The Trade Network of Textiles and Clothing Past the ATC

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The Trade Network of Textiles and Clothing Past the ATC

by

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Abstract: Despite increased globalization since the 1980s in many sectors remained the textile and clothing trade regulated through country-specific import quotas. In 2005, they were terminated by the Agreement on Textiles and Clothing (ATC). Subsequently it was expected that mostly China would gain in worldwide exports while preferentially treated countries and countries facing fewer restrictions would notice decreases in exports. These included developing countries, Southern Asia, as well as Turkey, Mexico, or Central and Eastern Europe. At the same time a higher concentration of exports on key countries and a decline in transshipping were foreseen. This study analyzes the medium-term changes by comparing the period before the ATC´s ending (1994 to 2004) to the subsequent period (2005 to 2011). As a novelty, it uses network analysis and value-added trade data.

Key Words: Agreement on Textiles and Clothing, Trade in Value-Added, Network Analysis

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1 Introduction

Since the mid-1980s the worldwide economy has witnessed increasing globalization characterized by fast growing migration, transnational investment flows, and international trade. The rising trade was accompanied by reductions in tariffs and other trade barriers leading to changing production and consumption patterns. Especially the accession of China into the world´s economy was noteworthy since the country became an important supplier of consumption goods (Schenk, 2011).

However, trade liberalization did not occur in all sectors equally. Especially the textile and clothing sector remained heavily regulated since countries retained the right to use country-specific import quotas. Western countries used this right to restrict imports from mainly Asia while developing countries and economies like Mexico, Turkey as well as Eastern and Central Europe were not affected.

The Agreement on Textiles and Clothing (ATC) terminated this practice in 2005. Thus, predictions regarding the likely consequences in the trade network were made. Especially China as a major restricted producer was expected to gain. Preferentially treated countries were expected to notice decreasing exports though geographical closeness to Western markets could countervail these processes. Overall, a concentration of exports on key supplying countries and a decline in transshipments was predicted.

Few studies exist on the actual consequences after 2005. Furthermore, these studies are usually restricted to the immediate time after 2005 and do not distinguish between the years before and after the ATC´s end. Also, they do not analyze the development of the concentration and transshipments in this trade.

Moreover, they use presumably misleading gross trade data, which is subject to double-counting. The problem of gross trade data is illustrated by the growth in trade of intermediate goods since the 1980s. It led to a fragmentation of production processes and sophisticated worldwide production chains. In these chains industries produce inputs, which are used elsewhere as further inputs. This created a statistical problem since the traditional gross trade flows do not correct for the trade in intermediate inputs. Today, researchers are developing value-added trade measures correcting for this effect. Thus, value-added trade data deliver a more accurate picture of worldwide trade (Johnson, 2014).

1.1 Objective of the Study

The objective of this study is to determine and analyze the actual changes in the trading network of textiles and clothing after the ATC´s expiry in 2005. The approach is to derive predictions regarding the likely developments, which are consequentially tested using network analysis. For this analysis, value-added trade data are used. They are currently available in the TiVA database for the years 1995 to 2011.

The guiding research question of this study therefore is: How did the trade network of textiles and clothing change after the ATC´s ending in 2005? The scope of this research question enables the study

I To describe the trade network before and after 2005

II Analyze how it changed and

III Determine whether these changes correspond to the predictions or not.

1.2 Outline of the Thesis

The analysis consists of six steps. First, the basics of classical free trade theory are presented. These arguments form the theoretical backbone and serve to better understand the regulations imposed in the textile and clothing trade. These are outlined in the second step. Third, predictions regarding the trade network after 2005 are derived from two former chapters. Fourth, it is motivated why trade data on value-added instead of gross trade flows should be used. The fifth part introduces network analysis, which is applied in the sixth part. Overall, the study finds support for most hypotheses though the year 2005 appears not to be a trend break to the extent as previously thought.

1.3 The Contribution of this Study

The contribution of this study is threefold.

First, the study fills a literature gap by providing a comprehensive evaluation of the actual changes in the textile and clothing trade after 2005. It does so by analyzing the period between 1995 and 2011 going beyond considering the immediate years after the ATC´s ending as competing studies did.

Second, to the best of the author´s knowledge it is the first study considering value-added instead of gross trade flows in the textiles and clothing trade. Thereby this study gives a more accurate picture of trading patterns in this sector and adds to the growing literature on value-added trade.

Third, the study applies network analysis as a novel methodology to the analysis of trade flows. By applying network analysis to international trade flows this study thus paves the way for other researchers to use this promising method.

1.4 Technical Note

To deliver a printer-friendly result most figures are in black and white. However, graphing networks in black and white is next to impossible. Thus, they are printed in color.

2 Free Trade and Import Quotas in Theory

This chapter presents basic trade theory to better understand the history of trading textiles and clothing as subsequently outlined.

2.1 Motivating Free Trade

Classical economists usually favor free trade. After all, David Ricardo argued that trade yields welfare gains for all participating countries if they specialize in the production of goods in which they have a comparative cost advantage. Ricardo´s argument rests on the concept of opportunity costs, which measure the potential monetary gain a country could have received by producing one good if it had not specialized in the production of another. Consequentially, each country has a comparative cost advantage in the production of the good for which its opportunity costs are lower than the ones of the other country. Free trade is beneficial since each good is consumed at the lowest price (van Marrewijk, 2012).

Eli Heckscher and Bertil Ohlin showed that these gains from free trade are not equally distributed within countries. In the Heckscher-Ohlin model production inputs are labor and capital, which are available to countries in different amounts. They argued that countries have a comparative advantage in the production of goods making use of the relatively abundant factor of production (van Marrewijk, 2012). Thus, if China is relatively labor-abundant and the production of e.g. clothing uses relatively much labor, then China´s comparative advantage lies here.

The crux of the Heckscher-Ohlin model is that it can be used to explain why certain groups in one country are in favor of free trade while others oppose it (van Marrewijk, 2012). For example, the Chinese clothing sector is likely to be in favor of free trade given its comparative advantage. However, capital-intensive Chinese sectors will favor protectionism since they are facing competition from capital-abundant and thus more competitive foreign producers.

2.2 Implications of Abolishing Trade Restrictions

Despite possible welfare gains trade restrictions remain a part of the international economy (the following explanations are based on van Marrewijk, 2012 and Krugman & Obstfeld, 2009). Two common measures are the imposition of import quotas and tariffs. A tariff is a tax imposed by a government on the country´s imports or exports. An import quota is a quantitative limit on the imports of a certain good. Governments set these quotas by selling import

licenses. Though these two measures vary in practice they have the same welfare effects when imposed and abolished. Figure 1 depicts this situation. If implemented both measures result in a higher domestic price since consumers face the world market price plus the markup due to the tariff or import quota. Consequentially both measures serve to protect domestic producers since they can demand the same high price but get to keep the markup.

Conversely, when abolishing import quotas or tariffs this markup ceases to exist. Therefore, consumers enjoy the good at the lower world market price. This increases their surplus making them demand more. However, domestic producers will provide less of the good since the price fall reduces their surplus. The total amount of imports will thus rise. Given the fall in revenue from tariffs or import licenses the state government will notice a decrease in revenues. Overall, domestic consumers gain while the government and domestic producers lose from increasing free trade. The total welfare effect is always positive for a small country not able to influence the world market price. If the demand is large enough to influence the world market price the total welfare effect is potentially negative. The reason it that the increased demand can increase the world market price prompting even higher losses for import license holders and the government.

In practice, the imposition of import quotas and tariffs is subtler (the following explanations are based on Baldwin & Wyplosz, 2015). Often governments impose trade barriers only against selected countries giving other countries an advantage. The effects of this situation are analyzed in figure 2 using three steps. First, country 1 does not impose an import quota against countries 2 or 3. Thus, the import supply curve of country 1 consists of the two export supply curves added together. Second, imposing the quota on both countries shifts the import supply curve upwards due to the higher price.

Third, country 1 imposes an import quota on country 3 but not on country 2. When this preferential treatment is in place the import supply curve of country 1 consist solely of the imports supplied by country 2 until the quota´s costs are met for country 3. From there both countries supply. Thus, the import supply curve of country 1 takes the curved form. Thereby country 2 supplies relatively more of the good in question compared to a situation where free trade between all countries takes place (C > A for country 2). Conversely, country 3 supplies less compared to the situations when quotas are imposed on both countries and under free trade (C < B < A for country 3). Thereby trade diversion and creation take place. The preferential treatment diverts trade away from country 3 compared to the free trade situation and creates trade between countries 1 and 2, which would otherwise not exist.

When country 1 redraws the preferential treatment of its partner country by abolishing the trade restrictions faced by country 3 its imports will change in quantity and origin. First, the imports from country 3 to 1 will rise. This rise is higher than the decrease in imports from country 2. In total, these changes in the source of imports will cause a rise in the supply of the respective good a lower price (a > c and Price A < Price C2 for country 1). Depending on the size of the price drop this liberalization has the welfare implications sketched above.

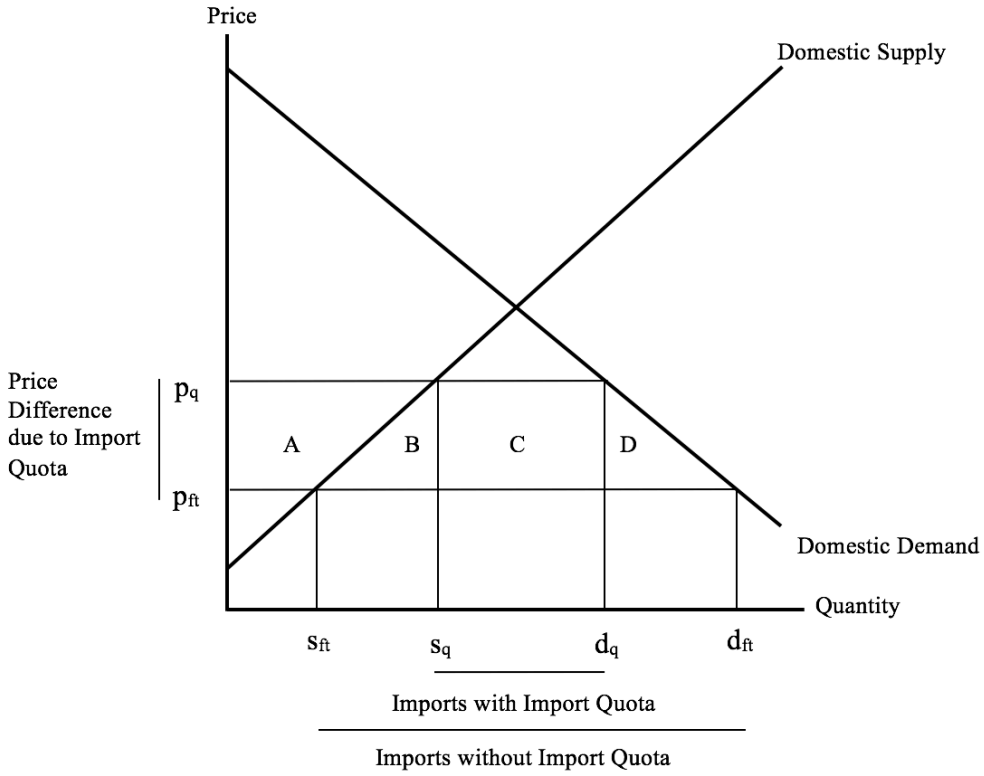
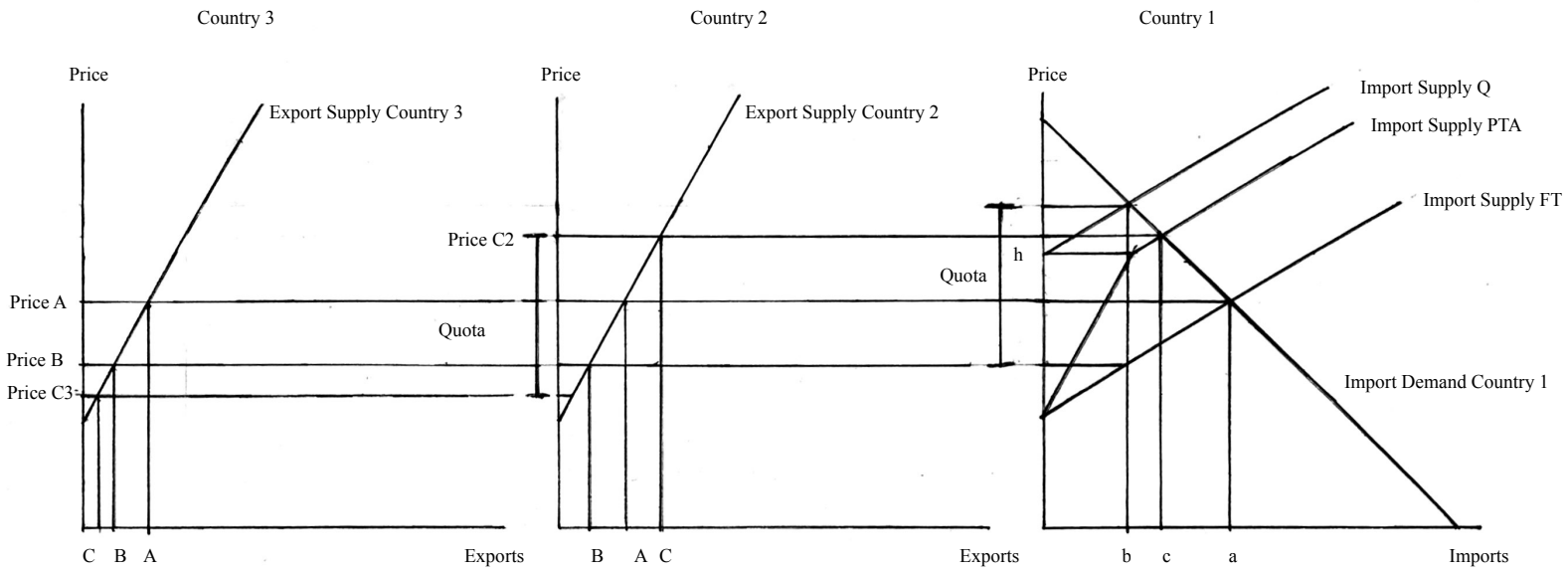


Figure 1: The welfare effects of abolishing import quotas in a small country. The consumer surplus is denoted by the area under the domestic demand curve. The producer surplus is denoted by the area above the domestic supply curve. The revenue of the state due to selling the import quotas is denoted by area C. Thus, when abolishing the import quota the consumer surplus rises by +(A + B + C + D) while the producer surplus decreases by A. The state loses the income from the quotas C. The total welfare effect is thus always positive by +(B + D) (own representation, based on van Marrewijk, 2012)



A: Export supply under free trade (a for import demand in Country 1)
B: Export supply under import quota by Country 1 on Countries 2 and 3 (b for import demand in Country 1)
C: Export supply under PTA (c for import demand in Country 1
PTA: Preferential trade agreement, Country 1 imposes import quota on Country 3 but not Country 2
Q: Country 1 imposes import quota on Countries 2 and 3
FT: Free Trade, no import quotas imposed
P: Price received by each country in situations A, B, or C; if no number is included Countries 1 and 2 receive the same price
h: Price under PTA at which the cost of the quota is covered for country 3 and it starts exporting to country 2

Figure 2: Modelling preferential trade agreements (own representation, based on Baldwin & Wyplosz, 2015)

3 Trade Restrictions until 1995

This chapter illustrates how these import quotas and preferential trade agreements disturbed the textile and clothing trade until 2005.

3.1 Textiles and Clothing: A Sector outside the GATT

After the Second World War Western countries were aware of potential welfare gains due to free trade (World Trade Organization 3, n.d.). However, increasing free trade was a contested issue. First, domestic producers favored protectionism since it increased their producer surplus as outlined. Second, workers in uncompetitive industries were equally not in favor of free trade. Furthermore, developing countries deemed protection for their development necessary. Nevertheless, Western countries adopted a set of rules aiming to increase and govern worldwide trade. These rules were comprised in the General Agreement on Tariffs and Trade (GATT) running from 1947 to 1995 (Schenk, 2011; World Trade Organization 2 & 4, n.d.).

Alongside tariff-reductions the GATT´s central element was the imposition of the most-favored nation clause. It required each member state to treat all imports from other members the same. Thus, if a member state wanted to reduce tariffs or abolish quotas of another member, all other members had to be given the same reduction. This principle thereby forbade the imposition of preferential trade agreements as outlined above. However, regional free trade areas remained allowed and not all industries were included. Especially trade in agriculture, textiles, and clothing remained heavily regulated (World Trade Organization 1, 2 & 4, n.d.).

3.2 Trade Regimes until 1995: STA, LTA, and MFA

Despite increased free trade Western countries continued imposing trade restrictions in textiles and clothing to shelter from competition from developing countries. The textile and clothing industry was perceived as the ideal starter industry for developing countries because it operated at low fixed costs and employed the available abundant unskilled labor. Thus, according to the Heckscher-Ohlin theorem developing countries had a comparative advantage in this industry. For its production, simple technology sufficed making the creation of the industry relatively easy. It was therefore used by developing countries throughout Asia, Africa, and South America for an export-led industrialization. This industrialization started as later outlined in different years depending on the country since the 1950s. Thus, textiles were produced in many places and used as inputs for further clothing production (Gereffi & Frederick, 2010; Staritz, 2011).

Because developing countries became highly competitive in producing textiles and clothing the incentive to impose trade restrictions ranged high in developed countries. The textile and clothing producers in the USA pushed first for protective measures as predicted by the Heckscher-Ohlin theorem. The beginning was in 1955 when the country negotiated so-called voluntary export restraints on cotton imports from Japan (Naumann, 2006).

In 1961, the Short-Term Arrangement Regarding Trade in Cotton Textiles (STA) was ratified and replaced in 1962 by the Long-Term Arrangement Regarding International Trade in Cotton Textiles (LTA). 20 countries adopted the LTA, which initially ran for five years. It was renewed twice in 1967 and 1970. Under these regimes mainly the USA and European Countries imposed import quotas on cotton-based textiles from developing countries. Restricting clothing imports was also allowed if no sufficient voluntary restriction by the exporting country took place (Naumann, 2004 & 2006).

In 1974, the LTA was replaced by the Multifibre Arrangement (MFA), which expanded the coverage from cotton to other fibers reflecting changing production methods. The MFA was renewed several times until 1995. It again allowed member states to impose unilaterally import quotas to protect their domestic industries though targeted growth rates of the quotas were set. The import quotas were country and product specific resembling the STA and LTA. Especially European countries and the USA used them to restrict mostly China, Hong Kong, Japan, Korea, and Taiwan (Gereffi, 1999; Naumann, 2004 & 2006).

3.3 The Effects of the Trade Regimes

These trade regimes must be seen critically. First, since they allowed imposing import quotas on a country-specific basis they departed from the most-favored nation clause and thereby from the commitment to freer trade by Western countries. Second, they did not protect the Western textile and clothing industry from experiencing a downturn. For example, it has been estimated that Europe´s textile and clothing industry lost over one million jobs or alternatively 31 percent of the workforce between 1990 and 1998 in the last years of the MFA (Keenan, Satias & Kroener, 2004).

And third, instead of restricting the competitiveness of developing countries the agreements on the contrary boosted it. Since the large demand for textiles and clothing in Western countries could only be met through imports, the textile and clothing industry had to spread across many countries. Thus, when manufacturers in restricted countries reached their limit they subcontracted further orders to other countries. This increased the competition for Western countries further. The process has been labeled the “three shifts”. First, the textile and clothing industry shifted from Western markets to Japan in the early 1960s. From there it shifted to Hong Kong, Taiwan, and South Korea until the early 1980s. Eventually the industry moved to China and other South Asian countries until the early 1990s (Gereffi, 1999).

3.4 Constrained and Non-Constrained Countries

Outside of Asia the textile and clothing industry was set up in Central and South America as well as Sub-Saharan Africa. These developing countries offered equally cheap labor and could thus specialize their economies in a Heckscher-Ohlin framework. Often, they were exempt from all quotas or faced fewer restrictions on the Western markets to further their economic development. Thus, the offered a good business environment for firms seeking to export textiles and clothing to Western countries. Furthermore, the preferential treatment of facing no quotas in Western markets was also granted to countries taking part in regional free trade agreements. NAFTA gave Mexico preferential access to the northern American market. Similarly, imports from Central and Eastern European countries as well as Turkey were treated preferentially in the European Union by neither facing quotas nor tariffs. Often American and European firms used these countries for outward-processing activities. Thereby they first exported intermediate goods to the previously mentioned countries, which assembled these goods into final products and exported them back (Applebaum, 2005; Gereffi, 1999; Nordas, 2005; Smith, Pickles, Begg, Roukova & Buček, 2005; Staritz, 2011).

3.5 The Evolution of Transshipping

Due to the complexity of the MFA and its accompanying high administrative costs illegal trading schemes evolved as well. These consisted either of committing document fraud by declaring a false country of origin or transshipping (Din & Abbas, 2000). Especially transshipping was a problem. It is a forbidden solution to the problem that country 1 cannot export more goods to country 2 because it filled its quotas. The solution involves country 1 shipping its goods to country 3 not facing quotas in country 2. From there the goods are shipped to country 2. Measuring transshipment is a difficult undertaking. However, evidence suggests that e.g. Hong Kong was an important transshipping country for textiles and clothing produced in China or Taiwan (Fung, 1998; Gereffi, 1999).

4 The Agreement on Textiles and Clothing

Towards the 1990s the GATT ran into problems. Recessions created the incentive for governments to shelter foreign competition through subsidies. Furthermore, the GATT did not cover the increasing service sector (World Trade Organization 2, n.d.). Thus, member states gathered between 1986 and 1994 in the Uruguay Round. It aimed at creating a new international trading scheme, which would also cover the textile and clothing sector. It ended in 1995 with the creation of the World Trade Organization (WTO). The GATT remained its umbrella treaty governing trade in goods. 123 countries took part in the negotiations. Today, the WTO has 164 member countries including all major economies (World Trade Organization 5, 6 & 7, n.d.).

4.1 The Aim of the ATC

To liberalize the textile and clothing trade GATT member states signed the Agreement on Textiles and Clothing (ATC) running from January 1, 1995 to January 1, 2005. Its aim was to integrate the sector into normal GATT rules by forbidding the imposition of import quotas after 2005. This essentially meant the introduction of the most-favored nation clause in this sector. However, normal GATT rules still allow the imposition of non-discriminatory tariffs and regional free trade agreements (World Trade Organization 1 & 8, n.d.).

The ATC´s implementation covered four steps. First, countries had to abolish import quotas between 1995 and 1997 on products amounting for not less than 16 percent of their textile and clothing import volume in 1990. Consequentially, these imports had to be managed according to normal GATT rules. The next step on December 31, 2001 required the integration of at least 17 percent. Until December 31, 2004 the level was set to at least 18 percent. All remaining import quotas (49 percent) had to be lifted on January 1, 2005 when the ATC ended. Countries were free to choose which goods they wanted to integrate at each step. However, it was required that each step contained the integration of goods from four previously defined categories: tops and yarns, fabrics, made-up textile products, and clothing. Pre-existing and not yet abolished quotas from the MFA were increased at each step. Other quantitative restrictions not allowed under GATT rules had to be eliminated (World Trade Organization 9, n.d.).

Furthermore, the ATC included several clauses to prevent transshipments, re-routing, false declaration of origin, and falsification of documents. Second, it entailed safeguard measures to protect countries from sudden import surges in goods not yet liberalized. For this a country had to proof that imports from a specific country were causing harm to its domestic industries. Consequentially, consultations had to take place before any safeguard measures could be im-

posed. These measures were allowed for three years and applied 24 times in total (World Trade Organization 9, n.d.).

4.2 The ATC in Practice

The following issues stood out in the ATC´s implementation. First, only the USA, the European Union, Norway, and Canada chose to retain their import quotas from the MFA after 1995. All other countries integrated their textile and clothing imports into normal GATT rules before the start of the ATC (GATT 9, n.d.).

Second, the ATC was only slowly implemented. The reason was its flexibility letting countries decide which goods should be integrated at each stage. Thus, Western countries chose to integrate textile and clothing products insensitive to their own industries first. Often these were goods on which no quotas had been imposed but which still fell under the ATC. Also, goods where quotas had not been filled were integrated first. Moreover, since the integration was based on volumes and not value the integration of the most-valuable goods was pushed towards 2005. Thus, before 2005 mainly goods with low value were integrated (Naumann, 2006).

A report from 2001 indicates how many quotas were retained until 2005. It states that the USA carried 758 quota restrictions from the MFA over into the ATC in 1995. Canada had 295 restrictions in 1995, the European Union 218 restrictions, and Norway 54. Of these quotas, the USA had to terminate 701, Canada 239, and the European Union 167 restrictions in 2004 during the fourth and last phase. Thus, the USA postponed the termination of 92, Canada 81, and the European Union 77 percent of its quotas to the last step. Only Norway managed to terminate its import quotas before the fourth stage occurred (World Trade Organization, 2001).

The original goal of continuously liberalizing the textile and clothing trade remained therefore theoretical. The USA and European Union as major buyers of clothing and textiles continued restricting until 2005 mainly Asian countries. Previous research found that mainly China, India, Hong Kong, and Taiwan remained most restricted. Other developing southern Asian countries like Thailand, Indonesia, and the Philippines also faced quotas but to a much lower extent. Exempt from quotas and thus preferentially treated were developing and least-developed countries in Africa as well as Central and South America. Also, developing countries in Asia like Bangladesh, Cambodia, and Sri Lanka enjoyed preferential treatment in the European Union and to some extent also in the USA. As outlined, countries with regional trade agreements like Mexico for the USA as well as Central and Eastern Europe and Turkey for the European Union did not fall under the quota regimes (Applebaum, 2005; Ernst, Ferrer & Zult, 2005; Nordas, 2004; Staritz, 2011).

5 The Developments after the ATC

5.1 Predicted Changes in Trading Patterns

Since most import quotas remained to be abolished in 2005 researchers tried to predict the likely consequences. These predictions can be derived from the preferential trade model and historical background as sketched above. The importing countries were in this scenario the USA and Europe. They restricted big exporting countries such as China while other countries like Mexico, Turkey as well as Central and Eastern Europe enjoyed preferential treatment. Thus, trade was diverted trade away from restricted to countries with preferential access. This process should reverse after 2005 according to the model.

Thus, upon ending this preferential treatment the total amount of imports into Western markets should increase while the price falls. The previously restricted countries will export more and increase their worldwide share. Conversely, the preferentially treated countries will notice decreases in their exports. This section reviews studies regarding the future of the textiles and clothing trade. Their predictions can be traced back to these theoretical considerations.

Ernst, Ferrer and Zult (2005) used a gravity model based on trade flows between 1999 and 2004 to predict the locational change in the textile and clothing supply after 2005. They calculated that the countries most restricted (China including Hong Kong and Taiwan, India) would be the biggest winners, which corresponds to the theoretical considerations from above. Especially China was expected to gain the most. Countries with preferential treatment in some sectors and overall lower quota restrictions such as Indonesia, the Philippines, Thailand, Cambodia, Bangladesh, and Vietnam were predicted notice conversely much smaller increases or even losses in exports after the ATC´s ending. Countries such as Mexico, Central America, as well as Central- and Eastern Europe, Turkey, and North Africa were predicted to notice large decreases given their lower competitiveness and loss of preferential access to the Western markets. Least developed countries also having preferential access (most notably Sub-Saharan Africa) were predicted to be worst-off.

Hildegunn Nordas (2004) obtained a similar result. Her analysis used the GTAP general-equilibrium model regarding markets of the European Union and USA. China was predicted again to notice the largest increase. Hong Kong however would notice a decrease in exports. For India, a rise in exports was predicted. Economies enjoying preferential treatment in the core markets of the USA and European Union were similarly expected to notice decreases in their worldwide exports. These would include Turkey, Central and Eastern Europe, Mexico, Central America as well as developing countries in North and Sub-Saharan Africa. The exact numerical changes are stated in appendix A.

One point of critique to these studies is that they rely only on relative prices when modelling the prospective trade flows after 2005. Especially geographical distance between the supplying and consuming countries plays no role. As Nordas (2004) pointed out being close to core markets is especially important in the textile and clothing trade. Being close to core-markets gives countries a time advantage, which became increasingly important. Thus, Nordas (2004) speculated that countries close to the core-markets of the European Union and USA would be affected to a lesser extent than stated. These would mainly be Central and Eastern Europe, Turkey, and Mexico. Least-developed countries located far away from these core-markets and losing their preferential treatment would on this account be worst-off.

For the European Union, Buelens (2005) corroborated these hypotheses. He also predicted that mainly China and India would notice the largest increases in exports after 2005. Other Asian countries would lose to them. The same was predicted for Central and Eastern European countries though their close distance to the European Union might countervail this effect. Evans and Harrigan (2003) provided an analysis for the US market with similar results. They suggested that for apparel goods where time matters most imports from Mexico and the Caribbean historically grew faster than those from China and Asia. Thus, being closer to core-markets was predicted to be an asset in the post-ATC world.

Due to these processes fewer countries were expected to export most of the textile and clothing goods after 2005 thereby increasing the concentration of this trade. As shown above, the quotas caused a dispersion of the textile and clothing industry across many economies. Due to the abolishment of quotas a reversal of this process was predicted since without quotas the most efficient countries could export textiles and clothing (Hayashi, 2005; Naumann, 2004). The decline in transshipping could add to this process, which was after all a goal of the ATC as outlined above.

In summary, four hypotheses regarding the textile and clothing exports to Western markets after 2005 hold:

I Previously restricted countries will notice a rise in exports. Researchers agreed that this would most-importantly be China.

II Countries with previous preferential treatment or lesser restrictions will notice a decrease in their exports. Among them are developing countries in Southern Asia as well as least-developed countries in Sub-Saharan Africa and South America. The same result holds for countries close to core-markets such as Central and Eastern Europe, Turkey, and Mexico.

III However, being close to core-markets could also be an advantage possibly counteracting the negative impact from the loss of preferential access due to the quota removal.

IV The textile and clothing exports will be concentrated on fewer countries and the practice of transshipping will decrease.

5.2 The Developments after 2005

Only few studies exist on the actual consequences after 2005. Moreover, the available studies are often restricted to few years after the quota removal. Two such analyses are provided by Curran (2006 & 2009). She finds largely support for the hypotheses in the two years following the quota removal. Her analysis indicates that Chinese and Indian exports gained the most (Curran, 2006) while countries close to core-markets noticed decreases in their exports (Curran, 2009).

Gereffi´s and Frederick (2010) studied the changes only in the clothing trade. They determined that the European Union, the USA and Japan continued to be the core destination markets for clothing products by accounting for 76 percent of the worldwide imports in 2008. They concluded that China was the biggest winner from the quota removal since its worldwide share increased from 15 to 33 percent between 1995 and 2008. Counterintuitive was the rise in exports from Vietnam and Bangladesh despite previous preferential access. Especially Bangladesh became an important clothing supplier given that it continued offering low wages. Regional suppliers in Central America, Central and Eastern Europe as well as North Africa noticed decreasing exports as expected (Gereffi & Frederick, 2010).

The stark rise of Chinese exports in 2005 caused fears of a Chinese import flood on the Western markets. Curran (2006) argues that these were one-time adjustments and the fears overstated. However, they resulted in prolonged quotas on a set of Chinese products. This was not illegal since the possibility of prolonging Chinese quotas was part of China´s WTO accession protocol from 2002. These new restrictions ran until December 31, 2007 for the European Union and December 31, 2008 for the USA. After that the international trade in textile and clothing was free from the imposition of import quotas and only subject to normal GATT rules (Shen, 2008; European Commission, 2005).

The fact that only few and temporally limited studies on the actual consequences in the textile and clothing trade are available is unsatisfactory for several reasons. First, the previously mentioned studies only analyze few years after the ATC´s ending and do not explicitly distinguish between trade patterns before and after 2005. Also, each destination market of textile and clothing goods is analyzed separately. A study capturing all trade flows in an integrated manner for more years after 2005 would thus yield a clearer picture of the actual changes after 2005.

Furthermore, the previous studies concern mostly trade in clothing but not textiles. This is somewhat understandable since clothing tended to be restricted by more quotas and was therefore a harder-fought issue (Francois, Glisman & Spinager, 2000). Also, clothing accounts for most of the trade in this sector (Courran, 2009). However, textiles still play a role in the world´s economy and therefore need to be included in the analyses.

As outlined in the introduction, the contribution of this paper is to provide an analysis of the actual changes in the trade of textiles and clothing after 2005. It does so by analyzing data until 2011 and considers the year 2005 as a point of comparison. Furthermore, it includes both

trade data on textiles and clothing. The study proceeds by testing the derived hypotheses using network analysis. As a novelty, it uses value-added trade data for these tests.

6 Data

This chapter first motivates why value-added instead of gross trade data should be used in this study. Second, it reviews the methodology behind calculating value-added trade data. It then critically presents the Trade in Value-Added (TiVA) database, which is used in this analysis.

6.1 Motivating the Usage of Value-Added Trade Data

The previously mentioned studies regarding the development after the ATC´s ending employ gross trade data, which capture the import value of goods as recorded by customs. The usage of gross trade flows is in principle not a problem. Most studies rely on gross trade flows since they are relatively easy to measure (Johnson, 2014). However, their major problem is the relationship between what they measure and how we want to interpret their values. For example, when one states that China increased its exports by 10 percent this means that customs around the world measured in total a 10 percent growth of Chinese imports. From this claim one likely assumes that these increased imports were entirely produced in China. This was for example the reasoning behind the extended quotas for China after 2005 since a sudden rise in Chinese imports caused fears of unfair competition in the USA and Europe. Thus, these countries extended quotas on certain goods to restrict Chinese competitiveness.

However, gross export flows do necessarily measure how much of the exports was also produced in the exporting country. Sinn (2006) points this fact out for Germany. Even though Germany is a worldwide leader in e.g. exporting cars, not all value creation takes similarly place in Germany. Many parts are sourced from other economies and only assembled in Germany. As such, he claims that the German economy resembles a bazaar and its often-critiqued trade surplus needs to be revisited.

Economists acknowledge the fact that gross trade data do not measure how much a country adds in value and therefore fail to deliver an accurate picture of worldwide trade flows. This is where value-added trade data comes to help. They measure how much value of exports was also produced in each country. Thus, they correct for the double-counting present in gross trade data (Johnson, 2014).

Value-added trade data are therefore likely to revise the standard view of global trade flows. For example, it is reported that the value-added rages often only between 50 and 90 percent of the gross trade flow value. Problematic is that these differences are not homogenous across countries making it impossible to simply adjust gross trade flows by a certain factor. Furthermore, trade in manufacturing is generally overstated by gross measures because many foreign inputs are used in the production while trade in services is understated (Johnson, 2014; Johnson & Noguera, 2012).

Textiles and clothing are part of the manufacturing sector. Thus, they are vulnerable to presumably misleading analyses based on the usage of gross trade data. As mentioned played outward processing an important role in the textile and clothing production, which further influences trade statistics. Thus, by only analyzing gross trade flows as previously done one potentially overstates the contribution of countries having the final position in the production chain. Conversely, one understates the contribution and importance of countries in the beginning of the production chain. The analysis of the trade flows in textiles and clothing after the ATC´s ending should therefore be conducted using value-added trade data instead of gross trade flows.

6.2 The Method of Calculating Value-Added Trade Data

As explained above suffer gross trade flows from the issue of double counting. In the mentioned example by Sinn (2006) not the total value of the car should count as a German export as it is the case when using gross trade measures. Instead, only the value-added in Germany should be measured. For one good the value-added is obtained by following the production chain backwards to its origin. Thereby one can determine where each input was produced. The value of each input is then deducted from the German export value and accounted to the country where it was produced (Johnson, 2014).

Automatically one notices that such calculations would be very labor-intensive if undertaken separately for each good. However, Wassily Leontief showed that this decomposition of gross trade flows into value-added is mathematically feasible using input-output analysis. Input-output analysis is a complex field relying on matrices describing the trade flows in final and intermediate goods between sectors and countries. This section can give only a brief and intuitive account of how the value-added data are calculated. These explanations are based on the introductory book on input-output analysis by Miller and Blair (2009) as well as on United Nations (1999), Timmer, Erumban, Los, Stehrer and de Vries, (2014), and OECD-WTO (2012).

Leontief´s method departs from the assumption that all goods produced in an economy are either used as intermediates for further production or consumed. Thus, the following equation in matrix form holds: $Q = BQ + C$ with Q being final output and C denoting final consumption in each country. B is a matrix of input coefficients measuring the number of intermediates needed to produce one unit of final output. Thus, the input coefficients multiplied by total output plus final demand equals total output. These matrices are very large since they have rows and columns for each industry in each country showing the respective trade flow.

This formula can be reformulated into $Q = (I - B)^{-1}C$ where I is the identity matrix. The first term $(I - B)^{-1}$ is called the Leontief inverse. It measures the total output of all products needed to produce one unit of final demand. Thereby it measures all direct effects (inputs needed to produce the final demand) and indirect effects (inputs needed to produce other inputs) throughout the economy.

The value-added by each production factor is measured in matrix F. These are country- and industry-specific values. By multiplying Q with F one obtains the final matrix $K = F(I - B)^{-1}C$. The matrix K consequentially indicates how much value is added by each factor in each country for each good. Thus, by adding all value-added of the textile and clothing sector of one country together one obtains the country-specific value-added embodied in each of its exports.

6.3 The TiVA Database and its Benefits

From the previous remarks, it should be clear that much data and mathematical efforts are needed in calculating value-added trade data. Fortunately, databases providing these data already exist. This study uses the Trade in Value-Added (TiVA) database, which is the result of a joint initiative of the WTO and Organization for Economic Co-operation and Development (OECD). The database has various editions with 2016 being the latest one. It is freely available for download from the OECD website (OECD 1, n.d.; OECD, 2016).

Overall TiVA provides yearly data on 63 countries and for 34 industrial sectors between 1995 and 2011. All OECD, EU28, and G20 economies are included. Furthermore, data on many East and South-East Asian as well as selected South American countries are included. It also includes an estimate for the rest of the world (RoW) to balance the trade values. Appendix B lists all included countries. This large country-coverage is an essential benefit of TiVA over major competing databases such as the World Input-Output Database (WIOD, n.d.). Regarding the sectoral coverage TiVA aggregates textiles and clothing into a single value, which is subsequently critically examined. The contained goods in the database confirm to the codes D17-19 in the ISIC revision 3 classification (OECD 3, n.d.; OECD, 2017).

In total TiVA provides over 40 different indicators on value-added and gross trade flows. These indicators are either measured in current million US dollars in basic prices or percentages. Basic prices measure how much a producer receives for the sale of its goods. As such they exclude taxes and transport costs but include subsidies. Thereby they reflect the value of a product best and are regarded as most relevant to the decision making of suppliers (OECD 2, n.d.).

This study uses most importantly an indicator called domestic value-added content of gross exports. This indicator measures the exports in value-added from the textile and clothing industry in country 1 to country 2 in nominal US dollars. As such, the indicator builds the sum of three parts. First, it measures the direct domestic value-added. For example, this is the value-added by the Chinese textile and clothing industry in its exports. Second, it measures the value-added in exports coming from other upstream sectors in the same economy. This is for example the contribution from the Chinese farming industry to the value-added in exports by the Chinese textile and clothing industry. Third, it measures the value-added embodied in re-imports. Thus, if rubber is exported from China to Japan, then manufactured in Japan into a tag, and then re-imported into China to be put onto a T-shirt, the value-added of the rubber is included in the value-added of the Chinese textile and clothing industry. By including these

three terms the indicator captures all value-added embodied in the textile and clothing exports of each country. This procedure yields presumably the most accurate picture of the worldwide trade.

6.4 Critical Evaluation of the TiVA Database

Despite providing more accurate trade data the TiVA database also faces certain drawbacks regarding coverage and methodology.

6.4.1 Coverage Issues

A coverage issue is the available country data. As stated above TiVA includes data on 63 major countries and an estimate for the rest of the world. Among the included countries are most key trading countries as identified in the previous literature. However, as stated developing and least-developed countries play a role in the international textile and clothing trade as well. Also, as Gereffi & Frederick (2010) argued became especially Bangladesh after 2005 a major clothing exporting country. Unfortunately, Bangladesh and many developing or least-developed countries in Africa, Central and South America as well as Asia are not explicitly included in the TiVA database.

However, the usage of TiVA remains justified for two reasons. First, competing databases like WIOD (n.d.) cover even fewer countries. Second, the values for the countries not explicitly mentioned are included in the estimate for the rest of the world (RoW). Thus, the problem becomes a grouping issue. The usage of RoW as a proxy for many least-developed and developing countries is not a problem since in theory they should all experience the same development after 2005. Given their economic status they received preferential treatment making them likely to notice decreasing exports after 2005. Thus, the country-coverage is not perfect but acceptable.

The coverage of the years 1995 to 2011 is similarly acceptable. It would of course be better to have older as well as newer data. Especially the inclusion of newer data would be interesting since for example the economic recession beginning in 2008 potentially influences the data. Long-run data after 2011 would possibly corrected for its effects. However, it is so-far unclear what effect the crisis had on the textile and clothing industry in each country and how lasting it was. Possibly the data of the years until 2011 already corrected for some effects. In any case the database includes enough years before and after the ATC´s ending in 2005 to analyze the medium-term changes.

6.4.2 Harmonizing Trade Data

The second issue concerns the harmonization of trade data across countries. To calculate value-added trade data input-output tables are needed as described above. They are obtained

from national statistics offices. However, these data are often provided in different classifications (OECD-WTO, 2012). A further measurement problem is that the reported exports by one country do not necessarily match the reported imports from the destination country even though they should in theory. The reason is that the importing country can execute a different valuation procedure than the exporting country resulting in a different value (World Integrated Trade Solutions, n.d.).

The researchers involved in the creation of the TiVA database undertook multiple steps to solve these problems. First, to solve the classification issues they aggregated all trade data according to the ISIC 3 rules. Thus, they decided on a broad category covering all the product-specific classifications. Thereby it is not possible to analyze the trade for specific textile of clothing goods. Instead TiVA contains only one trade value for textiles and clothing combined. To harmonize trade flows the creators of TiVA sought dialogue with statistics offices to remedy possible inconsistencies in the underlying trade data. Where conflicts arose, they balanced the trade data under output constraints (OECD-WTO, 2012).

6.4.3 Nominal Trade Data

Because trade data is assembled from national statistics offices it is provided in national currencies. Thus, another issue is their harmonization into a common currency, i.e. US dollars. The TiVA database uses for this conversion purchase power parity methods as communicated in private email conversation to the researcher. These methods take a basket of common consumption goods and compare its price across countries. Though the definition of an accurate basket changes over time complicating the calculations, this method is arguably better than taking nominal exchange rates (Deaton & Heston, 2010; de la Escosura, 2000).

However, the price indices used are not indexed to a special base year, which renders the exchange rates nominal (OECD, 2017). By using nominal exchange rates one consequentially also obtains a nominal US dollar estimate. This makes an analysis of the real trade value prima facie impossible. No appropriate price index is published by the OECD to deflate the nominal values. Thus, this study must rely nominal US dollar values. To make the values comparable over time they are expressed in shares of each year's total trade. This yields further discussions as explained in the methodology chapter.

6.4.4 Assumptions Underlying TiVA Calculations

Further issues with the TiVA database are of methodological nature. In creating input-output tables describing the flows of goods and intermediates across industries and countries four key assumptions are necessary. First, one assumes goods produced by an industry to be homogenous, i.e. there are no quality differences. Second, constant returns to scale are assumed. Thus, when inputs are doubled one obtains the double amount of output and there are no scale effects. Third, it is assumed that all companies within an industry and country produce their goods using the same production processes. This holds because one calculates country-specific and not company-specific input coefficients in matrix B. And fourth, technological

progress takes only place between periods of analysis but not within (Lee & Mokhtarian, 2004).

Arguably, these assumptions do not represent reality. Production processes differ between companies leading to different productivity levels within a country and possible scale effects. This also leads to technological upgrading and goods of different quality. Nevertheless, the assumptions stem from basic economic theory. They are not randomly selected but a requirement of the model. Thus, if one believes value-added trade data to be the more correct one must accept these assumptions to obtain the data.

6.5 Justifying the Usage of TiVA

Despite these drawbacks, the TiVA database nevertheless provides a good basis for the present analysis. One reason is that it covers more countries than competing databases, which are facing similar issues anyway. Furthermore, it also provides enough years to analyze the trade in textiles and clothing before and after the ending of the ATC. Because of the drawbacks of the database it seems appropriate to use TiVA measures not as official statistics but rather as estimates. This interpretation is also recommended by the TiVA researchers (OECD-WTO, 2012). As such the data show general trends but cannot be individually interpreted for each country. Since this study takes a network approach it follows this suggestion as it uses all data relative to each other. The findings of this study should therefore similarly be interpreted as trends rather than hard-facts.

7 Methodology

To analyze the value-added trade data and test the hypotheses this paper uses network analysis. This chapter introduces the methodology.

7.1 Definition of a Network

A network is a set of points connected by lines. The points are called nodes while the lines connecting them are called edges. The internet for example is a network where computers (nodes) are connected through wires (edges) transporting data flows (Newman, 2010). In this study countries are nodes and trade is modeled using the edges. Consequentially, network analysis provides a set of tools to analyze the structural properties of the nodes and edges.

7.2 Network Types

A network is either directed or undirected. In undirected networks the direction of the edges and thus relation between two nodes does not matter (Newman, 2010). The friendship-structure of Facebook is one example where two people either are friends or not. In directed networks the direction of the edges between nodes matters. The direction of the edge is indicated by an arrow (Newman, 2010). Twitter is one example since one person can follow a second person while the reverse is not required.

Furthermore, the edges in networks are either weighted or unweighted. Weighted networks serve to distinguish between more and lesser important edges (Newman, 2010). A weighted network would for example apply to friendships. Here some friendships are more important than others and thus have a higher weight.

The data needed to graph networks is stored in the adjacency matrix. It is a n times m matrix with element z_{ij} showing the weight of the edge between node i and j. Thus, for an un-weighted (un-) directed network this matrix consists of 1´s when an edge between two nodes exists and a 0 otherwise. For a weighted directed network, each element in the matrix equals to the weight assigned to the edge (Newman, 2010). Since trade flows differ in size and direction this study uses weighted directed networks.

7.3 Visualizing Networks

The information contained in the adjacency matrix is used to visualize the network. Visualization is a highly important tool since it gives an intuitive overview of the network. Usually visualization is done by using computer software. The networks graphed in this study were created using the freely available program Gephi (n.d.).

When visualizing network data, the researcher must decide according to which rules nodes and edges should be portrayed. Fortunately, network scientists developed different algorithms for this. Each algorithm emphasizes different aspects of the network. In case of the textile and clothing trade almost all countries trade with each other as subsequently indicated. Thus, this study needs an algorithm graphing the network in an intuitive and easily understandable way. Previous research found that force-directed algorithms are a good option for this (Fruchterman & Reingold, 1991).

One influential algorithm within this group is the Fruchterman-Reingold algorithm. Its basic operating principle is that nodes connected by an edge should be drawn close to each other but not too close. This is achieved by calculating a force akin to gravitation operating between the nodes. This force attracts neighboring nodes but repels all others. Repeating this process leads eventually to a stable situation, which is captured as the network. In comparison to other layouts this algorithm tends to distribute the nodes evenly across the available space, minimizes the amount of edges crossing each other, and has a roughly equally long edge-length (Fruchterman & Reingold, 1991). Thus, it captures the network in an intuitively understandable layout and is used in this study.

Moreover, edges have different sizes and colors depending on their respective weight. The higher the weight the larger and greener the edge is. A similar reasoning applies to nodes. In this study, more important nodes are bigger and greener. The next section explains how the importance of each node is calculated.

7.4 Centrality Measures to Analyze Importance

Distinguishing nodes according to their importance is crucial for this study since it serves to establish the processes in the textile and clothing trade before and after 2005. However, different concepts for measuring the importance of nodes exists. This makes it necessary to choose the appropriate one for this analysis. In network analysis, the concept of importance is called centrality. Thus, more important nodes have a higher centrality. This section defends the usage of degree centrality for this study. It also outlines why competing concepts like closeness and betweenness centrality were not chosen.

7.4.1 Degree Centrality

Degree centrality deems a node to be important when it has many connecting edges. The degree of a node in an undirected network is the total number of its edges. Consequentially one distinguishes in an unweighted directed network between in- and out-degree. In-degree measures the sum of incoming edges while out-degree measures how many edges depart from the specific node (Newman, 2010). Degree centrality can be intuitively understood from appendix C.

The same concept applies to weighted networks though in this case the term strength is used. Similarly, each node in a weighted network has an in- and out-strength. The in-strength is calculated as the sum of the incoming weights on the edges. The out-strength is calculated conversely as the sum of the outgoing weights on the edges. In the case of trade flows in-strength is thus a measure for how important a country is as a consumer. Conversely, out-strength measures how important a country is in supplying a specific good (Newman, 2010).

This study uses out-strength as a centrality measure because of the underlying data´s nature and the resulting intuitive interpretation. As explained above the TiVA database contains value-added trade flows in nominal US dollars. They are captured in the adjacency matrix for each year with element z_{ij} showing the trade flow from country i to country j. Because these trade flows are in nominal terms the adjacency matrices need to be normalized. This is standard procedure in network analysis to make the adjacency matrices comparable over time (Newman, 2010). Thus, each element in the adjacency matrix z_{ij} is divided by the total sum of the yearly worldwide trade. The obtained element x_{ij} shows how much trade in value-added country i ships to country j as a share of worldwide trade. When using out-strength as a centrality measure one adds all these shares together. Thus, the out-strength indicates the share of each country in worldwide value-added. The formal notation is:

$$Out - Strength\ of\ Node\ o_i = \sum_j x_{ij}$$

Given that this is an intuitively understandable measure it can directly be used to test the hypotheses. Hypothesis 1 stated that previously restricted countries will increase their shares in worldwide exports after 2005, which is directly measured by the out-strength. Similarly, out-strength can be used to test if preferentially treated countries notice decreases in their shares (hypothesis 2), if closeness to core-markets counteracted this decrease (hypothesis 3), and if the network became more concentrated (hypothesis 4).

7.4.2 Closeness and Betweenness Centrality

Two competing centrality measures are closeness and betweenness. When using closeness centrality, the on average closest node to all others is most central. When using betweenness centrality the node located to the highest extent between all other nodes is most central (Newman, 2010). Appendix C indicates the functioning of both measures intuitively. Overall, these two centrality measures analyze the strategical location of each node in relation to the others. As such they do not analyze how important each node is as a supplier. Thus, they are not analyzed in this study because they make the intuitive interpretation of out-strength as shares in worldwide exports impossible.

7.5 Concentration Measures

The fourth hypothesis states that the exports will likely be more concentrated after the ATC´s ending. Given that out-strength can be interpreted as the share of each country in worldwide exported value-added it is possible to calculate the Gini coefficient for each year. This is a common measure for inequality. To calculate the Gini coefficient one compares an observed distribution with a completely equal one. For example, it could be that 50 percent of all countries export 90 percent of worldwide exports. Thus, the observed distribution is more unequal to the ideal distribution where 50 percent of the countries also exports 50 percent of worldwide value-added. The Gini coefficient measures the extent to which both distributions diverge. It ranges from 0 (complete equality with all countries having the same share in worldwide value-added) to 1 (complete inequality where only one country is responsible for all value-added). Some researchers regard it as the optimal measure for analyzing the concentration of the out-strength in networks (Badham, 2013).

7.6 Further Indicators

7.6.1 Domestic Value-Added Share of Gross Exports

Three further network indicators are used in this study. The domestic value-added share of gross exports is used to test a possible decline in transshipments after 2005. It is given by the TiVA database for each country and calculated by dividing each country´s total exports measured in value-added by its gross exports. It ranges between 0 and 100 percent. The latter case indicates that all exports are domestically manufactured. The former case says that none of the gross exports were manufactured in the country. Transshipping countries should thus have a comparatively low domestic value-added share of gross exports. The indicator can also be used to motivate why value-added instead of gross trade flows should be analyzed since it shows their difference over time and regions. Often, a decline over time is taken as an increase in globalization since it means that more foreign inputs are used in the production of gross exports (OECD, 2016).

7.6.2 Average Annual Growth Rates

A methodological issue concerns the calculation of average annual growth rates. Their calculation is necessary to analyze if the out-strength of each country and region developed after 2005 as predicted. For calculating average annual growth rates different methodologies exist. This study uses a method proposed by Feinstein & Thomas (2012). It relies on regression analysis by fitting a line through the data. The slope of this line is then converted into the average annual growth rate in percent. The benefit of this method is that it takes all yearly values into account. The alternative method of taking an average end and beginning value of three years and calculate their average annual growth rate is also conducted as a test. Both methods yield similar results.

7.6.3 Density

A further metric used to analyze the network is its density. It measures the extent to which a network is connected. Density is calculated by dividing the amount of existing edges by the amount of possible edges. Thus, the closer the value gets to 1 the more edges and overall a higher connectivity exist in the network (Golbeck, 2013).

7.7 Weaknesses and Limitations of Network Analysis

By using this method one encounters some weaknesses and limitations, which must be mentioned. The first issue concerns the usage of shares for indicating out-strength. This results from the reporting of nominal trade data in TiVA. Unfortunately, shares do not tell us anything about the absolute movements. Thus, a decreasing growth rate can occur even though the actual exports increase if only the exports by other countries increase by much more. Shares therefore only tell us how important countries are in relative terms to each other. This makes the usage of shares not inherently false. But one must pay attention in their interpretation. Given that no trade database in constant dollars is available this limitation must be accepted.

Furthermore, network analysis provides a snapshot of the trade in textiles and clothing at one point in time. Thus, when portraying trade flows, they appear to take place simultaneously. This is not the case in reality since products are as outlined above often used as inputs for further production. Thus, trade flows occur successively. Because no data at a product-specific level is available the tracing of these production chains is impossible. Here the study needs to rely on previous literature about the textile and clothing industry in each country. Also, the share of domestic value-added to gross output can be used as a proxy. The lower it gets the higher the likelihood is that a country first imports intermediate goods, and processes them into further inputs or goods for final demand.

A third limitation is that network analysis as applied in this study is a rather descriptive analysis. As such, it is not able to single out specific causes for the observed changes. In the real

world, multiple processes happen simultaneously each affecting the observed outcome, i.e. the observed network. Thus, when a change in the network of the world´s textile and clothing trade is observed after 2005 it does not necessarily have to do with the ATC. Among others also the economic recession of 2008 could play a role as outlined. However, it is very likely that the observed changes are connected to the ATC given that its termination was the major event in the textiles and clothing trade as indicated.

7.8 Justifying and Applying Network Analysis

The benefit of network analysis is its holistic approach to the trade data because it allows for capturing all worldwide trade flows simultaneously. Similarly, the method does not prevent focusing on key trade flows since they can be extracted and recalculated from the adjacency matrix. Thus, network analysis enables the researcher to highlight the interdependencies in trade between countries and their tracing over time by using network statistics. Contrary to the mentioned previous analyses the researcher is therefore not limited to study only the imports of selected countries.

Based on the previous explanations network analysis is applied to the trade data in six steps following the order of the hypotheses. As a preparatory step the trade data is normalized. To motivate the analysis of value-added rather than gross trade data the domestic value-added share of gross exports is calculated. To indicate which country is most central and thus important the out-strength is calculated. It can be interpreted as the share of exports by each country in the worldwide trade measured in value-added. The weights and out-strengths are consequentially used to visualize the trade networks before and after 2005. The obtained figures give an account of the direction of trade flows. In these figures, greener as well as thicker edges and nodes denote larger weights and out-strengths. Consequentially, the average annual growth rates of the out-strengths before and after 2005 are calculated and compared to the predictions. The concentration of the network is measured using the Gini coefficient. Lastly, using the share of domestic value-added in gross exports before 2005 and the growth rate of gross exports afterwards a potential decline in transshipping is tested.

To make the presentation of the results clear countries contained in TiVA are grouped into regions. This grouping is based on the economic status of the country (developed or developing), their location, and whether they were preferentially treated or not. Key countries with individual predictions were not aggregated into regional groups. The regional groupings are shown in appendix B.

As outlined in the historical background, only the USA, European Union, and Canada (subsequently called core markets) retained import quotas between 1995 and 2005. These countries absorbed roughly 60 percent of worldwide exports each year (appendix D). If necessary the analysis focusses specifically on exports going to these countries. The relevant trade values for this analysis are then recalculated from the adjacency matrix.

Such an application of network analysis to international trade data is relatively new. Though it has been used to identify world systems theories (Smith & White, 1992) and general trade

patterns (Fagiolo, Reyes & Schiavo, 2008) it is not a common methodology. Recently Amador and Cabral (2016) made advances by using value-added trade data and network analysis to study global value chains and production networks. These authors end their discussion with a plea for further network analyses of value-added trade data. This is precisely what this study does.

8 Results

This chapter presents and discusses the results of the network analysis while the next chapter embeds them in a broader context.

8.1 Domestic Value-Added Share of Gross Exports

To motivate the study of value-added over gross trade data figure 3 shows the yearly domestic value-added share of gross exports for the most relevant countries. The exact values for all countries are stated in appendix E.

Figure 3 supports Johnson´s (2014) claim that the value-added share of gross exports shows persisting differences between countries and over time. The share ranges up to 90 percent for India in the beginning, while the lowest value is 57 percent for Mexico in 2010. This makes Mexico one of the highest users of foreign inputs for its textile and clothing exports. Since the share is decreasing for most countries and thus on average, the usage of foreign inputs in the production of exports generally increased. According to OECD 1 (n.d.) this can be interpreted as an increase in globalization. Exceptions are China and RoW. Thus, these countries used increasingly domestic inputs for producing their exports, which indicates the occurrence of upgrading the domestic production.

The observation that the share differs in amount and direction of movement across countries and time therefore justifies in accordance with Johnson (2014) the usage of value-added instead of gross trade data. It presumably yields a more accurate picture of the global textile and clothing trade and is thus used in the subsequent network analysis.

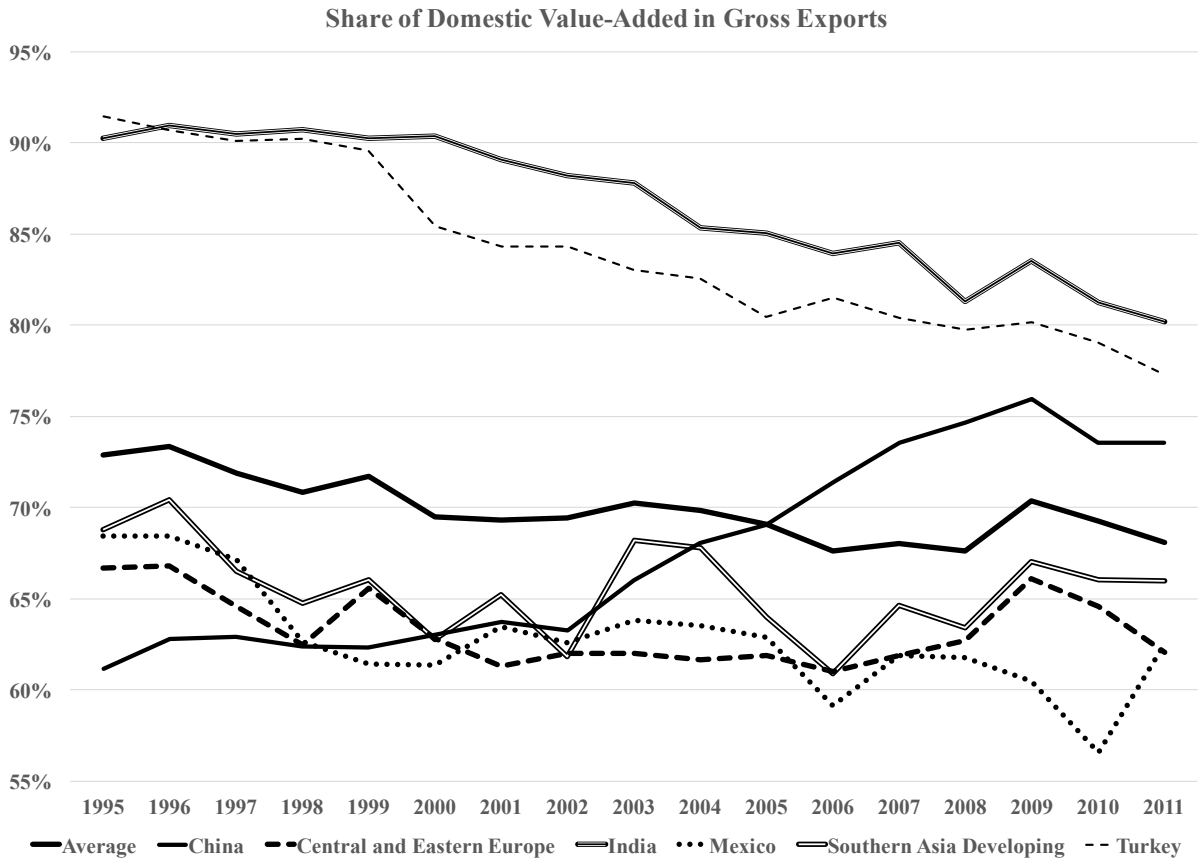


Figure 3: Share of domestic value-added embodied in gross exports of key countries (own calculations and representation)

8.2 Out-Strength and Export Shares

Figure 4 shows the out-strength and thus share in worldwide exports of each regional group between 1995 and 2011. To make the figure easily understandable some regions from appendix F were further grouped together, which states the exact values. Furthermore, appendix G shows the out-strength of trade going only to core markets.

Measuring the out-strength indicates that Northern Europe was in 1995 the most-important exporter of value-added in textiles and clothing since its worldwide share accounted for 21 percent. The most important country in adding value was Italy with a share of 13 percent. China was on third place with 9 percent. East Asia (9 percent) had in 1995 a higher importance than Southern Asian developing countries (7 percent) and RoW (6 percent). The previously identified regional suppliers in Central and Eastern Europe, Turkey, Africa, and Mexico were of lesser importance since they each accounted for values between 1 and 4 percent with India being in the same range.

Until 2011, the out-strength and thus the importance of each country changed. Basically, all countries noticed decreases in their out-strengths and thus shares in worldwide exports except China, RoW, Turkey, and India. The increase was especially remarkable for China, which became the most-important textile and clothing exporter. RoW nearly doubled its share, India increased its by one percentage point while Turkey´s stayed constant. Losses were especially pronounced for Northern Europe with Italy noticing a decrease by 5 percentage points.

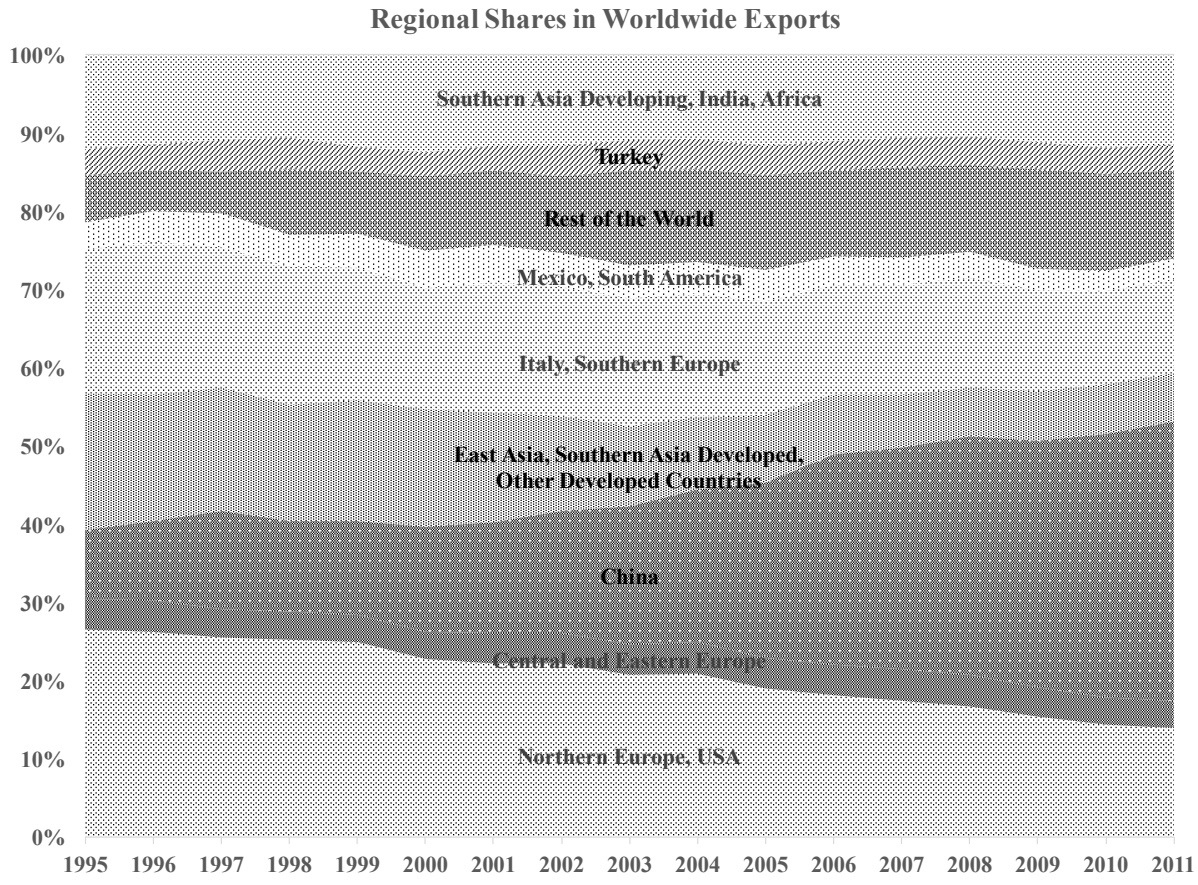


Figure 4: Regional out-strengths and thus regional shares in worldwide exports to all markets (own calculations and representation)

8.3 The Textile and Clothing Trade Network

Using the adjacency matrix data, it is possible to graph the textile and clothing trade network. This makes an overview of the trade flows possible and thus indicates where the exports went before and after the ATC´s ending. The following networks were obtained by calculating an average weight for each edge for the periods 1995 – 2004 and 2005 – 2011. This procedure was chosen since separate networks for each year would be hard to compare. The exact weights are given in appendix H. The layout of the first period was used for the second as well to make an intuitive comparison of both possible. Since the networks cannot be geographically interpreted this procedure is unproblematic. The methods previously outlined were followed. Appendix I facilitates the understanding by picturing only trade to core markets.

8.3.1 The Years 1995 – 2004

Almost all countries traded with each other during the first period, which is indicated by the density coefficient of 90 percent (appendix J). However, figure 5 indicates that only few trade flows were among them the most important ones. First, the figure indicates that the USA, Northern Europe, and to some extent East Asia stood out as the major destination markets for textiles and clothing. This supports the previous results from Gereffi & Frederick (2010). The other countries and regions were consequentially on the supplying-side.

Second, figure 5 relativizes the large Northern European out-strength from previous section. It resulted mainly from intra-European trade. As such it was not subject to any quotas and played no role in the previous studies. Furthermore, figure 5 in conjunction with appendix I suggests that differences in the sourcing-patterns of the USA and Northern Europe existed. Especially Northern Europe seemed to source mainly from nearby countries. These were in descending order Italy, Southern Europe, Central and Eastern Europe, as well as Turkey. Italy´s high share of domestic value-added embodied in gross exports (around 80 percent, appendix E) indicates that it was an important producer of textiles and clothing at that time since most of its exports were domestically manufactured. China and RoW were important suppliers as well but their trade flows to Europe had smaller weights.

The USA seemed to source from a rather different set of countries. Their main suppliers were RoW, China, and other Southern Asian developing countries. As stated, RoW is likely to include other Asian, African, and South American developing countries. Mexico was an important supplier but did not play the most important role.

Also, figure 5 suggests that the trade between Northern Europe and Central, Eastern, and Southern Europe as well as between the USA and Mexico was of a different nature than other trade flows. In this trade, the core markets of Northern Europe and the USA were not only the recipient of clothing and textile imports but themselves exporters. This likely reflects the previously mentioned outward processing activities by European and American firms in these

countries. This claim is supported by their lower than average domestic value-added share of gross exports (appendix E).

8.3.2 The Years 2005 – 2011

The slightly increased density coefficient of 0,94 (appendix J) indicates that even more countries were trading with each other after 2005. However, again few trade flows stood out as the most important ones. The biggest change compared to the network of the first period was the increase of Chinese exports. This reflects the rise in Chinese out-strength from figure 6, which was spread across all destination markets. Thus, China became the most important supplier on core markets as well as in East Asia and other developed countries.

Especially the increase in Chinese exports to Northern Europe are worth mentioning. Here it appears that China replaced mostly Southern Europe, Italy, Turkey as well as Central and Eastern Europe. Regarding trade flows to the USA, China increased its share at the cost of Southern Asian Developing countries, East Asia, and Mexico. Since China increased its share of domestic value-added in gross exports (figure 3) it likely experienced industrial upgrading, which made a more autonomous production relying less on foreign inputs possible. RoW exports to Northern Europe were now more important while its importance in the USA remained relatively constant.

Other observations are the following: India´s out-strength spread roughly equally to Northern Europe and the USA in both periods. For Turkey, the main destination markets continued to be Northern Europe and Italy. Also, in intra-European trade became less important. This likely reflects a continuation of the downturn of the Northern European textile and clothing industries as established in the historical background.

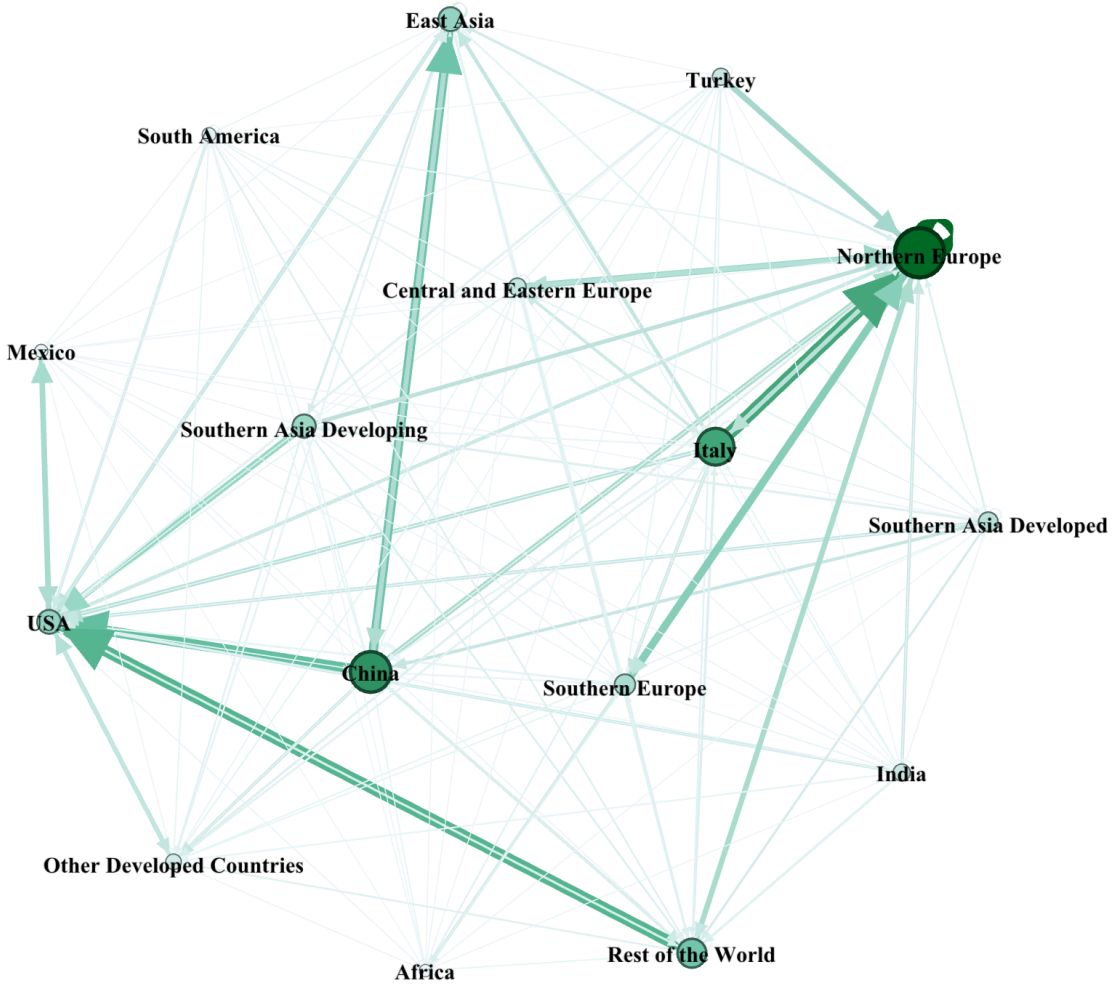


Figure 5: Worldwide trade network in textiles and clothing 1995 – 2004 (own calculations and representation)

Figure 6: Worldwide trade network in textiles and clothing 2005 – 2011 (own calculations and representation)

8.4 Growth Rates Before and After 2005

The previous sections indicated which countries were most important in supplying textiles and clothing as well as where their exports went. This section tests if the exports of each country changed after 2005 according to the predictions. This is done by calculating and comparing the average annual growth rates of each region´s out-strength before and after 2005. Given that the predictions apply for trade to core markets, only these flows are analyzed in this section. The results of these calculations are given in figure 7 and in numerical form in appendix K. For completion, appendix L displays the same figure for exports to non-core markets.

Given the previous theoretical and historical considerations and the layout of figure 7 (x-axis: average annual growth rate 1995 – 2004, y-axis: average annual growth rate 2005 – 2011) one would expect the following findings: countries previously restricted by quotas should have average annual growth rates relatively close to zero or even negative before 2005 and positive ones afterwards. Countries with preferential access should have average annual growth rates vice versa. For countries with preferential access and a close location to core-markets the average annual growth rate of their share in exports could be positive in both periods.

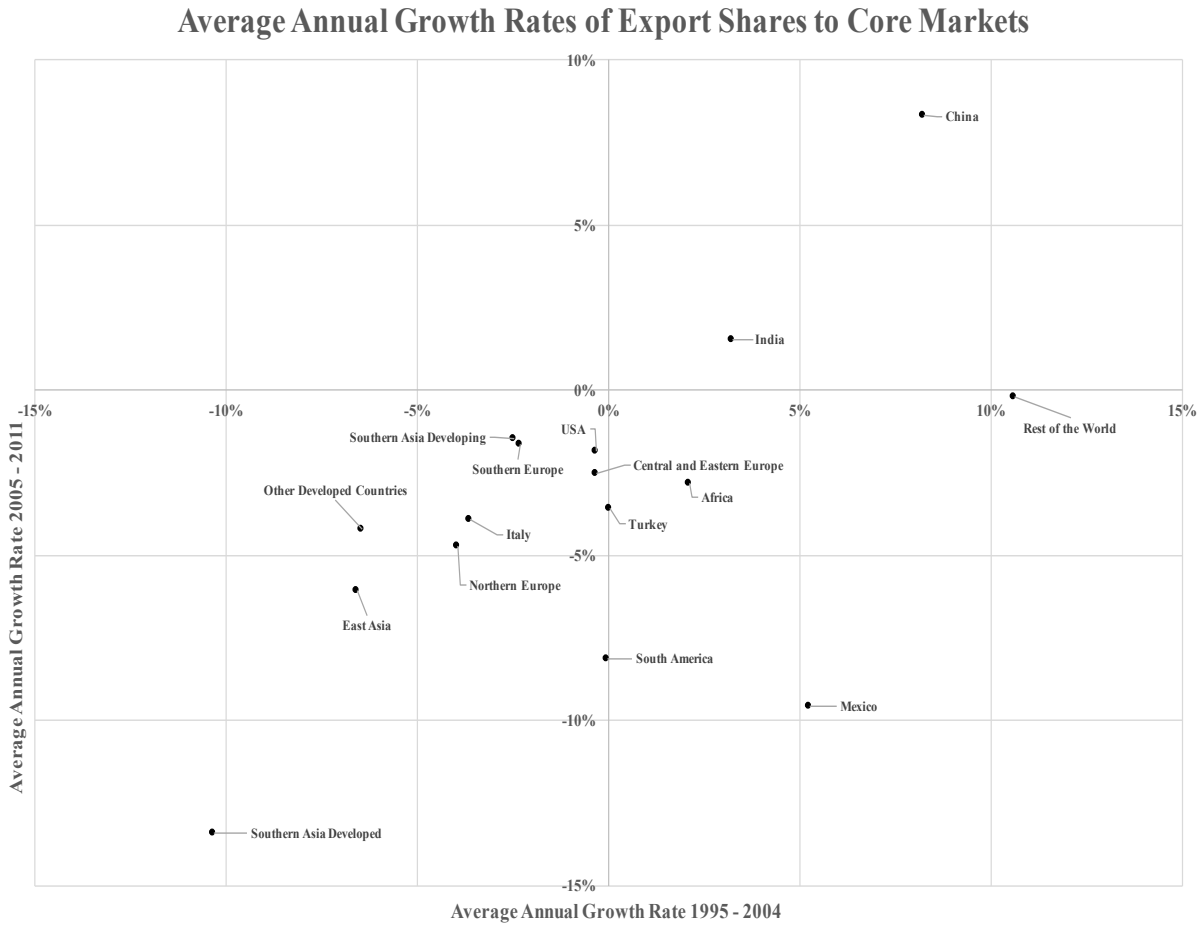


Figure 7: Average annual growth rates of shares in worldwide exports (out-strength) to core markets (own calculations and representation)

8.4.1 China and India

Overall, figure 7 supports some of the hypotheses. As the only two countries China and India noticed positive average annual growth rates after 2005. This was to be expected given that they were as explained the most restricted countries in Western markets. Especially for China the rise in exports after 2005 is unsurprising given the large increase in out-strength shown in figure 4 and appendix G.

However, figure 7 indicates that the average annual growth rates of the first period were equally large for China and even larger for India. Thus, the countries did gain shares in the exports to core markets after 2005 as expected. But this study also suggests that they did so even before the quota removal at an equal growth rate. However, even though India´s growth rate was positive it did not increase its share in worldwide exports by many percentage points (figure 4 and appendix G).

Since China was expected to be the main beneficiary and became indeed the world´s most important supplier it presents a more interesting case to analyze. For China figure 4 and appendix G suggests that the rise in out-strength began not after 2005 but instead around the year 2002. Thus, when taking 2002 as the demarcation one indeed finds a larger average annual growth rate for the following years than for the years before (appendix K). This result challenges the claim that most adjustments due to the ATC would occur after 2005, which is discussed in the next chapter.

8.4.2 Developing Southern Asia and RoW

As shown in the historical background many developing Southern Asian countries also faced quotas in core markets but to a lesser extent. Thus, in relation to countries such as China and India they were preferentially treated as well. Therefore, researchers predicted a decrease in their exports after 2005.

Since the region showed negative average annual growth rates after 2005 the development seems to support the predictions on the first look. However, the region already exhibited much larger negative growth rates before 2005. Thus, even though the export shares from Southern Asia decreased after 2005 they did so at a lower rate than before. The overall development contradicts therefore the predictions since ending a preferential treatment should decrease exports compared to the initial situation.

To analyze this counter-intuitive result it is necessary to look at the country-specific developments within developing Southern Asia. Here the growth processes were diverse (appendix M). Thailand and the Philippines noticed much larger decreases in their out-strength after 2005 than before, which supports the predictions. Cambodia and Vietnam had similarly lower growth rates after 2005 than before. However, their growth rates overall remained positive, which hints that these countries were at least to some extent capable of competing with China and extending their share in worldwide exports after the ATC´s ending. Furthermore, Indonesia had a constant share in worldwide exports after 2005 compared to a decreasing one before.

Given its preferential treatment this result is surprising. These counterintuitive results for Cambodia, Vietnam, and Indonesia are further discussed in the next chapter.

As explained, RoW is likely to include many developing countries in Africa. Asia, and Central as well as South America. As such it is not surprising that it showed a high average annual growth rate during the first period when it received preferential treatment but a slightly negative one during the second. Thus, the observed increase in out-strength was not equally spread throughout both periods. As discussed in the next chapter this result would likely further change when the TiVA database would include specifically Bangladesh.

Developed Southern Asian countries (Hong Kong, Singapore, Taiwan) exhibited a steady and much more pronounced decline in their export shares to core markets. Though they faced quotas in core markets making a growth in exports theoretically possible, this result is not surprising and in line with Nordas (2004) prediction. Given the intertwined relationship between the industries of these countries and China (Gereffi, 1999) it is likely that China as the more efficient producer simply took over large portions of these exports.

8.4.3 Mexico, Turkey, Central and Eastern Europe

Also for other preferentially treated countries in core markets before 2005 figure 7 supports the hypothesis that a negative average annual growth rate would occur afterwards. This is especially true for Mexico, which had a positive average annual growth rate of its export share before 2005 but was most negatively affected of all countries afterwards. The result also holds for Africa, Central and Eastern Europe, Turkey, and South America although their growth rates were generally very low or even slightly negative until 2005. Thus, their decline in importance appears to have begun earlier than 2005. This result also suggests that being close to core markets did not outweigh the loss of preferential treatment as some researchers hypothesized.

8.4.4 Trade to Non-Core Markets

The trade to non-core markets is of lesser interest since it was not influenced by the quota regimes. Thus, the hypotheses do not necessarily apply here. However, for completeness appendix M shows the average annual growth rates of each countries´ out-strength for these exports as well. China and India showed high growth rates again during both periods. In comparison to the exports to core markets RoW, Turkey, Mexico, developing Southern Asia, and Africa noticed positive average annual growth rates after 2005 as well. These findings suggest that some countries could compete with China in non-core markets given that they had similar or even larger average annual growth rates. Thus, even though the amount of trade going to non-core markets was smaller some offsetting effects appear to have taken place.

8.5 The Concentration of Trade Flows

The prediction that exports would be more concentrated after 2005 concerns core markets. Thus, figure 8 shows the Gini coefficient for exports to core markets with the corresponding average annual growth rates. For completeness, appendix N shows the Gini coefficient for exports to non-core markets, which were highly concentrated at a constant level.

The higher average annual growth rate of the Gini coefficient in the years following 2005 compared to the years before 2005 suggests that exports became increasingly concentrated as predicted. However, also for the Gini coefficient it seems that the increase started in fact around 1999 and not as expected after 2005. This result is further discussed in the next chapter.

Figure 8: Gini coefficient measuring the concentration of exports to core markets between 1995 and 2011 (own calculations and representation)

8.6 The Development of Transshipping

Related to the predicted increase in concentration after 2005 was a possible decline of transshipments. Such a process would reinforce the increased concentration and was as stated a goal of the ATC. As explained, transshipping countries are characterized by a low share of domestic value-added embodied in gross exports. Thus, if transshipping declined after the ATC´s ending countries having a low average domestic value-added share between 1995 and 2004 should noticed a decrease in their gross exports after 2005. This hypothesis is tested using figure 9. Given that this hypothesis concerns specific countries and not aggregated regions, all countries with a below-average domestic value-added share of gross exports were analyzed.

Overall, the evidence for declining transshipping is very weak. The first reason is that it is hard to speak of any country in the figure as being a transshipping country given that the lowest share of domestic value-added to gross exports remains at 50 percent in the case of Luxembourg. This implies that half of Luxembourg's exports were still produced within the country. Admittedly there exists no defined value at which transshipping begins or ceases to exist. However, a domestic value-added share of 50 percent or above seems too high to conclude that transshipping occurred.

Second, the relationship between value-added and growth in gross exports is generally very weak. This is shown by the almost straight line fitted into the figure. The domestic value-added share of gross exports before 2005 and the growth rate of gross exports after 2005 are on this account not related.

Furthermore, it would be in principle unreasonable to attribute the existence of transshipping to many countries mentioned in figure 9. For example, Central and Eastern European countries likely conducted no transshipping since they imported from and exported to mainly Northern Europe as figures 5 and 6 suggest. This made them the recipient of outward-processing rather than transshipping activities. Furthermore, Hong Kong is interestingly missing from figure 9 despite previous researchers identifying it as a transshipping country for China (Fung, 1998; Gereffi, 1999). From all countries present in figure 9 and the historical background one could speculate that Singapore was a transshipping country. It is a WTO member since 1973 and as such would offer Chinese exporters easier access to Western markets. But even for Singapore the domestic value-added share of gross exports was relatively high before 2005. Also, its gross exports increased after 2005 and did not decline as it would have been the case for a country conducting transshipping.

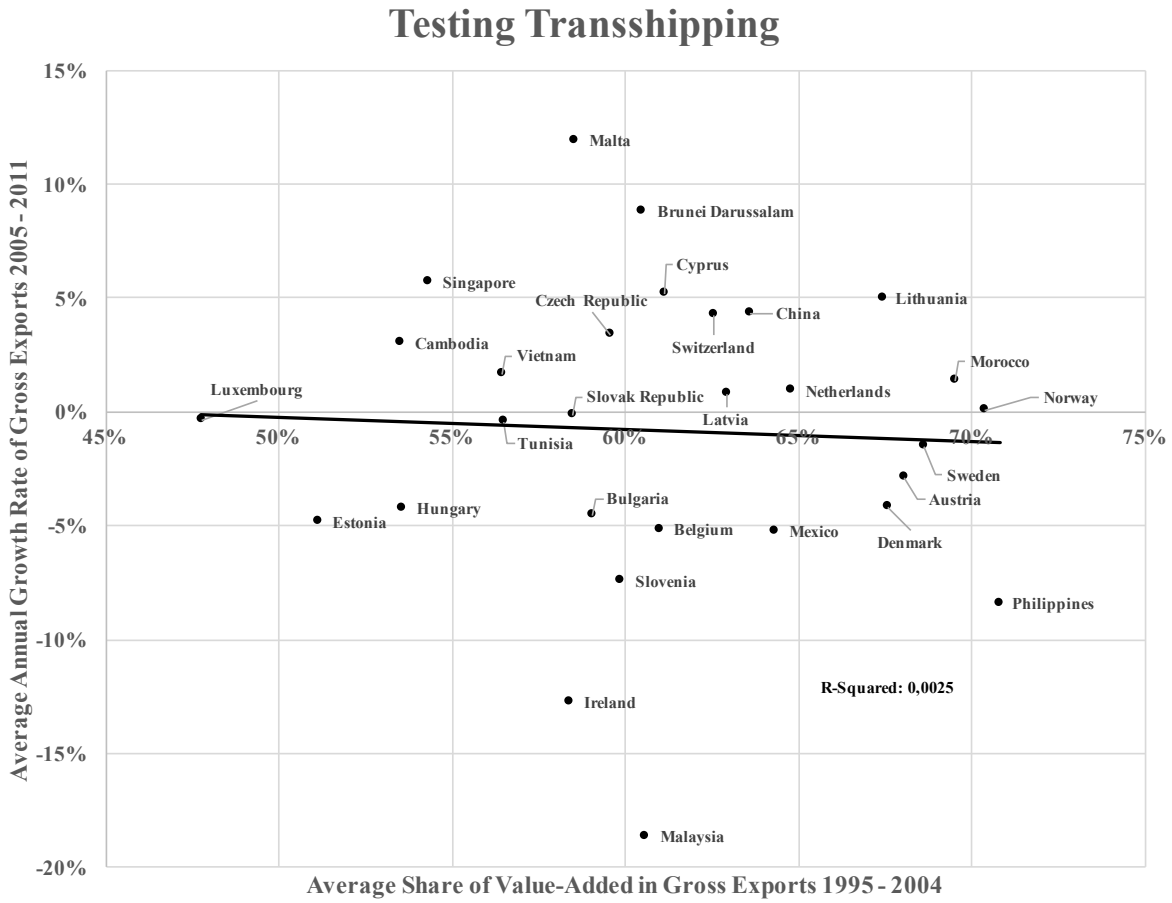


Figure 9: Testing transshipping by relating the share of value-added in gross exports between 1995 to 2004 to the average annual growth rate of gross exports between 2005 and 2011 (own calculations and representation)

9 Discussion and Implications

This chapter provides a broader discussion of the obtained results in relation to the hypotheses and previous research embedding the findings in a wider context.

9.1 Hypothesis 1: The Effects on Restricted Countries

As expected, India and especially China increased their share in worldwide exports after 2005. Though India increased its share on the world market it did not gain much percentage points. Thus, especially China appeared to be the main beneficiary since it increased its share in worldwide exports the most, became the leading supplier of textiles and clothing, and noticed the highest growth rates. This suggests that the artificial trade diversion from restricted to preferentially-treated countries caused by the MFA and ATC came to an end after 2005. This result is in line with previous research by Gereffi & Frederick (2010), Curran (2006, 2008), and Shen (2006) who analyzed the years immediately after the ATC´s ending.

However, this study casts doubt on the claim by the previous literature that the adjustment processes would occur after 2005. This study instead suggests that Chinese exports started growing after 2002. A possible reason for this could be China´s accession to the WTO in 2002. Though China was member of the ATC already before 2002 and thus entailed to the quota phase-out its WTO accession possibly reduced other trade barriers, which made exporting easier. For example, the WTO accession entitled China to normal and thereby non-discriminatory tariffs (Martin, Bhattasali, & Li, 2004). Since the previous studies perceived the quota phase-out as being the major event in the textile and clothing trade this study followed suit and did not analyze tariff data. But maybe tariff developments were beneficial for China causing it to increase its exports even before 2005. This question warrants further research.

A second possible explanation might be the lack of product-specific data available for this analysis. Thus, it remains unknown in which products China increased its exports after 2002 and respectively 2005. The ATC aimed as explained at a continuous liberalization of the textiles and clothing trade from quotas by establishing four stages for the removal of quotas. As shown in the historical background previous research generally agreed that the ATC failed in this respect. The reason was that the liberalization of a large majority of quotas including the most restrictive ones was pushed towards its end in 2005 while only low-value goods were integrated first (Naumann, 2006; World Trade Organization, 2001).

However, this does not preclude the possibility that the increased exports observed in this study after 2002 fell in the earlier liberalized categories. Even though they were of low value they could have caused the observed increases in exports if the growth in volume was suffi-

ciently large. If this was the case the ATC seems to have performed better in continuously liberalizing the textile and clothing trade than originally thought. However, to analyze this question product-specific data would be needed.

The fact that Chinese exports started to rise in 2002 and not 2005 also shines a different light on the previously mentioned extended quotas on a set of Chinese goods after 2005. Of course, the increase of Chinese imports on core-markets from was from 2004 to 2005 relatively large as seen from the hike in figures 4 and appendix G. Thus, producers in other countries were rightly concerned about losing their shares in exports to China.

However, the data in this study suggest that similar hikes occurred before and after 2005, which normalized in the following years. Furthermore, the increase is quite continuous over the whole period of analysis and not concentrated solely around the year 2005. Thus, this study agrees with Curran (2009) that the stark increase in Chinese imports on Western markets in 2005 was a normal adjustment to the quota phase-out not worth regulating.

Furthermore, if the aim of these extended measures was to protect other countries from Chinese competition after 2005, the results of this study suggest that stronger regulations should have been in place much earlier. By 2005 China was already the most important supplier of textiles and clothing to Western markets. This made it unlikely that temporary quotas on a set of products would bring a trend reversal and significant room for other countries to compete.

9.2 Hypotheses 2 and 3: Preferential Treatment

One result suggested by this study is that nearness to core markets apparently did not have a benign effect on the exports from preferentially treated countries. Thus, Mexico, Turkey as well as Central and Eastern Europe noticed decreasing shares in worldwide exports. The trade created by the MFA and ATC between these countries and the Western markets thus decreased as expected. This result stands in line with previous research (Courran, 2006 & 2009; Gereffi & Frederick, 2010) regarding the immediate years after the ATC´s ending.

However, for Central and Eastern Europe as well as Turkey these processes again seemed to be more a continuing trend since their average annual growth rates were close to 0 percent already before 2005. This suggests that these countries lost their shares in worldwide exports to China even before the ATC´s ending.

The results for Africa, South America, and RoW support the predictions as well. Given their preferential access to core markets they first noticed growth in their worldwide export share but then a decline after 2005. This suggests that they could compete with China until 2005 but not afterwards. Given that these are developing countries, which likely rely on the textile and clothing industry in a Heckscher-Ohlin framework for industrialization, their declining share in worldwide exports become a development issue. Given this situation Hayashi (2005) argued that local governments should look for alternative employment opportunities and receive support from developed countries. Estimating the extent to which that has been the case after 2005 yields new research areas.

However, the growth rates of developing Southern Asian countries did mostly not support the predictions. Even though they faced certain quotas they were overall lesser restricted making a decline in exports after 2005 likely. This expectation came not true especially for Cambodia, Indonesia, and Vietnam. The reason are likely relative factor price movements within Asia. It has been reported that especially countries like Bangladesh, Cambodia, Indonesia, and Vietnam continued offering cheap labor and stable exchange rates, which prompted manufacturers to move there even after the ATC´s ending. Given increased wages in China these countries therefore became an attractive business place. Some researchers even speculated about a fourth shift in the textile and clothing trade from China to these countries (Mehta, 2010; Joarder, Hossain & Hakim, 2010; ANZ Insights Commercial Banking Asia, 2012; Gereffi & Frederick, 2010). Thus, expected results do not need to be set in stone. If more recent data become available developing Southern Asia might play a larger role.

Especially interesting would be an inclusion of Bangladesh in the TiVA database. When measured in gross trade flows it improved its position after 2005. For the reasons mentioned above it thereby became a major textile and clothing provider (Joarder, Hossain & Hakim, 2010; Gereffi and Frederick, 2010). In this study, Bangladesh is included in RoW. Thus, if specific data for Bangladesh were available and the gross trade flows moved relatively in unison with their counterparts in value-added it would be likely that RoW exhibited a larger decline after 2005 while Bangladeshi exports continued to grow. For RoW this would support the predictions even further and make the need for industrial restructuring likely more urgent.

9.3 Hypothesis 4: Concentration and Transshipping

To the authors knowledge this study is the first to test a rising concentration and declining transshipping after 2005. The observation that the Gini coefficient started growing earlier than 2005 is likely tied to China´s growth in worldwide export share. Conversely, other countries noticed decreases in their worldwide exports shares before 2005 resulting equally in the higher concentration. However, the already high Gini coefficient in 1995 suggests a high concentration was not a new phenomenon. The fact that a high Gini coefficient was observed is itself not surprising given that some economies are simply larger and can export more. But the results suggest that the ATC´s ending only increased an already high concentration. If this represented a trend break compared to a high but stable concentration before 1995 as expected or rather a continuing trend remains for further research.

Interestingly, this study did not identify a decline in transshipping. This is surprising given that it was a policy goal of the ATC. Moreover, it does not appear to be a problem at all given that the domestic shares of value-added embodied in gross exports were for all countries too high to justify transshipping. Thus, transshipping might be a lesser problem than previously thought. Alternatively, it might only be a problem for certain specific goods or trade flows but not for others. If this is the case it likely does not show up in the aggregated data used in this study. A third reason for not identifying transshipping might be that it does not show up in the official trade statistics. If document fraud continued to be a problem throughout the period, data to identify transshipping could likely not have been collected in the first place. However,

large scale fraud seems unlikely in the age of continuous controls and trade monitoring. Thus, the suggestion that no transshipping took place seems to some extent justified.

10 Conclusion

10.1 Summary

The world´s economy has seen a rise in trade and economic integration since the late 20th century. However, unlike other sectors the textile and clothing industry remained restricted by import quotas with Western countries granting preferential access to some countries but not to others. The ATC ended this discriminatory practice in 2005 by abolishing import quotas. Previous studies made predictions regarding this liberalization. Follow-up studies however addressed the developments only for few subsequent years. Furthermore, these studies relied on gross trade measures, which do not give a reliable account of worldwide trade due to the double counting of inputs.

Thus, this study aimed to analyze the changing trade patterns in textiles and clothing between 1995 and 2011. To do so it first sketched the history of the trade in textiles and clothing. Based on trade theory and previous studies four hypotheses regarding the likely developments after 2005 were formulated. Mainly China and India as restricted countries were supposed to increase their exports. Developing countries, Mexico, Turkey as well as Central and Eastern Europe having preferential access to Western markets were supposed to notice decreasing exports. However, the nearness of the latter countries to core markets could countervail these processes. The concentration of the trade was predicted to increase and the occurrence of transshipping to decrease.

As a novelty, this study used network analysis and value-added trade data to analyze these hypotheses. The study found that China was the main beneficiary while developing countries, Mexico, Turkey as well as Central and Eastern Europe noticed decreasing exports after 2005. Thus, nearness to core markets appears to have had no benign effect. In contrast to the expectations many processes such as China´s growth began earlier than 2005. Some countries in developing Southern Asia did not lose out to the extent as predicted. The concentration of exports on key countries increased though it was even before 2005 at a high level. Interestingly no occurrence or decline of transshipments could be identified despite it being a goal of the ATC.

It is debatable what kind of practical implications a historical study can give. Nevertheless, this study pointed out some aspects. Given that many processes expected to occur after 2005 began earlier it seems that restricting competitiveness is much harder in practice than in theory. Given that free trade benefits participating nations as motivated in the beginning this question the effectiveness of quotas. Since mainly developing nations seem to have been negatively affected by ending of their quota protection the question of how to promote free trade while at the same time allowing all nations to develop is raised.

10.2 Limitations and Future Research

Of course, this study followed a rigorous approach. Nevertheless, it faced certain limitations, which were already outlined in the data and methodology chapters. The main limitations are summarized below and areas for further research are indicated.

One limitation of network analysis is its descriptive character. As such, it is not able to attribute observed changes to the ending of the ATC or other factors. Especially the recession in 2008 could have influenced the data. How this recession impacted the textile and clothing industry in each country is left for further research. Given that the abolishment of import quotas was the major event in this sector most changes observed can likely be attributed to it.

Interestingly this study suggested that many processes such as the growth of Chinese exports did not begin in 2005 as expected but rather in 2002. Possibly, this development was due to tariffs influencing the trade and certain product-specific developments. To test these ideas detailed product-specific tariff, quota, as well as trade data would be necessary. To provide such data is left for further research. Given that currently trade data in value-added is hard to harmonize at a product-specific level further research could especially help here. Likewise, new datasets should include more countries and more years given that especially Bangladesh is important in exporting textiles and clothing today.

Moreover, it remains a drawback of the study that it had to rely on nominal trade values. Therefore, it had to operate in percentages. Because of the usage of nominal values, it would prima facie be possible for a country to increase its exports but notice decreases in its worldwide share if the other countries increase their exports by much more. Thus, this study cannot exclude the occurrence of such developments. Further research could thus be directed at the creation of real value-added trade data.

Using real trade data would also make an analysis of the price developments of textiles and clothing possible. As stated in the theoretical background trade liberalization should be accompanied by decreasing prices, which increase the consumer surplus. However, nominal trade data prohibits the analysis of prices. Thus, with real trade data price decreases could be analyzed and the increased consumer surplus estimated.

Lastly, network analysis provided a good method to analyze worldwide trade flows. Its benefit is that it can consider all trade flows in unison, which was not possible for previous studies and warrants further applications in trade research. Further applications could also include the usage of the different centrality measures as outlined. Closeness and betweenness centrality would provide interesting possibilities for trade analysis especially in conjunction with product-specific value-added trade data. If product-specific trade data becomes available, network analysis could e.g. be used to trace production chains across countries. Thereby researchers could estimate in which intermediate goods each country is relatively specialized and where thus upgrading possibilities exist. Overall, network analysis and value-added trade data seem a promising combination for future research, which is only at its beginning.

References

Amador, J. & Cabral, S. (2016). Networks of Value-added Trade, The World Economy, pp. 1-23

ANZ Insights Commercial Banking Asia (2012). Textile and Garment Industry Market Update, Australia and New Zealand Banking Group, Available Online: http://www.anzbusiness.com/content/dam/anz-superregional/Textiles%26GarmentIndustryUpdate.pdf (accessed 20 March 2017)

Appelbaum, R. P. (2005). TNCs and the removal of textiles and clothing quotas, UNCTAD/ITE/IIA/2005/1, Geneva: United Nations Publication

Badham, J. M. (2013). Commentary: measuring the shape of degree distributions, Network Science, vol. 1, no. 2, pp. 213-225

Baldwin, R. & Wyplosz, C. (2015). The Economics of European Integration, 5th edn, London: McGraw Hill Education

Buelens, C. (2005). Trade Adjustments following the Removal of Textile and Clothing Quotas, Centre for European Policy Studies (Working Paper), Iss. 222, Available Online: https://www.ceps.eu/system/files/book/1221.pdf (Accessed 20 March 2017)

Curran, L. (2006). From the container to the high street – does trade liberalisation really bring benefits to EU consumers?, Journal of Fashion Marketing and Management: An International Journal, Vol. 10, Iss. 4, Available Online: http://dx.doi.org/10.1108/jfmm.2006.28410daa.001 (Accessed 18 March 2017)

Curran, L. (2009). The EU clothing market in 2008 – opening the floodgates?, Journal of Fashion Marketing and Management: An International Journal, Vol. 13, Iss. 3, p. 305-310

Din, M. U. & Abbas, K. (2000). The Uruguay Round Agreement and Pakistan's Trade in Textiles and Clothing, South Asia Economic Journal, vol. 1, no. 1, pp. 101-115

Ernst, C., Ferrer, A. H. & Zult, D. (2005). The end of the Multi-Fibre Arrangement and its implication for trade and employment, International Labor Organization Employment Strategy Paper, vol. 16

European Commission (2005). EU – China textile agreement, 06/10/2005, Available Online: http://europa.eu/rapid/press-release_MEMO-05-201_en.htm (Accessed 15 March 2017)

Evans, C. L. & Harrigan, J. (2003). Distance, time, and specialization, National Bureau of Economic Research, no. w9729, Available Online: http://www.nber.org/papers/w9729 (Accessed 20 March 2017)

Fagiolo, G., Reyes, J. & Schiavo, S. (2008). On the topological properties of the world trade web: A weighted network analysis, Physica A: Statistical Mechanics and its Applications, vol. 387, no. 15, pp. 3868-3873

Feinstein, C. H. & Thomas, M. (2002). Making History Count – A primer in quantitative methods for historians, Cambridge: Cambridge University Press

Francois, J. F., Glismann, H. H. & Spinanger, D. (2000). The cost of EU trade protection in textiles and clothing, Kiel Working Paper, Vol. 997, Kiel Institute of World Economics

Fruchterman, T. M. & Reingold, E. M. (1991). Figure drawing by force-directed placement, Software: Practice and experience, vol. 21, no. 11, pp. 1129-1164

Fung, K. C. (1998). Accounting for Chinese trade: some national and regional considerations, in R. Baldwin, R. Lipsey & J. D. Richards (eds), Geography and ownership as bases for economic accounting, University of Chicago Press, pp. 173-204

Gephi (n.d.). Gephi – The Open Figure Viz Platform, Available Online: https://gephi.org (Accessed 30 March 2017)

Gereffi, G. (1999). International trade and industrial upgrading in the apparel commodity chain, Journal of international economics, vol. 48, no. 1, pp. 37-70

Gereffi, G. & Frederick, S. (2010). The global apparel value chain, trade and the crisis: challenges and opportunities for developing countries, in O. Cattaneo, G. Gereffi & C. Staritz (eds), Global value chains in a postcrisis world: A development perspective, World Bank, pp. 157-208

Gibson, H., Faith, J., & Vickers, P. (2013). A survey of two-dimensional figure layout techniques for information visualization, Information visualization, vol. 12, no. 3-4, pp. 324-357

Golbeck, J. (2013). Analyzing the Social Web, (e-book) Waltham: Morgan Kaufmann / Elsevier, Available Online: https://www-dawsonera-com.ludwig.lub.lu.se/readonline/9780124058569 (Accessed 25 March 2017)

Hayashi, M. (2005). Weaving a New World: Realizing development gains in a post-ATC trading system, Geneva: United Nations Publications, UNCTAD/DTC/TNCD/2005/3, Available Online: http://unctad.org/en/docs/ditctncd20053_en.pdf (Accessed 20 March 2017)

Heymann, S. (2014). Gephi, in R. Alhajj & J. Rokne (eds), Encyclopedia of social network analysis and mining, New York: Springer, pp. 612-625

Johnson, R. C. (2014). Five facts about value-added exports and implications for macroeconomics and trade research, The Journal of Economic Perspectives, vol. 28, no. 2, pp 119-142

Johnson, R. C. & Noguera, G. (2012). Accounting for intermediates: Production sharing and trade in value added, Journal of international Economics, vol. 86, no. 2, pp. 224-236

Keenan, M., Satias, O. & Kroener, I. (2004). A dying industry – or not? The future of the European textiles and clothing industry, Foresight, Vol. 5, Iss. 5, pp. 313-322

Krugman, P. & Obstfeld, M. (2009). International economics: Trade and policy, 8th edition, New York: Peasron

Lee, T. & Mokhtarian, P. (2004). An Input-Output Analysis of the Relationships between Communications and Travel for Industry. Institute of Transportation Studies, Working Paper Series, UC Davis, Available Online: https://ideas.repec.org/p/cdl/uctcwp/qt55x4h2r2.html (Accessed 25 March 2017)

Martin, W., Bhattasali, D. & Li, S. (2004). China´s Accession to the WTO: Impacts on China, in K. L. Krumm & H. J. Kharas (eds), *East Asia integrates: A trade policy agenda for shared growth*, Washington: World Bank Publications

Mehta, M. (2010). Quiet Migration: Apparel and Textile Companies Head Out of China, *Apparel Magazine*, 9 June, Available Online: http://apparel.edgl.com/news/Quiet-Migration--Apparel-and-Textile-Companies-Head-Out-of-China63714 (Accessed 27 March 2017)

Miller, R. E. & Blair, P. D. (2009). Input-Output Analysis Foundations and Extensions, 2nd edition, Cambridge: Cambridge University Press

Naumann (2004). Implications of the Removal of Quotas in Textiles and Clothing Trade, tralac Trade Brief, no. 8, Available Online: http://www.tralac.org/wp…/Implications_of_the_Removal_of_Quotas.doc (Accessed 25 March 2017)

Naumann, E. (2006). The Multifibre Agreement – WTO Agreement on Textiles and Clothing, tralac (working paper), Available Online: http://www.tralac.org/wp-content/blogs.dir/12/files/2011/uploads/20060518_multifibre_naumann.pdf (Accessed 25 March 2017)

Newman, M. (2010). Networks – An Introduction, Oxford: Oxford University Press

Nordås, H. K. (2004). The global textile and clothing industry post the agreement on textiles and clothing, World Trade Organization Discussion Paper; no. 5, Available Online: http://iiu.oie.go.th/Textile/Textile%20Document%20Library/global_agreement.pdf (Accessed 25 March 2017)

OECD 1 (n.d.). Trade in Value Added, Available Online: http://www.oecd.org/sti/ind/measuringtradeinvalue-addedanoecd-wtojointinitiative.htm (Accessed 19 March 2017)

OECD 2 (n.d.). Glossary of Statistical Terms: Basic Prices, Available Online: https://stats.oecd.org/glossary/detail.asp?ID=189 (Accessed 25 March 2017)

OECD 3 (n.d.). Trade in Value-Added Industry Coverage, Available Online: http://www.oecd.org/sti/ind/tiva/TiVA_2016_Industries.pdf (Accessed 25 March 2017)

OECD 4 (n.d.). STAN Input-Output Total, Domestic and Imports, Available Online: http://stats.oecd.org/oecdstat_metadata/showmetadata.ashx?dataset=stan_io_tot_dom_imp (Accessed 27 March 2017)

OECD (2016). Trade in Value Added (TiVA) database, Available Online: http://stats.oecd.org/Index.aspx?DataSetCode=TIVA_2016_C1 (Accessed 5 April 2017)

OECD (2017). Trade in Value-Added Indicators definitions, Available Online: http://www.oecd.org/sti/ind/tiva/TIVA_2016_Definitions.pdf (Accessed 2 April, 2017)

OECD-WTO (2012). Trade in Value-Added: Concepts, Methodologies and Challenges (Joint OECT-WTO Note), Available Online: http://www.oecd.org/sti/ind/49894138.pdf (Accessed 20 March 2017)

Smith, A., Pickles, J., Begg, R., Roukova, P. & Buček, M. (2005). Outward processing, EU enlargement and regional relocation in the European textiles and clothing industry: reflections on the European Commission's communication on 'the future of the textiles and clothing sector in the enlarged European Union, European Urban and Regional Studies, vol. 12, no. 1, pp. 83-91

Rhoades, S. A. (1993). The Herfindahl-Hirschman Index, Federal Reserve Bulletin, vol. 79, p. 188-189

Shen, D. (2008). What's happening in China's textile and clothing industries?, Clothing and Textiles Research Journal, vol. 26, no. 3, pp. 203-222

Schenk, C. R. (2011). International economic relations since 1945, Oxon: Taylor & Francis

Sinn, H. W. (2006). The pathological export boom and the bazaar effect: how to solve the German puzzle, The World Economy, vol. 29, no. 9, pp. 1157-1175

Smith, D. A. & White, D. R. (1992). Structure and dynamics of the global economy: Network analysis of international trade 1965-1980, Social forces, pp. 857-893

Staritz, C. (2011). Making the Cut? Low-Income Countries and the Global Clothing Value Chain in a Post-Quota and Post-Crisis World, (e-book) Washington, D.C.: The World Bank, Available Online: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2011/01/07/000334955_20110107051736/Rendered/PDF/588510PUB0Maki101public10BOX353816B.pdf (Accessed 15 March 2017)

Timmer, M. P., Erumban, A. A., Los, B., Stehrer, R. & de Vries, G. J. (2014). Slicing up global value chains, The Journal of Economic Perspectives, vol. 28, no. 2, pp. 99-118

United Nations (1999). Handbook of Input-Output Table Compilation and Analysis, Department of Social and Statistics Affiars, Statistics Division, Studies in Methods, Handbook of National Accounting, Series 7, no. 74, Available Online: https://unstats.un.org/unsd/publication/SeriesF/SeriesF_74E.pdf (Accessed 28 March 2017)

van Marrewijk, C. (2012). International Economics – Theory, Application, and Policy, 2nd edn, Oxford: University Press

World Integrated Trade Solutions (WITS) (n.d.). World Bank Imports, Exports and Mirror Data with UN Comtrade http://wits.worldbank.org/wits/wits/witshelp/Content/Data_Retrieval/T/Intro/B2.Imports_Exports_and_Mirror.htm

World Trade Organization 1 (n.d.). Principles of the trading system, Available Online: https://www.wto.org/english/thewto_e/whatis_e/tif_e/fact2_e.htm (Accessed 19 March 2017)

World Trade Organization 2 (n.d.). The GATT Years: From Havanna to Marrakesh, Available Online: https://www.wto.org/english/thewto_e/whatis_e/tif_e/fact4_e.htm (Accessed 19 March 2017)

World Trade Organization 3 (n.d.). The Case for Open Trade https://www.wto.org/english/thewto_e/whatis_e/tif_e/fact3_e.htm

World Trade Organization 4 (n.d.). The 128 countries that had signed GATT by 1994, Available Online: https://www.wto.org/english/thewto_e/gattmem_e.htm (Accessed 19 March 2017)

World Trade Organization 5 (n.d.). What is the World Trade Organization?, Available Online: https://www.wto.org/english/thewto_e/whatis_e/tif_e/fact1_e.htm (Accessed 19 March 2017)

World Trade Organization 6 (n.d.). The Uruguay Round, Available Online: https://www.wto.org/english/thewto_e/whatis_e/tif_e/fact5_e.htm (Accessed 19 March 2017)

World Trade Organization 7 (n.d.). WTO Member states, Available Online: https://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm (Accessed 19 March 2017)

World Trade Organization 8 (n.d.). Textiles: back in the mainstream, Available Online: https://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm5_e.htm (Accessed 19 March 2017)

World Trade Organization 9 (n.d.) Textiles Monitoring Body (TMB) The Agreement on Textiles and Clothing, Available Online: https://www.wto.org/english/tratop_e/texti_e/texintro_e.htm#(ATC) (Accessed 19 March 2017)

World Trade Organization (2001). Comprehensive Report of the Textiles Monitoring Body to the Council for Trade in Goods on the Implementation of the Agreement on Textiles and Clothing During the Second Stage of the Integration Process, G/L/459

WIOD (n.d.). World Input-Output Tables, Available Online: http://www.wiod.org/database/wiots16 (Accessed 20 March 2017)

Appendix A: Changes in Exports after 2005

Table 1: Predicted changes by Nordas (2004) of the shares in European and American textile and clothing imports after the ATC's ending. – indicates that no value was given (own representation based on Nordas, 2004)

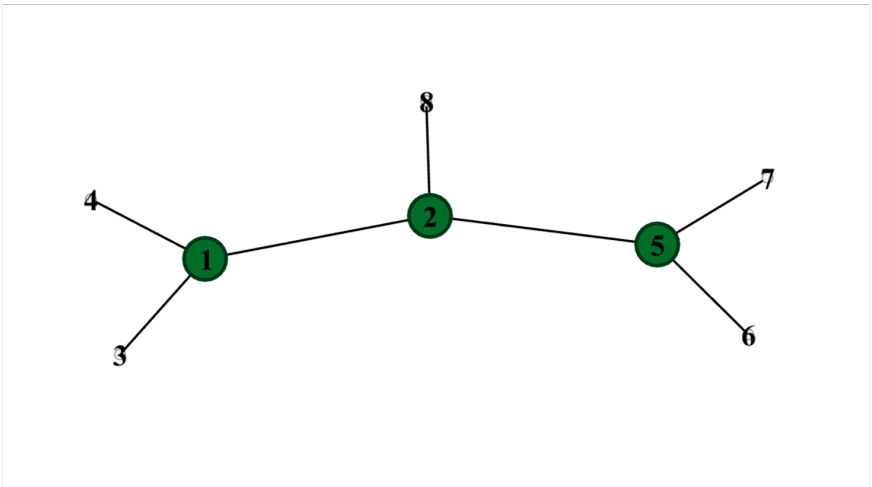
For European Union	Textiles			Clothing		
Share by ... in all exports to the EU	Before	After	Change	Before	After	Change
Bangladesh	-	3%	-	3%	4%	1%
China	10%	12%	2%	18%	29%	11%
Hong Kong	-	-	-	6%	6%	0%
India	9%	11%	2%	6%	9%	3%
Indonesia	4%	5%	1%	3%	3%	0%
Korea	5%	4%	-1%	-	-	-
Morocco	-	-	-	5%	4%	-1%
Other Central and Eastern Europe	6%	6%	0%	9%	6%	-3%
Other North Africa	3%	3%	0%	6%	5%	-1%
Poland	-	-	-	5%	4%	-1%
Rest of the World	36%	34%	-2%	30%	24%	-6%
Sub-Saharan Africa	3%	-	-	-	-	-
Taiwan	3%	3%	0%	-	-	-
Turkey	13%	12%	-1%	9%	6%	-3%
USA, Canada	8%	7%	-1%	-	-	-
For United States of America	Textiles			Clothing		
Share by ... in all exports to the USA	Before	After	Change	Before	After	Change
European Union	16%	14%	-2%	5%	-	-
Bangladesh	-	-	-	4%	2%	-2%
China	11%	18%	7%	16%	50%	34%
Hong Kong	6%	5%	-1%	9%	6%	-3%
India	5%	5%	0%	4%	15%	11%
Indonesia	3%	3%	0%	4%	2%	-2%
Japan	3%	3%	0%	-	-	-
Korea	6%	6%	0%	-	-	-
Mexico	13%	11%	-2%	10%	3%	-7%
Philippines	-	-	-	4%	2%	-2%
Rest of Americas	10%	8%	-2%	16%	5%	-11%
Rest of the World	20%	21%	1%	24%	10%	-14%
Sri Lanka	-	-	-	-	2%	-
Taiwan	7%	6%	-1%	4%	-	-
Thailand	-	-	-	-	3%	-

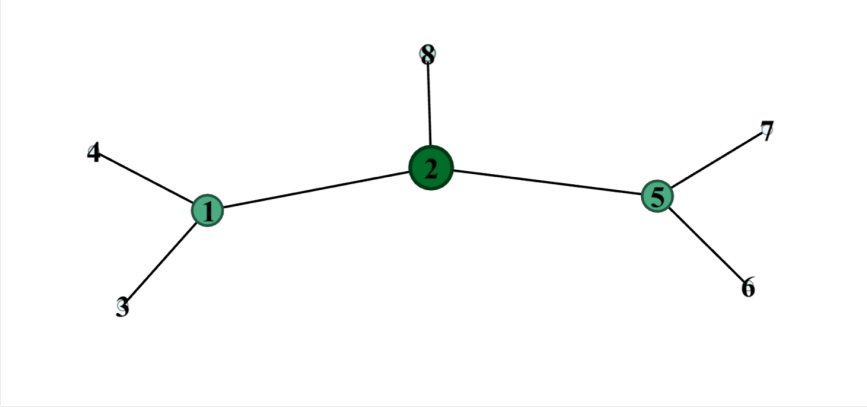
Appendix B: TiVA Country Coverage

Table 2: Country coverage of the TiVA database and the regional grouping in this study (based on OECD 1, n.d., own grouping and representation)

Northern Europe	Central and Eastern Europe	Southern Asia Developed	East Asia
Austria	Bulgaria	Hong Kong	Japan
Belgium	Croatia	Singapore	Korea
Denmark	Czech Republic	Taiwan	
Finland	Estonia		Africa
France	Hungary	Southern Asia Developing	Morocco
Germany	Latvia	Brunei Darussalam	South Africa
Iceland	Lithuania	Cambodia	Tunisia
Ireland	Poland	Indonesia	
Luxembourg	Romania	Malaysia	South America
Netherlands	Slovak Republic	Philippines	Argentina
Norway	Slovenia	Thailand	Brazil
Sweden		Vietnam	Chile
Switzerland	Individual Countries		Colombia
United Kingdom	USA	Other Developed Countries	Costa Rica
	China	Australia	Peru
Southern Europe	India	Canada	
Cyprus	Italy	Israel	
Greece	Mexico	New Zealand	
Malta	Rest of the World (RoW)	Russia	
Portugal	Turkey	Saudi Arabia	
Spain			

Appendix C: Centrality Measures





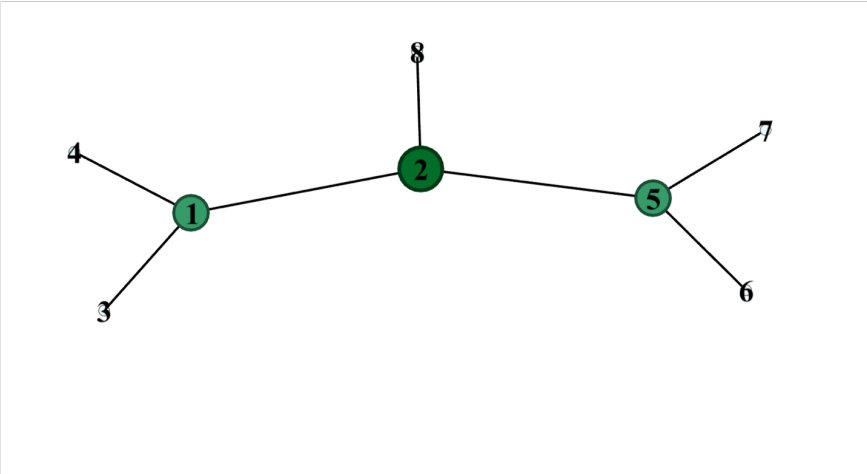


Figure 10: A representation of which nodes are most central using degree, closeness, and betweenness centrality in descending order. Greener and larger nodes indicate a higher centrality. Using degree centrality nodes 1, 2, and 5 are most central given that they are connected to most edges. Only node 2 has however the highest closeness centrality. As easily seen from the graph it is on average closest to all other nodes. Node 2 has similarly also the highest betweenness centrality by being most central in the network. Taking node 2 away would result in its breakdown (own representation)

Appendix D: Core and Non-Core Markets

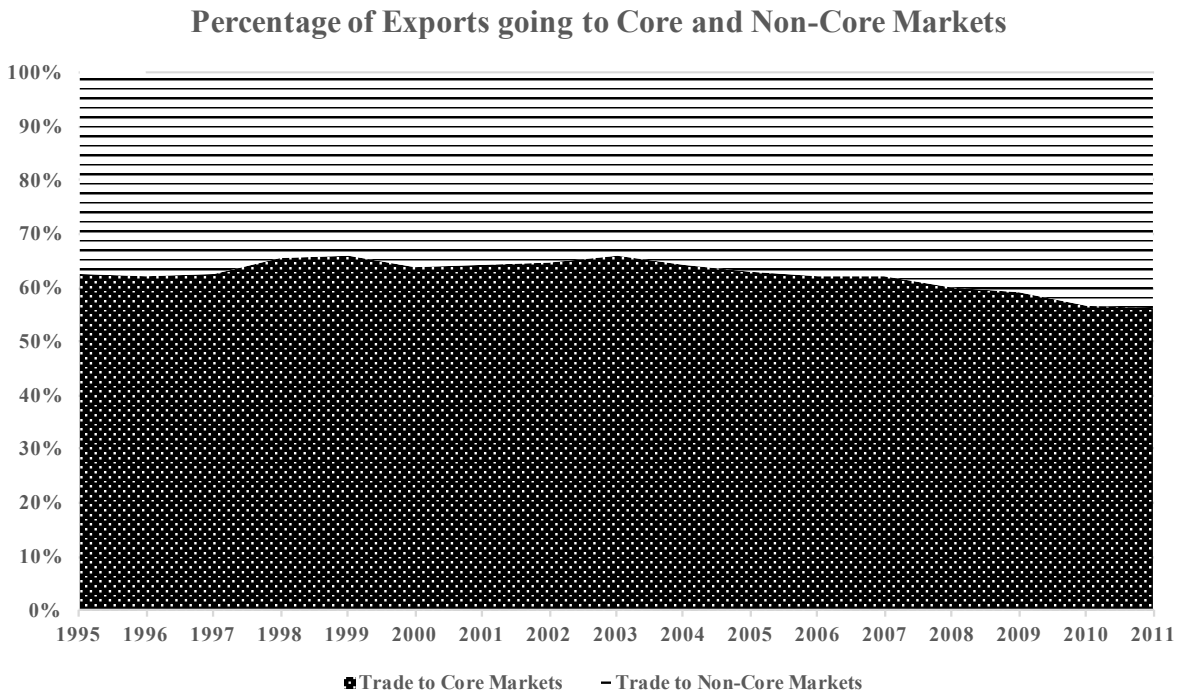


Figure 11: Yearly percentage of trade going to core and non-core markets (own calculations and representation)

Appendix E: Value-Added in Gross Exports

Table 3: Regional shares of value-added embodied in gross exports including their average annual growth rates (own calculations and representation)

Share Domestic Value-Added in Gross Exports	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average Annual Growth Rate 1995-2011	Average Annual Growth Rate 1995-2004	Average Annual Growth Rate 2005-2011
Average	73%	73%	72%	71%	72%	69%	69%	69%	70%	70%	69%	68%	68%	68%	70%	69%	68%	-0,39%	-0,58%	0,14%
Africa	74%	74%	73%	69%	69%	67%	65%	66%	67%	68%	65%	65%	64%	63%	68%	67%	63%	-0,77%	-1,28%	0,19%
Central and Eastern Europe	67%	67%	65%	62%	66%	63%	61%	62%	62%	62%	62%	61%	62%	63%	66%	65%	62%	-0,23%	-0,92%	0,68%
China	61%	63%	63%	62%	62%	63%	64%	63%	66%	68%	69%	71%	74%	75%	76%	74%	74%	1,45%	0,86%	1,01%
East Asia	85%	85%	84%	83%	84%	82%	81%	81%	80%	77%	77%	75%	74%	70%	74%	71%	70%	-1,31%	-0,92%	-1,46%
India	90%	91%	91%	91%	90%	90%	89%	88%	88%	85%	85%	84%	85%	81%	84%	81%	80%	-0,82%	-0,56%	-0,90%
Italy	83%	84%	83%	82%	82%	80%	80%	80%	79%	78%	77%	75%	75%	75%	77%	74%	73%	-0,83%	-0,72%	-0,66%
Mexico	68%	68%	67%	63%	61%	61%	63%	63%	64%	64%	63%	59%	62%	62%	61%	57%	63%	-0,69%	-0,89%	-0,46%
Northern Europe	69%	69%	68%	67%	68%	66%	66%	67%	67%	67%	66%	64%	64%	64%	66%	66%	64%	-0,42%	-0,40%	0,02%
Other Developed Countries	77%	79%	78%	78%	78%	77%	75%	75%	75%	74%	75%	73%	73%	73%	75%	73%	72%	-0,49%	-0,58%	-0,31%
Rest of the World	71%	72%	72%	74%	75%	73%	74%	75%	75%	76%	77%	77%	78%	78%	79%	79%	80%	0,72%	0,69%	0,60%
South America	87%	87%	86%	85%	85%	85%	84%	83%	83%	83%	83%	83%	81%	81%	83%	83%	82%	-0,37%	-0,57%	-0,06%
Southern Asia Developed	65%	66%	67%	70%	71%	66%	70%	70%	69%	66%	67%	65%	64%	60%	61%	57%	55%	-1,02%	0,42%	-3,04%
Southern Asia Developing	69%	70%	66%	65%	66%	63%	65%	62%	68%	68%	64%	61%	65%	63%	67%	66%	66%	-0,24%	-0,45%	1,05%
Southern Europe	72%	72%	71%	70%	70%	66%	65%	66%	69%	69%	67%	67%	67%	67%	72%	73%	73%	0,01%	-0,86%	1,79%
Turkey	91%	91%	90%	90%	90%	85%	84%	84%	83%	83%	80%	82%	80%	80%	80%	79%	77%	-1,05%	-1,27%	-0,65%
USA	85%	85%	84%	84%	83%	82%	83%	83%	81%	82%	81%	80%	82%	82%	85%	83%	82%	-0,16%	-0,43%	0,60%

Appendix F: Regional Out-Strength of Worldwide Exports

Table 4: The following tables show the yearly regional out-strength and thus share in worldwide exports (own calculations and representation)

Region	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Africa	1,46%	1,46%	1,35%	1,73%	1,74%	1,55%	1,60%	1,65%	1,67%	1,59%
Central and Eastern Europe	3,94%	3,98%	3,69%	3,65%	3,48%	3,52%	3,82%	3,88%	3,90%	4,07%
China	8,78%	10,11%	12,44%	11,55%	11,97%	13,44%	14,24%	15,73%	17,65%	19,51%
East Asia	8,74%	7,51%	7,00%	6,73%	7,07%	7,20%	6,48%	5,51%	4,74%	4,06%
India	3,19%	3,22%	3,35%	3,25%	3,51%	3,96%	3,76%	3,99%	3,77%	3,82%
Italy	13,14%	14,07%	12,69%	12,35%	11,58%	10,73%	11,74%	11,40%	11,13%	10,91%
Mexico	1,08%	1,44%	1,92%	2,03%	2,34%	2,45%	2,32%	2,20%	2,21%	1,66%
Northern Europe	20,86%	20,22%	18,53%	18,35%	17,83%	15,30%	15,31%	15,44%	15,07%	15,37%
Other Developed Countries	2,89%	3,11%	3,20%	3,08%	3,24%	3,12%	3,14%	2,84%	2,56%	2,50%
Rest of the World	6,14%	5,32%	5,45%	8,34%	7,97%	9,54%	9,59%	9,84%	12,15%	11,92%
South America	2,39%	2,39%	2,32%	2,06%	1,98%	2,29%	2,35%	2,09%	2,07%	2,34%
Southern Asia Developed	5,86%	5,59%	5,69%	5,00%	5,13%	4,78%	4,34%	3,76%	2,96%	2,71%
Southern Asia Developing	7,31%	6,71%	6,21%	5,63%	6,45%	6,98%	6,25%	5,89%	5,47%	5,29%
Southern Europe	5,21%	5,53%	5,24%	5,38%	5,37%	4,76%	4,97%	5,15%	5,20%	4,95%
Turkey	3,31%	3,31%	3,95%	3,99%	3,24%	2,97%	3,17%	3,93%	3,79%	3,87%
USA	5,70%	6,04%	6,96%	6,87%	7,11%	7,38%	6,91%	6,68%	5,65%	5,44%

Region	2005	2006	2007	2008	2009	2010	2011
Africa	1,34%	1,39%	1,35%	1,23%	1,37%	1,22%	1,05%
Central and Eastern Europe	3,88%	4,00%	4,08%	4,19%	3,76%	3,44%	3,36%
China	22,41%	26,83%	28,25%	30,43%	31,59%	33,78%	35,75%
East Asia	4,05%	3,64%	3,26%	3,05%	3,19%	3,21%	3,24%
India	4,02%	4,07%	3,95%	3,94%	4,23%	4,77%	4,54%
Italy	10,08%	9,89%	9,91%	9,86%	8,81%	8,18%	8,47%
Mexico	1,54%	1,24%	1,02%	0,97%	0,84%	0,77%	0,82%
Northern Europe	13,93%	13,36%	13,23%	12,61%	11,61%	10,39%	10,19%
Other Developed Countries	2,34%	2,03%	1,83%	1,60%	1,49%	1,48%	1,42%
Rest of the World	12,16%	10,89%	11,68%	11,14%	12,78%	12,42%	11,20%
South America	2,46%	2,43%	2,47%	2,32%	1,81%	1,88%	1,79%
Southern Asia Developed	2,38%	2,05%	1,70%	1,57%	1,61%	1,62%	1,53%
Southern Asia Developing	6,26%	5,52%	5,19%	5,27%	5,52%	5,81%	5,87%
Southern Europe	4,35%	4,15%	4,13%	4,19%	4,13%	3,69%	3,62%
Turkey	3,78%	3,82%	3,76%	3,63%	3,49%	3,40%	3,35%
USA	5,03%	4,69%	4,19%	3,99%	3,77%	3,94%	3,79%

Appendix G: Exports to Core Markets

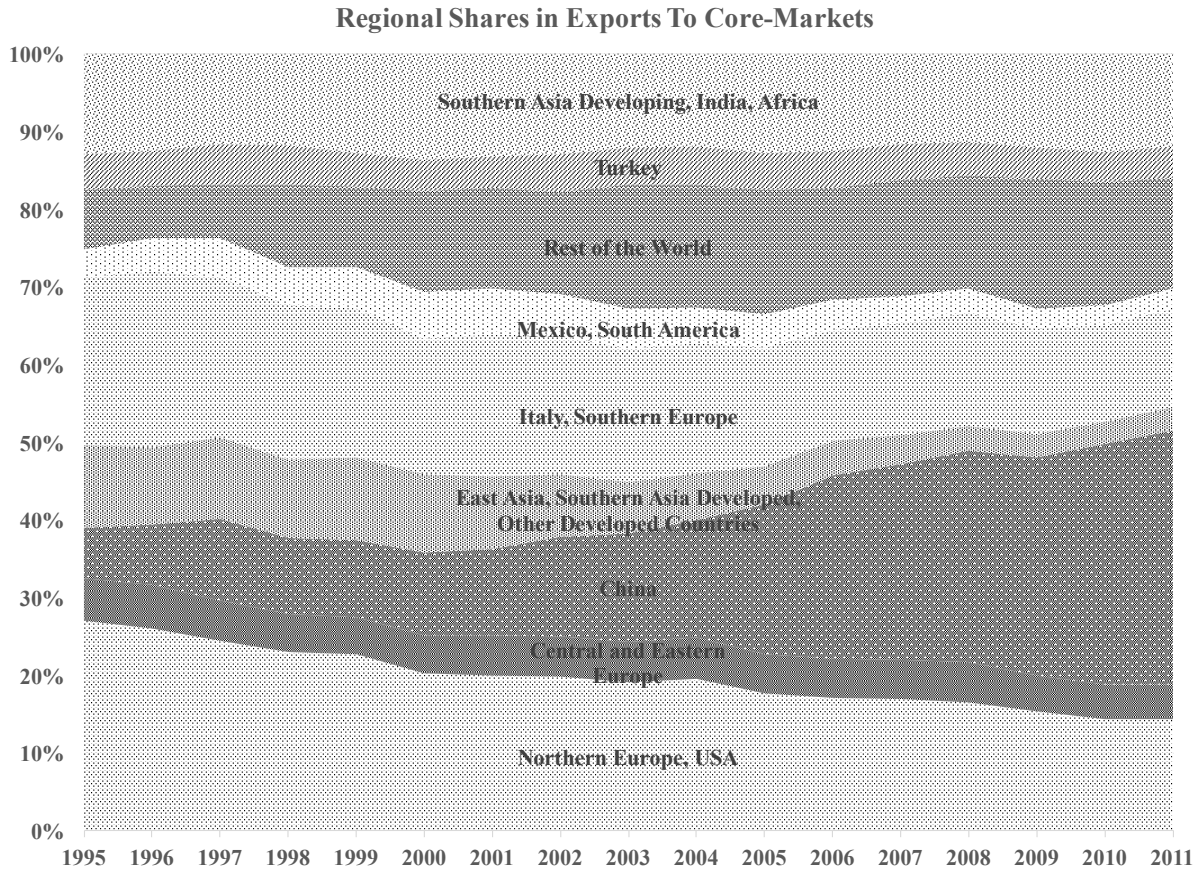


Figure 12: Regional out-strengths and thus shares in worldwide exports to core markets (own calculations and representation)

Table 5: The following tables show the yearly regional out-strength and thus share in exports going to core markets (own calculations and representation)

Region	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Africa	1,74%	2,07%	1,79%	2,42%	2,28%	2,15%	2,23%	2,26%	2,26%	2,17%
Central and Eastern Europe	5,44%	5,54%	5,17%	4,89%	4,72%	4,89%	5,23%	5,20%	5,12%	5,30%
China	6,60%	7,83%	10,49%	9,83%	9,95%	10,69%	11,07%	12,80%	14,06%	15,22%
East Asia	4,11%	3,36%	3,44%	3,53%	3,72%	3,55%	3,25%	2,74%	2,22%	1,91%
India	3,48%	3,28%	3,05%	3,32%	3,65%	4,25%	4,08%	4,24%	3,99%	4,10%
Italy	14,49%	15,05%	13,50%	12,96%	12,29%	11,31%	12,04%	11,42%	10,98%	10,71%
Mexico	1,57%	2,13%	2,85%	2,96%	3,42%	3,72%	3,52%	3,32%	3,25%	2,49%
Northern Europe	25,22%	24,78%	22,90%	21,66%	21,64%	19,24%	18,94%	18,84%	18,01%	18,29%
Other Developed Countries	1,51%	1,31%	1,33%	1,19%	1,20%	1,12%	1,12%	0,92%	0,81%	0,82%
Rest of the World	7,65%	6,69%	6,99%	10,62%	10,39%	13,04%	12,98%	13,20%	15,88%	15,91%
South America	2,03%	2,24%	2,18%	1,92%	1,95%	2,29%	2,28%	2,11%	1,98%	2,11%
Southern Asia Developed	3,65%	3,48%	3,76%	3,17%	3,32%	2,87%	2,60%	2,02%	1,56%	1,42%
Southern Asia Developing	7,71%	7,12%	6,77%	6,08%	6,90%	7,27%	6,88%	6,41%	5,86%	5,59%
Southern Europe	7,14%	7,57%	7,09%	6,93%	6,87%	6,14%	6,26%	6,32%	6,22%	6,06%
Turkey	4,54%	4,52%	5,13%	5,07%	4,27%	3,94%	4,10%	4,87%	4,75%	4,89%
USA	3,12%	3,03%	3,54%	3,46%	3,43%	3,53%	3,43%	3,32%	3,06%	3,02%

Region	2005	2006	2007	2008	2009	2010	2011
Africa	1,84%	1,92%	1,85%	1,72%	1,92%	1,74%	1,49%
Central and Eastern Europe	4,97%	5,07%	5,04%	5,11%	4,67%	4,46%	4,39%
China	19,34%	23,62%	25,20%	27,22%	28,11%	31,07%	32,77%
East Asia	1,46%	1,34%	1,20%	1,02%	1,04%	0,94%	1,09%
India	4,54%	4,64%	4,38%	4,21%	4,60%	5,05%	4,86%
Italy	9,89%	9,47%	9,47%	9,55%	8,43%	7,71%	8,12%
Mexico	2,34%	1,90%	1,54%	1,49%	1,29%	1,22%	1,30%
Northern Europe	17,02%	16,21%	15,80%	15,13%	14,09%	13,01%	13,03%
Other Developed Countries	0,71%	0,62%	0,57%	0,58%	0,55%	0,54%	0,53%
Rest of the World	15,98%	14,41%	15,06%	14,59%	16,64%	15,79%	14,26%
South America	2,06%	1,97%	1,89%	1,65%	1,35%	1,42%	1,30%
Southern Asia Developed	1,06%	0,94%	0,78%	0,65%	0,55%	0,46%	0,50%
Southern Asia Developing	6,43%	6,00%	5,44%	5,47%	5,60%	5,86%	5,63%
Southern Europe	5,28%	4,88%	4,87%	5,02%	5,06%	4,64%	4,63%
Turkey	4,69%	4,65%	4,55%	4,22%	4,00%	3,90%	3,91%
USA	2,39%	2,36%	2,36%	2,37%	2,11%	2,18%	2,19%

Appendix H: Network Data Worldwide Trade

Table 6: Average annual regional out-strength for the periods 1995 – 2004 and 2005 – 2011 for the worldwide trade (own calculations and representation)

1995 - 2004	Africa	Central and Eastern Europe	China	East Asia	India	Italy	Mexico	Northern Europe	Other Developed Countries	Rest of the World	South America	Southern Asia Developed	Southern Asia Developing	Southern Europe	Turkey	USA
Africa	0,00%	0,01%	0,01%	0,03%	0,00%	0,21%	0,00%	0,97%	0,04%	0,09%	0,00%	0,01%	0,01%	0,11%	0,01%	0,08%
Central and Eastern Europe	0,00%	0,26%	0,00%	0,02%	0,00%	0,63%	0,00%	2,38%	0,10%	0,11%	0,00%	0,00%	0,00%	0,07%	0,01%	0,20%
China	0,08%	0,12%	0,00%	3,66%	0,04%	0,36%	0,04%	1,96%	0,99%	0,89%	0,17%	0,67%	0,22%	0,25%	0,04%	4,06%
East Asia	0,04%	0,05%	1,72%	0,69%	0,03%	0,07%	0,09%	0,47%	0,31%	0,58%	0,10%	0,31%	0,62%	0,09%	0,04%	1,30%
India	0,04%	0,04%	0,05%	0,16%	0,00%	0,19%	0,02%	1,01%	0,23%	0,59%	0,03%	0,05%	0,04%	0,13%	0,03%	0,96%
Italy	0,23%	0,92%	0,17%	1,19%	0,02%	0,00%	0,06%	5,15%	0,45%	0,62%	0,09%	0,19%	0,06%	1,08%	0,16%	1,58%
Mexico	0,00%	0,00%	0,00%	0,01%	0,00%	0,00%	0,00%	0,02%	0,05%	0,04%	0,03%	0,00%	0,00%	0,00%	0,00%	1,81%
Northern Europe	0,59%	1,55%	0,13%	0,70%	0,03%	1,49%	0,04%	8,02%	0,55%	1,10%	0,08%	0,17%	0,14%	1,31%	0,18%	1,15%
Other Developed Countries	0,01%	0,03%	0,12%	0,17%	0,02%	0,15%	0,05%	0,28%	0,17%	0,20%	0,02%	0,06%	0,06%	0,03%	0,02%	1,58%
Rest of the World	0,08%	0,13%	0,26%	0,21%	0,02%	0,45%	0,04%	1,94%	0,34%	0,00%	0,13%	0,06%	0,11%	0,23%	0,10%	4,52%
South America	0,01%	0,01%	0,07%	0,05%	0,01%	0,15%	0,06%	0,17%	0,08%	0,31%	0,28%	0,03%	0,03%	0,07%	0,01%	0,91%
Southern Asia Developed	0,04%	0,02%	0,97%	0,21%	0,02%	0,04%	0,04%	0,42%	0,16%	0,61%	0,06%	0,15%	0,57%	0,05%	0,01%	1,20%
Southern Asia Developing	0,03%	0,05%	0,11%	0,63%	0,02%	0,16%	0,04%	1,37%	0,28%	0,38%	0,06%	0,28%	0,18%	0,17%	0,03%	2,44%
Southern Europe	0,11%	0,14%	0,01%	0,12%	0,00%	0,34%	0,05%	2,90%	0,12%	0,29%	0,04%	0,02%	0,01%	0,60%	0,03%	0,38%
Turkey	0,02%	0,11%	0,01%	0,03%	0,00%	0,19%	0,01%	2,08%	0,18%	0,24%	0,01%	0,01%	0,01%	0,13%	0,00%	0,52%
USA	0,04%	0,05%	0,15%	0,68%	0,03%	0,12%	2,04%	0,93%	1,15%	0,59%	0,28%	0,17%	0,13%	0,07%	0,02%	0,00%

2005 - 2011	Africa	Central and Eastern Europe	China	East Asia	India	Italy	Mexico	Northern Europe	Other Developed Countries	Rest of the World	South America	Southern Asia Developed	Southern Asia Developing	Southern Europe	Turkey	USA
Africa	0,00%	0,02%	0,02%	0,02%	0,00%	0,19%	0,01%	0,60%	0,04%	0,08%	0,01%	0,00%	0,01%	0,23%	0,01%	0,05%
Central and Eastern Europe	0,01%	0,48%	0,02%	0,04%	0,00%	0,76%	0,01%	1,84%	0,16%	0,17%	0,00%	0,01%	0,00%	0,11%	0,04%	0,15%
China	0,35%	0,61%	0,00%	5,60%	0,27%	1,12%	0,19%	5,19%	3,21%	2,34%	0,82%	0,65%	0,71%	0,94%	0,27%	7,59%
East Asia	0,01%	0,03%	1,30%	0,23%	0,03%	0,05%	0,05%	0,18%	0,15%	0,28%	0,04%	0,11%	0,45%	0,03%	0,04%	0,40%
India	0,05%	0,10%	0,11%	0,14%	0,00%	0,24%	0,04%	1,16%	0,27%	0,60%	0,10%	0,03%	0,05%	0,23%	0,09%	1,01%
Italy	0,24%	0,95%	0,38%	0,73%	0,04%	0,00%	0,08%	3,41%	0,45%	0,76%	0,05%	0,11%	0,07%	0,98%	0,18%	0,87%
Mexico	0,00%	0,00%	0,01%	0,01%	0,00%	0,01%	0,00%	0,01%	0,07%	0,02%	0,02%	0,00%	0,00%	0,00%	0,00%	0,87%
Northern Europe	0,34%	1,34%	0,26%	0,42%	0,05%	1,29%	0,05%	5,22%	0,47%	0,67%	0,06%	0,12%	0,10%	1,01%	0,13%	0,66%
Other Developed Countries	0,01%	0,02%	0,12%	0,06%	0,03%	0,07%	0,05%	0,14%	0,12%	0,20%	0,01%	0,02%	0,05%	0,02%	0,02%	0,81%
Rest of the World	0,15%	0,35%	0,39%	0,27%	0,11%	0,81%	0,15%	2,85%	0,71%	0,00%	0,22%	0,06%	0,17%	0,56%	0,36%	4,61%
South America	0,02%	0,03%	0,17%	0,05%	0,01%	0,15%	0,13%	0,18%	0,07%	0,36%	0,29%	0,02%	0,04%	0,06%	0,01%	0,57%
Southern Asia Developed	0,01%	0,01%	0,58%	0,07%	0,03%	0,02%	0,03%	0,11%	0,07%	0,19%	0,03%	0,03%	0,33%	0,01%	0,01%	0,26%
Southern Asia Developing	0,03%	0,08%	0,25%	0,53%	0,03%	0,13%	0,10%	0,97%	0,32%	0,39%	0,11%	0,13%	0,21%	0,18%	0,11%	2,05%
Southern Europe	0,13%	0,21%	0,04%	0,08%	0,01%	0,36%	0,08%	1,64%	0,13%	0,31%	0,04%	0,02%	0,02%	0,75%	0,05%	0,17%
Turkey	0,05%	0,26%	0,04%	0,03%	0,01%	0,27%	0,02%	1,71%	0,29%	0,33%	0,01%	0,01%	0,01%	0,33%	0,00%	0,23%
USA	0,02%	0,03%	0,26%	0,37%	0,07%	0,07%	0,98%	0,65%	0,73%	0,59%	0,19%	0,10%	0,08%	0,04%	0,02%	0,00%

Appendix I: Trade Network to Core Markets

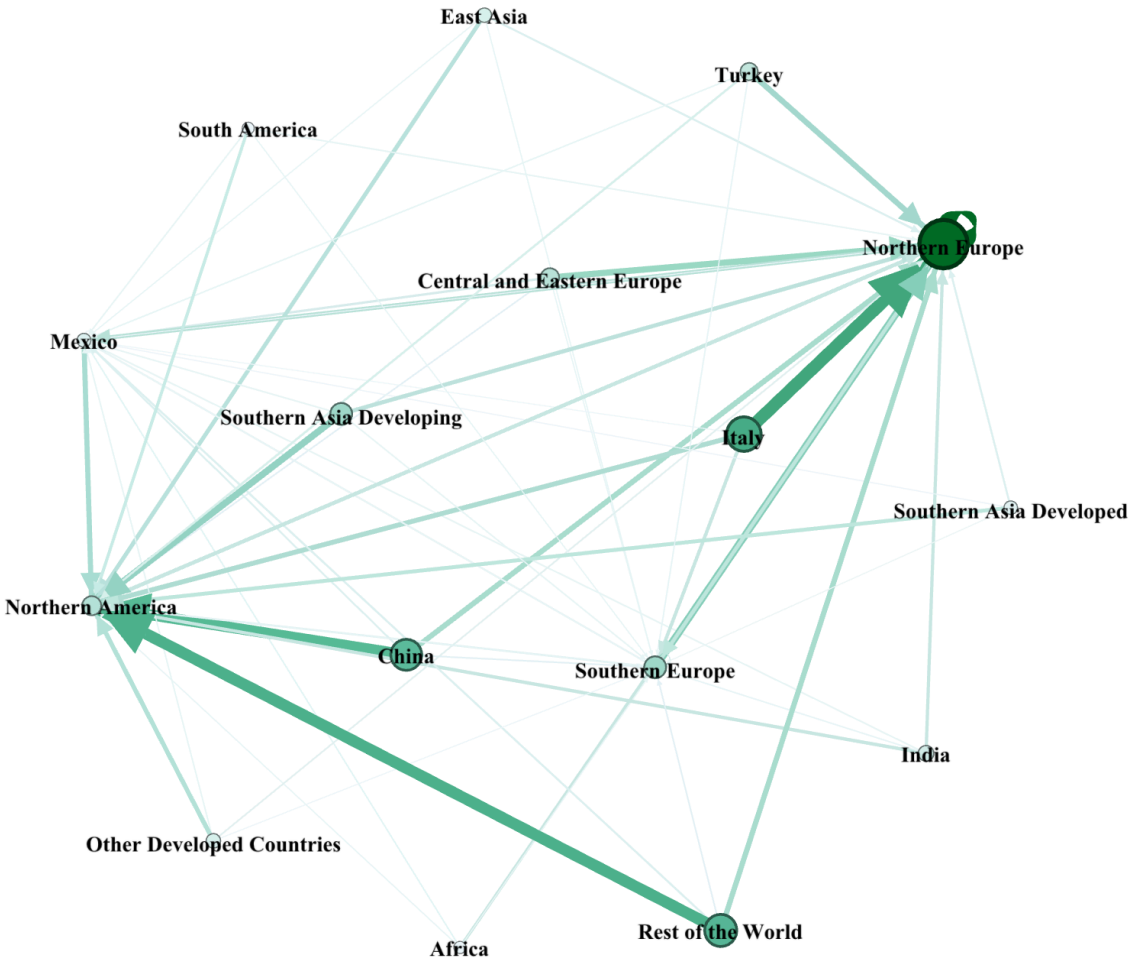


Figure 13: Network portraying the trade to core markets between 1995 and 2004 (own calculations and representation)

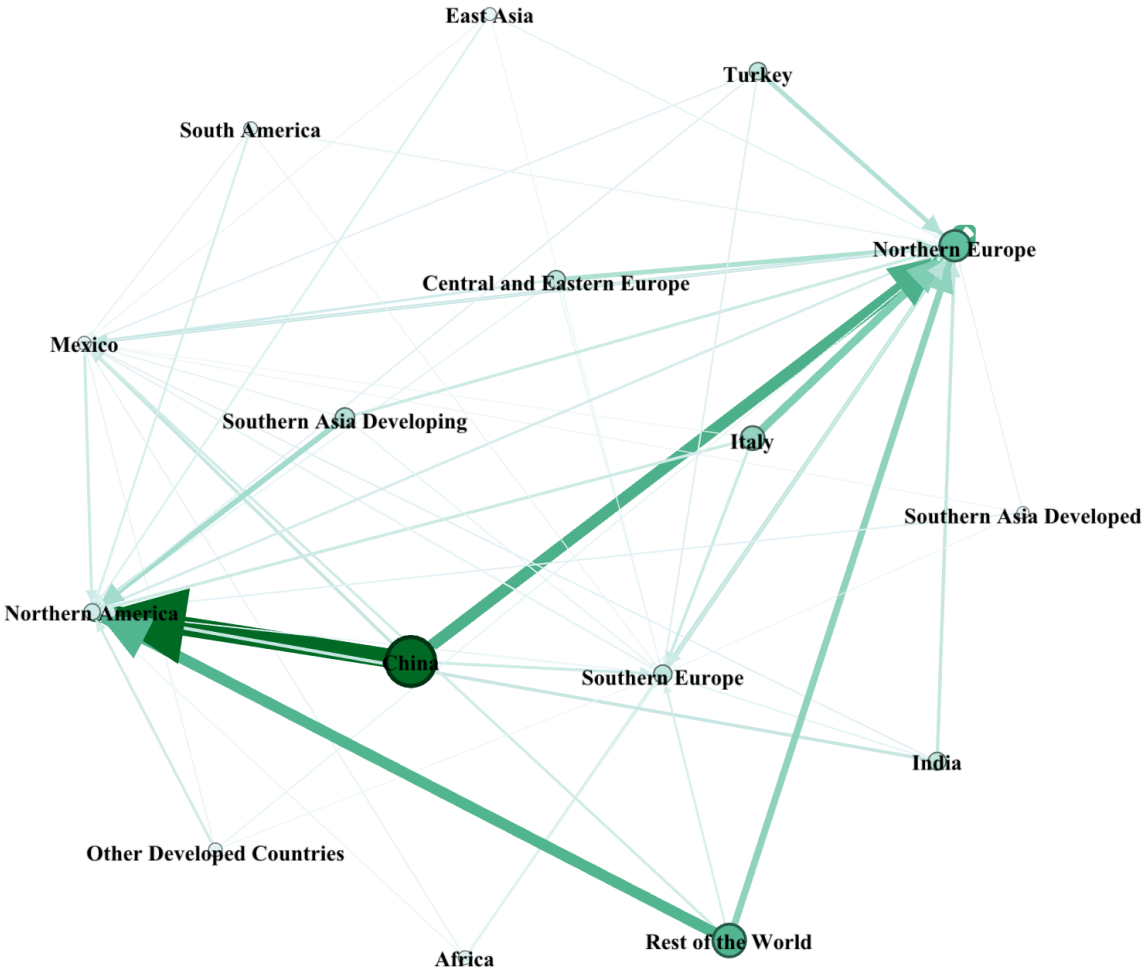


Figure 14: Network portraying the trade to core markets between 2005 and 2011 (own calculations and representation)

Appendix J: Network Density

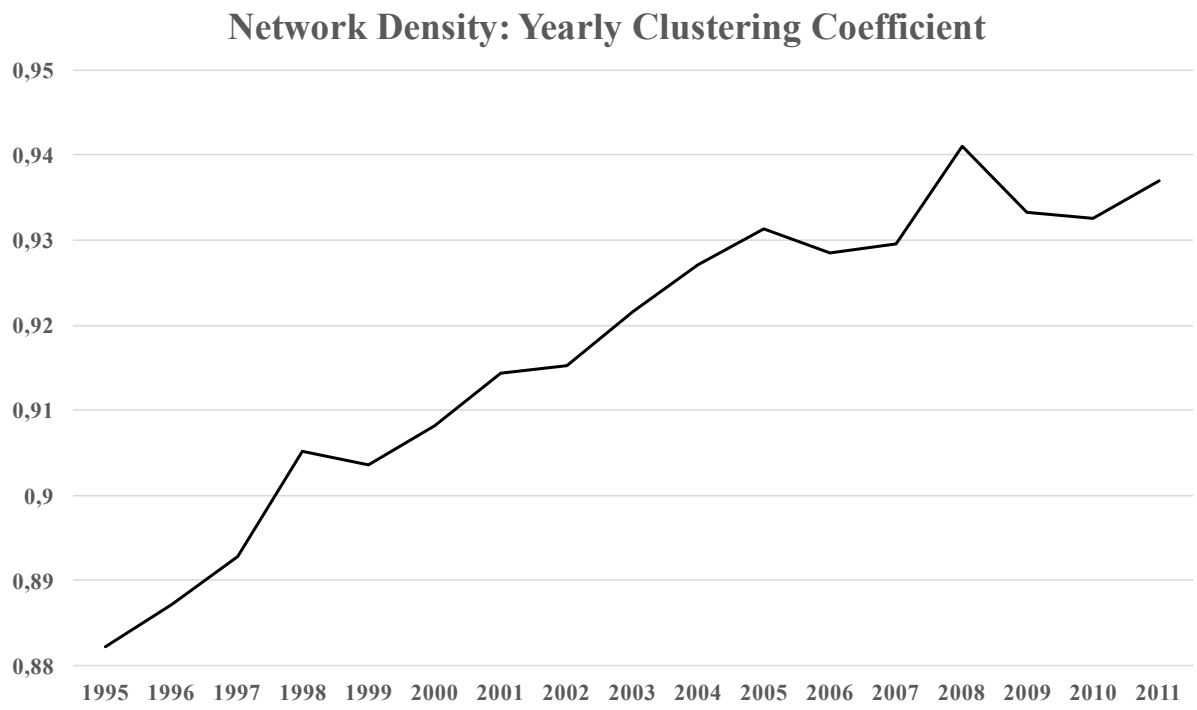


Figure 15: The yearly clustering coefficient of the worldwide trade network (own calculations and representation)

Appendix K: Growth Rates of Exports to Core Markets

Table 7: Average annual growth rates of the shares in exports to core markets (out-strength) for different periods (own calculations and representation)

Region	Average Annual Growth Rates 1995 - 2011	Average Annual Growth Rates 1995-2004	Average Annual Growth Rates 2005-2011	Average Annual Growth Rates 1995 - 2001	Average Annual Growth Rates 2002 - 2011
Africa	-1,30%	2,11%	-2,80%	3,84%	-3,83%
Central and Eastern Europe	-0,82%	-0,32%	-2,50%	-1,62%	-1,83%
China	10,53%	8,23%	8,33%	7,88%	11,64%
East Asia	-9,86%	-6,59%	-6,08%	-1,81%	-10,64%
India	2,61%	3,23%	1,54%	4,28%	1,95%
Italy	-3,78%	-3,61%	-3,92%	-4,27%	-4,06%
Mexico	-4,76%	5,26%	-9,56%	14,19%	-11,48%
Northern Europe	-3,97%	-3,93%	-4,72%	-4,95%	-4,31%
Other Developed Countries	-6,91%	-6,44%	-4,19%	-4,59%	-6,14%
Rest of the World	5,07%	10,62%	-0,21%	12,58%	0,39%
South America	-2,70%	-0,03%	-8,13%	0,96%	-5,67%
Southern Asia Developed	-13,85%	-10,32%	-13,43%	-5,31%	-15,37%
Southern Asia Developing	-1,79%	-2,46%	-1,47%	-1,00%	-1,06%
Southern Europe	-3,13%	-2,31%	-1,62%	-2,98%	-3,51%
Turkey	-0,88%	0,03%	-3,56%	-2,69%	-2,80%
USA	-3,28%	-0,32%	-1,86%	2,01%	-4,69%

Appendix L: Exports to Non-Core Markets

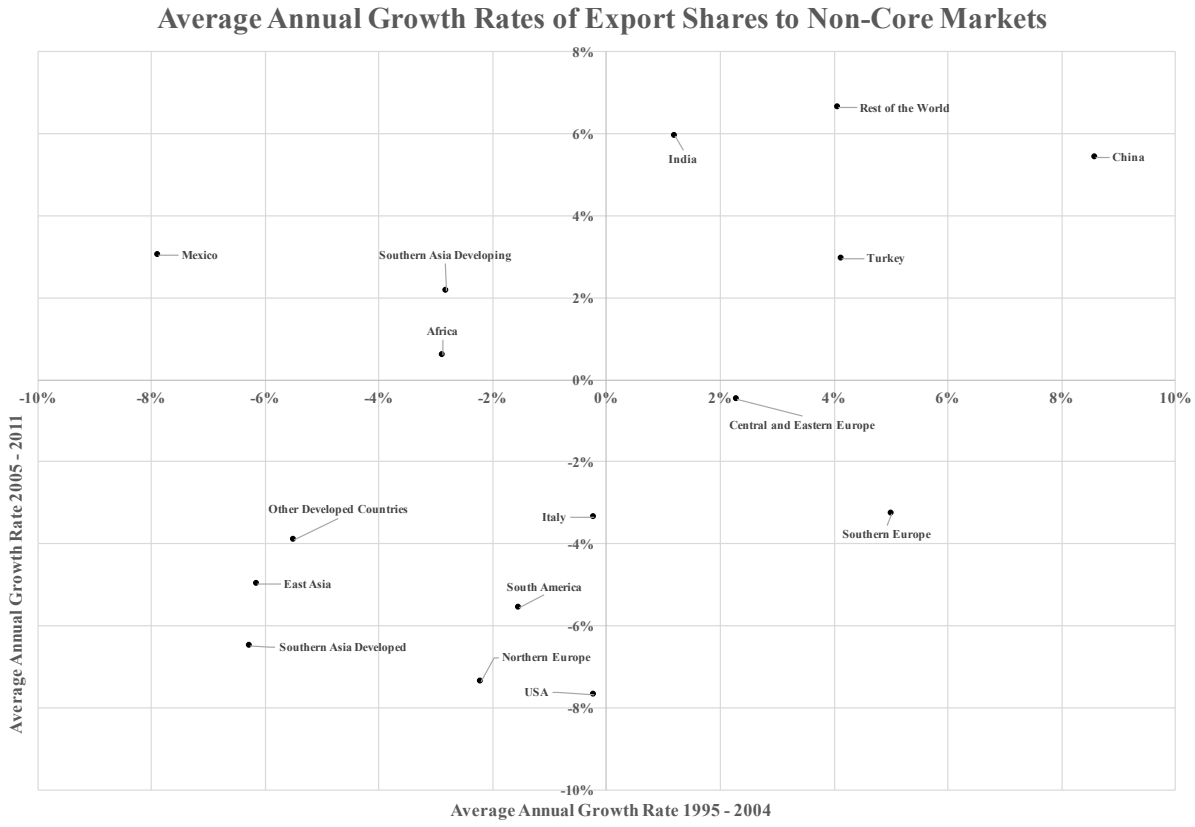


Figure 16: Average annual growth rates of shares in exports (out-strength) going to non-core markets (own calculations and representation)

Appendix M: Developing Southern Asia

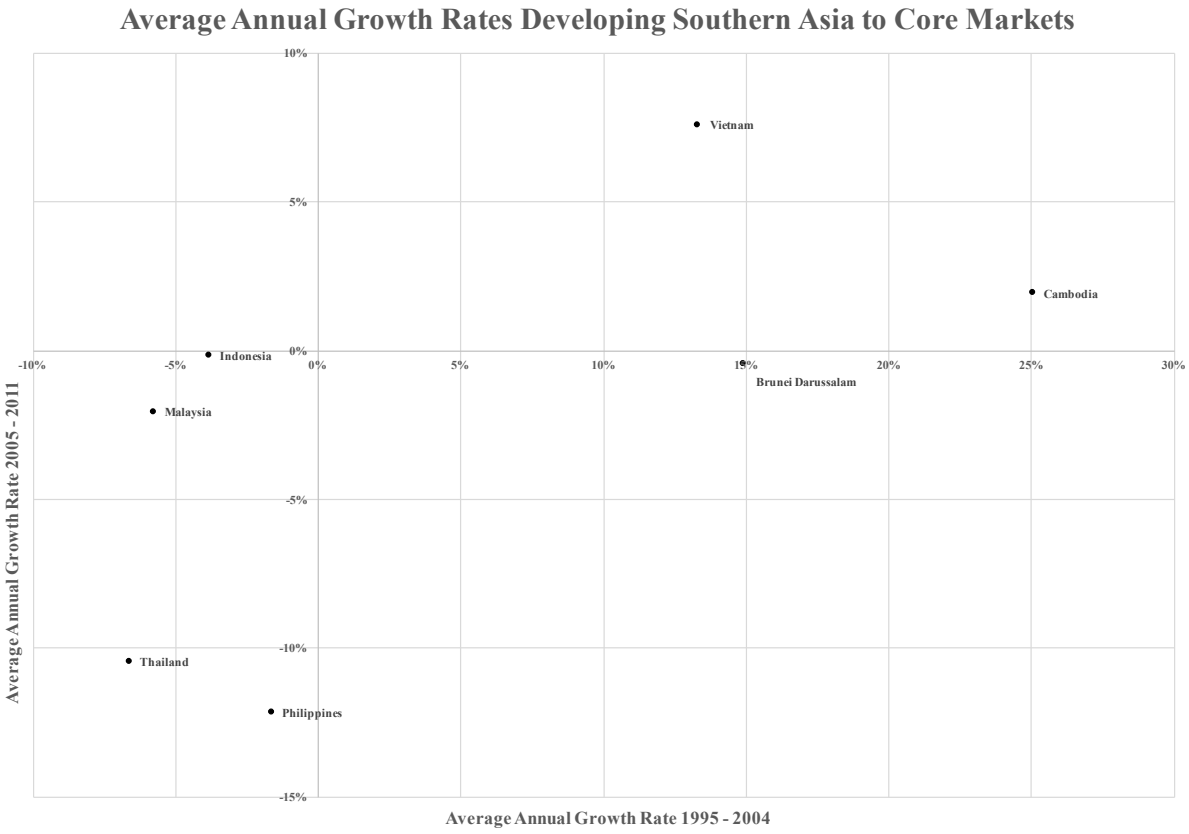


Figure 17: Average annual growth rate of shares in worldwide exports of developing Southern Asian countries to core markets (own calculations and representation)

Appendix N: Gini Coefficient

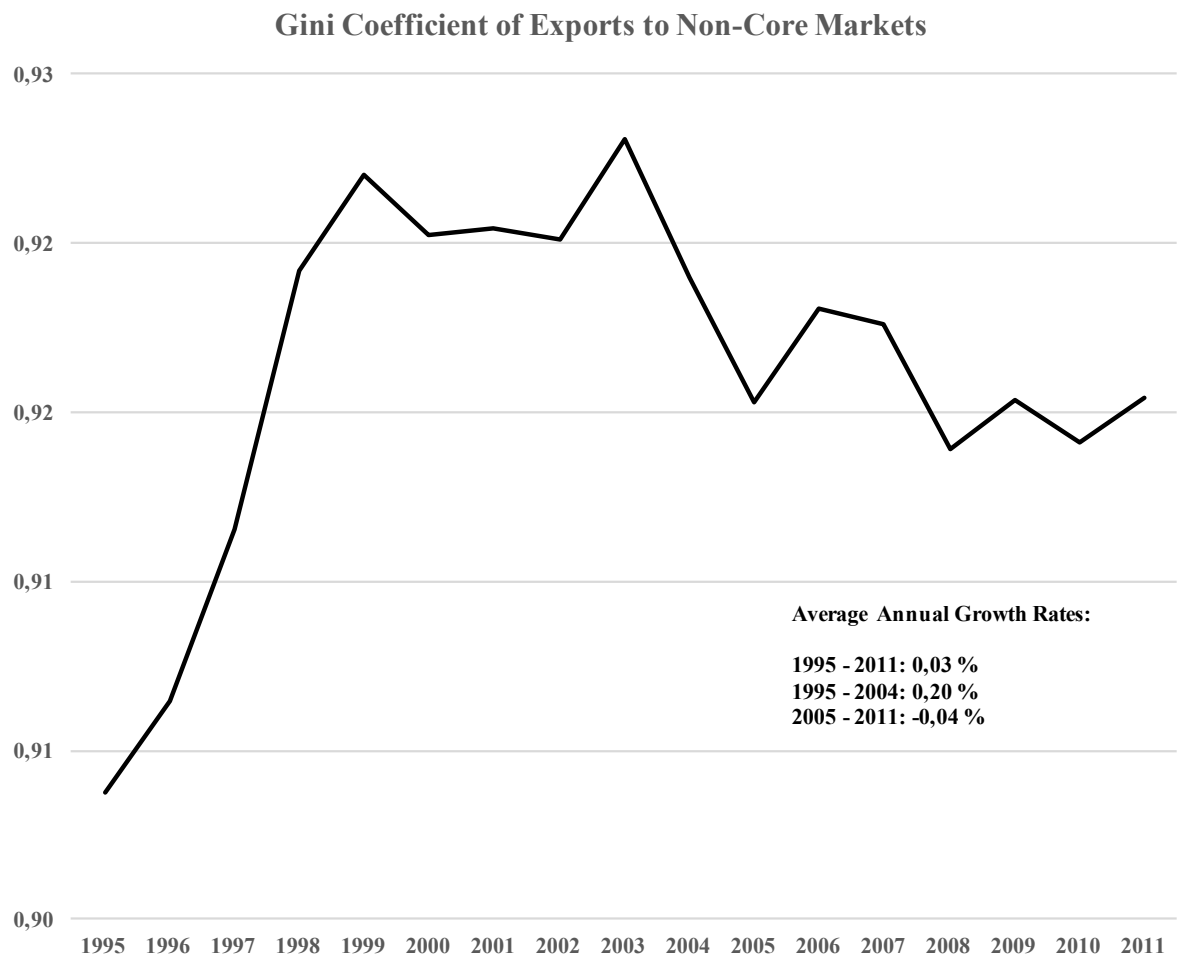


Figure 18: Gini coefficient for exports going to non-core markets (own calculations and representation)