidence that indeed, larger capacities have a negative effect on freight rates – even though the coefficient (i.e. percentage change effect) is very small. We find that the oil price causes significant degrees of multicollinearity which is the reason for the variable being dropped out of the regression equation. The distance in kilometres between capitals is statistically significant and positive, suggesting – as expected – that countries further apart are subject to higher freight rates. Finally, the variable competition shows a strong negative (and statistically significant) effect on freight rates. That is: the more trade routes there are between countries, the stronger competition, the lower freight rates.

Scenarios

As already mentioned the outcomes of the scenarios used for the GSIM model are the basis for the degree of freight rate change, when combined with our findings on coefficients a3 and a6 from our regression analysis. There is a vast literature available on the do's and don'ts of extrapolation and measurement of effect long into the future (Brezinski & Redivo-Zaglia, 1994**),** especially the validity of such predictions in light of structural breaks in the structure of the economy.

If we assume that there are no structural breaks in the economy, we use Table 43 and Table 42 to calculate the expected changes in freight rates by 2020, depending on what scenario for demand and supply growth has materialised.

Table 43: Scenarios - change of imbalance

	Scenario 1	Scenario 2	Scenario 3
Old imbalance	349.9	349.9	349.9
New imbalance	299.5	403.3	353.2
Percentage change	-14.4	15.3	0.9

Source: WITS & results GSIM model

The coefficient of imbalances (number of containers) is 0.002 (p-value of .00), which implies that a 1% increase in imbalance leads to a 0,2% increase in freight rates. Therefore the change of freight rates due to changing imbalances can be assumed to be small.

Results and Analysis

From Table 44, we see that the new freight rate eastbound, based on our GSIM projections and only because of changes in trade balances between Asia and the EU, is expected to be between US$ 828 (scenario 1) and US$ 879 (scenario 2). Westbound freight rates are expected to be between US$ 994 (scenario 1) and US$ 1054 (scenario 2).

Table 44: Changes of freight rates (2009 US$)

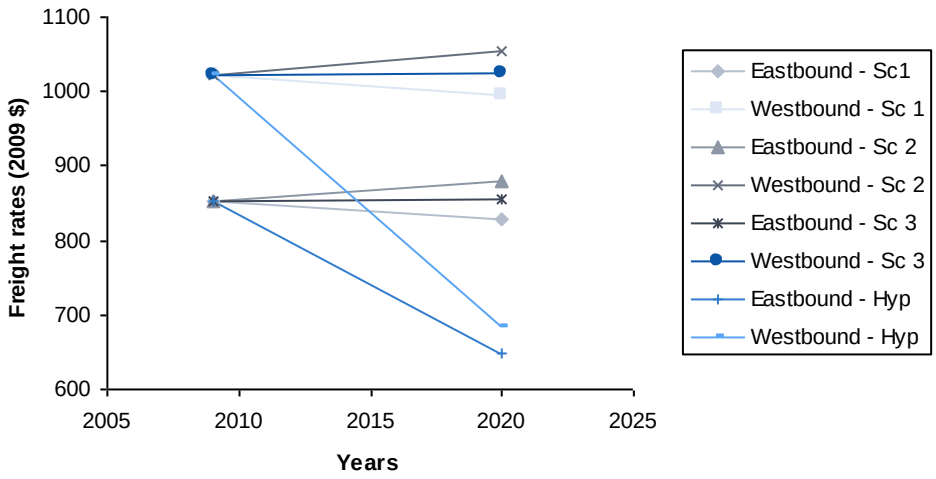
	Scenario 1	Scenario 2	Scenario 3	Hypothetical
Freight rate change EB (%)	-2.9	3.1	0.2	-100
Freight rate change WB (%)	-2.9	3.1	0.2	-100
Freight rate change EB (2009 $)[15]	-24.6	26.1	1.6	-171
Freight rate change WB (2009$)[16]	-29.5	31.2	1.9	-205

Source: own calculation based on regression analysis

If – hypothetically (last column in Table 44) – the imbalance would be completely eliminated (which is highly unlikely given our demand and supply scenarios that do serve as likely upper- and lower bound estimates), the change in imbalance would be -100 percent, which would

[15] Base rate from Containerisation International 1. Quarter 2009, 853 $
[16] Base rate from Containerisation International 1. Quarter 2009, 1023 $

result in a -20 percent change in freight rates or US$ - 171 for EB and US$ - 205 for WB, resulting in a hypothetical freight rate in 2020 of US$ 648 – US$ 682 for EB and WB respectively. This would be a freight rate change only due to solving the imbalance problem. These numbers are presented graphically in Figure 17. From the 2009 known starting point, we see the possible East- and Westbound freight rates in 2020 depending on the scenario regarding imbalance that we employ.



The regression analyses have shown that the trade imbalance does influence the freight rate significantly with a coefficient of 0.2% for each percentage change in imbalance (p-value of .00). This effect, albeit highly statistically significant at 1% level, is rather small. It turns out that especially the degree of competition has a much stronger effect on freight rates than an imbalance between east- and westbound container trade.

This leads us to conclude that even if the containerised trade flows between Asia and the EU would be totally balanced, the freight rates westbound and eastbound would change only to a limited extend due to the reduction of imbalances. From these results it can be inferred that the effort made to containerise more goods on the eastbound side to increase demand for capacity, to balance the trade flows more, only marginally add to an increase in freight rates. This is obviously done to be able to contribute to the fixed costs of a liner shipping company.

Chapter 7 Conclusions

The imbalances of containerised goods are a result of the trade flows and the diverging degree of containerisation between eastbound and westbound EU - Asia. Consequently everything that affects the trade flows and the difference of the degree of containerisation between east- and westbound also affects the imbalances. The most important factors that influence trade flows are the development of tariffs and non-tariff measures and economic growth. Economic growth may be the consequence of increases in supply or demand, both of which affect trade flows, but in a different way.

The goal of this research is to look at what factors affect the imbalance between East- and Westbound container traffic, how this imbalance may develop over the next 10 years, and what the consequences of this development are for EU-Asia and Asia-EU freight rates.

Factors influencing the trade imbalance between the EU and Asia

The most important factors that influence the freight rates – stemming from the literature – are levels of competition on trade routes, capacity available, distance (economic and/or geographical), scale economies, port efficiency, amount of regulations, input cost prices (e.g. the oil price), and the trade imbalance.

Projections of changes in the trade imbalance up to 2020 and effects on freight rates

According to the 3 scenarios run in the GSIM model up to 2020, the imbalances are not going to decrease unless a huge demand shock occurs in Asia (especially in India and China). Even with significant demand shocks, the imbalance decreases but not significantly so. In other cases the containerised trade imbalances are going to persist, or if Asian supply growth dominates, even increase. The comments of some that imbalances will disappear and even reverse is therefore not substantiated by this research.

Second, even though the imbalances of container flows between Asia and the EU have proven to be significant in determining freight rates, a huge change of freight rates cannot be expected because the magnitude of the effect of imbalances on freight rates is not large; i.e. freight rates will not change drastically in response to changes in the imbalance.

Areas for further research

During this research, we have run into various interesting aspects as well as limitations that would warrant further research. First of all, more research into generating time series country specific data would aid to further increase the accuracy of predictions and forward-looking estimations. Second, the importance and the effect of NTMs has been estimated to be higher

than the impact of tariffs, however the regulatory divergences are difficult to measure. Further research could be done on the impact of a potential reduction of NTMs and its impact on trade flows. Finally, we have used the GSIM model for our growth projections, linking those to changes in the trade balance. The GSIM model was a good tool to use, but in order to further corroborate our findings, it would be interesting to run these analyses using a general equilibrium model and analyse similarities and differences in results. In case the GE outcomes are in line with our findings, our results would be strongly reinforced.

Annex

Interview Erin Haltom, Trade Analyst - Asia Eastbound, Middle East, Oceania Maersk Benelux B.V.

1. According to an article in Lloyds List a decrease of imbalances in trade flows has already started. Have you seen this trend in practice as well?

No not really. Trade flows between Europe – Asia (eastbound) and Asia Europe (westbound) are very imbalanced. China in particular has seen a slight decrease in its export volumes but imports into the European Union are picking up again. We see that over the years the imbalance is even increasing and not decreasing. China continues to grow and even though we have seen a recent dip lately it is not expected to continue.

2. Which are the most important kinds of goods transported in containers:

- **Eastbound**
- **Westbound especially in terms of volume.**

For eastbound it is raw material like scrap metal and waste paper which is especially important in the Netherlands. We also have seen a slight pickup in chemicals and insulation materials for factories. Westbound it is mostly freight of all kinds, anything that is moving in a container. There is though a special focus on furniture, electronics, consumer goods and household goods.

Drop of waste cargo?

The waste that is mainly shipped from the Netherlands is waste paper. The container which is traditionally a 40 foot container does not require a lot of cleaning after it has been used for waste paper. The current container shortage concerns mainly 20 ft dry containers, which are mainly used for scrap metal which require a lot of repairs after the usage. The major concern for carriers is now the turn time. Therefore the free time is reduced to return the container as soon as possible. We have cut back a little on waste paper as the rates were so low, but there will always be a market for waste paper in China as they recycle it and use it for other packaging.

3. Do you have an idea to which degree the trade flow between Europe and Asia is containerized? Are there differences between eastbound and westbound?

You have to look at the commodity shipped. Construction material and raw materials are rather shipped in bulk from for example Africa. As both ends are developed (Asia and Europe) bulky goods like construction material are not shipped between those two regions. Therefore we can assume that the degree of containerisation is quite high.

4. Do you know any trends in liner shipping that affect the imbalance (an example would be "increase of containerisation)

For eastbound westbound it really depends on the commodities that we ship and what is big in the commodities in Asia what we expect in the commodities growing out of Europe. Waste paper, chemicals and scrap metal are commodities that are not growing. They are growing in terms of volume but it's nothing that is expanding. Though if you look at China they are growing into different consumer markets and increase the electronics market. So I think we will just continue to see the imbalance very heavy on the Asia side not so much on the Europe side. It very much depends on the economy because last year in 2009 when everything started to tend everybody went into the recession and waste paper and scrap metal just exploded. It is a cheap commodity and it is needed and everybody was buying it in bulk so they can get up on it while it is cheap and then hold on to it when prices will go up later when the recession will be over. From this it becomes clear that it is important to look into trends in a

country and what technologies are they getting into, what consumers segments are they getting into but also what kind of commodities thrive.

5. How do you think will the aggregate demand of China, Japan, South Korea and India develop in the next 10 years and how will it affect the EU27?

I think Japan and South Korea will not change so much cause Japan is in it self-contained, we have seen Japanese volumes decreasing for the future, decreasing this year and a little bit next year. South Korea again is also so contained. There are a lot of services but it is not a big player like China and India. In China the demand is going to increase. The supply of the goods that are coming is going to increase and I think we will continue to see this fight for power between India and China because right now with all the piracy issue they are trying to find the best way to get to the Indian ocean - to the Chinese market and to service the Indian market as well. So I think we are going to see China trying to make power plays to get in with Bangladesh as they don t have a direct water link to the Indian ocean. We will continue to push that because they are trying to access the string of pearls, so they are really focusing on the Indian ocean. I think that is going to be a big place to watch coming up because India and China are going to try to make strategic moves to get ports or naval basis in there so that they can make sure that they can protect their commodity going through those routes.

Consumer goods demand?

I think in India it will go up. In China there has been a move, they are moving towards internal consumption so they are not reaching out for many goods from Europe but I think as India continues to develop and its infrastructure grows stronger consumer goods will definitely pick up. Moreover Africa is coming up as the next China and especially with that market in the Indian ocean, as the infrastructure in India and Africa pick up the consumer goods demand will pick up as well. One thing about the European Union right now I think it is important to know being a country in the euro zone is especially hard right now because of the US-Euro conversion and the problems with Greece, Spain, Germany and Portugal and all the debt and the bonds that we are seeing right now. I don't expect Europe to explode any time soon because everybody is a little timid and worried what is going to happen. As soon as there is a clear picture how this is going to be handled that debt, how the economies are going to move forward, we might see a little tightening on the belt for Europe.

Advantage for Europe due to exchange rates?

I think it could be a benefit in regards to buying goods but looking at the investment picture it is definitely not good because the risk involved what's going to happen even as the euro has been depreciating we haven't seen much increase in European goods being sold. Yes theoretically looking at it I would expect it to be a very big advantage to go after things as you can buy them cheap but I think the risk is so prevalent that it is scaring people away.

6. Do you think the imbalance will decrease?

No I don t think it is going to decrease any time it is getting larger and larger as the years go by.

7. Which factors do affect the freight rate in your opinion?

Definitely capacity and we spoke already about the economy but just looking at the capacity we are about to see big input of capacity into the market as carriers are taking deliveries of new ships, they are introducing new services. Just on the Asia eastbound market, we saw the Grand Alliance split. There are 2 loops that they had combined on the Asia eastbound route but it is now split so it is introducing around 64 TEU into the market on a weekly basis. When it is tight and there is less capacity, we can push the freight rates because space is tight so people have to pay to get on board. As soon as we saw the freight rates go up and the economy is improving even though people expect that there might be a double dip in some

countries, everybody has seem to flood the market with capacity again. So as soon as we fly with extra capacity, freight rates drop again because anybody can get space anywhere. It has to be a very precise balance on how much capacity enters the market and how much you want to limit depending on where you want your freight rates to go. It also depends on the specific commodity markets because some carriers want to buy into certain commodity markets so they can really carry a lot of this volumes but if they do that it affects the freight rates for that commodity because then shippers go out to other carries saying well I can get this rate from another carrier can you give it to me as well? Then you see this market go down which affects the freight rates. We are constantly looking at capacity, what the commodity markets are doing and how that is going to affect the freight rates.

Container capacity and its influence?

Yes definitely we have seen equipment imbalance surcharges. MSC is announcing an equipment imbalance surcharge so definitely that's going to push the price up because you want to make sure that the twenties that everybody is feeling now, if you moving cargo in those twenties you want to fill those containers with the cargos that move the highest prices since it is a hot commodity. Since we don't have any money in the container we want the highest commodity to go inside. Eastbound we have seen a lot of push to get empty evacuation out there. So while the vessel might not be that well utilized and we still have space on the vessel we will fill it with empty containers to make sure that this equipment is available in Asia. So yes definitely the freight rates are affected though not so much the base rates but for additional surcharges.

8. Does Maersk expect a box shortage in Asia? Will it have an impact on the freight rates? If there will be a shortage what is Maersk planning to do about it (e.g. reduction of slow steaming?)

All carriers have the box shortage now in Asia. Maersk not so much because we did a good job in looking ahead where the shortages will be. So we had plans in place but I think you have seen a lot of carriers going out and requesting new builds on containers. In 2009 was the lowest year - nobody requested new containers to be built because it was just not the time and the market to carry them. Now as the commodity is going better and we are seeing more and more cargo demand, carriers are going out and trying to purchase newbuilds. We buy and lease containers.

9. Which factors are included when calculating the cost (e.g. is there an repositioning of empties surcharge etc...)

It is directable variable costs, flow adjustments, aspects like - would it give a credit or debit to the rate so is it helping us or hurting us to get containers to that area. That's going ti affect what kind of rate we give. Moreover there are semi fixed operational costs and the fixed vessel costs. First we have two kinds of services: The mother vessels of the string where we are the string owner and second slot charters. Trades like Oceania which might not have their own trade buy slots let's say on the Asia – Europe service. So they have to look at the slot costs for them to get on that vessel and they also have to look at what it takes to be competitive compared to that trade. Oceania has to look at its freight rates and the Asia – Europe freight rates and it is always higher. So we try to see what can we do and what cost do we have to look at for that slot charter and see where the freight rates need to be on that. It is just everything. We look at all costs involved where is the break-even-point on moving the container across and then the profit that we make on that.

We are looking on the transportation costs, it depends a lot on where it is destination. Is it a sea wide location or an inland location. So it's really going to count on the transportation costs from the port to the inland or is it a port that is easy to service for us, is it a port that is longer with more bunker costs. But if you look at equipment it is really going to be that flow adjustment because we depend on the intermodal department to tell us that there is a debt of

containers here and then they tell us based on the container movement you can have a credit on this and this location. This is really going to affect the profit range that you will have. A flow adjustment based on the transportation costs is the number one.

Whole loop costs are taken into account?

No I wouldn't say that. That comes into effect in the thinking process when you looking at the freight rates. But more important on eastbound and westbound is what that market is doing. Because it is very imperative to look at what can customers get out there from competitors what is the rate for those goods right now. Because if we would be only looking at to cover eastbound by increasing westbound rates we will not get any cargo at those rates. So really the important points are: what are they getting out there, what are the competitors charging and the costs.

10. Do you think a decline of imbalances would have an effect on the freight rates and if yes which?

When I think about it I have to think about the transatlantic trade because this one is almost totally balanced for eastbound and westbound. A good example is we took a service out there. Rates jumped up because there was always too much capacity, so even if it is balanced and there is too much capacity the freight rates are going to be low. So the moment we took out a service, freight rates went up, space got tight and now you have to compete for the space. So I think when you have a balanced trade it is really about how much capacity you have in a vessel situation because then you can strengthen and tighten your belt and say okay so there is not enough space out there you have to come up with the rates and if you have too much capacity or you want to introduce capacity then you have to be prepared that freight rates will go down. But I think capacity and equipment availability will play the biggest part.

11. How do you forecast container volumes on routes + future freight rates?

We look at a huge range of everything. So we look at external publication, like Dina Liners, CBS, we also look at the feedback of our sales force because they really now best as they are out there with the customer face to face finding out what is going on, finding out who is going bankrupt, who is building, who is investing, that is really helping us with the volumes forecast. Looking at the market levels again: are they going up, are the going down what does that indicate, what commodities are getting stronger, which volumes can we expect. It is a huge range of things but I think that external publications are really good in forecasting. **Model?**

Looking at all these factors you get an idea about the market but it is nothing scientific where you would plug in certain numbers and the model comes up with a result. It is just looking at the forecast and what you think. If we go down by this much on this rate for this commodity I expect based on the feedback from our sales that we could get this increase in volumes. For our forecasting the info from our sales force is most important because they really know the customers are paying this if we go down by this then we will get an increase of this much. Then we just take that feedback and look at the publications expectations is that what happens and the commodities sales if we move one rate or, we offer different services and then we can see but it is kind of a feel.

Interview Mr. Aernoud E. Willeumier - Manager Business Analysis & Intelligence, Containers, Breakbulk and Logistics

1. Comments on the topic "growing importance of back haulage from Europe to Asia and its impact on freight rates

There has been an extreme tendency of production in Asia and consumption in Europe. The imbalances could also be seen on the trade lane between Asia and the US. Consequently goods were mainly produced in Asia and then shipped towards Europe. This made the westbound leg of the Europe – Asia route heavier then the eastbound leg. As the westbound leg was the heavy leg, large amounts of empties have been shipped back from Europe to Asia.

Particularly the eastern European countries are developing further. They are entering the European Union, a lot of activity to boost their industrial production facilities can be seen and the cost levels are still lower than in the west part of the European Union. Due to these factors there has been the expectation that a lot of production of western European companies which have developed their production facilities in Asia, would move back their production plants to Europe. This would majorly impact the shipping transport in general and the development of the ports.

Although I do not deny that such a trend will happen, it will probably take some time. On the other side I do not believe that the imbalance will completely fade away because those are big companies such as Philipps etc... They did not build their production plants in Asia only because of the lower costs but also because of the market potential. This potential is far bigger than the potential of the rest of the world. Therefore in my opinion even if the difference between the cost levels of the production in Asia and Europe fade away, it will still be important for those companies to have their productions close to their biggest consumer market, which is Asia.

Moreover I foresee that the total production capacity will increase primarily driven by the fast growth of the Chinese market. Therefore the total production capacity will increase, the total cost unit costs will decrease and that will have a negative effect on the potential production capacity of Europe. Consequently I think that the main production and transport stream from Asia to Europe will continue to be westbound leg. There will be productions shifts but I do not believe that due to them the imbalances will completely disappear. The European continent does not really produce goods but rather services and therefore I do not foresee an increase in demand for transport capacity outbound.

The automotive industry has still a reasonable size and place in Europe but will it grow? I do not think so. It will probably maintain on a certain level but I do not think it will experience a great expansion. A boost of the automotive industry will probably be seen in India or China. Moreover also the export of half-products will probably disappear. Currently you can see in bulk shipping, that large volumes of ore are shipped to the German steel mills. This will disappear or at least decline and the same trend will be visible in Belgium. Here in Holland we also have a steel mill. You might see some development in that area but in general you will see a shift in the whole steel supply chain. The production of steel half products will shift closer to the origin of ore. This means that it will shift to Brazil and maybe to China as well.

Does Chine have ore?

No not really but I wonder whether they will find some in the future. This is a bit of a guess of mine. It is true that they are the biggest steel importer. What I mean to say in respect to Europe, the import of ore will decrease but we expect an increase of steel products. I mention that to indicate that there will be a shift from raw material to processed products but this will not affect the imbalances between Europe and Asia. The main imbalance on the Asia- Europe trade is on the container trade but we will see a bit of relaxation. Last year during the financial crises we could see a steep drop of imports from Asia but the exports from Europe actually stayed more less at the same level. This indicates that the exports from Europe to Asia are pretty stable, which means that they probably will not grow much whereas the import flows from Asia into the European consumer market are much more volatile and stronger increases can be seen.

I think there is always the question whether the European consumer market is unlimited. There is usually always a kind of ceiling, on the other hand particularly on the eastern European side you may expect a fairly large growth potential. It depends on how far you want to look ahead but in the next 10 to 20 years I would not expect a steep decrease of the imbalances.

Impact on freight rates
In principal the freight rates are determined by supply and demand but the supply is very much driven of the dominant leg. If the imbalances continue to be like they are, the dominant leg will continue to be the Asia – Europe westbound. The highest freight rates are always on the westbound leg because shortages may occur there. This is caused by a constant delay of new shipping capacity. The history has proven that the shipping industry is always wrong. When the market is there they order like hell and it takes a couple of years until the vessels are built and meanwhile the market is gone. Then there is a huge oversupply, the crisis is a little extreme but it is a similar pattern like in the last 5 to 7 years cycles. I think the impact on the freight will be driven by supply and demand particularly on the westbound leg. If there is additional capacity to meet the demand and the imbalances will remain at a certain level then you will always have a number of empties which you have to ship back. There is always the sort of dilemma for shipping lines whether to wait for eastbound cargo or to send the vessel back as soon as possible to get the capacity (vessel and container) back to the strong leg.

2. Do liners include a surcharge on the strong leg for returning empty containers?

Yes they do on a cost level. The market price is only driven by demand and supply. Shipping lines can only raise their prices in a situation of an expected shortage of capacity particularly in situations where shippers and forwarders are concerned about being able to get their cargo to the client. Only in these situations the freight rates will be driven up. The shipping lines will calculate against those freight rates their basic costs of transporting the box but they will include a cost equivalent to cover the empty return. That depends obviously where the box ends up. In my experience in P&O Nedlloyd there was a system that calculates a so called imbalance charge which is a hypothetical charge which reflects the costs an empty box will create to bring the box back to the port where you can pick it up easily and ship it back to Asia. The vessel costs are sort of fixed costs because the ship sails anyway. But the total transport costs must be covered by the total throughput of the ship. In particular on those pre- and on-carriage legs it may take too long or cost too much and there is not enough cargo, so the shipping line will send them back empty.

3. Reposition imposes costs on the shipping lines. In a perfect world without imbalances those costs would not exist, wouldn't that then have an impact on the freight rates?
You could expect if you have a full income from the return leg, the eastbound leg that you would not have to include in your westbound leg a surcharge for the empty return. You could in that respect reduce your freight rate but if the market is tight you will not do it. So only if you

would have an over capacity on the dominant leg in a balanced situation, freight rates would reduce on both sides. This is not driven by the fact that the trade flows are balanced but by the oversupply. From a cost perspective it is an element to consider in a perfect balanced situation that would not have to be included as a surcharge. Therefore your base is lower and the freight rate may remain higher and therefore this would increase the earning capacity of the company.

4. **Do you agree with the statement that because of decreasing imbalances European carriers will have an advantage in attracting more cargo to transport then their Asian counterparts?**

No. There are four main Japanese carriers and they have obviously strong ties with the major Japanese producers / shippers. There is definitely a sort of captive cargo flow for the Japanese carriers because this is due to nation pride which is fine but we also know that the Japanese shippers are keen on having other non-Japanese lines in their portfolio of carriers. The same applies for the rest of Asia. You may expect a special situation in China. Cosco is big and China shipping is getting big. Let's not forget that China shipping just started in 1997 and since then they have shown a boos which virtually no shipping line has been able to achieve. I would not be surprised if there would be at the end of the day a desire by the Chinese government to ship a certain amount of cargo via a Chinese carrier. This is a personal statement which has not been confirmed by anybody so far.

You can see it in their steep development of their ship yards. Ten years ago it was unforeseeable that you would order a 10.000 TEU ship in a Chinese ship yard. It was only a matter of a couple of years where all the shipping lines partly driven by the need of construction costs started building in China. Therefore at the end of the day I would not be surprised if the Chinese government would steer some things but for the rest it is an open market.

5. **How much of the goods are containerised Asia - Europe?**

I think you have to differentiate between the legs of the Asia – Europe trade. I think on the westbound leg it could be around 60 to 70 percent but on the eastbound let it should be less because there you see quite some shipments of bulk goods.

6. **Does the Port of Rotterdam statistics on what is in the container?**

No we do not. We do get information through CBS who are also having difficulties to establish the content of the containers. The information is there because the customs need to have it.
It is important for a port to have a rough idea about the containerized typed of goods to anticipate future developments but from a port authority perspective we do not need to know such detailed information as we do not compete with shipping lines. They are our clients.

Interview Roy Lenders; (Vice President) Capgemini Consulting 30 June 2010; 14:00

My name is Roy Lenders I have been for 17 year with Capgemini and when I started it was still Ernest & Young Consulting and then it was bought by Capgemini in 2001. Currently I have 2 roles: I am responsible in the Netherlands for the supply chain consultancy practice which is about 60 consultants but I have the same role globally but in Capgemini consultancy which is around 800 consultants. What we call supply chain management focus on procurement, procurement teams, logistics, manufacturing, innovation R&D, lean, all types of different areas where people are working.

Why did we start the Global Trade Index, because it is a quality publication. We started it at the end of the last year. We do a lot of topic leadership and it is mostly on Supply Chain topics but every time you speak about supply chain it turns up in trade magazines but not in financial magazines. So we wanted to develop something which was more what financial newspapers would like . That's why we developed the global trade index because trade is Supply chain so you are talking about the same topic. It is more in financial terms and that's the reason why we developed it. The global trade index looks at basically the top 23 trade countries which cover 90 percent of world trade. The idea was to look at them each quarter what are the changes of world trade volume, changes across regions, which countries are doing better than others therefore a sort of ranking. So in the last couple of quarters I am also part of the board of advisers of the Holland International Distribution Council, where Schiphol, Rotterdam and all those ports are also part of. The flows to China and India from Europe are growing much faster than the flows from China and India to Europe. Obviously this could have a big impact on the whole global supply chain industry. At the moment the Asian containers lines are ruling the world, so if it would be the other way round, it will be back to the Europeans and the US. So we would probably take a better position there. And similarly at the moment containers are going back empty from Rotterdam to China but if the balance shifted the containers could go empty back to Europe. So that would also have a dramatic impact on pricing and how shippers would organize their global supply chains.

So that's something if this trend that we have seen in the last 2-3 quarters will continue it will obviously have a big impact. Probably this will be a 10 to 15 years trend, so this will not happen spontaneous and directly. It is definitely happening right now that China, India and especially Brazil are pulling the world trade and it is not because Europe or the US is doing well. Europe and the US are doing well because the export a lot to China and the Amazone.

1. **Why would you say did the demand pick up so much that the import rates of China (Asia) increased so much?**

I think the main difference now is that if you look back there was still growth in Europe and the US because of the bigger markets in Europe and the US and it was still pulling global trade. But what you will see now is that Europe is more stable, the US is growing a little bit but the growth rate of China is 8-9 percent. A similar situation can be seen in India and in Brazil. So in terms of absolute volumes most of the trade products come from those countries.

2. **What kind of cargo is moved into that direction?**

The cargo from China into Europe is quite obvious: T-shirts and shoes but also high-tech stuff. I think the cargo the other way round is in the world of automotive and machinery. Germany is

doing quite well in that field I would say. I would say more expensive products, the high ends like Loui Vuitton.

3. Do you think the appreciation of the Chinese Won will have a drastic impact on the import volume of China?

I don t think so because it is a government controlled industry and companies tend to do what the government tells them to do. I don`t think it has the same steering mechanisms as a capitalistic country like the US where products get cheaper or where you would import faster than buying from the local market. I don`t think this mechanism works the same way in China. It will though the other way round. If imports from China get more expensive then companies will likely relocate some of their manufacturing back to Europe and to US which is already happening. So this pheromone might grow strong.

4. Methodology of Index:

We basically took the 23 top trade countries which is 90 percent of world trade. What we look at are 3 figures: Import, Export and GDP. And if you have the GDP and you calculate with import and export you also know the local market growth. Those are the variables we look at. So what we tend to look at, we base the calculations on 4 parameters which are: local domestic growth, trade as part of the GDP , the quarter over quarter growth in exports, the quarter over quarter growth in imports and that calculates into a sort of index figure in which the calculations are ranked. When we developed this index initially we devised this formula to come up with an index calculation so we also looked back the last 5 years to see whether this really gives the trick or not. What we also found is that trade is reacting faster than local GDP. Trade is 2 or 3 quarters faster than any reaction in the local market. Which is normal or right because if the economy booms, you see global trade booming a lot earlier then the local economy and also the other way round the economy goes into a crisis global trade gets impacted earlier then the local economy. From that perspective it is also a leading indicator for, how the GDP grows in the crisis. So that was also a little bit the idea behind the indicator that it would be a sort of a leading indicator for economies as a whole.

Interview with Mr. Shi Lei – Assistant Vice President, Industry Analyst and Research & Strategic Planning Shipping

1. Do you see any trend or special commodity that might decrease the imbalances?
Yes because China is a big trade partner for Europe and the other way around. As we know the GDP and the per capita wealth in China is increasing. If you look at the backhaul cargo except waste and scrap there is just some furniture and sometime high end machinery from Germany. As the GDP increases, wealth is increasing as well and this will lead to an increase for these kinds of products but even if the percentage of this increase will be substantial it will not be enough to balance the trade flows. This means that I do not see the impact on the back haulage to be significant.

2. Do you think the appreciation of the Yuan would affect the imbalances?
In the long term yes. The Chinese government has already announced an increase of flexibility of their currency system but if you look at it after four weeks now only very little has changed. Therefore there will not be a onetime adjustment. Even for the medium to the long term there will be a gradual increase. This will provide a positive impact on the backhaul from Europe to Asia. Whether it will appreciate in the first place, the Chinese government will take into consideration the effects on the exports. Actually I just discussed with my colleague that in 2008 exports were around 36 percent and dropped to 24 percent in 2009 due to the globalisation. We know that the Chinese government is pretty determined to overhaul the economic structure but I do not see it happen overnight. It is a long term plan for at least 5 to 10 years. If that happens the currency impact on the back haulage will be very slow.

3. "Dollar – Euro and Yuan" a chance to capture volume from the US?
On this issue I have not done any study yet but the idea is that you look at the export figures from Europe to Asia and you see that they have increased significantly last year but the growth has already dropped this year. You may gain some relative comparative advantage from the U.S. but a lot of the treaties are contracts and this will not change overnight. It takes some years to get new customers and sign new contracts. It depends on how long and how low the Euro will go. If it is a short term phenomenon the impact will not be that big. The Euro will remain weak for quite a few month and this may provide some benefits for the backhaul volume. For the last year the basis is already high in terms of volume so if you want further growth it is going to be difficult. The growth rate is going to be difficult to maintain at the level of last year. Actually you see that imports from the U.S. into Asia grew significantly last year. If you want to look into this you should look into commodity types. The main commodity types for export from the US to China and from Europe to China. If there is a mismatch then probably the impact will not be that big. Another fact that you should take into account are the shipping costs. If the shipping costs change in terms of value of the cargo then it is another story but I doubt that that will be the case as the backhaul shipping costs are very low.

4. What do think about the demand expectation of the other countries (Japan, South Korea and India)

Actually what you should look at is Middle East. In terms of liner services going to India lot of them are designed or organized together for both India and Middle East. Of course there are some different focuses but these two regions should be looked at together. Another thing that you should look at on the backhaul freight is that some Asia to Europe services have a way port call Middle East or India. On the way back actually you should look at services which have

a way port call on the backhaul in India and Middle East. Because for trade for the Middle East and Indian Subcontinent to Europe actually export from Europe is the front haul. So this portion of the cargo may be loaded on vessels from Europe to Asia. This may play some role in freight rate and in terms of slot allocation. If there is other cargo to be loaded on a vessel from Europe to Asia and they carry some premium in terms of freight and you need empty boxes to be carried back to Asia to get to the front haul then you do not have a lot of spaces for back haul cargo which carries low premium and it may cost time to put them into the business again.

This might be a reason that causes the freight increase that we will see later last year. In terms of backhaul freight we have some freight increase on that side that is really unusual. But in terms of demand into Japan we didn't see anything from Europe significant on the Japanese side. The economy is just struggling and anything that movement in terms of volume or in terms of freight rates is unlikely caused by Japan. In terms of back haul Japan is following the trend. It is not an outperformer or significantly underperformer.

India is a growing country in terms of GDP and trade but more importantly from Europe to the Middle East and the Indian subcontinent that is the front haul. Unfortunately I don t have much data on what is the percentage of cargo from Europe to Indian subcontinent and Middle East that are loaded on the backhaul service from Europe to Asia.

We did not look too much into South Korea either. We did not look into country specific factors because we look at regional growth and the reason why we talk so much about China is because it is the growth centre in the global economy at the current stage and it is driving trade volumes and trade flows and that is why it is getting our attention.

5. Methodology of your trend forecasts?

We try to forecast the T/C rate – time charter rate and asset value which should be derived from vessel demand and this is basically driven by the front haul of cargo volumes. In that sense we have a forecasting model, actually in-house developed. Basically we have pool of variables which we look at either as drivers or as constraints to put into the model which generates three different demands. Then you look at the supply side and you arrive at the calculation of the utilisation which generates the asset value and time charter rate. When we talk about those factors on the marco-side we do not really have anything that is really different from other forecaster. We consider our forecasts better in the sense that we take a lot into consideration: the constraints, the optimization of network in terms of shipping operations... and this often makes a big difference.

If we talk about marco economical factors that would be GDP growth, trade volume, consumer spending, unemployment rate, earning level and disposable income. So basically that would be the key factors that we look at but of course we also use some short term indicators which are inventory level or sales-to-inventory ratio.

The macroeconomic factors that we use are not something special and are not much different from others. Of course we look at the same variables but how we process those variables, put them in a model, put them into use and derive your results makes a big difference. For example Clarkson when they talk about trade growth they talk about liftings (=throughput). That does not really make sense to us, it is one indicator but it does not give us a better indication for vessel demand. We know that there has been an increase in FTAs between Asian countries so we expect that the intra Asia volume will increase. If you see a signigicant increase of Chinese port throughput then you have to differentiate by what this increase is caused.

Ah before I forget, weight issue is another issue of back haulage. So you look at scrap metal, waste paper and plastic– these heavy materials, they take up space. This type of commodity is

prevalent on board on the back haulage and they limit the space for empty boxes you can position. This is a key issue. That is why we are saying even if there is cargo demand the liner might choose not to carry the cargo. That is also causing maybe the freight rate increase.

6. A guess of the percentage of containerisation between Europe and Trade

I cannot name any figure. What I can suggest is if you want to look at it yourself is the commodity type. Important is what is the urgency of the transition time to get the destination because actually transit time is a little bit conflicting in the current market. Transit time and reliability are key issues that the cargo owner looks at. If you attend all those conference you see that the shippers are complaining about the transit time due to the slow steaming carried out by the carrier but according to the shippers they do not have much to say. The would probably be willing to pay more if there is any faster service but there are no service differentiations provided by liner companies. Especially for high value goods the cargo owner want them to stay in the supply chain as short as possible so on the back haul the value of the cargo is less and then they are less sensitive in time.

The whole idea of containerisation arises because it is a big logistical problem to shorten the transition times. If this would not be a problem you can see whether they have any cheaper options. Another thing is if it is not bulk iron or any other bulk commodity the question is do you have any other service or alternative options other than liner services.

Because the thing is that from Africa to Asia the grain stuff and fertilizers and normally which might be shipped in other type of other ocean shipment is now containerised. But the idea is if you are exporting stuff, what we look at other option are general cargo vessels, multipurpose vessels but if you look at those vessels in terms of size – they are small. As compared as those large container vessels they are really small. If you have a vessel that is that large and your economic skill is good they can offer you a freight rate that is much cheaper and that is the comparative advantage. And now we are talking not about from Europe to Far East which is over 10.000 nautical miles almost 20. If you ship by those small vessels it might be difficult to make economical sense. Probably it is worth looking whether there are any other seagoing services which I am not aware of much. Another thing is by rail but by rail it is 2 weeks at least. As long as you cross different countries then the customs clearance will be a major hurdle what I am suggestion now if you want to look into it there are different option and how much in terms is transported via other modes. I am sure that for air cargo this is really a small percentage.

Interview with Mr. Theo van Ravesteyn (Managing Director MSC – Netherlands) 29. June 2010 14:30

1. Which factors increased the demand from Asia

Chinas economy is increasing which results in a higher demand. A lot of financial means went into loans for their industry by doing so they stimulated heavy demand for their middle class. In general the demand for import cargo was stimulated which was done on purpose as they had a slack in terms of import cargo. The Chinese economy was based exports. As their exports fell in 2008 and 2009 they steered the wheel immediately in the right direction. This big stimulation of demand requires raw materials, half fabricates etc...

2. If the won is appreciated will this really affect drastically the import rate?

There might be a longstanding demand for particular merchandised. Whether this is going to happen depends also on the Dollar – Euro relationship which source is the best for certain commodities like waste paper, scrap metal, plastic and other raw materials. Another commodity that could see a surge of demand are chemicals, base chemicals and advanced chemicals.
The question is how long this increase of demand in Asia will last. China might start to produce those kind of commodities themselves by introducing a recycling system like “der grüne Punkt” to collect waste paper. If they start to collect those commodities themselves they might satisfy their own needs and the demand for import waste paper from Europe will decline. It though will take a while until China will be able to do so as there is a huge need for production as there are still people who need their first TV set, their first bike or car. Therefore we hope that the increase of demand from China will last long.

Currently the Chinese are exploiting in Africa and South America natural resources to satisfy their need for raw materials for their industry. This is not help but business deal: money for resources. So as I said we hope but we are never sure.
There is a huge armada of ships piling up and down far east, which are predominatly there for the cargo need from Asia to Europe. Ships are built for cubic, for light cargo, for clothing, textiles, furniture etc... The capacity is there and up to a certain moment we were importing much more than we were exporting. Recently there has been a statistics that shows that the volume of Chinese imports exceeded the exports which is unique. As a matter of fact Chinese exports were decreasing due to the economical crisis whereas Chinese imports were increasing due to their demand. This makes us believe that China will be a mature economy with their own domestic needs. This is good for us because if their growth is between 8 and 10 percent a certain amount of that growth can always we translated into transport. If there is a growth in an economy that means there is more movement of cargo in containers transported via vessels.

3. Which kind of cargo were you mostly carrying from Europe to Asia before the demand of China went up?

In 95 MSC entered into the Far East comparatively late as MSC was originally a north-south carrier. Before we entered we did a market study on the commodity types that are moving to the Far East. It was wastepaper, waste scrape and waste. Now of course there are some chemicals and more metals but basically there is a lot of raw materials and half fabricates but not many finished products. Foodstuff is slowly developing but we are not shipping any beer, cheese or milk powder to China. To sum up it is mainly waste.

4. Is the ship full in terms of volume or only in terms of weight?

The ships today have between 10.000 and 15.000 TEUs and they are built for cubic. The average weight of a container on the back haulage (Europe – Asia) is much heavier which makes it difficult to optimize the ship. Therefore we have to top up with empties. It is basic mathematics if you have a ship with 10.000 TEU every week, you have 10.000 TEUs on the front haulage and the back haulage

5. Which factors determine the price (freight rate)?

It all comes down to the price mechanism, demand and supply. The price is driven by 100 percent demand and around 90 percent supply. If we have an half empty ship prices go down, if the ships are full, people are waiting in line get a slot on the ship. It is either the vessel or the equipment availability that plays a critical role.

You can do very sophisticated things about added value, speed and so onbut it comes down in the end to demand and supply. For sure we try to disguise it by doing nice tricks, beautiful ships, better containers, either faster or slower but in general it is only supply and demand. You can differentiate here and there but the margin is 20 percent up and down but not more.

6. What is most important to look at to answer the research question?

We are driven by the market it is not the other way around. What comes to my mind is that we are reactive. We can try what we want but we cannot make the cargo. Cargo is there, we use the ship to carry it, and hopefully to make a living out of it. We can look at the commodity what we can do about it here and there but at the margin. We can talk about special equipment reefer etc.., generate a new type of cargo for the container. For example there are still a lot of roads to be built in China. An idea would be to transport the ready asphalt in containers to China as the transport is cheap and the product is available in Europe. As already said we cannot create a commodity but we can marginally influence the amount of cargo sent by making it containerisable.

The container is addictive and it promotes itself as a product. The container has been invented in the 60s and has so far not changed.

7. Topic ongoing containerisation:

Containerisation is an ongoing situation. For example 10 to 15 years ago it was unthinkable to put soy beans, corn and coffee into a container. Today that has changed. People order in smaller quantities, the insurance premiums are better, the credit line is better, the speed, the regularity, the stores, the handling, all those factors have improved a lot and lead to an increase of containerisation.

The demand for sending goods in containers from Europe to Asia was created because the price was low. When the price went up, the demand was still there because the container is a very convenient way of transporting goods.

Abbreviations and Variables of GSIM model

r,s	Exporting region
v,w	Importing region
i	Industry designation
Parameters	
$Q_{i,v}$	The composite good in region v
Av	An efficiency term calibrated so that the price of Q, P=1
$Y_{(i,v)r}$	The CES expenditure weight term
ρ	The CES exponent term, where the substitution elasticity: Es = 1 /(1-ρ)
$Ew_{,(i,v)}$	Aggregate import demand elasticity; define for aggregate imports $M_{(i,v)}$ and composite price $P_{(i,v)}$ =ϑ $M_{(i,v)}$/ ϑ P $_{(i,v)}$ x $P_{(i,r)}$*/$X_{(i,r)}$
Calibrated Coefficients	
$N_{(i,v),(r,r)}$	Own price demand elasticity
$N_{(i,v)(r,s)}$	Cross-price elasticity
$T_{(i,v)r}$	The power of the tariff, T=1+t
θ $_{(i,v)r}$	Demand expenditure share(at internal prices) $\theta_{(i,v),r} = M_{(i,v),r}T_{(i,v),r} / \sum_s M_{(i,v),s}T_{(i,v),s}$
φ $_{(i,v)r}$	Export quantity shares $\phi_{(i,v),r} = M_{(i,v),r} / \sum_w M_{(i,w).r}$
Variable	
M	Imports (quantity)
X	Export (quantity)
P	Composite domestic price
$P^*_{(i,r)}$	World Price for exports from region r
$P_{(I,r),v}$	Internal prices for goods from region r imported into region v
$T_{(i,r)v}$	Import tariffs for goods from region r imported into region v

World Bank & IMF Growth Projection

	World Bank		IMF	
Countries	average growth rate / year	total growth rate %	average growth rate / year	total growth rate %
China	13.53	358.71	11.09	217.96
India	16.46	522.53	8.85	176.77
Japan	0.89	11.27	3.44	45.06
South Korea	5.78	96.27	5.85	86.82
ROW	2.73	38.13	5.75	75.49
EU	2.47	26.64	1.01	12.28

Bibliography

1. Asian Development Bank (2008), “Asian Development Outlook 2008 - East Asia: People's Republic of China”, Asian Development Bank, http://www.adb.org/documents/books/ado/2008/PRC.asp

2. Auswärtiges Amt (2010a), “China - Wirtschaft”, http://www.auswaertiges-amt.de/diplo/de/Laenderinformationen/01-Laender/China.html

3. Auswärtiges Amt (2010b), “Indien – Wirtschaft“ http://www.auswaertiges-amt.de/diplo/de/Laenderinformationen/Indien/Wirtschaft.html

4. Auswärtiges Amt (2010c), “Japan – Wirtschaft“ http://www.auswaertiges-amt.de/diplo/de/Laenderinformationen/Japan/Wirtschaft.html

5. Auswärtiges Amt (2010d), “South Korea – Wirtschaft“ http://www.auswaertiges-amt.de/diplo/de/Laenderinformationen/KoreaRepublik/Wirtschaft.html

6. Barboza, D. (2010), “Market Defies Fear of Real Estate Bubble in China”, The New York Times, 4 March 2010, http://www.nytimes.com/2010/03/05/business/global/05yuan.html
7. Barnard, B. (2010), “Asia – Eurpe Container Volume Surges 20 Percent”, The Journal of Commerce, http://global.factiva.com/hp/printsavews.aspx?ppstyp=article

8. Berden, K., Francois, J., Tamminen, S., Thelle, M., Wymenga, P. (2009), „Non-tariff Measures in the EU-US Trade and Investment – An Economic Analysis“, Ecorys Netherlands BV, Reference No. OJ 2007/S 180-219493, http://trade.ec.europa.eu/doclib/docs/2009/december/tradoc_145613.pdf

9. Bloomberg (2010), “China overtakes Japan as the World’s Second-Biggest Economy”, 16.8.2010, http://www.bloomberg.com/news/2010-08-16/china-economy-passes-japan-s-in-second-quarter-capping-three-decade-rise.html

10. Brett, D. (2010), “Chinese exports reach an all-time high”, ifw, http://www.ifw-net.com/freightpubs/ifw/searcharticle.htm?artid=20017792389&highlight=true&keywords=thight+squeeze+on+asia+europe&phrase=

11. Brett, D. (2010), “Tight squeeze on Asia – Europe”, ifw, http://www.ifw-net.com/freightpubs/ifw/searcharticle.htm?artid=20017783040&highlight=true&keywords=thight+squeeze+on+asia+europe&phrase=

12. Brezinski, C.' Redivo-Zaglia, M. (1994), „Extrapolation Methods“, *Applied Numerical Mathematics*, vol. 15, issue 2: 123 - 131

13. Bussière, M., Schnatz, B. (2007), “Evaluating China’s integration in world trade with a gravity model based benchmark”, *Open Econ. Rev*., vol. 20: 85 – 111

14. Capgemini Consulting (2010), "Global Trade Flow Index", http://www.capgemini.com/insights-and-resources/by-publication/global-trade-flow-index-q1-2010/

15. CIA (2010) "CIA World Factbook – Unemployment rate", https://www.cia.gov/library/publications/the-world-factbook/fields/2129.html

16. Clark, X., Dollar, D., Micco A. (2004), "Port efficiency, maritime transport costs, and bilateral trade", Journal of Development Economics, vol. 75: 417 – 450

17. Comtois, C., Rodrigue, J. P., Kuby, M. (2010), "Transport Costs", http://people.hofstra.edu/geotrans/eng/ch7en/conc7en/ch7c3en.html

18. Copenhagen Economics (2007), "Economic Impact of a Potential Free Trade Agreement (FTA) Between the European Union and South Korea" Copenhagen Economics, http://trade.ec.europa.eu/doclib/docs/2007/march/tradoc_134017.pdf

19. Decreux, Y., Mitaritonna, C. (2007), "Economic Impact of Potential Free Trade Agreement (FTA) Between The European Union and India", CEPII-CIRE;

20. Dong, Y., Whalley, J. (2009), "Model structure and the combined welfare and wrade effects of China's trade related policies", Working paper No. 15363, National bureau of economic research

21. Dyer, G. (2010), "China trade surplus in surprise drop", Financial Times, 10 September 2010, http://www.ft.com/cms/s/0/43a98376-bc8f-11df-a42b-00144feab49a.html

22. Economist (2009), "Wanted: new customers" 1st October 2009

23. Economist (2010), "Learning to crawl" 24th July 2010/ a

24. Economist (2010), "The long march" 24th July 2010 / b

25. Economist (2010), "The next China", 29 July 2010

26. Economist, (2010), "Yuanimpressed – China's adjustment of its currency is too small and too slow for many", 1st July 2010

27. Economist, "Go sell", 11 March 2010

28. Edgerton, J. (2009), "Estimating Machinery Supply Elasticities Using Output Price Booms", http://edge.marginalq.com/capElastic.pdf

29. European Commission (2008), "China: Out of the Dragon's Den?" Working paper no. 01-08, European Commission

30. European Commission (2010a), "China – EU bilateral trade and trade with the World", European Commission Trade, http://trade.ec.europa.eu/doclib/docs/2006/september/tradoc_113366.pdf

31. European Commission (2010b), "India – EU bilateral trade and trade with the World", European Commission Trade, http://trade.ec.europa.eu/doclib/docs/2006/september/tradoc_113390.pdf

32. European Commission (2010c), “Japan – EU bilateral trade and trade with the world”, European Commission Trade, http://trade.ec.europa.eu/doclib/docs/2006/september/tradoc_113403.pdf

33. European Commission (2010d), “South Korea – EU bilateral trade and trade with the world”, European Commission Trade, http://trade.ec.europa.eu/doclib/docs/2006/september/tradoc_113448.pdf

34. Feng, C. M, Chang, C. H. (2008), “Empty container reposition planning for intra-Asia liner shipping”, *Maritime Policy and Management*”, vol. 35, no. 5: 469 – 489

35. Francois, J. (2007), “An Extended Global Simulation Model: Analysis of Tariffs & Anti-Dumping Policy Impacts on Prices, Output, Incomes and Employment”, *Institute for International and development economics*, http://ideas.repec.org/p/lnz/wpaper/20090803a.html

36. Francois, J., Hall H.K. (2003), “Global Simulation analysis of Industry-Level Trade Policy” http://140.119.76.100/faculty/kmchen/homepage/GSIMpaper.pdf

37. Francois, J.; Norberg, H., Pelkmans-Balaoing, A (2008), „Trade Impact Assessment of an EU-India Free Trade Agreement”, Institute for international and development economics

38. Fraser, S. (1994), “Containerization and waste: It’s a perfect match”, *Argus Business*, vol. 37, no. 3: 20

39. GDV (2010), “Container Handbook”, Gesamtverband der Deutschen Versicherungswirtschaft, http://www.containerhandbuch.de/chb_e/stra/index.html?/chb_e/stra/stra_01_01_00.html

40. Goyax (2010), “Brent oil prices 2000 – 2010”, http://www.goyax.de/oelpreis

41. GTAP (2008), “GTPA database – version 7”, Global Trade Analysis Center: Purdue University

42. Hailey, R. (2010), “Damned lies and statistics: container trends laid bare”, *Lloyd’s List*, 29th April 2010

43. Holzner, M. (2004), “GSIM Measurement of the Costs of Protection in Southeast Europe”, The Vienna Institute for International Economic Studies, https://www.gtap.agecon.purdue.edu/resources/download/2057.pdf

44. Jonkeren, O., Demirel, E., van Ommeren, J., Rietveld, P. (2008), „Endogenous Transport Prices and Trade Imbalances“, Discussion paper no. TI2008-088/3 Tinbergen Institute

45. Kamphuis, T. (2010), “An analysis of a Brazil – EU Free Trade Agreement”, Erasmus University Rotterdam

46. Kang, J. M., Kwong, J. K. (1988), “An estimation of import demand, export supply and technical change for Korea“, Applied Economics, vol. 20: 1661 - 1674

47. Kee et al (2006), "Estimating trade restrictiveness indices", Centre for Economic Policy Research Discussion Paper No. 5576, London, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=912678

48. Kee, H. L., Nicita, A., Olarreaga M. (2004), "Estimating Import Demand and Export Supply Elasticities", http://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=NASM2004&paper_id=368

49. Korea Maritime Institute, United Nations E.S. C. A. P. (2007), "Regional Shipping and Port Development – Container Traffic Forecast", http://www.unescap.org/ttdw/Publications/TIS_pubs/pub_2484/pub_2484_fulltext.pdf

50. Lawrence, R. Z., Dzieniek Hanous, M., Doherty, S., Moavenzadeh, J. (2010), "The Enabling trade Index 2010" World Economic Forum, http://www.weforum.org/pdf/GETR10/Global-Enabling-Trade-Report-2010.pdf

51. Lloyds List (2010) "Half of German owners have laid up ships" 2 July 2010

52. Maerks (2010), "Total shipments vs. Container shipments" Trade & Marketing NLC, internal Maersk presentation

53. Marquez Ramos, L., Martinez Zarzoso, I., Pérez García, E., Wilmsmeier, G. (2006), „Determinants of martime transport costs. Importance of connectivity measures", University Le Havre, http://www.univ-lehavre.fr/actu/itlcsge/ramos.pdf

54. Martin, W. (1993), "Modeling the Post-Reform Chinese Economy", Journal of Policy Modeling, vol. 15: 545 – 579

55. McKinnon, A.C. (1989), „The physical distribution systems", Routledge, New York

56. McLellan, R. (2006), "Liner shipping development trends", *Maritime Policy and Management*, vol. 33, no. 5: 519 – 525

57. Micco, A., Pérez, N. (2002), "Determinants of Maritime Transport Costs", Working paper no. 441, Inter American Development Bank

58. Notteboom, T., Rodgrique, J.P. (2008), "Containerisation, Box Logistics and Global Supply Chains: The Integration of Ports and Liner Shipping Networks", *Maritime Economics and Logistics*, vol. 10: 152 – 174

59. OECD (2005), Economic Globalisation Indicators, Paris, http://www.oecd.org/document/63/0,3343,en_2649_33763_35794687_1_1_1_1,00.html#TOC

60. OECD (2009), "Statistics Japan", http://stats.oecd.org/index.aspx?queryid=23087

61. OECD (2009), "Statistics South Korea", http://stats.oecd.org/index.aspx?queryid=23090

62. OECD, (2010), "Economic Surveys: Korea, June 2010" http://www.oecd.org/dataoecd/14/34/45432048.pdf

63. Poleg, D. (2005), “China currency: Trade, Revaluation, Exchange Rate”, http://www.danwei.org/china_information/china_currency_trade_revaluati.php

64. Quinn, J. P. (2006), “Lower Rates on the Horizon”, *Logistics Management*, June 2006,

65. Raballand, G., Kunth, A., Auty, R. (2005), “Central Asia’s transport cost burden and its impact on trade”, *Economic Systems*, vol. 29: 6 – 31

66. Ryan, L. (2004), “Ocean Carriers – Containerlines looking ahead to improving economies”, *Logistics Outlook 2004*, http://web.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=2&hid=107&sid=4e8ed9b6-b2e2-4cc3-af91-0cf4566f8c5c%40sessionmgr113

67. Sánchez, R. J., Hoffmann, J., Micco, A., Pizzolitto, G., Sgut, M., Wilmsmeier, G. (2003), „Port Efficiency and International Trade: Port Efficiency as a Determinant of Maritime Transport Cots“, *Maritime Economics and Logistics*, vol. 5: 199 – 218

68. Schnieder, E. (2007), “Verkehrsleittechnik: Automatisierung des Straßen- und Schienenverkehrs“, Springer Verlag, Heidelberg, p. 445

69. Song, D. P., Carter, J. (2009), “Empty container repositioning in liner shipping”, *Maritime Policy and Management*, vol. 36, no. 4: 291 – 307

70. Stastny, P. (2004), “A made in China problem”, *marketwatch: marine carriers*, vol. June 2004

71. Sunesen, E.R., Francois, J.F., Thelle, M. H. (2009), “Assessment of Barriers to Trade and Investment between the EU and Japan”, Copenhagen Economics

72. UN Comtrade (2009a), “Import – Export – Trade Balance China”, http://comtrade.un.org/pb/CountryPagesNew.aspx?y=2009

73. UN Comtrade (2009b), “Import – Export – Trade Balance India”, http://comtrade.un.org/pb/CountryPagesNew.aspx?y=2009

74. UN Comtrade (2009c), “Import – Export – Trade Balance Japan”, http://comtrade.un.org/pb/CountryPagesNew.aspx?y=2009

75. UN Comtrade (2009d), “Import – Export – Trade Balance South Korea”, http://comtrade.un.org/pb/CountryPagesNew.aspx?y=2009

76. Van Marle, G. (2010), “Trading places”, *Lloyds List*, 1^{8th} May 2010

77. Vinod, H. D., McCullough, B.D. (1994), “Bootstrapping Demand and Supply Elasticities: The Indian Case”, Journal of Asian Economics, vol. 5, issue 367 – 379

78. Wang, L., Whalley, J. (2007), “The imbacts of Renminibi appreciation on trades flows and reserve accumulation in a monetary trade model”, Working paper No. 13586, National bureau of economic research

79. Wilmsmeier, G., Hoffmann, J. (2008), „Liner Shipping Connectivity and Port Infrastructure as Determinants of Freight rates in the Caribbean”, *Maritime Economics and Logistics*, vol. 10: 130 - 151

80. World Bank (2009a), “Doing Business 2010 – China”, http://www.doingbusiness.org/Documents/CountryProfiles/CHN.pdf

81. World Bank (2009b), “Doing Business 2010 – full report”, http://www.doingbusiness.org/documents/fullreport/2010/DB10-full-report.pdf

82. World Bank (2009c), “Doing Business 2010 – India”, http://www.doingbusiness.org/Documents/CountryProfiles/IND.pdf

83. World Bank (2009d), “Doing Business 2010 – Japan”, http://www.doingbusiness.org/Documents/CountryProfiles/JPN.pdf

84. World Bank (2009e), “Doing Business 2010 – South Korea”, http://www.doingbusiness.org/Documents/CountryProfiles/KOR.pdf