The development of EU value added exports and the potential influence of TTIP.

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Abstract

In this thesis we have given an overview of EU value added over time and specifically of EU value added exports to the US. By means of a gravity regression we have tried to estimate the potential impact of TTIP – i.e. a reduction in trade costs (tariffs and Non Tariff Measures) – on EU value added exports to the US. We found that the presence of trade costs has a small negative impact on EU value added exports to the US. Finally we have estimated the impact of trade cost reductions in TTIP on EU value added exports to the US.

Content

1 Introduction

Adding value. Ever since mankind started producing (food, agriculture equipment, etc.), we have been adding value. The definition of value added though came only many centuries later. In early times it was common that the entire product was made by one person or one firm. Therefore the total value of the product was solely created by that one person or firm. Over time it became common knowledge that production was done faster and cheaper if not done by one person but if several persons specialised on different parts of the production process. As a result the value added was no longer created by one person but spread over the different persons working on the product. Each one adding a little bit of value when further finalising the product. This process only evolved slowly.

Over the past 20 years however, we have seen that production processes have become significantly more spread over different industries. Industries started to specialize more in specific stages of the production process instead of specializing in a single product. For various reasons, including dropping transport costs and an increased number of trade agreements being negotiated and entered into force, the concept of value chains has come up (Backer & Miroudot, 2013) (OECD, 2013a). Since it has become cheaper to outsource parts of the production process, all the different stages of the production process became dispersed all over the globe to the locations where it was cheapest to produce – in essence creating a lot of small comparative (Ricardian) advantages, that, together, create a final product. Because of the increased (global) product fragmentation, a lesser share will be produced in the home country and therefore, there will be also fewer stages in the production process where a country can add value (compared to the situation where it produced the whole product). On the other hand, a country can participate in more value chains for specialised stages of production and thus create more value added – making use of scale economies.

In July 2013 the European Union and the United States of America have started the negotiations on what is being called the biggest trade agreement ever, namely the Transatlantic Trade and Investment Partnership, also known as TTIP. The trade agreement will not only encompass the reduction of tariffs but also the

removal of non-tariff measures (NTMs), setting international standards and – expectedly – opening up both markets for services, investment and public procurement[1]. The latter part will also be the main driver of the potential benefits. The benefits of the agreement will not be limited to the EU and the US only. Although they will receive the largest gains - the EU is estimated to see its GDP and its exports to the US increase by €119 billion (0.48 percent) and €187 billion (28 percent) respectively and the US will see its GDP and its exports to the EU increase by €95 billion (0.39 percent) and €159 billion respectively – global income (read all other countries) would increase by almost €100 billion (CEPR, 2013).

There has been a vast amount of studies conducted on estimating the potential impacts of TTIP. Most of these studies report the expected impact on GDP, trade or wages in the EU or the US. Other studies have a different focus and try to assess the impact on e.g. third countries, the environment or human health. Also the number of studies related to value added (exports) and its general development over time have increased tremendously the past 20 years. However the link between value added (exports) and TTIP has not yet been made and this is what we will aim to do by means of this thesis. By assessing how EU value added exports to the US have developed over time and how the presence of tariffs and Non-Tariff Measures (NTMs) affect EU value added exports to the US, we will aim to make some predictions about the impact of TTIP on specifically EU value added exports to the US. We thus aim to assess how TTIP can impact value added exports due to a reduction in trade costs. In this thesis we will only focus on the value added exports of the EU to the US, not on US value added exports to the EU. Before we can answer the main question, we will focus first on two sub questions in our analysis: i) How can one compute value added (exports)? ii) How have EU value added exports to the US evolved over time?

The remainder of the paper is organized as follows. In Chapter 2 we will give an overview of the existing literature on global value chains and value added in general. A concise introduction to TTIP and its context will be given in Chapter 3. In Chapter 4 we will present the methodological approach and data used. The

[1] http://ec.europa.eu/trade/policy/in-focus/ttip/about-ttip/

results and the analysis will be presented in Chapter 5. The last chapter, Chapter 6 concludes.

2 Value added and GVCs in general

This chapter provides an overview of the existing literature on global value chains (GVCs) and value added. We will start with an explanation of what value added is followed by an overview of the development of global value chains and fragmentation over time. The next section discusses the development of the relation between value added and gross exports over time.

2.1 What is value added?

Before we can answer the question of what is value added we first need to define value. In business terms, the value of something is the price of it or the expenditures made to create it. So the total value of a sweater for example would be the price we paid for it, let say € 30. If the full production process of making that sweater would be performed by a single person (i.e. shaving the sheep, turning the raw wool into thread, and knitting the sweater), the value added (to the economy) by that person would be € 30. When we involve multiple persons into the production process, all performing a different step of the production process, each person will add a share of the total value. The amount of value added will depend on the type of activity conducted. When you want to estimate the total value of a product that is produced at multiple stages it is important that you only sum the value that is added additionally at each stage and not the total value of the product at each stage, the latter would result in double counting. For example, a farmer at the beginning of the production process shaves its sheep and sells the raw wool for € 8 to a spinner.[2] At this point the total value added is € 8, the farmer started from zero and "created" wool. By making use of his spinning wheel the spinner turns the raw wool into thread and sells this to a knitter for € 10. The additional value that has been added by the spinner is € 2, adding to total value created of € 10. Finally the knitter turns the thread into a sweater and sells for € 30, adding another € 20 of value. As will be explained in more detail below, when the production process gets more dispersed, the total amount of value added remains the same but is added in several places.

[2] This is only an example, the prices are not realistic.

2.2 Development of global value chains and product fragmentation over time

Long before David Ricardo's theory of comparative advantage (Ricardo, 1817), countries were already trading and specializing in their production. Think of the Roman Empire, which had already laid out an extensive trade network and specialized in certain products. For instance, they imported grain from Egypt, spices and luxuries from India and silk from China, whereas the Romans being abundant in grapes, oil and clay, exported mainly wine, olive oil and pottery. The terms of product fragmentation and global value chains however were only invented several centuries later. Backer and Miroudot (2013) point out some examples of small scale global value chains before 1980 (although under different definitions); the real emergence of the global value chains however came only in the late nineties.

Value chains are described by the OECD as follows: "*A value chain is the full range of activities that firms engage in to bring a product to the market, from conception to final use*". These activities can range from research & development, production, marketing, and logistics to public relations and quality assessment; they can all be performed by the same firm or spread over several firms. As both production and trade started to increase, the production process became more fragmented, i.e. these activities became more dispersed over different firms in different countries, and the value chains turned into global value chains. A global value chain can take different forms, of which some are characterized as snakes or spiders (Timmer et al., 2014). Snakes involve a sequential process where intermediate goods are transported from country A to B, where then parts and value are added before transporting it to country C. This process continues until the good reaches its final destination and is transformed into a final good. Spiders on the other hand import intermediate goods from different countries into one country where all the parts are assembled into a final product. As simple as this might seem, most global value chains are a combination of the two. Specialisation started to shift from a certain product to a specific task or a part of the global value chain. Companies now try to locate the various stages of production over different sites and countries to increase productivity and competitiveness. As

Grossman and Rossi-Hansberg say correctly “it is no longer wine for cloth” (Grossman & Rossi-Hansber, 2006).

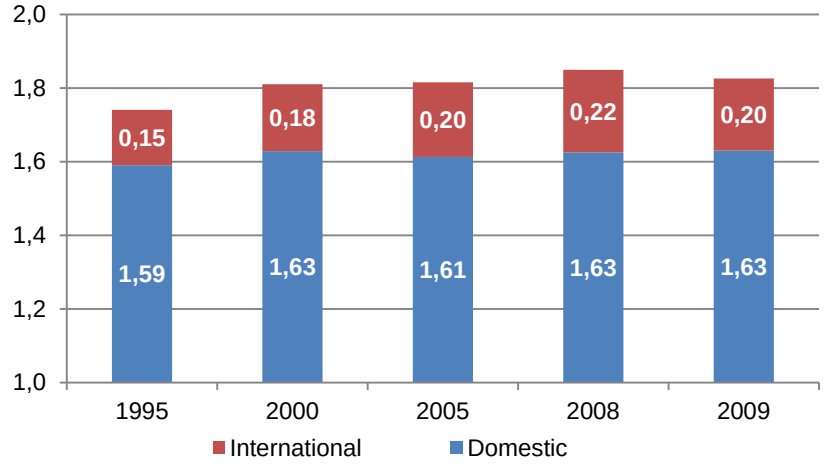
But what are the reasons for these value chains to become more globally dispersed? One of the reasons one can think of is the increase in the level of technology in e.g. telecommunication, the rise of internet, but also in areas like standardization and containerized shipping. The latter two have substantially decreased the costs of transportation. Another big contributor is the liberalization of trade and investment, this resulted in lower trade barriers and increased access to already existing markets. Also government reforms in transport and infrastructure helped reducing the costs. Next to these cost efficiency effects, there are also other factors that have played a role in the rise of the global value chains. One of these factors is the access to new foreign markets, as the growth of many developing countries had allowed for a shift of economic activity from developed countries to these developing countries. This shift went along with the increased access to knowledge. A last factor has been the increased demand; as population grew demand increased and so the need for an increase in (cost efficient) production (Backer and Miroudot, 2013; OECD, 2013).

Although the production stages have become more dispersed, the level of fragmentation can differ significantly per product. There is a large difference between manufactured goods and services. The production of manufactured goods can easily be fragmented across different countries. For services production this is not the case; hence services are less fragmented. The reason for this is that most services require face to face contact with the client, which is hard if you are on the other side of the globe. In addition, the level of product fragmentation also depends on the trade-off between a decrease in production costs and an increase in transportation costs. Due to the fact that several stages of production can be allocated to the countries were production is cheapest, the costs of production itself have decreased substantially. This reduction in production costs comes however at the cost of increased transportation costs, since several elements of the production are no longer in the home country and thus need to be transported back (Backer and Miroudot, 2013; OECD, 2013). According to Jones and Kierzkowski (2001) there is an optimal level of product fragmentation that will depend on the level of trade and the height of transaction costs. This implies first that the

expansion of global value chains will come to a hold at some point in time; and second that the nature and networks of global value chains change over time as levels of trade and transactions costs change over time.

Figure 2.1 shows the average length of value chains across all industries for the world as a whole, indicated by the number of production stages that are involved.

Figure 2.1 Average number of production stages



Source: TiVA database

When the index takes the value of 1 it indicates that the final industry is only involved in one production stage from the whole process. Once the industry uses inputs from the same or other industries its value increases (with a weighted average of the length of the production involved in these sectors as explained in Backer and Miroudot, 2013). The graph also shows the distinction between the domestic and the international part of the value chain. Whereas the domestic part of the length of the value chain has stayed constant over time, the international part has slightly increased.

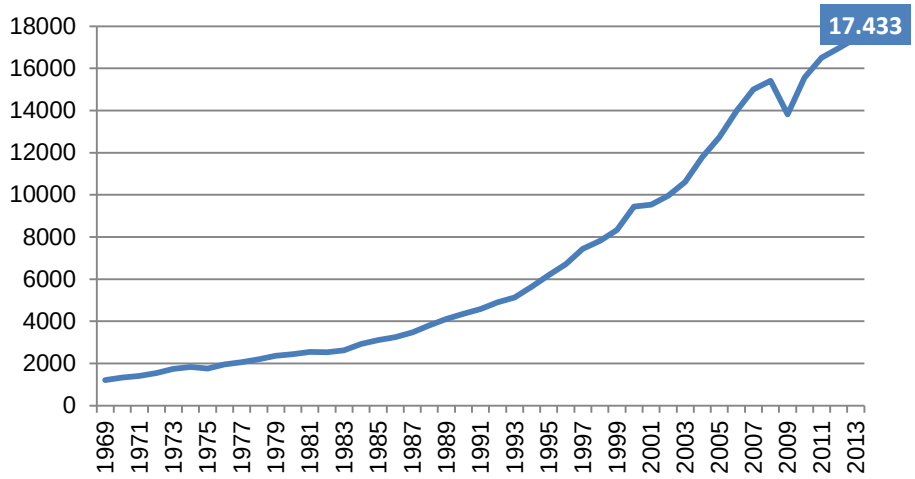
2.3 Value added versus gross exports over time

One way to define value added is as the rewards given to capital and labour used throughout the production process (Timmer, 2012). Robert Johnsen (2014) states that value added generated during the production process equals the expenditure on final goods. At the time when individual countries were still involved in the entire value chain (i.e. when an American car was 100% produced and made in Pittsburgh or Detroit), the share of domestic value added to gross exports was

high. With the rise of globalization, total value added created increased both in absolute and relative terms (due to an increase in demand for domestic products abroad). However as the production process became more fragmented over time, industries became only involved in smaller and smaller parts of the global value chain. This led to a smaller number of stages of the production process where an industry in a particular country could add value. Although the total value added in each final product did not decrease (rather it increased), the fragmentation of the production process led to the question “where exactly in the value chain the value was added” – and only parts were added in each individual country. A product of which parts were imported from a third country but was finalized in the home country will only see a small share of domestic value added, whereas the larger share will now be foreign value added (coming from not one but several third countries). For example, today we see a lot ‘made in China’ on final consumer products. In light of the above this only means for certain that final assembly has taken place in China. Chinese value added may, however, be limited to only that final assembly part.

Due to this increasing product fragmentation exports of both intermediate and final goods have increased even more. Figure 2.2 shows the volume of world trade in both goods and services over time (both intermediates and final goods). One should keep in mind that this is only one of the contributors to increased trade, there are other factors like e.g. increased population and thus increased demand, or trade agreements that entered into force and decreased the cost of trade.

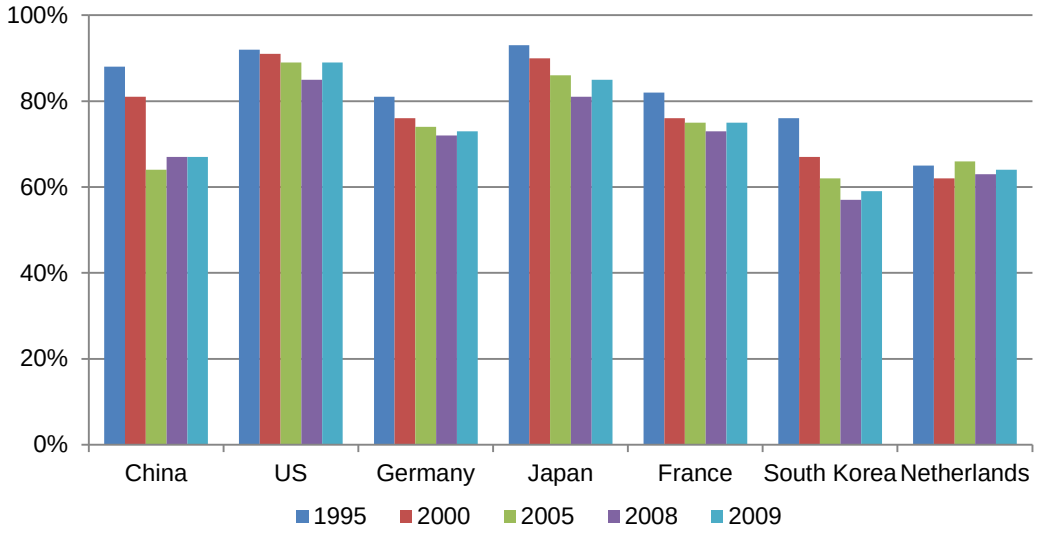
Figure 2.2 World trade volume in US$ billions



Source: TiVA database

From the graph one may see that until the nineties total world trade only grew steadily, whereas from half way the nineties until 2007 world trade increased at a much faster rate. Since gross exports were increasing faster than the domestic value added, the value added to export ratio, i.e. the amount of domestic value added embodied in final expenditure in each destination (Johnson and Noguera 2012a), started to decline. The value added to export (VAX) ratio can be calculated as value added over gross exports. Figure 2.3 below shows the VAX ratio for the top 7 exporting countries over time[3]. The destination to where the value added is exported is not one country specific, but the world as a whole.

Figure 2.3 Value added to exports ratio



Source: TiVA database

[3] Top 7 countries based on their exports in 2012. http://www.geohive.com/charts/ec_exim1.aspx

Interesting to see is that (except for the Netherlands) all countries see their VAX ratio decline over time (of which the reasons are discussed above), but see it increase in 2009. Due to the financial crisis in 2008 total exports decreased and countries started to produce more domestically again instead of importing. Table 2.1 shows the volume of total exports for the top 7 exporting countries for 2008 and 2009. This decrease in gross exports, combined with an increase in domestic production, and thus a higher share of total value added domestically, caused the VAX ratio do increase again. This is not only the case for these 7 countries, almost all countries saw an increase in their VAX ratio in 2009, some exceptions were Norway, Iceland and Saudi Arabia. Johnson (2014) also finds that value added exports have been declining over time, equalling 85 percent of gross exports in the 70s and 80s, and about 70-75 percent now. In his study Johnson indicates that other studies have found similar results, i.e. a ration of value added to gross exports of about 71 to 76 percent. Johnson and Noguera (2014) found that the drop in this ratio occurred for the larger part after 1990. At this point in time the world economy had changed rapidly due to increased trade liberalisation in emerging markets, the adoption of regional trade agreements, the information technology revolution and the enlargement of the European Union. It should be noted though that the above mentioned numbers are averages. Johnson (2014) founds that the ratio ranges from 51 to 92 percent. With the lowest ratios in Taiwan (0.51), Belgium (0.53) and South Korea (0.58), and the largest ratios in Russia (0.92), Brazil (0.86) and Australia (0.84). Still the drop in the ratio has been witnessed in all countries.

Table 2.1 Export volume of the top 7 exporting countries (US$ billion)

Total exports (US$ billions)							
	China	US	Germany	Japan	France	South Korea	The Netherlands
2008	1,429	1,287	1,451	782	609	546	422
2009	1,202	1,056	1,121	581	476	432	364

Source: http://www.geohive.com/charts/ec_exim1.aspx

When looking back at the total picture, Johnson and Noquera (2014) found that declines in the VAX ratio have been larger in fast growing/emerging countries than in other countries. They also found some interesting facts at bilateral level. First that the VAX ratio on exports to the partner country declined more for nearby countries and countries within the same region than for more distant

countries.[4] Secondly they found that countries who have adopted regional trade agreements with a partner country saw a larger decline in their VAX ration on exports with that partner country, compared to countries with whom they did not adopt a trade agreement. For both facts – neighbouring country or trade agreement – the trade cost of trading with that specific partner country are smaller than with other third countries. It is thus not unlikely that trade with these partner countries increases, both final goods and intermediate. Consequently some of the domestic production process could shift to the partner country, resulting in relatively more exports and less value added domestically and thus a lower VAX ratio.

[4] As for nearby countries one can think of neighbouring countries, e.g. Germany and the Netherlands. For countries within the same region one can think of the European countries within the EU of the different states within the USA.

3 Concise explanation of TTIP and its expected impact.

In order to make any prediction about the potential effect of TTIP on EU value added exports to the US, it is important to first understand what the agreement is about and its context. In this chapter we will give a short overview of the EU-US trade relation and a concise explanation of the ongoing TTIP negotiations and we will present the potential overall impact of the trade agreement based on different studies.

3.1 The EU-US trade relation.

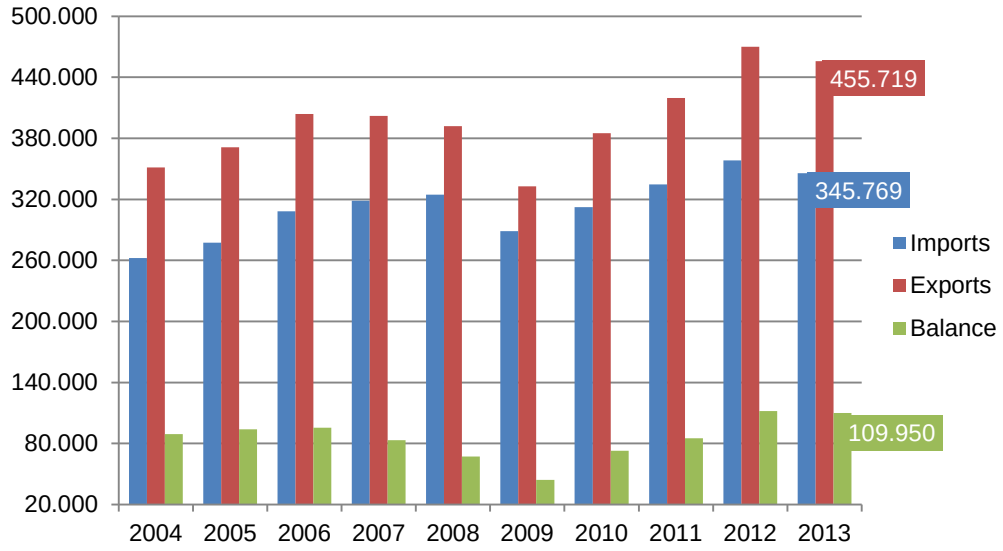
3.1.1 Trade

The EU and the US belong to the largest economies in the world, in 2012 they counted together for 26.6 percent of total world exports, and 32.2 percent of total world imports[5]. However with the rise of China and India, these numbers have been declining for the past ten years. Since 2000 China has tripled its share of exports and imports in world exports and imports. This came at the cost of the shares of among others the EU, the US, Canada, Japan and Mexico. Nonetheless in terms of import shares the EU and the US are still the two leading economies, and in terms of exports shares they take first and third place respectively, with China taking second place.

In 2013 the US was the number one export destination of the EU, and the third most important country where the EU sourced its imports from (after China and Russia). For the US the EU was the second most important import and export partner. Figure 3.1 shows the EU trade flows for goods and services with the US. It is clear to see that for all years the EU exports more to the US than they import from the US, resulting in a continuously positive trade balance for the EU.

[5] Eurostat.

Figure 3.1 EU trade flows in goods and services with the US (€ billion)



Source: Eurostat

Table 3.1 shows the ten EU sectors that exported the most to the US in 2011. The largest exports can be found in the sector of renting machinery and equipment and other business activities, amounting 97,986 million US dollar. The second and third most important export sectors to the US are the chemical sector and the transport equipment sector respectively.

Table 3.1 Top ten EU sectors exporting to the US (2011)

	EU sectors	Exports (US$ million)
1	Renting of M&Eq[6] and other business activities	97,986
2	Chemicals and chemical products	80,808
3	Transport equipment	53,892
4	Machinery	47,166
5	Electrical and optical equipment	45,634
6	Financial services	36,371
7	Coke, refined petroleum and nuclear fuel	31,129
8	Basic metals and fabricated metals	24,972
9	Food, beverages and tobacco	15,522
10	Pulp, paper, printing and publishing	12,277

Source: WIOD, author's calculations

Also in the US the renting of machinery and equipment and other business activities sector is the most important exporting sector to its partner, followed by financial services and transport equipment. A full list of the sectors and their exports values can be found in the annex.

[6] Machinery and equipment

Table 3.2 Top ten US sectors exporting to the EU (2011)

	US sectors	Exports (US$ million)
1	Renting of M&Eq and other business activities	92,467
2	Financial intermediation	70,568
3	Transport equipment	39,680
4	Chemicals and chemical products	38,507
5	Electrical and optical equipment	38,129
6	Coke, refined petroleum and nuclear fuel	23,347
7	Machinery	21,608
8	Inland transport	20,768
9	Wholesale trade	17,653
10	Other supporting and auxiliary transport activities	16,641

Source: WIOD, author's calculations

3.1.2 Tariffs and non-tariff measures

The existing tariffs between the EU and the US are low for many products. On average (weighted) the remaining tariffs amount 1.94 percent and 1.63 percent[7] applied by the EU and the US respectively in 2013. However there are still products/product groups that have higher tariffs in place. As can be seen from the figure below the EU has higher tariffs in place for processed foods (6.4 percent), manufacturing (4.1 percent) and transport (3.5 percent). These numbers may still seem relatively low, but when we take a closer look at the processed foods sector, we see that for example tobacco products face tariffs ranging from 10 percent up to 74.9 percent[8].

The US on the other hand still has high tariffs in place on minerals (6.6 percent), manufacturing (4.5 percent) and agricultural products (4.0 percent). Also here the numbers may seem relatively low, but within the processed food sector there are products with tariffs ranging 0 percent to 350 percent (tobacco) and 0 percent to 131.8 percent (prep. of vegetables, fruits and nuts). The same applies to the manufacturing sector, several product groups have maximum tariffs ranging from 32 percent to 48 percent.

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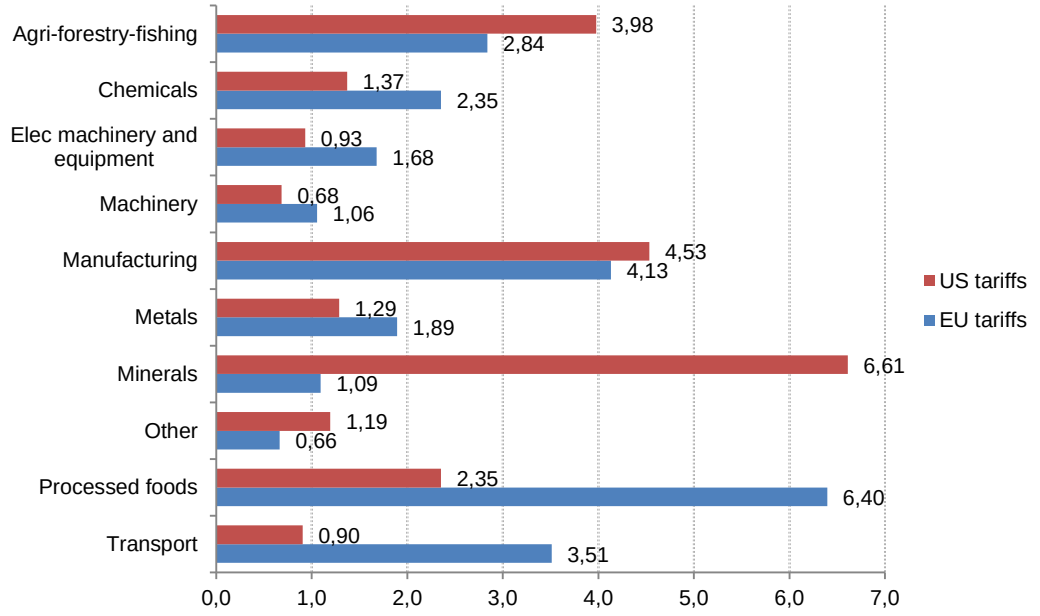
[7] These tariffs differ from the tariffs mentioned in section 2.3.1. The 1.94% and 1.63% tariff rates are trade weighted averages, i.e. the tariff of a certain product will only have a large share in this average rate if the import share of this product is large compared to the other products.

[8] WITS tariff database

Figure 3.2 Trade weighted average tariff rates (2013)



Source: WITS, author's calculations

The list of non-tariff measures that are in place between the EU and the US is however quite extensive. The Ecorys (2009) study describes non-tariff measures as follows:

"Non-Tariff Measures are defined as 'all non-price and non-quantity restrictions on trade in goods, services and investment, at federal and state level. This includes border measures (customs procedures, etc.) as well as behind-the border measures flowing from domestic laws, regulations and practices'. In other words, non-tariff measures and regulatory divergence are restrictions to trade in goods, services and investment at the federal or (member) state level."[9]

Non-tariff measures contain thus many different barriers to trade. Some well-known examples are:

- Labelling
- Testing requirements
- Pre-shipment inspections
- Import restrictions
- Certification and documentation requirements

[9] Berden, K. G., Francois, J., Thelle, M., Wymenga, P., & Tamminen, S. (2009). Non-Tariff Measures in EU-US Trade and Investment - An Economic Analysis. Rotterdam: Ecorys Nederland. P.39

- Safety requirements
- Quality requirements
- Export subsidies
- Customs surcharges

These are only a few examples from a vast list of trade barriers. Not only are there many more types of barriers to trade, also each type consists again of different specifications, differing as well per industry. For example labelling regulation can concern the indication of nutrition values, the colour and size of the label itself, information on country of origin, information on allergies and language use when one thinks of food products, but also energy efficiency, information about use and recycling, and information about possible hazardous material when we think about manufactured products[10]. For a better and more complete view on which non-tariff measures are in place between the EU and the US (per industry), we suggest to have a look at the Ecorys (2009) report - Non-Tariff Measures in EU-US Trade and Investment – An Economic Analysis.

3.1.3 Global value chains

As discussed above, value chains have been becoming more and more globally. Their depth, importance and length can be measured by different indicators. The participation index indicates to what extent countries are involved in the GVC and consists of the following two indicators:

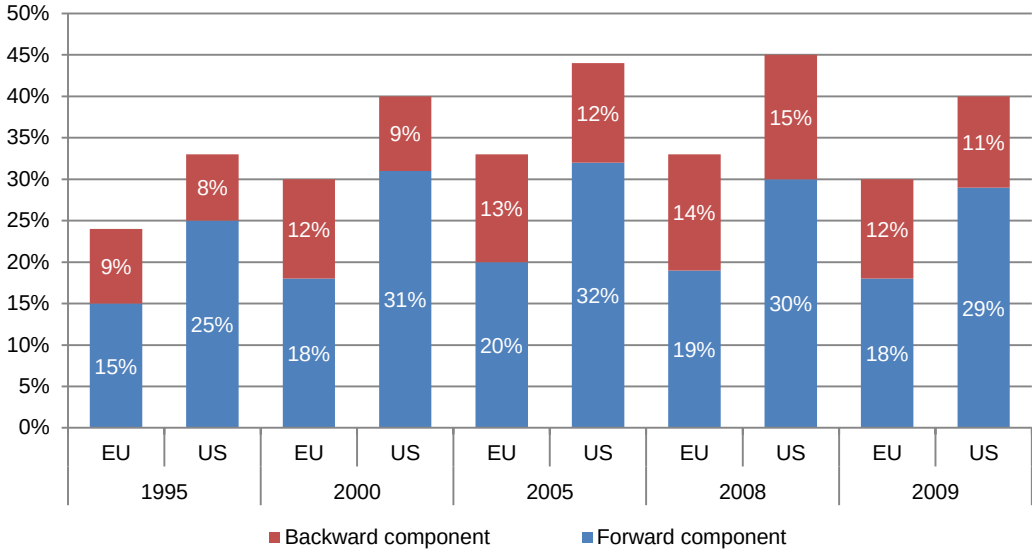
- Import content of exports, i.e. the share of imported inputs in the overall exports of a country.[11]
- The percentage of exported goods and services used as imported inputs to produce other countries' exports.

When combined they indicate the share of foreign inputs and domestically produced inputs used in third countries' export. Figure 3.3 shows the shares of the backward and forward component of the participation index for the EU and the US. The backward component shows the import content of exports and the forward looking component shows the percentage of exported goods and services used as imported inputs to produce other countries' exports.

[10] UNCTAD – Classification of non-tariff measures (2012)

[11] The products exported by a country can be either used as final goods or as intermediate products in the destination country. Often these products are produced by using intermediate products either sourced domestically or imported from another country. For the import content of experts, one looks at the value of intermediates sourced from third countries, and used domestically in the production of goods and services that are exported to another country.

Figure 3.3 Global value chain participation index



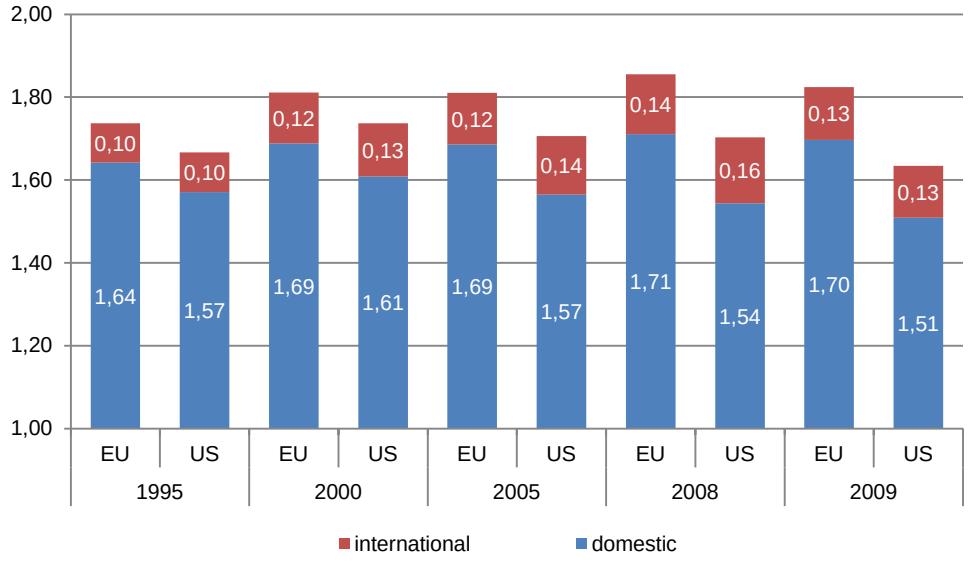
Source: TiVA database

It is clear to see from the graph that both the EU and the US have a higher share in the forward component than in the backward component of the value chain. Compared to smaller countries however the EU and the US have a relative low participation index[12].These two issues might be due to the fact that the EU and the US are large economies and are therefore able to produce more intermediate goods domestically, and thus need to import less, (World trade report, 2014), leading to a lower share of backward component and a relatively low participation index overall.

Another measure to give a description about the global value chain deals with the length of the GVC, it indicates how many production stages there are involved, and is presented in Figure 3.4. When the index takes the value of 1 it means that no intermediate inputs are used to produce a product, i.e. the production process is not fragmented and every step from beginning to end occurs in the same and thus final industry. The index value increases when inputs from the same industry or other industries are used, with a weighted average of the length of the production involved in these sectors (Backer and Miroudot, 2013). In the graph we have made the distinction between the domestic inputs and foreign inputs. Here you can see that a large share of the inputs is sourced domestically.

[12] The world trade report and the TiVA database show that countries like Chinese Taipei, Singapore, Malaysia and the Philippines had a participation index between 66% and 76% in 2008.

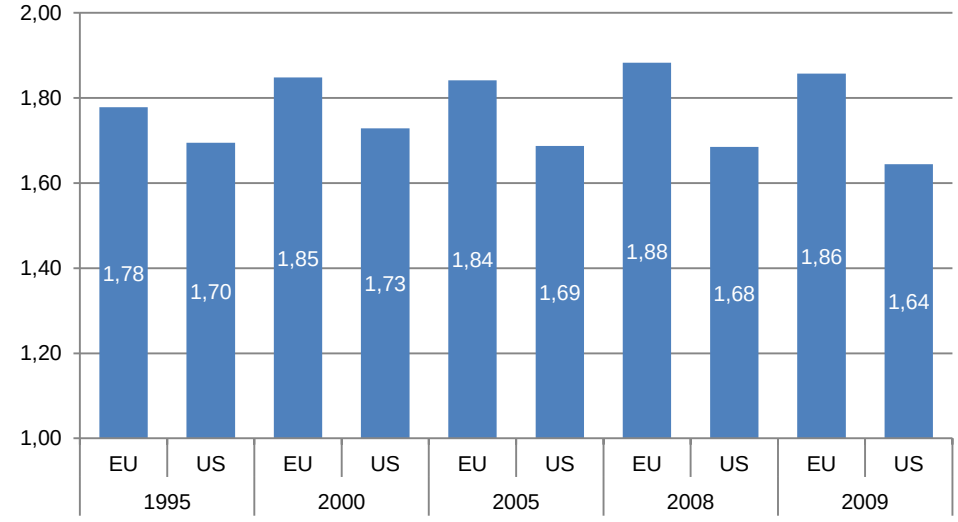
Figure 3.4 Average length of global value chains



Source: TiVA database

A third measure related to GVCs is the distance to final demand, and indicates the position of a country in the value chain, this can be either upstream (i.e. at the beginning of the process) or downstream (i.e. at the end of the process). The index indicates how may production stages there are left before the product reaches its final destination. The higher index number the more upstream the country is in the global value chain and the more production stages there are left before the product has reached final demand.

Figure 3.5 Distance to final demand



Source: TiVA database

When looking at the graph we can see that the measure of upstreamness stayed relatively the same for the EU between 2000 and 2009, but declined for the US, this would mean that US has moved more downstream along the value chain.

3.2 The Transatlantic Trade and Investment Partnership

3.2.1 The trade agreement

In July 2013 the European Union and the United States of America have started the negotiations on what has been called the biggest potential trade agreement ever, namely the Transatlantic Trade and Investment Partnership, also known as TTIP or TAFTA (Transatlantic Free Trade Agreement). The main objectives of the agreement are to increase trade and investment between the two nations and to create a real transatlantic market. They aim to achieve this by eliminating tariffs and other kinds of unnecessary trade restrictions, like technical barriers to trade, red tape restrictions, behind the border measures, etc.

The European Commission negotiates on behalf of the European Parliament and the European Council (consisting of the heads of the EU Member States). The latter two are not involved in the negotiation process, only at the end they have to ratify the entire agreement in order to let it pass. However they do frequently receive updates from the European Commission on where the negotiations stand. The Commission does not do this completely alone, they are advised by the Advisory Group on the topics included in the agreement. The Advisory Group consists of 14 experts who represent fields like e.g. law, health, agriculture, consumer protection, transport or business. These experts are only allowed to give advice, they do not have a say in the negotiation process itself.

The trade agreement consists of three main parts, namely:

- Market access chapter,
- Regulatory cooperation chapter,
- Rules chapter.

Market access.

The first part deals with improving the access to both the European and the American market for American and European business. It consists of the following 6 elements:

- *Tariffs.* They aim to remove 98 percent to 100 percent of all tariffs. Even though the overall average tariff rate is considered to be low (5.2 percent for the EU and 3.5 percent for the US[13]), there are still high tariffs for agriculture, other food products and motor vehicles. Also the total costs are still high due to the vast amount of goods and services that are traded every day. Interesting to see however is that for almost all sectors the EU implements larger tariffs than the US does.
- *Rules of origin.*
- *Trade defence measures*. Involves the establishment of regular dialogues on anti-dumping and anti-subsidizing measures.
- *Services.* The aim here is to make professional qualifications recognised on the other side of the Atlantic and to insure that EU companies can operate in the US under the same conditions as US companies.
- *Investment.* This part includes liberalisation and protection of investment.
- *Public procurement.* Government procurement markets should be open to both European and American companies.

Regulatory cooperation.

The largest gains (80 percent of all gains) of this trade agreement can be reaped in this area, by the reduction in non-tariff measures (NTMs). Non-tariff measures concern trade barriers which increase the costs of doing business. Here one can think of differences in testing procedures, health and safety regulation, environmental standards, or labelling requirements. Although both the EU and the US have high and similar standards of safety and protection, both nations achieve them in different ways (e.g. different testing procedures or labelling), creating duplication of testing and documentation, and unnecessary extra costs. By means of regulatory convergence and cooperation TTIP aims to reduce these unnecessary costs. Much can be done on sanitary and phyto-sanitary issues, in the chemical, automotive, pharmaceutical and medical devices industry.

Of course not all non-tariff measures can be removed since some non-tariff measures are based on culture, language or geography they cannot be removed.

[13] http://trade.ec.europa.eu/doclib/press/index.cfm?id=918

Next to eliminating these non-tariff measures the objective is also to prevent the creation of new measures by creating a “living agreement”.

Rules.

The focus here lies more on global issues instead of bilateral issues and contains topics like:

- Intellectual property rights (e.g. geographic indications),
- Trade and sustainable development (e.g. labour rights and the environment),
- Globally relevant challenges and opportunities (setting global standards).

3.2.2 Studies on the potential impact of TTIP

Since the start of the negotiations (and also before) many different studies on the impact of TTIP have been published. Studies ranging from an overall impact to a country specific impact and studies ranging from the impact on third countries to impact of a chemical chapter in TTIP on the environment. Below we will present the four most cited studies: CEPR (2013), Felbermayr (2013), Capaldo (2014) and Fontagné (2013). We will discuss the CEPR (2013) report in more detail as it is the most comprehensive study about the impacts on TTIP but also the one that is guiding the negotiators.

CEPR report.

The Centre of Economic Policy Research has conducted an economic impact assessment on the future trade agreement.[14] Their study is probably the most extensive so far (both in terms of variables and sectors) and used by many as input for discussions and negotiations (also by the European Commission). They have estimated the effects that different scenarios will bring. A less ambitious scenario is expected to remove 98 percent of all tariffs, 10 percent of non-tariff barriers on goods and services, and 25 percent of non-tariff barriers on public procurement. The ambitious scenario aims to remove 100 percent of all tariffs, 25 percent of non-tariff barriers on goods and services and 50 percent of non-tariff barriers on public procurement. The European Commission aims to achieve the latter scenario.

[14] Francois, J., Manchin, M., Norberg, H., Pindyuk, O., & Tomberger, P. (2013). Reducing transatlantic barriers to trade and investment - an economic assessment. London: Centre for Economic Policy Research.

They found that if the ambitious scenario is realised EU and US GDP will increase by €119 billion and €95 billion respectively, once the agreement is fully implemented. EU exports to the US will increase by 28 percent, and US exports to the EU will increase by 37 percent. Total exports are expected to increase with 6 percent and 8 percent for the EU and the US respectively. This agreement will not only benefit the EU and the US, due to spill over effects, global income will increase by roughly €100 billion. With respect to social factors the CEPR has estimated that wages are expected to increase by 0.5 percent in the EU and by 0.4 percent in the US.

Next to the overall impact, they have also conducted an analysis at sectoral level for the ambitious scenario. Table 3.4 shows the five sectors that will see the largest increase in their output (left) and the five sectors that will see the largest decrease/smallest increase in their output (right). The sector with the largest increase in the EU is the motor vehicle sector (1.5 percent), whereas the electrical machinery sector will see the largest drop (-7.3 percent) in its output. In the US it is the other machinery sector that will face the largest increase (1.7 percent) and the motor vehicles sector that will face the largest drop in output (-2.8 percent).

Table 3.4 Expected change in sector output

EU					
1	Motor vehicles	1.54%	1	Electrical machinery	-7.28%
2	Water transport	0.99%	2	Metal and metal products	-1.50%
3	Insurances	0.83%	3	Other transport equipment	-0.08%
4	Other manufacturing	0.79%	4	Other primary sectors	0.02%
5	Processed foods	0.59%	5	Agri-forestry-fishing	0.06%
US					
1	Other machinery	1.66%	1	Motor vehicles	-2.78%
2	Other transport equipment	0.83%	2	Electrical machinery	-2.04%
3	Metals and metal products	0.45%	3	Processed foods	-1.13%
4	Water transport	0.42%	4	Insurance	-0.44%
5	Air transport	0.39%	5	Chemicals	-0.40%

In table 3.5 you can see the five sectors[15] that will see the largest increase in their exports (left) and the five sectors that will see the largest decrease/smallest

[15] Based on expected percentage increase

increase in their exports (right), both in percentages and absolute values (million US$). For the EU the largest increase in exports can be found in the motor vehicles sector, both in terms of percentage (41.8 percent) and absolute value (94,857 million US$). Although the chemicals sector comes in fourth place in percentages change, it has a larger impact than the metal and processed food sector when we look at the change in absolute values. When we look at the right hand side, there is only one sector that is expected to see a decline in exports, namely electrical machinery (-0.01 percent), although relatively small.

On the US side the motor vehicles sectors is expected to have the largest increase in exports, both in percentage (59.5 percent) and absolute change (94,857 million US $) as well, followed by the metal and chemical sector. Also here the chemical sector will see a larger increase in exports in absolute terms than the metal sector, indicating that the chemical sector is a more important and larger sector than the metal sector in the US (and the processed foods sector in the EU). The US does not have any sectors that are expected to see a decline in exports.

Table 3.5 Expected change in sector exports

EU							
	Sector	**%**	**Mln $**		**Sector**	**%**	**Mln $**
1	Motor vehicles	41.75%	94,857	1	Electrical machinery	-0.01%	-10
2	Metal and metal products	12.07%	16,656	2	Agri-forestry-fishing	0.22%	490
3	Processed foods	9.36%	16,620	3	Other primary sectors	0.24%	313
4	Chemicals	9.26%	35,405	4	Other services	0.55%	410
5	Other manufactures	6.13%	13,327	5	Construction	0.64%	1,623
US							
1	Motor vehicles	59.47%	91,856	1	Other primary sectors	0.30%	526
2	Metals and metal products	22.45%	26,783	2	Other services	0.94%	2,571
3	Chemicals	11.49%	37,938	3	Agri-forestry-fishing	1.07%	5,204
4	Electrical machinery	8.86%	12,307	4	Water transport	1.52%	58
5	Other transport equipment	8.57%	14,853	5	Air transport	1.52%	808

Table 3.6 summarizes the expected changes in sector imports for both the EU and the US. The majority of the sectors that will see their exports increase (as discussed above), will also see their imports increase. Here it also clear to see that

the metal sector in the EU and the US and the chemical sector in the US are considerably important. They have a lower expected percentage increase than other sectors but an equally large or larger expected increase in absolute terms.

On the contrary to the expected change in exports, there are some US sectors that are expected to see a decrease in imports, namely the other services sector (-0.5 percent) and the other machinery sector (-0.4 percent). One should keep in mind that the percentages decrease is still relatively small.

Table 3.6 Expected change in sector imports

	EU						
	Sector	**%**	**Mln $**		**Sector**	**%**	**Mln $**
1	Motor vehicles	43.11%	78,626	1	Other manufacturing	0.63%	6,132
2	Other transport equipment	11.21%	10,353	2	Air transport	0.86%	832
3	Wood and paper products	11.20%	7,277	3	Other primary sectors	1.05%	7,322
4	Processed foods	10.07%	8,628	4	Other services	1.27%	3,476
5	Metals and metal products	9.76%	34,483	5	Water transport	1.49%	565
	US						
1	Motor vehicles	20.81%	86,693	1	Other services	-0.45%	-697
2	Processed foods	16.37%	17,189	2	Other machinery	-0.37%	-2,595
3	Chemicals	11.56%	31,081	3	Communications	0.43%	64
4	Other transport equipment	10.33%	8,855	4	Agri-forestry-fishing	0.59%	614
5	Metals and metal products	9.04%	17,530	5	Other primary sectors	0.70%	3,412

The CEPR report has also estimated the expected impact of TTIP on the bilateral exports between the EU and the US, see table 3.7. Both the EU and the US motor vehicle sector is expected to see an extensive increase in exports to the other, 148.7 percent increase for the EU sector and a 346.8 percent expected increase for the US sector. Also the other sectors are expected to see a large increase in their exports to the partner country, at least in percentage terms. When we look at the change in absolute values, we see that the processed foods and electrical machinery sector in the EU and the wood and processed foods sector in the US will only face a small increase.

This large expected percentage increase in bilateral exports for the motor vehicles and processed food sector could be a result of the large tariff rates that are currently still in place but are assumed to be reduced to zero once the agreement is fully implemented.

Table 3.7 Expected change in sector bilateral exports

EU --> US							
	Sector	**%**	**Mln $**		**Sector**	**%**	**Mln $**
1	Motor vehicles	148.70%	87,358	1	Other services	-1.00%	-491
2	Metals and metal products	68.20%	12,516	2	Other primary sectors	0.6%	55
3	Processed foods	45.50%	1.,405	3	Communications	0.9%	51
4	Chemicals	36.20%	29,895	4	Air transport	1.6%	333
5	Electrical machinery	35.00%	2.555	5	Business services	2.3%	1,545
US --> EU							
1	Motor vehicles	346.80%	65,903	1	Other primary sectors	0.40%	41
2	Metals and metal products	88.10%	18,778	2	Other services	1.50%	744
3	Processed foods	74.80%	4,083	3	Air transport	2.20%	374
4	Electrical machinery	44.10%	8,304	4	Finance	4.90%	1,240
5	Wood and paper products	42.50%	2,918	5	Business services	5.40%	1,931

Bertelsmann GED

The Bertelsmann Stiftung study[16] also works with two scenarios: 1) a tariff scenario which assumes that on average[17] tariffs are reduced to zero for all goods, and 2) a comprehensive liberalisation scenario which assumes the elimination of tariffs and a reduction in non-tariff barriers. In the latter scenario they assume that trade between the EU and the US will increase on average to the same extent is it has increased due to NAFTA or the forming of the European Union.

According to the study, extra EU trade will increase in both scenarios, whereas intra EU trade will face a decline ranging from -0.1 percent to -40.9 percent

[16] Felbermayr, G., Heid, B., & Lehwald, S. (2013, 06 17). Transatlantic Trade and Investment Partnership (TTIP): Who benefits from a free trade deal? Bertelsmann Foundation Global Economic Dynamics.

[17] They exclude some special/sensitive products.

depending on the country. The results on real income per capita are positive, TTIP does not lead to a greater divergence in living conditions in the EU. The change in real income per capita ranges from 0.0 percent to 0.6 percent in the tariff scenario and from 2.6 percent to 9.7 percent in the deep scenario. Also the US can expect positive numbers, namely 0.8 percent and 13.4 percent for the two scenarios respectively. Third countries on the contrary (with the exception of a few) will see a decline in their real income per capita. The tariff scenario results in a change ranging from -7.5 percent to 0.7 percent, where most losses can be found in Africa. The deep scenario results in a change ranging from -9.5 percent to 0.7 percent, the countries that will face the largest decline for this scenario are Canada, Australia and Mexico.

The results for employment and wages indicate that all the 18 EU Member States they accounted for and the US will see their unemployment levels decline and their wages rise (in both scenarios). For the deep scenario this would result in 1.1 million new jobs in the US and in 1.3 million new jobs in the EU18.

Jeronim Capaldo

The study[18] makes use of the United Nations Global Policy Model and includes the US and several EU member states and regions instead of the EU as whole, namely the UK, Germany, France, Italy, other northern Europe and other southern Europe. The simulation compares the results for a no TTIP scenario and a TTIP scenario for the year 2025.

According to the results, the US will profit from the agreement, 1.0 percent increase in net exports[19], 0.4 percent increase in GDP, 784,000 new jobs and a €699,- increase in labour income, whereas the EU will only see negative results. The decrease in net exports ranges from 0.4 percent (Italy) to 2.1 percent (other northern Europe), GDP will decline with 0.1 percent in the UK and with 0.5 percent in other northern Europe and unemployment in the EU as a whole will

[18] Capaldo, J. (2014, 10). The Trans-Atlantic Trade and Investment Partnership: European disintegration, unemployment and instability. Retrieved 12 2014, from Global Development and Environment Institute at Tufts University: http://ase.tufts.edu/gdae/policy_research/TTIP_simulations.html

[19] Percentage of GDP.

increase by 583,000. They conclude that TTIP will lead to European disintegration, unemployment and financial instability.

CEPII

The Centre d'Etudes Prospectives et d'Information Internationales conducted their study on TTIP making use of MIRAGE.[20] Their reference scenario included a full elimination of tariffs over time starting in 2015 and a 25 percent cut in non-tariff measures on goods and services (excluding public services and audio-visuals). The results are estimated for the year 2025 compared to a baseline scenario.

Bilateral exports will increase with 49.0 percent for the EU and 52.2 percent for the US, intra EU trade exports will decline with 1.2 percent. Due to the high existing tariffs on agriculture, this sector will see the largest increase in bilateral exports, namely 149.5 percent for the EU and 168.5 percent for the US. The EU will see its total imports and exports[21] increase by 7.4 percent and 7.6 percent respectively, the numbers for the US amount 7.5 percent and 10.1 percent. Due to the trade agreement both the EU and the US will see a rise of 0.3 percent in GDP.

[20] Fontagné, L., Gourdon, J., & Jean, S. (2013). Transatlantic Trade: Wither partnership, which economic consequences. Centre d'Etudes Prospectives et d'Information Internationales.

[21] Excluding intra EU trade.

4 Methodological approach and data

In this section we will discuss the methodological approach and data used in order to be able to analyse how TTIP could impact EU value added exports to the US by lowering trade costs. In order to do so we will here focus on the following sub-topics:

1. How can we compute value added exports?
2. What would be the right database to use?
3. How have EU value added exports to the US evolved over time?
4. Empirical modelling strategy.

4.1 Computation of value added exports

Before we are able to assess the evolution of EU value added exports to the US overtime, we need to be able to compute the value added export flows. According to Johnson and Noguera (2012a), value added exports can be relatively easy computed in the following way:

> *"Construct a synthetic table by combining input–output tables and bilateral trade data for many countries. Using this table, we split each country's gross output according to the destination in which it is ultimately absorbed in final demand. We then use value added to output ratios from the source country to compute the value added associated with the implicit output transfer to each destination. The end result is a data set of "value added exports" that describes the destination where the value added produced in each source country is absorbed."*

Domestic value added – let's say from the Netherlands – can be exported to the partner country – let's say the US – in several ways. It can be exported directly in the form of final products or intermediate products. The former concerns value that is added in the Netherlands when producing products that are used by the final consumers in the US. The latter concerns value that is added in the Netherlands when producing intermediate products that are used in US production to produce final products for the US market. Value added can also be exported

indirectly to the US in the form of intermediate products that are used in third countries' final products which are sold on the US market. With one intermediate linkage an illustrative example could look as follows: a Dutch company adds value when manufacturing car doors. The company however does not make the whole car, only the doors, and exports its products to Germany. In Germany they make the whole car, with the Dutch car doors. When the car is finished it is shipped to the US and sold on the US market. In this way the Dutch value added is exported to the US via Germany. It can also happen that there are more intermediate linkages than just one, for example: a Dutch company manufacturing the tongue connection of a seatbelt, exports its products to China where they produce the seatbelt straps and connect the two components together. Subsequently the product is exported to e.g. Japan, where they manufacture the car seats and connect the product imported from China to the car seat. Again this product is exported to a different country, where they attach the complete car seat to the carriage work. Finally it is exported to Germany where all the larger parts are assembled into one car. Again the car is sold on the US market to a US customer. This time Dutch value added is exported to the US via four different countries.

To manually track the "journey" of all value added exports of e.g. the Netherlands to the US is rather time consuming. Johnson and Noguera (2012) have, in their papers, presented a relatively more easy way to calculate the value added exports and track them back all the way to the starting point. Below we will present the different steps and calculations needed in order to calculate the value added export flows. The methodology presented below is fully based on the one described in Johnson and Noquera (2012).[22] So to start with, the quantity of final goods produced in sector s in country i and consumed in country j can be written as:

$$q_{ij}^{c}(s)$$

The quantity of intermediate products from sector s in country i used in production in sector t in country j can then be written as:

[22] Johnson, R. C. and Noquera, G., 2012. Accounting for intermediates: production sharing and trade in value added.

$q_{ij}^{m}(s,t)$

Together they form total production. Since total production needs to equal total demand, one would get the following formula:

$$y_i\ (s) = \sum_j\ c_{ij}(s) + \sum_j\ \sum_t\ m_{ij}(s.t)$$

Where $y_i\ (s) \equiv p_i\ (s)\ q_i\ (s)$, $c_{ij}\ (s) \equiv p_i\ (s)\ q_{ij}^{c}(s)$, and $m_{ij}(s.t) \equiv p_i\ (s)\ q_{ij}^{m}(s,t)$. The formula above shows that all total production in sector s in country i equals all final goods produced in sector s country i for all countries, plus the total of intermediate goods produced in sector s in country i used in production in all other sectors in all countries. As a next step, gross bilateral exports, i.e. final and intermediate products used abroad, is then written as:

$$x_{ij}(s) = c_{ij}(s) + \sum_t\ m_{ij}(s.t)$$

When we want to define the production value for all countries and all sectors it is necessary to make use of matrices and vectors. The use of intermediate inputs from country i by country j would then be denoted by$A_{ij}y_j$, where A_{ij} is $A_{ij}(s,t) = m_{ij}(s.t)\ /y_j(t)$. The latter formula shows which share of total output in country j, sector t stems from intermediates from country i, sector s. Gross exports can then also be written as $x_{ij} = c_{ij} + A_{ij}y_j$. Now we can write the intermediate goods sourcing and final goods flow in matrix from:

$$A \equiv \begin{pmatrix} A11 & A12 & A1N \\ A21 & A22 & A2N \\ AN1 & AN2 & ANN \end{pmatrix}, y \equiv \begin{pmatrix} y_1 \\ y_2 \\ y_N \end{pmatrix},\ c_j \equiv \begin{pmatrix} c_{1j} \\ c_{2j} \\ c_{Nj} \end{pmatrix}$$

When combining the vectors the above would result in the following formula:

$$y = Ay + \sum\nolimits_j c_j$$

We can rewrite the formula be making use of the Leontief Inverse of the input output matrix

$$y = \sum_j (I - A)^{-1} c_j$$

As explained above, the calculations are more complex than one would think of, as the intermediates used in production are often created by making use of other intermediates, which are again produced by making use of intermediates, etc.. If one would only take into account one level of intermediates the "first order" term [I+A] c_j would suffice. Including a second level of intermediates would result in the "second order" term [I+A+A^2] c_j. Consequently another layer of intermediate products would result in the "third order" term [I+A+A^2+A^3] c_j. You could continue to expand the formula until you have A to the power infinity. Therefore we make use of the Leontief inverse and rewrite $\sum_{k=0}^{\infty} A^k = (I-A)^{-1}$.

In order to calculate the value added associated with the output transfers, Johnson and Noguera define the ratio of value added to output for each sector in country i as $r_i(t) = 1 - \sum_j \sum_s A_{ji}(s,t)$. Value added exports from country i to country j are then written as $va_{ij}(s) = r_i(s)\, y_{ij}(s)$

Although it is very interesting to track the "journey" of a country's intermediate product and its value added, it is due to time constraints out of the scope of this thesis. Instead we will make use of the data that is already directly available.

4.2 The Trade in Value Added (TiVA) database

There are several databases one could retrieve value added (export) data from. The GTAP (Global Trade Analysis Project) database is very extensive with input output tables for more than 100 countries and 57 different sectors. The database covers the years 2000 till 2009, however it is not publicly available. The IDE JETRO database only covers the Asian and BRIC countries and is thus of no use for calculating EU value added exports. The WTO-OECD TiVA[23] database has value added for all EU countries, the remaining OECD countries and for several larger non OECD countries. A table with the specific countries can be found in the Annex. Their data is available for the years 1995, 2000, 2005, 2008/2011. In addition to value added data they have within their database different variables

[23] Trade in Value Added

related to value added for example: domestic or foreign value added content of gross exports, foreign value added embodied in domestic final demand, re-imported domestic value added content or forward and backward participation in GVCs. Some of these data have already been used in previous sections of this thesis. Another potential database is the World Input Output Database (WIOD) consisting of 40 countries (including EU27 and the US) and the Rest of the World (RoW), and includes 35 different industries[24] for the years 1995 and 2000/2011. As the name indicates, it is a database with input and output data and shows for each product produced its destination country and industry. At the same time it also indicates the source country and industry of intermediates used to produce a product in a certain industry. Finally there is the OECD Input Output Tables, also very extensive with data for 34 sectors and more than 60 countries (including EU 28) for the years 1995 till 2011. However the database only shows the total output of each country's sector used in another sector at the global level, whereas in the WIOD the output of each country's sector used in another has also been split out at country level in is thus more detailed.

For the purpose of this thesis both the WIOD and TiVA database are very suitable. In the case of tracing the European Union's value added exports through all third countries and all sectors before it reaches its final destination, the WIOD would be most suitable (as it is the most detailed and extensive database). However as indicated earlier, in this thesis we will not calculate the value added export of the EU to the US ourselves but make use of existing data. This is where we make use of the TiVA database, since it has readily available domestic value added embodied in foreign final demand, or in other words value added exports, and this precisely the data we need for our research. In case one would want to calculate the value added export flows through all third countries and sectors we would advise to use the WIOD. In addition to tracing value added exports flow, WIOD can – due to its detailed data – also be used for other research. The database is particularly useful for studying sector linkages. For example one can rather easily analyse which sectors are dominant suppliers to, or buyers from a certain industry, either at a global level or per country specific. One could thus also see whether certain goods are provided from all over the world or whether it

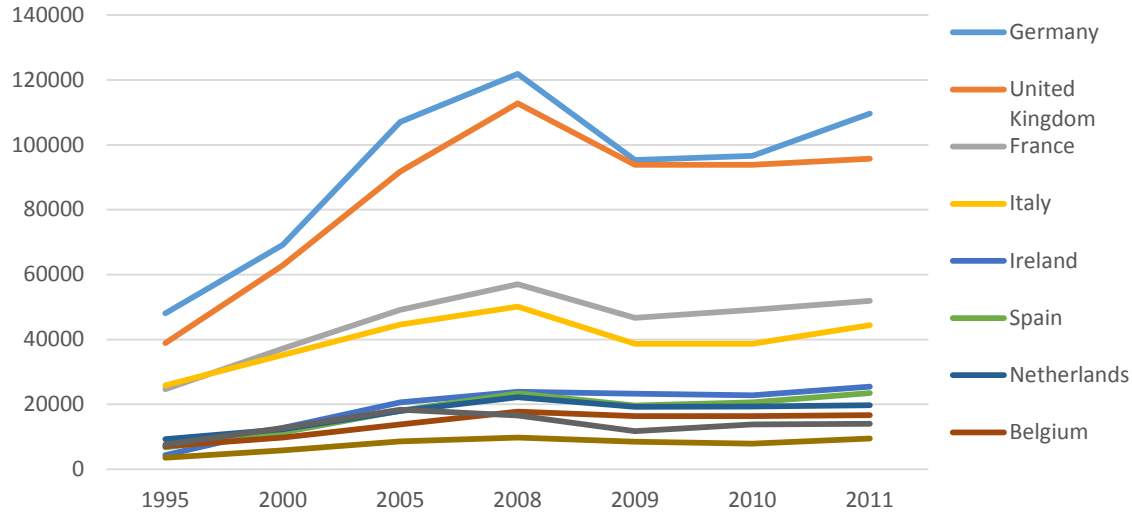
[24] Two digit ISIC rev. 3 level

is mainly provided by one or two countries who have a comparative advantage over this particular good. For clarity and potential further research a description of the WIOD can be found in the Annex.

4.3 Value added exports based on TiVA.

The EU value added exports to the US can be directly downloaded from the TiVA database. The “domestic value added embodied in foreign final demand” –as it is called in the TiVA database – contains both the EU value added directly exported to the US as well the EU value added that is exported to the US via third countries. The TiVA database uses the same method as Johnson and Noquera (as described above) to calculate the value added exports. Before we will use the data in our modelling we will shortly say something about the data. When looking at the domestic value added exported to the US we see that Germany is the largest exporter of value added to the US. In 2011, $109.6 billion of value added was exported to the US. Also the UK exported a significant amount of value added to the US, $95.7 billion. There is however a large difference when comparing Germany and the UK with the other EU countries. France and Italy export relatively also a large amount of value added to the US, $51.8 and $44.4 billion respectively. However, for the other EU countries, their value added exported to the US currently ranges from $320 million to $25.5 billion. While Germany, UK, France and Italy have seen their value added exports to the US increase over time – except for a drop in 2009 – the value added exports of other EU countries has only slightly increased.

Figure 4.1 EU value added exports to the US, top ten EU countries (million dollars)



Source: TiVA database.

4.4 Empirical modelling strategy

In this section we will describe the empirical model strategy we will use for this thesis. We will make use of a gravity estimation. Gravity equations are often used to predict bilateral trade flows or estimate the impact of a trade agreement, currency unions or exchange rate volatility (Baldwin and Taglioni, 2006). A standard gravity equation look as follows:

$$\ln(X_{ij}) = \alpha_1 + \alpha_2 \ln(Y_i) + \alpha_3 \ln(Y_j) + \alpha_4 \ln(d_{ij}) + \varepsilon_{ij}$$

Xij presents trade or exports, Y_i and Y_j the GDP of the respective trading countries, and d_{ij} the distance between the two countries. However we will slightly adapt this formula for this thesis. Instead of bilateral trade flows between the US and the EU Member States we will use the bilateral value added exported from the EU Member States to the US as presented in the above section. Given the increasing importance of trade in parts and components, gross exports are not as representative anymore for value added flows as they used to be. In the past, when trade in parts and components was not that important, gross trade data was treated as if it is comparable to data on value added (Johnson, 2014). This is no longer the case, and gross trade includes double counting. Consequently, directly using value added exports will tell us more about value added flows and where value added is consumed then using gross trade data. Although it is applicable more general, Yücer et al. write in their paper that the trade in value-added would

be a “better” measure than gross value to understand the impact of trade on employment, growth, production etc.. They also mention that the coefficient for distance is smaller and less significant when its impact is estimated for exported value-added; GDP impact remains similar.

Like the standard gravity equation we will use an income measure of the country of origin and of the country of destination, as well as distance. However in order to control for the different country sizes, we will make use of GDP per capita, instead of total GDP. We have taken the GDP per capita data from the World Bank database and the distance data from CEPII. The main variable for which we want to estimate its impact on EU value added exports to the US is “tariffs + TCEs of NTMs”. The tariff lines between the US and the EU Member States can directly be downloaded from WITS, using UNCTAD TRAINS data. Here we use a weighted average tariff for all products together per country for each year separately. In order to include the cost of NTMs into the model, one would need a trade cost equivalent (TCE) of NTMs. Berden and Francois have compared different studies that have estimated the TCE of NTMs in EU –US trade.[25] They discuss five different studies that have used slightly different methods to calculate the TCE of NTMs for different sectors in EU-US trade. Three out of the five studies have estimated relatively similar TCEs for EU-US trade. We use the average of these three studies as a proxy for our trade cost equivalent of NTMs. This would then result in a TCE of 17.03 for EU exports to the US. Unfortunately these studies do not have a TCE of NTMS in EU-US trade for different years or for all EU MS separately. This sole estimate will thus be used for all the years in our model. The TCE of 17.03 covers the EU as a whole. Because we will use the same estimate for all EU countries and for each year, there is no variation in the variable over time and it will thus have no explanatory power in our regression. Consequently one should take the results – impact of NTMs on EU value added exports to the US – with a pinch of salt.

Additionally we will also use other (control) variables, namely common language and colonial ties. The data for these two variables is also sourced from CEPII. By combining these variables into the model we arrive at the following regression:

[25] Berden, K. and Francois, J. 2015. Quantifying Non-Tariff Measures for TTIP.

$$\ln(VAX_{ij}) = \alpha_1 + \alpha_2 \ln(Ycap_i) + \alpha_3 \ln(Ycap_j) + \alpha_4 \ln(total\ tradecosts_{ij}) + \varepsilon_{ij}$$

Where

$$\ln(total\ tradecosts_{ij}) = \beta_1 \ln(d_{ij}) + \beta_2 clang_{ij} + \beta_3 colony_{ij} + \beta_4 \ln(1 + tariffs)_{ij} + \varepsilon_{ij}$$

Where VAX_{ij} denotes the value added exports of the country of origin to the destination country (from an EU MS to the US), $Ycap_i$ denotes the GDP per capita of the country of origin and $Ycap_j$ of the destination country. D_{ij} represents the distance between the country of origin and the destination country, $clang_{ij}$ whether they share a common language and $colony_{ij}$ whether they had colonial links. The trade cost increase due to tariffs is presented by $(1 + tariffs_{ij})$.

5 Results and Analysis

Here we will present and discuss the results of our gravity analyses. We have run three different regressions. For the first regression we have only included tariffs, for the second we have included both tariffs and the TCE of NTMs but as two different variables, and for the third regression we have summed the tariffs and TCE of NTMs and included it as one variable.[26] For each regression we have made use of time fixed effects, exporter fixed effects and a combination of the latter two, i.e. time-exporter fixed effects. Note that the inclusion of only one importing country in our sample implicitly means that exporter fixed effects are actually also exporter-importer fixed effects. This also applies to the time-exporter fixed effects. With the time fixed effects we have a specific dummy for each year (α_t), with the exporter fixed effects we have a specific dummy for each exporting EU MS (α_i) and with the time-exporter fixed effects we have dummy for each time-country combination (αi_t). The sample we have used consists of 196 observations, and contains 7 years (all available years in TiVA) and 28 exporting countries (all EU MS). The regression results are presented in Table 5.1 below.[27] For all regression both GDP per capita of the exporting (EU MS) country and GDP per capita of the US have a positive impact on EU value added exports to the US. Distance on the other hand has for all regression a negative sign, as expected. The signs for common language and colonial ties differ per regression. Language has a negative sing when time fixed effects are used and positive sign when exporter fixed effects are used. The coefficients for tariffs and tariffs + TCE of NTMS as one variable are negative, but not significant. As regards the R^2 of the regressions, the regression with exporter fixed effects has the largest R^2 of 0.989.

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[26] The latter two would result in the following two regressions:

$\ln(VAX_{ij}) = \alpha_1 + \alpha_2 \ln(Ycap_i) + \alpha_3 \ln(Ycap_j) + \alpha_4 \ln(d_{ij}) + \alpha_5 clang_{ij} + \alpha_6 colony_{ij} + \alpha_7 \ln(1 + tariffs)_{ij} + \alpha_8 \ln(1 + TCEntm)_{ij} + \varepsilon_{ij}$

$\ln(VAX_{ij}) = \alpha_1 + \alpha_2 \ln(Ycap_i) + \alpha_3 \ln(Ycap_j) + \alpha_4 \ln(d_{ij}) + \alpha_5 clang_{ij} + \alpha_6 colony_{ij} + \alpha_7 \ln(1 + tariffs + TCEntm)_{ij} + \varepsilon_{ij}$

[27] The results of the 4th, 5th and 6th regression - with tariffs and the TCE of NTMs as two separate variables - are not included in table. Since we have used the EU overall TCE of NTMs for all years and all countries, there is no variation in the variable overtime and consequently STATA has omitted the variable from the regression. This results in the same coefficients for the other variables as in regression 1, 2 and 3.

The aim of this thesis is to say something about the potential impact of TTIP – by means of a reduction in EU-US trade costs (tariffs and NTMs) - on specifically EU value added exports to the US. The coefficient for “tariffs + TCEs of NTMs” is however not significant and the statements below can therefore not be considered as leading. When making use of time fixed effects the coefficient for “tariffs + TCEs of NTMs” is -0.123 and tells us that a reduction of 10 percent in these specific trade costs would result in a 1.23 percent increase in EU MS value added exports to the US. With exporter fixed effects the coefficient is -0.787 and a 10 percent decrease in these specific trade costs would result in a 7.87 percent increase in EU MS value added exports to the US. For time-exporter fixed effects the coefficient equals -0.100, telling us that a 10 percent decrease in these specific trade costs would results in a 1.00 percent increase in EU MS value added exports to the US.

As discussed in Chapter 3, many different scenarios have been assumed regarding the reduction of tariffs and NTMs in TTIP. The trade cost reduction scenarios assumed in the CEPR rapport are used by the European Commission to study the potential impact of TTIP. Therefor we will also use those trade cost reduction scenarios for our impact analysis on EU value added exports to the US. In the less ambitious scenario it is assumed that tariffs will be reduced with 98 percent and NTMs with 10 percent. In the ambitious scenario it is assumed that tariffs will be reduced with 100 percent and NTMs with 25 percent. Based on the current tariffs for each country and the TCE of NTMs we have calculated the new trade costs based on the two scenarios and the consequent change in total trade costs (see Table 5.2).

Table 5.1 Regression results

	Dependent variable: Value added exports (ln)					
	Time fixed effects	Exporter fixed effects[a]	Time-exporter fixed effects[b]	Time fixed effects	Exporter fixed effects[a]	Time-exporter fixed effects[b]
GDP per capita (EU MS) (ln)	1.323*** (0.119)	0.978*** (0.132)	1.311*** (0.121)	1.323*** (0.119)	0.978*** (0.132)	1.311*** (0.121)
GDP per capita US (ln)	0.248 (0.201)	0.657*** (0.223)	0.266 (0.206)	0.248 (0.201)	0.657*** (0.223)	0.265 (0.206)
Distance (ln)	-4.792** (2.378)	-8.464*** (1.505)		-4.792** (2.378)	-8.464*** (1.505)	
Language	-0.485 (0.815)	1.157*** (0.122)		-0.485 (0.815)	1.157*** (0.122)	
Colonial ties	1.689** (0.854)	-0.257 (0.211)		1.689** (0.854)	-0.257 (0.211)	
Tariffs (ln)	-0.101 (1.582)	-0.675 (1.818)	-0.081 (1.597)			
"Tariffs + TCEs of NTMs" (ln)				-0.123 (1.838)	-0.787 (2.113)	-0.100 (1.856)
Constant	34.413 (21.027)	66.738*** (13.359)	-7.893*** (1.256)	34.432 (21.026)	66.862*** (13.371)	-7.876*** (1.419)
Observations	196	196	196	196	196	196
R-squared	0.572	0.989	0.369	0.572	0.989	0.369

a: Since our sample includes only one importing country, taking exporter fixed effects implicitly means having exporter-importer fixed effects.
b: Since our sample includes only one importing country, taking time-exporter fixed effects implicitly means having time-exporter-importer fixed effects.
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

We have estimated that in the less ambitious scenario overall EU trade costs (tariffs + TCEs of NTMs) would be reduced by 3.22 percentage points, i.e. an 18.9 percent change. The largest reduction can be found in Bulgaria, with 7.71 percentage points (45.3 percent change), and the smallest reduction in Luxembourg with 2.44 percentage points (14.3 percent change). In the ambitious scenario overall EU trade costs would reduce by 5.81 percentage points (34.1 percent change). The largest decrease can again be found in Bulgaria, 10.39 percentage points (61.0 percent change). Luxembourg would see the lowest decrease with 5.01 percentage points (29.4 percent change). We will take Luxembourg and Bulgaria as the lower and upper bound for both scenarios. When using the coefficient of the regression with time-exporter fixed effects, this would result in an increase of EU value added exports to the US between 1.43 percent and 4.53 percent in the less ambitious scenario. For the ambitious scenario we then estimate a change in EU value added exports to the US between 2.94 percent and 6.10 percent.

Table 5.2 Trade cost reduction

	Current tariffs	Current NTMs	Current total trade costs	98% tariff reduction	10% NTM reduction	Total reduction	Total change	100% tariff reduction	25% NTM reduction	Total reduction	Total change
Austria	0,97	17,03	18	0,95	1,70	2,65	15,58%	0,97	4,26	5,23	30,7%
Belgium	1,94	17,03	18,97	1,90	1,70	3,60	21,16%	1,94	4,26	6,20	36,4%
Bulgaria	6,13	17,03	23,16	6,01	1,70	7,71	45,28%	6,13	4,26	10,39	61,0%
Croatia	1,66	17,03	18,69	1,63	1,70	3,33	19,55%	1,66	4,26	5,92	34,7%
Cyprus	1,69	17,03	18,72	1,66	1,70	3,36	19,73%	1,69	4,26	5,95	34,9%
Czech Republic	1,18	17,03	18,21	1,16	1,70	2,86	16,79%	1,18	4,26	5,44	31,9%
Denmark	1	17,03	18,03	0,98	1,70	2,68	15,75%	1	4,26	5,26	30,9%
Estonia	0,88	17,03	17,91	0,86	1,70	2,57	15,06%	0,88	4,26	5,14	30,2%
Finland	1,68	17,03	18,71	1,65	1,70	3,35	19,67%	1,68	4,26	5,94	34,9%
France	1,25	17,03	18,28	1,23	1,70	2,93	17,19%	1,25	4,26	5,51	32,3%
Germany	1,12	17,03	18,15	1,10	1,70	2,81	16,45%	1,12	4,26	5,38	31,6%
Greece	4,2	17,03	21,23	4,12	1,70	5,82	34,17%	4,2	4,26	8,46	49,7%
Hungary	1,2	17,03	18,23	1,18	1,70	2,88	16,91%	1,2	4,26	5,46	32,0%
Ireland	1,3	17,03	18,33	1,27	1,70	2,98	17,48%	1,3	4,26	5,56	32,6%
Italy	2,39	17,03	19,42	2,34	1,70	4,05	23,75%	2,39	4,26	6,65	39,0%
Latvia	1,01	17,03	18,04	0,99	1,70	2,69	15,81%	1,01	4,26	5,27	30,9%
Lithuania	5,48	17,03	22,51	5,37	1,70	7,07	41,53%	5,48	4,26	9,74	57,2%
Luxembourg	0,75	17,03	17,78	0,74	1,70	2,44	14,32%	0,75	4,26	5,01	29,4%
Malta	0,88	17,03	17,91	0,86	1,70	2,57	15,06%	0,88	4,26	5,14	30,2%
Netherlands	1,94	17,03	18,97	1,90	1,70	3,60	21,16%	1,94	4,26	6,20	36,4%
Poland	1,17	17,03	18,2	1,15	1,70	2,85	16,73%	1,17	4,26	5,43	31,9%
Portugal	4,18	17,03	21,21	4,10	1,70	5,80	34,05%	4,18	4,26	8,44	49,5%
Romania	2,22	17,03	19,25	2,18	1,70	3,88	22,78%	2,22	4,26	6,48	38,0%
Slovak Republic	1,55	17,03	18,58	1,52	1,70	3,22	18,92%	1,55	4,26	5,81	34,1%

Slovenia	1,38	17,03	18,41	1,35	1,70	3,06	17,94%	1,38	4,26	5,64	33,1%
Spain	3,1	17,03	20,13	3,04	1,70	4,74	27,84%	3,1	4,26	7,36	43,2%
Sweden	1,54	17,03	18,57	1,51	1,70	3,21	18,86%	1,54	4,26	5,80	34,0%
United Kingdom	1,57	17,03	18,6	1,54	1,70	3,24	19,03%	1,57	4,26	5,83	34,2%
EU overall	1,55	17,03	18,58	1,52	1,70	3,22	18.92%	1,55	4,26	5,81	34,1%

6 Conclusions

In this thesis we have tried to assess the potential impact of TTIP (a reduction in EU-US trade costs) on specifically EU value added exports to the US. Given the many studies conducted on the potential impacts of TTIP on the most common indicators like export, import, GDP, national income, wages and employment, we have deliberately chosen to study only the potential impact of TTIP on value added exports and not on these other indicators. By making use of a gravity analysis we have regressed EU value added exports to the US on trade costs for trading with the US. We found that the presence of trade costs (tariffs and NTMs) has a small negative impact on EU value added exports to the US. Based on this outcome and on the current assumptions about trade cost reductions within TTIP we have made an estimation about the potential change in EU value added exports to the US. In case of a less ambitious scenario, we estimate that EU value added exports to the US will increase between 1.43 and 4.53 percent (depending on the EU MS). In the case of an ambitious scenario this would be between 2.94 and 6.10 percent. One should however take these results with a pinch of salt for two reasons. First because we have taken the TCE of NTMs at EU level for one year and used this for all EU countries for all years. It is likely that the TCE of NTMs for certain countries was different in the first years of the time sample, as not all 28 Member States the EU currently constitutes of, were a member in the early years of our sample period. Consequently they might have had different (trade) agreements with the US and thus a different TCE of NTMs. Secondly the coefficients for “tariffs + TCEs of NTMs” were not significant.

The former issues brings us to a large potential for further research. It would be interesting to see if the TCEs of NTMs really differ for the EU MS and if they differ over the years, and if so, if this would change the current findings. Of course this thesis was focussed on EU flows to the US only, and for the whole economy. However one could do the same analysis at sector level and/or for multiple trading partners of the EU (or other countries). Although in the case of the latter, one would most likely look more at the overall impact of trade cost on value added exports, whereas this thesis focussed explicitly on EU value added flows to the US and EU-US trade costs. While it is not (directly) related to trade

costs, one could also make use of the WIOD instead of the TiVA database to calculate value added flows themselves in order to analyse the exact journey of value added, and the importance of different countries per sector. But the WIOD is also particularly useful for studying sector linkages. For example one can rather easily analyse which sectors are dominant suppliers to or buyers from a certain industry, either at a global level or per country specific. One could thus also see whether certain goods are provided from all over the world or whether it is mainly provided by one or two countries who have a comparative advantage over this particular good.

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Annex 1 – Additional tables

Table A.1 EU sector exports to the US

	EU sectors	Exports (US$ million)
1	Renting of M&Eq and Other Business Activities	97,986
2	Chemicals and Chemical Products	80,808
3	Transport Equipment	53,892
4	Machinery, Nec	47,166
5	Electrical and Optical Equipment	45,634
6	Financial Intermediation	36,371
7	Coke, Refined Petroleum and Nuclear Fuel	31,129
8	Basic Metals and Fabricated Metal	24,972
9	Food, Beverages and Tobacco	15,522
10	Pulp, Paper, Paper , Printing and Publishing	12,277
11	Manufacturing, Nec; Recycling	9,546
12	Air Transport	8,117
13	Rubber and Plastics	5,130
14	Textiles and Textile Products	4,717
15	Other Non-Metallic Mineral	4,540
16	Mining and Quarrying	4,479
17	Leather, Leather and Footwear	3,786
18	Agriculture, Hunting, Forestry and Fishing	3,128
19	Other Community, Social and Personal Services	3,054
20	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	3,047
21	Electricity, Gas and Water Supply	1,868
22	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods	1,354
23	Construction	1,133
24	Public Admin and Defence; Compulsory Social Security	1,130
25	Wood and Products of Wood and Cork	1,081
26	Education	850
27	Health and Social Work	398
28	Post and Telecommunications	373
29	Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel	303
30	Inland Transport	268
31	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	259

	EU sectors	Exports (US$ million)
32	Real Estate Activities	119
33	Water Transport	112
34	Hotels and Restaurants	110
35	Private Households with Employed Persons	0

Table A.2 US sector exports to the EU

	US sectors	Exports (US$ million)
1	Renting of M&Eq and Other Business Activities	92,467
2	Financial Intermediation	70,568
3	Transport Equipment	39,680
4	Chemicals and Chemical Products	38,507
5	Electrical and Optical Equipment	38,129
6	Coke, Refined Petroleum and Nuclear Fuel	23,347
7	Machinery, Nec	21,608
8	Inland Transport	20,768
9	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	17,653
10	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	16,641
11	Air Transport	15,229
12	Post and Telecommunications	13,046
13	Other Community, Social and Personal Services	11,351
14	Pulp, Paper, Paper , Printing and Publishing	10,157
15	Basic Metals and Fabricated Metal	9,600
16	Mining and Quarrying	8,748
17	Manufacturing, Nec; Recycling	5,718
18	Agriculture, Hunting, Forestry and Fishing	5,417
19	Food, Beverages and Tobacco	4,928
20	Rubber and Plastics	3,506
21	Public Admin and Defence; Compulsory Social Security	3,028
22	Textiles and Textile Products	2,229
23	Other Non-Metallic Mineral	1,857
24	Water Transport	1,204
25	Real Estate Activities	931
26	Wood and Products of Wood and Cork	756
27	Electricity, Gas and Water Supply	436
28	Health and Social Work	240
29	Leather, Leather and Footwear	149
30	Education	118
31	Construction	89

	US sectors	Exports (US$ million)
32	Hotels and Restaurants	50
33	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods	0
34	Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel	0
35	Private Households with Employed Persons	0

Table A.3 Industry categorisation of Figure 3.2

Industry group	HS-2 codes
Agri-forestry-fishing	1/15
Chemicals	28/40
Electrical machinery and equipment	85
Machinery	84,90/92
Manufacturing	41/43, 50/67, 93/96
Metals	71/83
Minerals	25/27
Other	44/49, 68/70, 97
Processed foods	16/24
Transport	86/89

Table A.4 Available countries in TiVA

EU Member States	Other
Austria	Argentina
Belgium	Australia
Bulgaria	Brazil
Croatia	Brunei Darussalam
Cyprus	Cambodia
Czech Republic	Canada
Germany	Chile
Denmark	China
Spain	Chinese Taipei
Estonia	Colombia
Finland	Costa Rica
France	Hong Kong
Great-Britain	Indonesia
Greece	India
Hungary	Iceland
Ireland	Israel
Italy	Japan

Lithuania	Korea
Luxembourg	Mexico
Latvia	Malaysia
Malta	Norway
Netherlands	New Zealand
Poland	Philippines
Portugal	Russia
Romania	Saudi Arabia
Slovakia	Singapore
Slovenia	Switzerland
Sweden	Thailand
	Tunisia
	Turkey
	United States
	Vietnam
	South Africa
	Rest of the World

Annex 2 – The WIOD

As explained above, the WIOD would be a good database to use when tracing back all the intermediates used in a production process and thus the value added exported from one country to another, either direct or indirect via many third countries. The WIOD is constructed of national supply and use tables (SUTs). A supply and use table shows data on the products produced by each domestic industry (supply) and how the product is used by the next industry or final user (use) (Timmer et al., 2012). The countries and sectors available in WIOD are presented in the two tables below.

Table A.5 Available countries in WIOD

EU Member States	Other
Austria	Australia
Belgium	Brazil
Bulgaria	Canada
Cyprus	China
Czech Republic	Indonesia
Germany	India
Denmark	Japan
Spain	Republic of Korea
Estonia	Mexico
Finland	Russian Federation
France	Turkey
Great-Britain	Taiwan
Greece	USA
Hungary	Rest of the world
Ireland	
Italy	
Lithuania	
Luxembourg	
Latvia	
Malta	
Netherlands	
Poland	
Portugal	
Romania	
Slovakia	

Slovenia	
Sweden	

Source: Timmer et al (2015)

Table A.6 Available sectors in WIOD

Manufacturing	Services
Agriculture, Hunting, Forestry and Fishing	Electricity, Gas and Water Supply
Mining and Quarrying	Construction
Food, Beverages and Tobacco	Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel
Textiles and Textile Products	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles
Leather, Leather and Footwear	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods
Wood and Products of Wood and Cork	Hotels and Restaurants
Pulp, Paper, Paper , Printing and Publishing	Inland Transport
Coke, Refined Petroleum and Nuclear Fuel	Water Transport
Chemicals and Chemical Products	Air Transport
Rubber and Plastics	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies
Other Non-Metallic Mineral	Post and Telecommunications
Basic Metals and Fabricated Metal	Financial Intermediation
Machinery, Nec	Real Estate Activities
Electrical and Optical Equipment	Renting of M&Eq and Other Business Activities
Transport Equipment	Public Admin and Defence; Compulsory Social Security
Manufacturing, Nec; Recycling	Education
	Health and Social Work
	Other Community, Social and Personal Services
	Private Households with Employed Persons

Source: Timmer et al (2015)

The table below provides a simplified overview of a WIOT (World Input Output Table) as available on WIOD. In this example the world consist of 3 countries (A, B, RoW) and 2 industries (1 and 2). The columns indicate the use of different intermediate products by a certain industry and country, while the rows indicated the supply of each industry's product. Columns 3 till 8 indicate the production of sector specific products by each industry. They show all the intermediate products

that have been used (and where they are sourced from) in order to make the sector specific products. Once the value added (i.e. compensation for labour and capital used) has been added to the value of the intermediate goods used we have the amount of total output created by country X in sector Y. Each industry uses intermediate products from both the domestic market and from abroad (imports). When looking at the rows, one can see that each industry supplies its product as an intermediate good to the different industries either at home or abroad (exports), and also supplies part of its production as a final good[28] either on the domestic market or on foreign markets. The two add up to total output (column 12), and should always be equal the total output as registered at the bottom of the table in row 10 (Timmer et al., 2012).

[28] A final good can either be private or government consumption or investment (Timmer et al., 2012)

Table A7 Schematic overview of a World Input Output Table.

		Country A	**Country A**	**Country B**	**Country B**	**Rest of the World**	**Rest of the World**	**Country A**	**Country B**	**Rest of the World**	**Total**
		Industry 1	*Industry 2*	*Industry 1*	*Industry 2*	*Industry 1*	*Industry 2*	*Final domestic*	*Final domestic*	*Final domestic*	
Country A	*Industry 1*	Intermediate use by A1 of A1	Intermediate use by A2 of A1	Intermediate use by B1 of A1	Intermediate use by B2 of A1	Intermediate use by Row1 of A1	Intermediate use by Row2 of A1	Final use of domestic output of industry 1	Final use by B of industry 1 exports from A	Final use by RoW of industry 1 exports from A	Total ouput of industry 1 in country A
Country A	*Industry 2*	Intermediate use by A1 of A2	Intermediate use by A2 of A2	Intermediate use by B1 of A2	Intermediate use by B2 of A2	Intermediate use by Row1 of A2	Intermediate use by Row2 of A2	Final use of domestic output of industry 2	Final use by B of industry 2 exports from A	Final use by RoW of industry 2 exports from A	Total ouput of industry 2 in country A
Country B	*Industry 1*	Intermediate use by A1 of B1	Intermediate use by A2 of B1	Intermediate use by B1 of B1	Intermediate use by B2 of B1	Intermediate use by Row1 of B1	Intermediate use by Row2 of B1	Final use by A of industry 1 exports from B	Final use of domestic output of industry 1	Final use by RoW of industry 1 exports from B	Total ouput of industry 1 in country B
Country B	*Industry 2*	Intermediate use by A1 of B2	Intermediate use by A2 of B2	Intermediate use by B1 of B2	Intermediate use by B2 of B2	Intermediate use by Row1 of B2	Intermediate use by Row2 of B2	Final use by A of industry 2 exports from B	Final use of domestic output of industry 2	Final use by RoW of industry 2 exports from B	Total ouput of industry 2 in country B
Rest of the World	*Industry 1*	Intermediate use by A1 of RoW 1	Intermediate use by A2 of RoW 1	Intermediate use by B1 of RoW 1	Intermediate use by B2 of RoW 1	Intermediate use by Row1 of RoW 1	Intermediate use by Row2 of RoW 1	Final use by A of industry 1 exports from RoW	Final use by B of industry 1 exports from RoW	Final use of domestic output of industry 1	Total ouput of industry 1 in country RoW
Rest of the World	*Industry 2*	Intermediate use by A1 of RoW 2	Intermediate use by A2 of RoW 2	Intermediate use by B1 of RoW 2	Intermediate use by B2 of RoW 2	Intermediate use by Row1 of RoW 2	Intermediate use by Row2 of RoW 2	Final use by A of industry 2 exports from RoW	Final use by B of industry 2 exports from RoW	Final use of domestic output of industry 2	Total ouput of industry 2 in country RoW
		Value added	**Value added**	**Value added**	**Value added**	**Value added**	**Value added**				
		Total output country A industry 1	**Total output country A industry 2**	**Total output country B industry 1**	**Total output country B industry 2**	**Total output RoW industry 1**	**Total output RoW industry 2**				

Source: Timmer et al., 2011