Universität für Bodenkultur Wien
University of Natural Resources and Life Sciences

Department of Economics and Social Sciences
Institute for Sustainable Economic Development

The Impact of a Transatlantic Trade and Investment Partnership on the Global Dairy Sector – A Partial Equilibrium Analysis

Master's thesis
submitted by

Reinhard Gleichweit

Master program:
Agricultural and Food Economics (457)

Supervised by
Univ.Prof. Dipl.-Ing. Dr. Erwin Schmid
Dipl.-Ing. Mathias Kirchner

University of Natural Resources and Life Sciences, Vienna
Institute for Sustainable Economic Development
Feistmantelstraße 4, A- 1180 Vienna

Vienna, 27/10/2014

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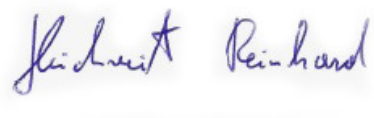

Danksagung

An dieser Stelle möchte ich mich bei meinem Betreuer Dr. Erwin Schmid für die ausgezeichnete Unterstützung bedanken. Vielen Dank für den Freiraum, den Sie mir während des gesamten Arbeitsprozesses gelassen haben.

Ebenfalls danken möchte ich meinem Co-betreuer DI Mathias Kirchner für seine wertvollen Kommentare und Anmerkungen.

Ein besonderer Dank gilt meiner Familie, die mich während meiner gesamten Studien- und Schulzeit in allen Bereichen unterstützt hat.

Lisa, dir möchte ich für deine Geduld und deinen Rückhalt danken. Dein Verständnis, besonders während der Zeit die wir nicht miteinander verbracht haben, bestärkte mich auf meinem Weg.

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Abbreviations

AoA – Agreement on Agriculture

ASM – Agricultural Sector and Mitigation

ATPSM – Agriculture Trade Policy Simulation Model

AVE – Ad-valorem Equivalent

CAPRI – Common Agricultural Policy Regionalized Impact

CEPII – Centre d'Études Prospectives et d'Informations Internationales

CETA – Comprehensive Economic and Trade Agreement

CU – Custom Union

ECU – European Currency Unit

EU – European Union

EUROSTAT – Directorial-General for Statistics in the EU

FAO – Food and Agriculture Organization of the United Nations

FDA – Food and Drug Administration

FTA – Free Trade Area

G-8 – Group of Eight

GATS – General Agreement on Trade in Services

GATT – General Agreement on Tariffs and Trade

GE – General Equilibrium

GLOBIOM – Global Biosphere Management Model

GSIM – Global Simulation Model

GTAP – Global Trade Analysis Project

HS – Harmonized System

ITO – International Trade Organization

MAcMap – Market Access Map

MFN – Most Favored Nation

MIRAGE – Modeling International Relationships in Applied General Equilibrium

NAFTA – North American Free Trade Area

NCIMS – National Conference on Interstate Milk Shipments

NTL – National Tariff Line

NTM – Non-tariff Measure

NTT – New Trade Theory

OECD – Organization for Economic Cooperation and Development

PE – Partial Equilibrium

PMO – Pasteurized Milk Ordinance

RTA – Regional Trade Agreement

SMP – Skimmed Milk Powder

SSG – Special Safeguard Measures

TRIPS – Agreement on Trade-Related Aspects of Intellectual Property Rights

TRQ – Tariff-Rate Quota

T-TIP – Transatlantic Trade and Investment Partnership

UN – United Nations

UN COMTRADE – United Nations Commodity Trade Statistics Database

UNCTAD – United Nations Conference on Trade and Development

US – United States

USDA – United States Department of Agriculture

USITC – US International Trade Commission

WITS – World Integrated Trade Solution

WMP – Whole Milk Powder

WTO – World Trade Organization

Abstract

In July 2013 the EU and the US started negotiations on a Transatlantic Trade and Investment Partnership – T-TIP. This agreement aims at creating growth and jobs in both economies. Various assessment studies have been carried out to evaluate the overall impact of such an agreement. The objective of this thesis is to analyze the impact of a T-TIP on the global dairy sector. GSIM, a partial equilibrium model, has been applied for the analysis. The results indicate that global trade in dairy products increases in a T-TIP. In a complete liberalization scenario the US value of trade with the EU increases by more than 150% while the EU trade value with the US rises by around 52%. Furthermore, the domestic prices in the EU and the US decrease by 4% and 9%, respectively. The net welfare impact is positive for the EU and the US, whereas the rest of the world is negatively affected. Thus, policy recommendations pro or against a T-TIP depend on weights given to national and global welfare impacts.

Kurzfassung

Seit Juli 2013 verhandeln Abgesandte der EU und der USA über ein transatlantisches Handels- und Investitionsabkommen – T-TIP. Durch dieses Abkommen sollen Arbeitsplätze und Wachstum auf beiden Seiten des Atlantiks geschaffen werden. Im Vorfeld der Verhandlungen wurden einige Studien zu möglichen Auswirkungen von T-TIP durchgeführt. Das Ziel dieser Masterarbeit ist es zu analysieren, wie T-TIP den weltweiten Handel mit Milchprodukten beeinflussen könnte. Die Analyse ist mit dem partiellen Gleichgewichtsmodell GSIM durchgeführt worden. Die Ergebnisse zeigen, dass durch T-TIP der weltweite Milchhandel wachsen wird. Durch eine vollständige Liberalisierung steigt der Handelswert zwischen den USA und der EU um mehr als 150%. Zwischen der EU und den USA hingegen erhöht er sich um 52%. Zusätzlich sinken die Inlandspreise in der EU und den USA um 4% beziehungsweise 9%. Dieses Wachstum bewirkt positive Wohlfahrtseffekte in der EU und den USA. Jedoch ist mit negativen Wohlfahrtsveränderungen in anderen Weltregionen zu rechnen. Dementsprechend hängt eine Politikempfehlung für oder gegen T-TIP von der Gewichtung der nationalen und globalen Wohlfahrtseffekte ab.

1. Introduction

The economic relationship between the 28 member states of the EU and the US is characterized by a high degree of integration. Nevertheless, trade between both partners is growing only moderately and their respective shares in the world market are declining. To strengthen their economic relation and position in a globalized world the EU and the US started negotiations on a comprehensive regional trade agreement in July 2013. The Transatlantic Trade and Investment Partnership – T-TIP – is supposed to create growth and jobs. To achieve this, negotiations will focus on eliminating existing tariffs, improving the compatibility of regulations and setting new international standards. The last two issues are criticized by some consumer organizations claiming that production standards will be lowered through a T-TIP. However, the mere reduction of tariffs may be insufficient to boost the economy. This is supported by impact assessment studies which have been carried-out in the run-up to the negotiations on a T-TIP – see ERIXON & BAUER 2010; EC 2013a; FRANCOIS ET AL. 2013. According to them both economies will be positively affected by such an agreement. However, simply reducing tariffs is estimated to have a minor impact as tariffs are already at a very low level. These assessments rely on general equilibrium models and are thus highly aggregated. Due to the distinctiveness of the agricultural market an analysis for a specific sector is likely to yield new and more specific insights. For example, with regard to dairy products, tariffs play an important role as the level of protection is considerably higher compared to other sectors.

This thesis aims at analyzing the influence of a T-TIP on the dairy sector in the EU and the US. Therefore, it emphasizes on welfare effects such as the producer and consumer surplus and changes in trade volumes. Although the main focus is on the EU and the US, the impact on the global dairy trade is scrutinized too. The purpose of this thesis is to obtain an insight into possible effects of a T-TIP. It serves as a rough guideline for policy makers, representatives of dairy farmers and companies involved in the processing and trading of dairy products.

Since the objective of this thesis is to analyze a specific sector, a partial equilibrium modeling approach has been chosen. This approach focuses on a single sector and omits any linkages to other parts of the economy. In contrary, general equilibrium models provide an extensive picture of the whole economy but their handling is time-consuming and they require a large amount of data. The Global Simulation

Model – GSIM – developed by FRANCOIS & HALL (2002) is applied on the dairy market. This partial equilibrium model allows for a rapid and transparent analysis of policy changes with a minimum amount of data.

Following this introduction, the second section provides a brief summary of the global as well as the bilateral dairy market. Moreover, it introduces some theoretical concepts with a focus on the impact of trade policy instruments as well as regional trade agreements. In the third section the methodology is explained followed by a description of the data. The results are presented in the fifth section which is accompanied by a sensitivity analysis. The last section provides a discussion of the results as well as some final conclusions.

2. Trade Theory

2.1. An Introduction to the Global Dairy Market

Dairy products play a vital role in dietary patterns in many countries worldwide. The main part of the milk production stems from cows followed by sheep, goats and buffalos. Globalization resulted in a deeper integration of the world dairy market. The following sections present key characteristics of the global production, consumption and trade as well as a snapshot on the EU-US trade relationship.

2.1.1. Definition

"Milk is the normal mammary secretion of milking animals … intended for consumption as liquid milk or for further processing" (CODEX ALIMENTARIUS 2011: p. 176). Milk products or synonymously dairy products are all products derived from milk by processing or through adding some ingredients. Following this definition this section provides an overview of recent developments of the global dairy market as well as the market in the EU and the US.

2.1.2. Global Consumption, Production and Development of Prices

In recent years, changing diets and consumptions patterns in the fast growing populations of Asian countries led to a rise in demand of milk and other dairy products of approximately 2-3% per annum. Amongst other factors, this explains the significant rise of prices since the year 2000 which peaked in an upsurge of 22% between March and April 2013 – see Figure 1. A strong opening of the milk production season in the EU and US combined with an extended season in New

Zealand resulted in a fall of the dairy price index since the beginning of 2014. Nevertheless, the medium-term prospect sees stable prices for the dairy sector. In 2014 the forecast for the world milk production is up by 2.1% reaching 783 million metric tons. Again, this increase is driven by demand in Asian countries. For instance India – the largest milk producing country worldwide – is supposed to increase its production by nearly seven million metric tons, thereby reaching a total production of close to 150 million metric tons. The run of high prices results in more production in the two major exporting countries namely, New Zealand – +7% – and the EU – +1.5% (FAO 2014).

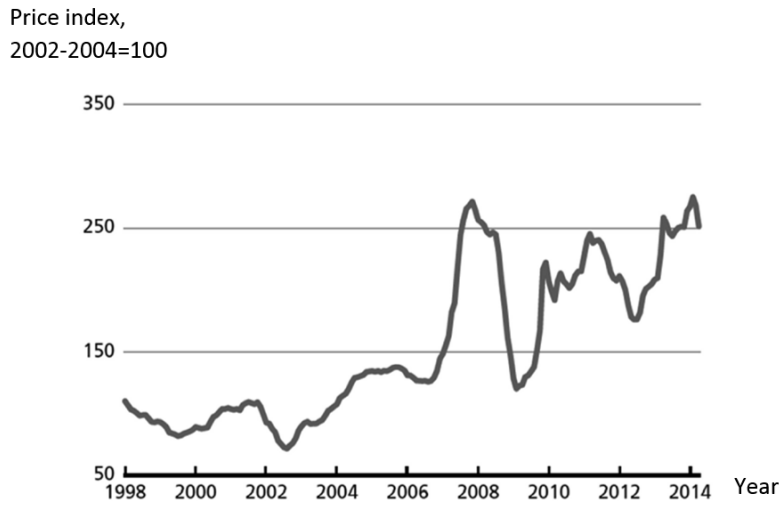

Figure 1 International Dairy Price Index

Source: FAO (2014)

2.1.3. International Trade in Dairy Products

According to this development, the EU and New Zealand will strengthen their position as the main exporting countries accounting for more than 50% of global trade. Yet, the global share of production that is traded remains below 10% and is supposed to stagnate in 2014. Figure 2 illustrates major exporting and importing countries.

As an example, the development of trade in whole milk powder – WMP – in the year 2014 is scrutinized more closely. WMP is the most traded dairy product. The trade volume is supposed to increase by 2.5% with China being the main driver of this trend as it accounts for one-third of all imports. Its recent stock building activities may provoke a price fall which would stimulate demand from other Asian countries. While New Zealand – contributing nearly 50% to all global exports – is likely to

increase their sales, other large exporters such as the EU, Australia and Argentina will see a decline. In the case of the two latter dry weather conditions have increased feed costs which resulted in less production. The supply by the EU declines due to the concentration on more profitable products such as cheese. Trade in skimmed milk powder – SMP – as well as butter is forecast to develop likewise. However, the international cheese market emerges to be less volatile in terms of prices and its volume is growing slightly less than other major milk products (FAO 2014).

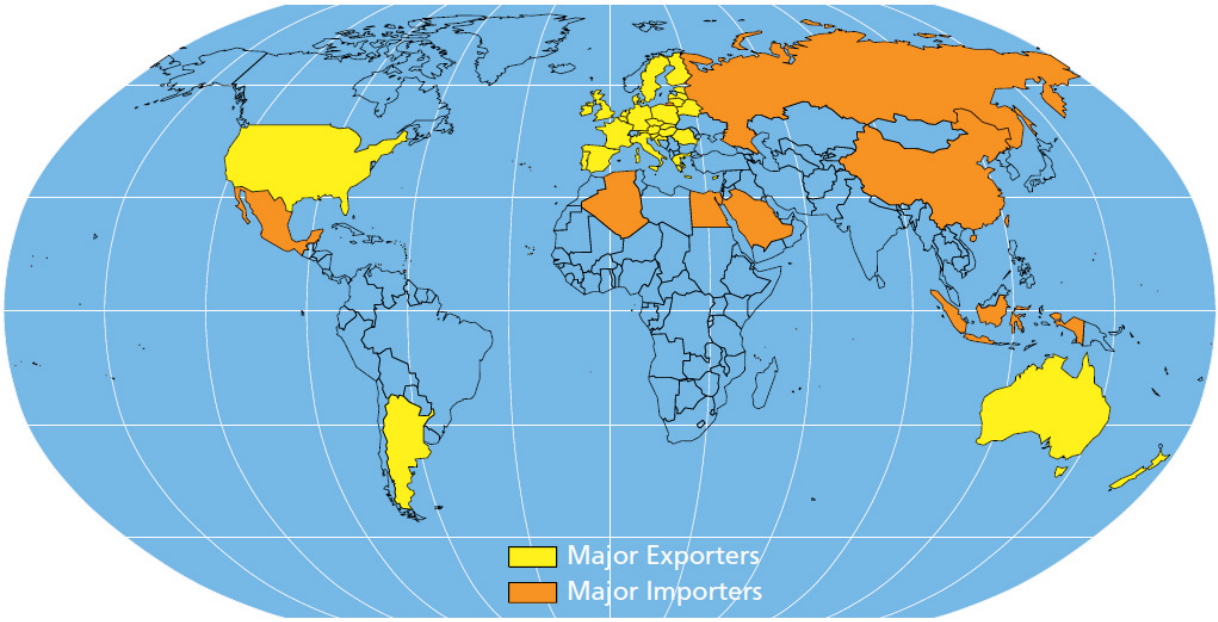

Figure 2 Major Dairy Exporters and Importers

Source: FAO (2014)

2.2. The Dairy Markets in the EU and the US

Dairy products play an important role in the economies of the EU and the US. Furthermore, it seems that any modification of the policy either domestic or trade related is likely to cause strong reactions from producers. A snapshot on the dairy market in the EU and the US as well as their trade relations aims at providing a basis for the following analysis.

2.2.1. Key Characteristics – Consumption, Production and Trade

EU Market – The milk sector accounts for 16% of the value of the EU agricultural output. From January to March 2014 the EU milk production increased by nearly 6% compared to the same period a year before. This increase is driven by the high price level as well as mild weather conditions. The overall production is estimated to reach 158 million metric tons in 2014. In 2012 the EU dairy herd increased for the first time

following 20 years of decline. This increase is not supposed to reverse the trend. Although the milk quota is going to be abolished in 2015 the number of milk cows is expected to decline again. Nevertheless, the production of milk is likely to rise due to more productivity. The average milk production per head varies considerably between member states (EC 2013b). Figure 3 illustrates the huge gap in terms of productivity between old member states and newer ones.

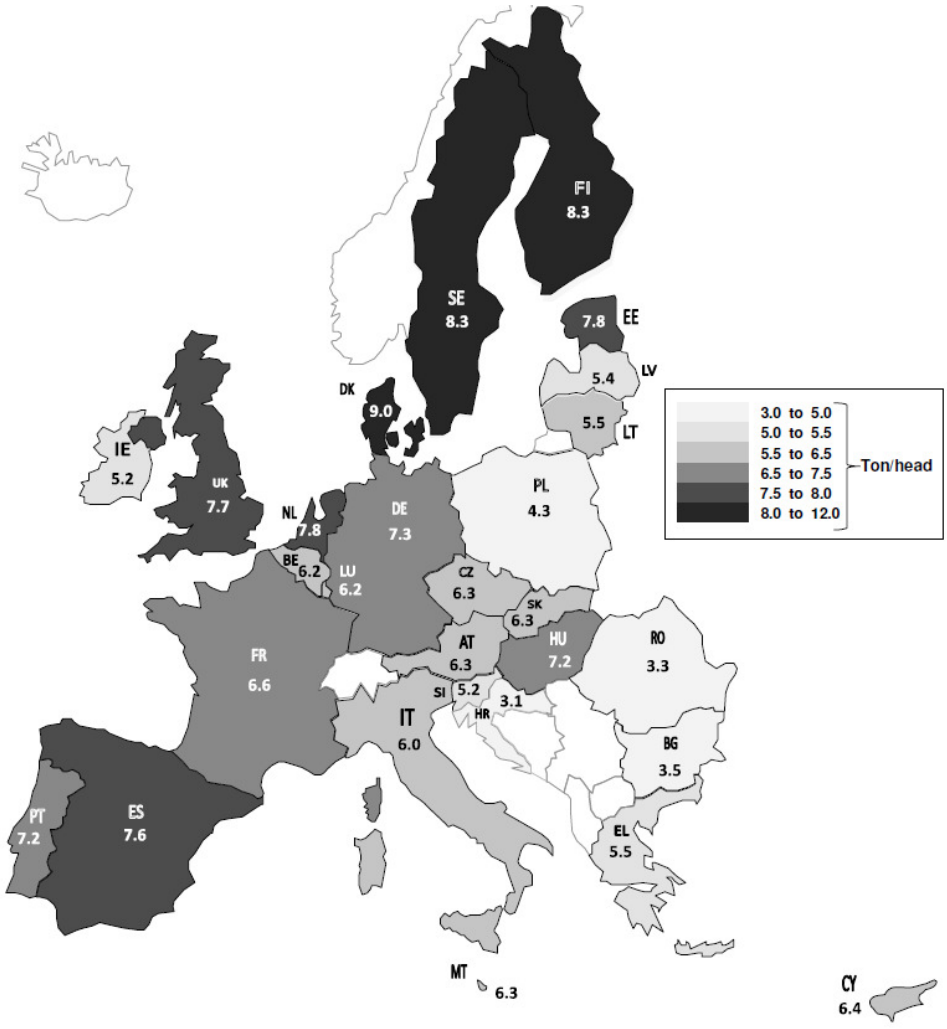

Figure 3 Milk Production in Metric Tons per Head in 2013

Source: EC(2014a)

Per capita consumption is relatively high in all EU member states. However, as the EU domestic market is saturated for most dairy products the medium-term forecast is stable with merely demand for cheese being prospected to grow slowly (EC 2013b). This situation underpins the important role that trade plays in any future development of the EU dairy sector. According to the biannual outlook of the FAO (2014) as well as the ten year outlook of the EC (2013b) the EU remains a major

exporter in most dairy products and its trade balance is likely to stay positive. Its share of world trade in dairy is likely to stay above 25%. While its trade share in WMP and butter is predicted to decline, its share in SMP faces a positive forecast for the next two years. Finally, on the cheese market where the EU accounts for 33% of all global exports the prospect shows that the EU is able to strengthen its position as the largest global supplier. The most important trading partners are the Russian Federation, the United States and, with growing importance, China. Besides its role as a global supplier, the EU is a major importer too. For instance, it is the fourth biggest butter importer and the third biggest importer of cheese. In 2013 butter imports mostly originate from New Zealand followed by the US which account for 10% of the imports. More than half of the cheese imports are supplied by Switzerland. Although US cheese exports to the EU increased considerably they remain of minor importance contributing merely 1% to the total EU imports (EC 2014b).

US Market – The value of dairy products account for 9% of the agricultural output in the US. Thereby, it is ranked fourth after meat, corn and eggs (USDA 2014a). After two years of dry weather conditions the production of milk has begun to slowly increase and will amount to 93 million metric tons in 2014. In the first period of 2014 milk production was up by 1% compared to the previous year. The average production per cow lies around 9.9 metric tons. Contrary to the EU, there is merely a minor gap between the average production in the main producing states in the West and North of the country and others. Regarding domestic consumption a similar picture can be drawn as in the EU. The overall per capita consumption is declining at a low pace which may be due to consumer preference to other beverages as well as the diminishing share of children in the population (USDA 2014b). Similar to the EU, the expansion of milk production has to be sold on the world market. US dairy exports account for 15% of world trade in dairy and thereby, it is the third largest supplier worldwide. A position predicted to hold in the medium-term. It is the largest supplier for SMP and the second largest for cheese where it is supposed to slightly gain market shares. The main markets for US dairy products are Mexico, Canada and China (FAO 2014). Table 1 summarizes some key characteristics of the dairy markets in the EU and the US.

	Share of dairy products in the agricultural output in %	Share of world trade in dairy in %	Production per cow in 2013 in metric tons	Production value in 2014 in million metric tons	Change in 2014 in %	Consumption in kg milk equivalents
EU	16.0	27.8	6.0	158.0	+ 3.0	277.0
US	9.0	15.0	9.9	94.0	+1.0	258.0

Table 1 Summary of the Dairy Markets in the EU and the US

Source: (HEMME 2010; WTO 2013a, 2013b; FAO 2014; USDA 2014c)

2.2.2. A Bilateral Trade Snapshot – Trade Flows, Tariffs and NTMs

Trade Flow – The EU and the US markets are highly integrated. Trade in agricultural products plays a minor role in this bilateral relationship accounting for around 10% of the total traded value. Agricultural exports from the EU to the US are dominated by beverages. US exports to the EU mainly consist of tropical fruits and spices as well as soybean with dairy products playing a nearly non-existing role (EC 2014c). Nevertheless, cheese accounts for 5% of the entire trade value. The minor role of dairy products is underpinned by the fact that without cheese the value of trade is less than 1% of the bilateral agricultural trade. With regard to dairy products, the pie charts in Figure 4 illustrate the share of each HS[1] 6-digit group in 2013. More than half of the US exports to the EU consist of butter and EU exports are largely dominated by cheese. Figure 5 demonstrates the development of trade in dairy products between the EU and the US from 2003 onwards. The value of trade was growing slightly, only interrupted through the financial crisis beginning in 2008. However, this growth is very minor which might reflect that both markets are well protected.

[1] The Harmonized System is an international nomenclature to classify traded goods which has been developed by the World Customs Organization. It has been adopted by most WTO members. The digit represents a different level of aggregation with the 6-digit level being the most standardized disaggregated level.

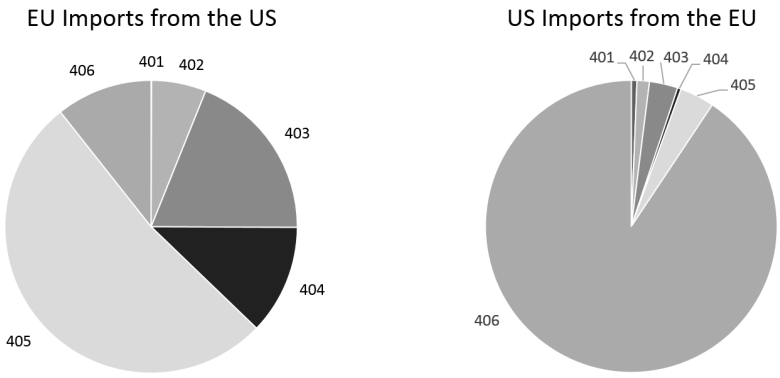

Figure 4 Share of Imports in 2013

Note that 401 is fluid milk, 402 is concentrated milk, 403 is buttermilk and yoghurt, 404 is whey, 405 is butter, 406 is cheese and curd. Only three digits of the HS 6-digit code are given. For detailed information see Appendix 1.

Source: WITS – UNCOMTRADE.

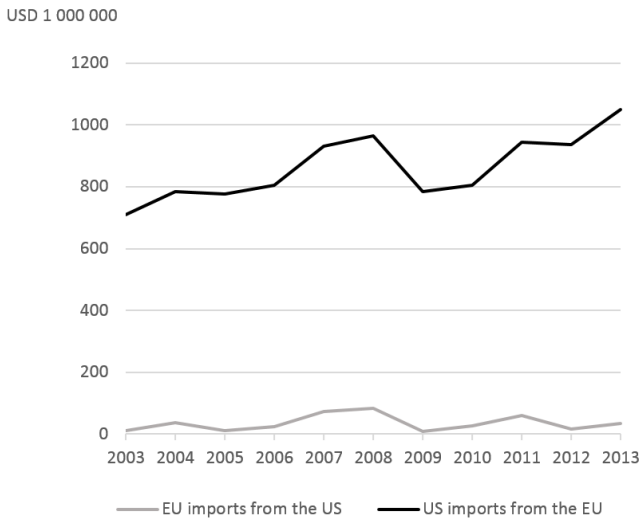

Figure 5 Development of EU-US Trade in Dairy Products

Source: WITS – UNCOMTRADE.

Tariffs – According to the most recent trade policy reviews (WTO 2013a, 2013b) of the EU and the US the simple average EU tariff rate for all merchandise goods is 6.5% and thereby slightly higher than the US average of 4.7%. However, in both countries the average tariff for agricultural products is nearly twice as high. Furthermore, trade in agricultural products is less transparent as the number of tariff lines2 facing non-ad-

[2] A tariff line is a product as defined in lists of tariff rates where the number of digits reflects the level of detail. For example, 0406 is the tariff line code for cheese and 040610 the tariff line code for fresh cheese.

valorem tariffs is elevated. Investigating the agricultural sector in more detail reveals that the dairy sector faces the highest average tariff levels with 31.7% in the EU and 22.0% in the US. With regard to the most traded products, i.e. butter for US and cheese for the EU, TRQs play an important role. The simple average in-quota tariff for butter exports from the US into the EU is 42.7% whereas the out-quota average is 69.1%. On the other side, EU cheese exports face in average an in-quota tariff of 11.9% and an out-quota tariff of 19.5%. A study by GAST (2002) concludes that the US TRQ system for cheese is binding, i.e. that the out-quota tariff applies. This is likely to be still the case since the system has remained similar with merely quantities being slightly adjusted. The EU as well as the US grant duty free access for around one quarter and a third of all imports, respectively. However, this mainly applies for non-agricultural products. Contrary, agricultural products account for more than one third of all domestic peaks, meaning a rate which is three times higher than the domestic average. This demonstrates that tariffs remain a serious impediment to trade in agricultural products. Thus, reducing them has the potential to create new trading possibilities for both partners. A summary of the MFN tariffs between the EU and the US can be found in Table 2.

TRQs – In addition to tariffs, both partners apply TRQs for several tariff lines related to dairy. In the year 2011 the EU notified four TRQs and the US 18 to the WTO. These affect 62 and 77 national tariff lines[3], respectively. The fill rates of these quotas vary significantly depending on the product ranging from nearly 100% for certain cheese types to less than 10% for milk powder. These rates have to be assessed cautiously because low fill rates can have various reasons. The in-quota may be less than 100% due to special safeguard - SSG - measures which allow higher duty rates under certain conditions specified in the Agreement of Agriculture – AoA – and thus impede trade further. Moreover, the applied method of administration may hinder trade and result in unfilled quotas. Table 2 provides an overview of the share of TRQ in the EU and the US for the year 2011 (WTO 2012a, 2013c).

[3] A national tariff line – NTL – is a classification code for a product which is longer than the HS 6-digit level. It is based on the HS system an introduced by countries to further specify their products. For instance, 040310 refers to yogurt and the US NTL 040310.50 to yogurt in dry form and 040310.90 to yogurt not in dry form.

Product	EU simple average in %	US simple average in %	EU share of TRQs in %	US share of TRQs in %
All	6.5	4.7	4.9	1.9
Non-agricultural	4.4	4.0	1.0	N.a.
Agricultural	8.5	14.8	19.2	11.8
Dairy	31.7	22.6	31.6	11.0
Cheese	36.1 (17.5)	19.5 (11.9)	83.6	50.0
Butter	69.1 (42.7)	65.9 (6.17)	66.6	40.0

Table 2 Summary of MFN Tariffs 2012

Note that n. a. means not available, data for the US stem from 2012 and values in parenthesis are the simple average of in-quota rates.

Source: WTO (2013a, 2013b) and own calculation.

Non-Tariff Measures – NTMs – seriously impede trade. In contrast to tariffs their reduction is less straightforward as they might have a legitimate purpose such as consumer health and environmental protection. Different NTMs in the EU and the US derive, amongst other reasons, from differing fundamental approaches. Both partners want to guarantee risk-free and healthy food. While the EU is trying to achieve this through traceability, i.e. transparent information, the US focuses on testing the final product. This divergence results in complex certification procedures which are cost-adding for firms on both sides. A seminal study of the Dutch consulting company ECORYS (BERDEN ET AL. 2009) for the EC estimated that the cost increase for US-firms due to divergent EU-legislation is 57%. This increase is even higher for EU-firms which face 73% more costs. Nevertheless, it is unlikely that all NTMs can be fully aligned as some derive from differences in geography, preference, culture, history or language. Other NTMs may be hard to align due to constitutional reasons. For instance, divergent SPS standards of the EU and the US may be burdensome for US-firms but as the Lisbon Treaty allows member states to introduce

their own national provisions in this area a change of legislation is rather unlikely. The study suggests that in the agricultural sector around half of all NTMs are actionable[4] i.e. that they can potentially be reduced if the political will exists. A list of the most important NTMs as identified in a survey on EU and US firms is added in Appendix 2. Besides NTMs which affect a wide range of sectors such as the *US-Bioterrorism Act* or the lack of harmonization between US states, there are NTMs that affect a sector or merely a sub-sector. A severe impediment to trade in dairy is the US *Pasteurized Milk Ordinance* – PMO – which sets rules for the commerce of certain dairy products. It is almost impossible for foreign exporting firms to fully comply with these rules and thus, to enter the US market. This more than 400 pages strong document enlists various rules and requirements to reduce the risk of food borne diseases related to certain dairy products such as pasteurized milk and milk based products including fluid milk, cream, cottage cheese and yoghurt. Foreign companies have three options to enter the US dairy market. First, a contract between a state and the exporting company by which the state ensures to treat the company as it was in its own jurisdiction. Second, the region, respectively country, where the exporting company is situated, adopts the US rules and thereby can become a member of the Conference[5]. Third, the Food and Drug Administration – FDA – recognizes the EU rules as equivalent. However, the first two options are nearly impossible to accomplish because the PMO requirements are very burdensome and regular inspection from US-officials are expensive. Therefore, the EC launched negotiation for equivalence with the FDA in 2005 which showed merely modest progress since then. A less trade distorting NTM is the *dairy research and promotion bill* which foresees a levy of $ 0.75 per hundredweight of dairy import (NMPF 2014). Both measures are believed to be actionable if the political will exists and a T-TIP might be an opportunity to achieve this.

[4] The concept of *actionability* is based on parameters such as the level of sensitivity, the legal and technical change required, economic incentive as well as the scope of each NTM (BERDEN ET AL. 2009).

[5] The National Conference on Interstate Milk Shipments – NCIMS – consists of various player in the dairy food chain and sets, jointly with the FDA, the main rules in the PMO.

2.3. From Mercantilism to New Trade Theory

Following the introduction to certain aspects of the dairy market the next sections provide the theoretical background for the analysis. The legitimacy of trade between nations is drawn from theory. Nevertheless, it is eminent that the conducted policy is influenced by more than mere economic theory. In practice, trade policy has to take into account interests of various sectors and political groups. This section introduces the basic economic theory on trade and common models which are derived from it. Furthermore, it explains how policy measures fit into theory and what role international agreements play in modern trade.

2.3.1. Mercantilism

The era of modern economy begins with the British economist Adam Smith in the 18th century. He was a major critic of mercantilism, the prevailing economic system at that time and the first reasonable concept of international trade. In a nutshell mercantilism can be described by the claim that exports are good and that imports are bad. Smith states that "in the mercantile system the interest of the consumer is almost constantly sacrificed to that of the producer" (SMITH 1904, s.p.). Thereby, he depicts the major drawback of this system, namely omitting consumer benefits. Although most nations agree that the concept of mercantilism is outdated, and thus opposed today, it can be argued that this type of policy is still widely implemented in our modern world. Some nations, for instance, still use measures such as the undervaluation of their domestic exchange rate to facilitate their exports (WEINTRAUB 2007).

2.3.2. Smith's Model – Absolute Advantage

Smith's model of trade is based on the principle of absolute advantage. A nation possesses an absolute advantage if it is able to produce more than a competitor by using the same resources. Consequently, if one nation has no such an advantage no trade will occur. Smith was one of the first advocates of free trade, however his thinking included various exemptions where the national security is concerned (MANESCHI 2007).

2.3.3. Ricardian Model – Comparative Advantage

David Ricardo (1772-1823) was one of the first to claim that the absolute advantage merely indicates the size or total resource base of a country. He was concerned

about the question, if a country can benefit from trade even if it can produce everything more efficient than another country. For answering this question he introduced the concept of comparative advantage. Gains from trade are based on different labor productivity and thus, opportunity costs, i.e. the quantity of one good a country must give up to produce another good. Two countries involved in trade will gain as long as each country specializes in the one good where it has lower opportunity costs. RICARDO (1817) developed a trade scenario for two countries – England and Portugal – and two goods, namely cloth and wine. Figure 6 shows that with trade – dashed line – the consumption possibilities for both countries are higher and thus, welfare is increased compared to autarky – continuous line. For instance, consuming the same quantity of cloth, trade allows England to consume more units of wine.

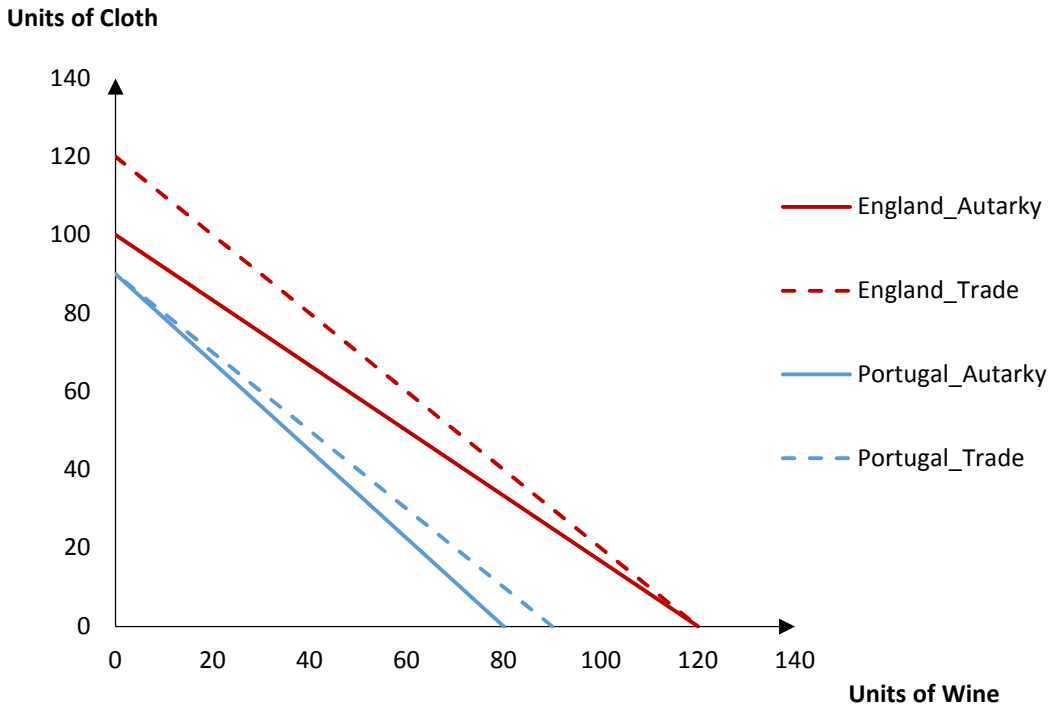

Figure 6 Consumption Possibility with and without Trade

Source: RICARDO (1817) and own calculation.

2.3.4. Heckscher-Ohlin Model

In Ricardo's model trade ultimately occurs due to different labor productivity. In his model the comparative advantage arises from this single factor. In the 1930s two Swedish economists – Eli Heckscher and Bertil Ohlin – developed a new model which determines the comparative advantage of a country by different factor

endowments such as labor, capital, land and infrastructure. Each country is exporting those goods which use their local abundant factor intensively (KRUGMAN & OBSTFELD 2006). The Heckscher-Ohlin model as well as the Ricardian model assume constant returns of scale together with perfect competition. Therefore, these models allow the explanation of inter-industry trade, i.e. different goods are traded between two countries. The question remains, why similar goods such as different types of cheese are traded amongst countries with similar factor endowments. Grubel and Lloyed provided empirical evidence for this type of trade, called intra-industry trade, which cannot be explained by the classic and neoclassic models. New Trade Theory – NTT – overcomes this problem by introducing increasing returns of scale and imperfect competition (BENARROCH 2007).

2.3.5. New Trade Theory and Intra-Industry Trade

The term NTT is applied to several economic models which have been developed starting from the 1980s. KRUGMAN (1979) laid out the two main principles of the NTT. First, consumers prefer variance and second, economies of scale exist in production. The latter provides an explanation of international trade even if consumer preferences, technology and factor endowments in two countries are identical. Through the expansion of the market, trade enables firms to lower their average costs and achieve increasing returns of scale. This leads to gains from trade due to decreasing prices and more product varieties. Moreover, an expansion of the market means more competition which forces large domestic firms to become more competitive. Krugman's model helps to understand trade in similar goods between industrial countries.

The standard method to measure the extent of intra-industry trade is the Grubel-Lloyd index. For any industry, i, the index is given by

$$I_i = 1 - \frac{|X_i - M_i|}{X_i + M_i}$$

With X standing for the value of exports and M for the value of imports. I_i always takes a value between 0 and 1, $0 \leq I_i \leq 1$ with $I_i = 1$ meaning that all trade is of intra-industry type. The Grubel-Lloyd index can be calculated for all industries at any level of aggregation. However, one of its major drawbacks is its sensitivity to different aggregation levels. In general, the more the industries are aggregated the higher the index will be (BENARROCH 2007).

BRUELHART (2008) scrutinizes the development of I_i from 1962 to 2006. His empirical evidence demonstrates that I_i is particular high for middle- and high-income countries as well as lower levels of aggregation. The bilateral share of intra-industry trade – $I_i = 0.40$ – between the EU and the US is the highest worldwide. This indicates a high degree of similarity between both economies. Furthermore, his study illustrates that primary goods exhibit a lower I_i than intermediate or final goods. The sectorial I_i differs considerable too. Chemicals and machinery exhibit the highest share of intra-industry trade while minerals and fuels have the lowest. Food products saw a remarkable nine-fold increase in I_i since 2006. According to Bruelhart this indicates the increased differentiation of products as well as the vertical integration of production chains. Around one quarter of total world trade in dairy products is of intra-industry nature.

2.4. Trade Policy and its Instruments

The previous sections indicated why countries become engaged in trade. All theories but mercantilism are in favor of freer trade and thus, against most kinds of market intervention. Yet, governments frequently intervene in international markets. In general, three motives for this behavior can be scrutinized. First, governments set policy measures as a reaction to the lobbying of groups that would be put at a disadvantage if trade was to be liberalized. Second, governments are pursuing their own national interest by manipulating the international terms of trade to their own advantage. And finally, governments may attempt to restore the efficiency by correcting market failures (GAISFORD 2007). The following section analyzes the impact of tariffs and tariff-rate quotas – TRQs – two common policy instruments in modern trade policy.

For this purpose two functions are introduced, namely the import demand, MD and export supply, XS, function. These functions are derived from the respective demand, D, and supply, S, function of each country. MD is defined as the demand of consumers which cannot be supplied by domestic producers and is thus imported. In Figure 7 the MD is derived from demand and supply in country A. At the autarky price, P_h, import demand is zero because producers supply exactly the quantity demanded by consumers. At a lower price, P^*, consumers are willing to purchase more but as domestic producers cannot supply at this price MD becomes positive. The gap – shown by the arrow – between what consumers demand and producers

supply at a given price is filled through imports. MD has a flatter curve than the demand function. This means that MD is more elastic than the domestic demand function. Similar XS is the excess production which is not demanded in the domestic market and thus exported. XS is upward sloping and more elastic than the domestic supply function. In a competitive market framework with no transportation costs, the world equilibrium determines the price at which MD equals XS.

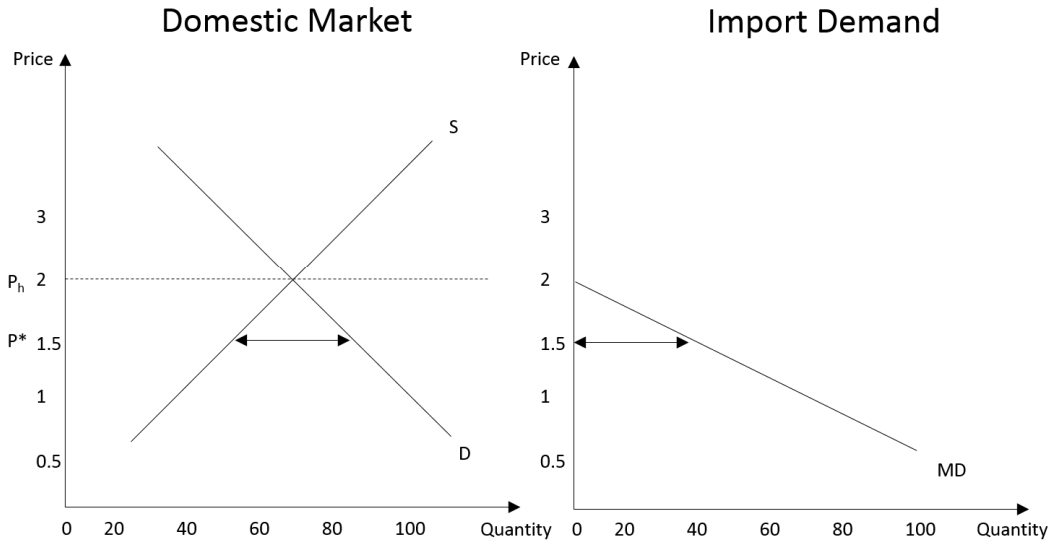

Figure 7 Graphical Derivation of the Import Demand Function of Country A

Source: KRUGMAN & OBSTFELD (2006) and own calculation.

2.4.1. Impact of a Tariff

Tariffs are assumed to be the most transparent form of import barriers. In general, a tariff can be a constant amount per imported unit – specific tariff – or a constant percentage of the import value – ad-valorem tariff. Additionally, one can find all sorts of combination of these two types. Specific tariffs such as $ 0.34 per liter milk are usually converted to its ad-valorem equivalent – AVE[6] – to facilitate the analysis of tariffs (KRUGMAN & OBSTFELD 2006). While specific tariffs and its derivatives play an unimportant role in non-agricultural products, they are prominent in the agricultural sector. Table 3 summarizes figures of the WTO (2012b) which demonstrate that the share of non-ad-valorem tariffs is relatively high for agricultural goods compared to other goods.

[6] An AVE tariff represents a percentage of the value of a good and is the equivalent of a specific, mixed, compound or any other tariff.

Country	Share of non-ad-valorem tariffs in %		
	All goods	Agricultural goods	Non-agricultural goods
EU	4.9	32.0	0.6
US	8.2	40.2	3.4

Table 3 Overview of non-ad-valorem Tariffs for Different Goods

Source: WTO (2012b)

The framework for the following tariff analysis is a competitive market with zero trading costs. Furthermore, we assume that changes in supply and demand have no impact on the world price. This so-called small country assumption will be relaxed later. Figure 8 shows the market of a small country. The world price, P^*, is below the domestic equilibrium. Therefore, this country is importing because domestic demand, Q_d, exceeds domestic supply, Q_s. MD is the difference between Q_d and Q_s which is the distance $\overline{Q_s Q_d}$. A tariff, T_m, per unit of import places an artificial wedge between the import and export price. The domestic price rises to $P_h = P^* + T_m$ which leads to an increased supply of Q_s' and a decreased demand of Q_d'. Consequently, MD declines to $\overline{Q_s' Q_d'}$. The tariff effectively protects the interests of domestic producers as it isolates them from the world price. However, the new market price in this country sends the wrong signals to consumers and producers. In consequence, total welfare decreases by the area $a_2 + a_4$ due to inefficient production and consumption. The gain in producer surplus equals a_1 and tariff revenues arise equal to area a_3. These gains are overshadowed by the decline in consumer surplus which equals $a_1 + a_2 + a_3 + a_4$. Thus, the total welfare loss due to a tariff is $a_2 + a_4$ (GAISFORD 2007).

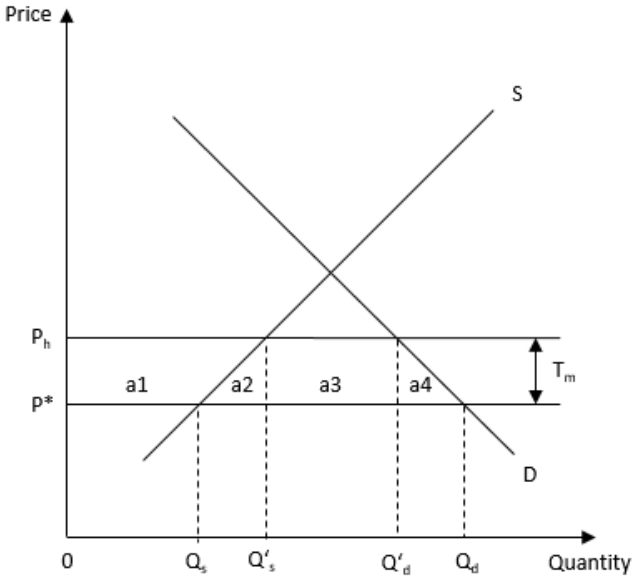

Figure 8 Impact of a Tariff in a Small Country

Source: Own graph based on GAISFORD (2007)

The example above is, given the underlying assumptions, true for countries which cannot affect the world market price. A large enough country might influence the world market price through changes in its trade pattern. Thereby, less MD or more XS results in a lower P^*. Consumers in ROW will benefit from this, while foreign producers are adversely affected. Therefore, this kind of policy may lead to trade conflicts as large countries can use a tariff to increase their welfare at the expense of others (GAISFORD 2007). Finally, DOUGLAS (2009) states that the impact of a tariff is underestimated if the preference of consumers for variety is ignored. The consumer welfare is reduced because a tariff reduces the range of products available.

2.4.2. Tariff-Rate Quota – TRQ

A TRQ is a two-tiered tariff. It is composed of four parts

1) a low-tier tariff or in-quota tariff, $1 + t$,
2) a high-tier tariff or over-quota tariff, $1 + T$,
3) a quota, Q, to specify the volume of in-quota imports and
4) a method of administration.

An example for a TRQ concerns butter imports into the US for 2014. The first 6977 metric tons of butter are imported at the in-quota tariff of 1.9%. Every additional metric ton will be charged the over-quota tariff of 23.9%. There are two types of

import licenses, namely historical and non-historical. The latter is granted through a lottery systems every year (USDA 2014d).

Historically, TRQs became important with the assignment of the Agreement on Agriculture – AoA. The AoA is a WTO related agreement that bans quantitative trade restrictions such as quotas. Therefore, it requires that these restrictions are converted into tariffs. In this process of *tariffication,* TRQs have been understood as an intermediate or even initial[7] step between quotas and tariffs. While a quota absolutely inhibits imports once it is filled, a TRQ still enables imports, at least legally, at a higher tariff rate. Another reason why TRQs where prominently applied in the last two decades is that it allows for *water in the tariff*. This means that between the bound tariff – maximum rates that a country agreed to charge its trading partners – and the applied tariff – the rate actually charged – there exists a difference. This difference enhances the trade discretion of a country. If for instance, a country finds imports of a product desirable it charges the in-quota tariff but if they are undesirable it can charge the over-quota tariff (SKULLY 2007).

Figure 9 illustrates that a TRQ leads to a kinked XS curve. The vertical step appears when the quota is filled. The impact of a TRQ depends on the P^* and the MD. If there is no demand at P^* such as in $MD1$, then there will be no trade and thus, no impact of the TRQ. The curve $MD2$ is below $1+t$ hence, domestic demand is the binding constraint. With import demand shifting even further to the right, $MD3$, the in-quota tariff becomes binding. The domestic price, P_h, is now at $1+t$ and the volume of imports equals $M(t)$. In this situation tariff revenues occur equal to the area $a1$. At $MD4$ trade is constraint by Q. The domestic price equals $P_h = 1+t+r$ with r being per unit quota rents which are to the benefit of the license holder. Quota rents are the difference between the new domestic price and the world price inclusive of the in-quota tariff. In our example the quota rents equal the area $a2$. As soon as Q is filled – $MD5$ – the over-quota tariff becomes binding and the import volume is $M(T)$. The new price equilibrium lies at $1+T$. Now, $a2+a3$ represent quota rents, $a1+a5$ stand for in-quota tariff revenues and similar, $a4$ indicates tariff revenues obtained from imports charged the over-quota rate.

[7]TRQs were used to provide a minimum market access of five percent of average domestic consumption in the three-year base period from 1986-1988.

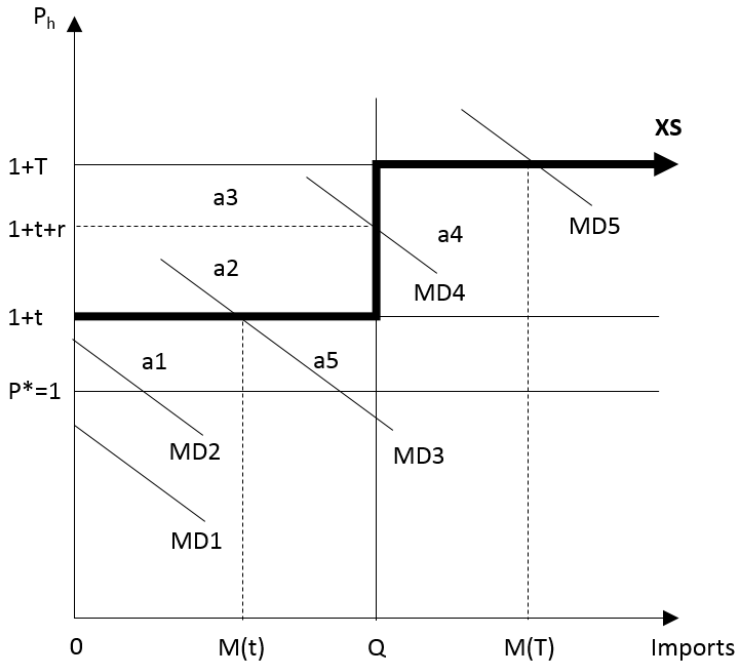

Figure 9 Graphical Analysis of a TRQ

Source: Own graph based on SKULLY (2007)

What does this indicate for trade liberalization? To provide an increased market access, one has to determine the constraining factor – $t, T \; or \; Q$ – which is then relaxed. However, better market access alone cannot guarantee the efficient allocation of resources. The latter depends on the method of administration. The way a quota is distributed decides who will benefit from it. If one firm produces at higher costs than another firm, a quota may allow the high-cost firm to stay in the market due to the quota rent. Therefore, a binding quota may lead to inefficient use of resources. Depending on the market conditions liberalizing $t, T \; or \; Q$ has different impacts.

t: Reducing t can provide minimum market access as for $MD2$ or expand the import volume – $MD3$ – or diminish revenues and increase rents – $MD4$ and $MD5$.

Q: Increasing the quota yields higher rents as long as MD is elastic and T is not binding – $MD4$ – or it diminishes revenues by increasing rents – $MD5$.

T: Reducing T diminishes rents and provides better market access – $MD5$.

An easier way to assess TRQs are fill rates. This ratio of the actual in-quota imports and potential imports is commonly used as an indicator for TRQs. However, it remains unclear what a low fill rate indicates. First, it may indicate that there is a lack of import demand to fill the quota. Second, a low fill rate may indicate that the market

access is inhibited somehow, either by the method of administration or by additional fees and bureaucracy. In rare cases, importers choose to pay the higher tariff directly to avoid transaction costs which arise from obtaining the quota rights (SKULLY 2007).

2.4.3. Non-Tariff Measure

The last two sections analyzed the influence of tariffs on trade. However, after more than 60 years of international cooperation in trade, tariff rates are low and a further reduction might affect trade only slightly. This development has increased the importance of NTMs. NTMs are commonly defined as measures that distort trade, either negatively or positively. This definition includes a wide range of measures beginning with quantitative restrictions, costume procedures and all kinds of government interventions up to technical and sanitary measures. This huge field of measures makes it difficult to analyze the impact of NTMs. Moreover, it is hard to distinguish between a legitimate policy objective such as public health or food safety, and protectionist measures (DEARDORFF & STERN 1998).

The overall success of a T-TIP might essentially depend on the deregulation and harmonization of standards. Nevertheless, due to the relatively high tariffs in the agricultural and especially in the dairy sector, a reduction or even the elimination of these classical trade instruments can have a considerable impact on trade flows and welfare.

2.5. Trade Conduct – The Scope of Trade Agreements

The sections above described mainly theoretic aspects of trade. Undoubtedly, actual trade policy is driven by many other facts than pure trade theory. The following section describes the development and coordination of trade since the Second World War. A special emphasis is placed on the analysis of regional trade agreements – RTA.

2.5.1. Multilateral Agreement – From the GATT to the WTO

Following World War II efforts have been undertaken to guarantee peace and to prevent another global war from happening. The absence of international cooperation has been recognized as a major failure that led to the outbreak of the two wars that dominated the first half of the 20th century. Four major fields were identified where more cooperation was required (1) the solving of political disputes

between states, (2) the use of devaluation of a country's currency to gain an advantage, (3) differences in the national welfare, i.e. income and (4) the use of trade distorting measures. In order to settle political tensions the United Nations – UN – was created to replace the ineffective League of Nations. Besides the UN, two other international institutions have been created during the negotiations in Bretton Woods, US. First the International Monetary Fund, to cope with the strategic use of currency devaluation, and second the World Bank, to foster economic development. The third Bretton Woods Institution should have been the International Trade Organization – ITO. However, as this organization lacked the support of the US Congress it was still to be born. Instead of a comprehensive international trade organization only one agreement of the ITO was signed which deals with trade rules and mechanism for tariff reduction (KERR 2007).

This General Agreement on Tariffs and Trade – GATT – became the *de-facto* multilateral trade organization after its ratification in 1947. The pre-war situation illustrated the need for such an agreement. During the economic crisis of the 1930s the US raised its tariffs substantially. This caused retaliation from other countries and in consequence, trade decreased and the crisis was aggravated. Furthermore, this *beggar thy neighbor* policy resulted into political tensions. The signing partners of the GATT agreed on certain trade rules of which non-discrimination is the central principle. This means that national regulations must treat foreign suppliers the same way as domestic suppliers and any tariff reduction granted to one partner must also be granted to another partner. However, this Most Favored Nation – MFN – clause contains exemptions which led to the proliferation of regional trade agreements – see section 2.5.2. Since the GATT was signed in 1947 several rounds of negotiations took place which have achieved a considerable reduction of tariffs and an enlargement of the group (DOUGLAS 2009).

Another milestone in the international cooperation on trade was the conclusion of the Uruguay Round in 1994. It led to the conversion of the GATT into a formal institution, the World Trade Organization – WTO – nearly 50 years after the ITO was rejected. For the first time, agricultural trade was included into the system. Therefore, multiple barriers to trade had to be converted to tariffs in order to make the protectionist effect of different NTMs comparable. Through converting most NTMs

into tariff equivalents, negotiators are able to ensure reciprocity in trade offers. However, *tariffication*[8] is a contentious issue as a standardized method to calculate the equivalent degree of protection is missing. In some cases this process led to higher protection than before. The modalities to calculate the appropriate tariff were agreed during negotiations on the AoA. According to these, the appropriate tariff is the amount by which the domestic price was above the world price during the base period of 1986 to 1988. In this period prices were low which allowed a higher degree of protection. SWINBANK (2004) provides an example for the EU tariff on sugar imports. In July 1995 when the agreement came into force the EU tariff equivalent on sugar was set at 507 ecu[9]/ metric ton. However, in this year the world market price for sugar was higher than during the base period. Thus, the equivalent of the variable import levy, which has been in place until June 1995, was lower at 423 ecu/ metric ton. This example raises the question of the appropriateness of the implementation rules and may suggest that certain members deliberately set the base period in order to avoid the liberalization of their markets.

Besides the AoA, other agreements for instance the General Agreement on Trade in Services – GATS – or the Agreement on Trade-Related Aspects of Intellectual Property Rights – TRIPS – were signed with the forming of the WTO. Furthermore, the WTO provides formal rules to solve trade disputes. On the one hand, this dispute settlement procedure is an efficient way of handling trade conflicts, on the other hand, it is criticized of being opaque and driven by industry interests (DOUGLAS 2009).

As the mission of the WTO broadens, negotiations of new trade deals become increasingly complex. The last round, known as the Doha Round, started in 2001 but stays unfinished for the time being. Although agricultural trade accounts for less than ten percent of global exports it seems to be one of the key elements to conclude negotiations. Besides farmers in developed countries, a lot is at stake for food exporters who possess a preferential market access, for example license holders of TRQs. Furthermore, least-developed countries are afraid of losing their preferential market access to certain developed countries (ANDERSON & MARTIN 2005).

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[8] Ideally, *tariffication* results into a tariff rate with the same degree of protection for a commodity as has been provided by all NTMs.

[9] The ecu – European Currency Unit – was the unit of account of all currencies of the European Community before it was replaced by the Euro.

In December 2013, progress in the Doha Round has been made during the ninth Ministerial Conference of the WTO in Bali. The so-called *Bali Package* is the first agreement reached by the WTO which has been signed by all members. Decisions related to agriculture concern food security issues in developing countries such as India (WTO 2013d). Negotiations on the *Bali Package* serve as an example of the complexity of modern multilateral agreements. India and its allies demand the right to support their farmers in order to stock food and thus prevent food insecurity. However, such measures are perceived to be trade distorting and therefore limited. Although all members agree on the vital importance of food security, some fear that this would weaken the overall discipline in dealing with domestic support. The compromise reached in Bali includes, amongst other requirements, a peace clause for India in the next four years, meaning that WTO members "refrain from lodging a legal complaint" (WTO 2013d: s. p.).

With all its weaknesses the WTO is still the major forum for international trade. The question remains if the trend towards more bilateral and preferential agreements undermines the competence of the WTO (DOUGLAS 2009).

2.5.2. Regional Trade Agreements – Stumbling Blocks or Stepping Stones?

All members of the WTO have the right to enter into an RTA. This allows them to grant preferential access to certain countries although this discriminates countries outside the RTA. In general, for standard types of RTAs can be distinguished. (1) A free trade agreement – FTA – is the simplest form of an RTA. The members of a FTA eliminate barriers to trade on certain products but maintain their own trade policy towards non-members. This enables non-members to export to their target market through a member country. To prevent this, members elaborate rules, so called *rules of origin*, which imply bureaucratic costs. An example for a FTA is the North American Free Trade Area – NAFTA – between the US, Canada and Mexico. (2) A deeper integration is achieved by forming a Custom Union – CU. Members of a CU agree on a common trade policy against non-members. This reduces their individual sovereignty but increases their collective power. The gain of power is one reason to form an RTA. For instance, the forming of NAFTA is to some extent seen as a reaction to the deeper economic integration in the EU. (3) Creating a common market is the next step of integration. A common market allows the free movement of capital, labor, goods and services and thus, reduces individual sovereignty even further. In

return members expect higher factor productivity and more growth. To ease distributional tensions regional policies are implemented such as the regional development fund of the EU. (4) The ultimate form of an RTA is an economic union which is based on the idea of equal economic conditions for firms and workers. This requires the harmonization of the fiscal and monetary policies as well as the broader economic and social legislation. The EU is an example for an RTA on the way to an economic union. However, vital requirements such as harmonized tax rates remain missing (PERDIKIS 2007a).

All WTO members are allowed to enter an RTA under certain conditions specified in Article XXIV of the GATT[10]. These are that

a. the average trade barriers for non-members are not raised,
b. tariffs and NTMs on substantially all products in intra-regional trade are eliminated and
c. all RTAs have to be notified to the WTO.

Through these conditions trade diversion should be minimized, trade creation maximized and it should be ensured that all RTAs are in line with the GATT criteria (PERDIKIS 2007a). According to the WTO (2014a), 260 RTAs are currently in place and another 40, such as T-TIP, are under negotiation (WTO 2014b). At the present, the EU is part of 34 RTAs and negotiates another twelve agreements. Whereas the US merely has 14 RTAs in place and one under negotiation (WTO 2014a).

The Canadian economist VINER (1950) developed a conceptual framework to assess the impact of an RTA. He concluded that changes in welfare due to RTAs can be summarized in trade creation and trade diversion effects. With trade creation defined as new trading possibilities due to the elimination of internal barriers. Contrary, trade diversion occurs when low-cost suppliers outside the RTA are replaced by high-cost suppliers inside the RTA. Viner's concept is discussed in more detail in the end of this section.

Opponents of RTAs claim that they lead to trade diversion, increased complexity of the international trading system and finally, impede further multilateral trade agreements. Supporters believe that trade creation outweighs diversion and small

[10] Similar but weaker conditions exist for services as stated in the GATS.

countries gain from economies of scale due to the enlargement of their markets (KENDALL & GAISFORD 2007).

KENDALL & GAISFORD (2007) point out some stylized facts about circumstances at which trade creation dominates trade diversion. If initial high tariffs are eliminated through an RTA then trade creation is likely to dominate. The same may be true if transport and transaction costs with members are low. Considering the cost of production, large countries as a partner tend to be low-cost supplier and therefore, leading to more trade creation. Lastly, the more substitutable products of an RTA-partner are the more likely trade creation will dominate trade diversion.

2.5.3. Analysis of Trade Creation and Trade Diversion

The following section analyzes the impact of a FTA between two countries, A and B, and ROW under perfect competition in a static model. MD_A signifies import demand of A and XS_B export supply of B. Furthermore, we assume that the world price, P^*, is affected by the formation of the FTA. Pure trade creation and trade diversion is considered in the first two paragraphs as well as in Figure 10. Contemporaneous trade creation and trade diversion is analyzed in the third paragraph as well as in Figure 11.

First of all, we assume that B is a low-cost supplier meaning that the price, P_E, at which it would sell to A in an exclusive agreement is lower than P^*. Initial imports from A at the tariff-ridden domestic price, P_A, equal Q_A and as B receives P^* its initial exports are Q_B. Forming a FTA eliminates the tariff, T_A, for exports from B and thus, results in a new price at P_A' as well as increased imports of Q_A'. This increase related to the elimination of T_A is classified as the trade creation effect signified by the distance $\overline{Q_A Q_A'}$. Consumer surplus in A totals the area $a_1 + a_2$ but as tariff revenues decrease by a_1 total welfare gains are a_2. Under the condition that P^* is constant, a_2 represents the joint welfare effect of both countries. However, as B exports more to A and less to ROW, excess demand occurs at the global market and P^* is likely to rise. This is beneficial to B – the exporter – but negative to A – the importer – as well as ROW. The gains of B are larger than the losses of A because B exports more than A imports. To sum up, the joint impact of a FTA is positive for A and B but its impact on global welfare is harmful (KENDALL & GAISFORD 2007).

Secondly, we consider a situation where B is a high-cost supplier to A, meaning that $P_E > P_A$. By forming a FTA, A substitutes low-cost imports from ROW by high-cost

imports from B. However, as A still imports from ROW, the domestic price, P_A, stays constant. Now, producers in B gain from the preferential market access which increases the price to P'_B and consequently, exports to Q'_B. This increase represents trade diversion for A. In this scenario A's tariff revenues decrease by $a_1 + a_2$ and are now only a_3. As producers in B gain area a_1 the joint total impact of the FTA is negative, namely area a_2. Again, a decline of P^* is likely as net import demand from A and B decreases and excess supply on the global market occurs. The exporting countries – B and ROW – will lose by this. The joint impact of forming a FTA is negative but the joint impact of the decline in P^* is positive. This means that the results of a FTA remain ambiguous if the exporting country is a high-cost supplier (KENDALL & GAISFORD 2007).

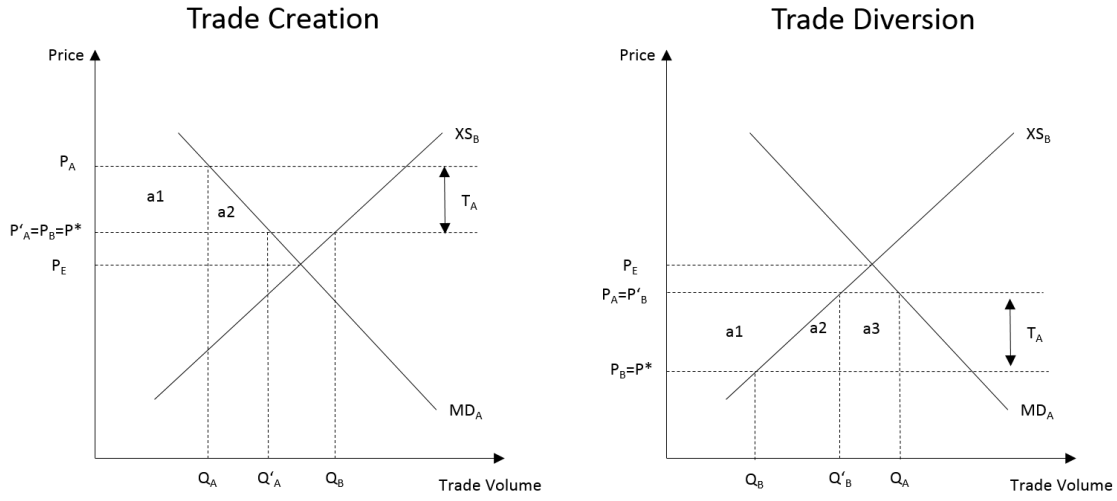

Figure 10 Graphical Analysis of Trade Creation and Trade Diversion

Source: Own graph based on KENDALL & GAISFORD (2007)

In the third scenario we think of B as a mid-cost supplier, meaning that $P_A > P_E > P^*$. Following the formation of a FTA, domestic prices as well as imports and exports of A and B are identical, $Q'_{A=B}$ and $P'_{A=B}$. The impact of a FTA is two-sided. First, it creates new imports to the extent of $\overline{Q_A Q'_{A=B}}$ and second, it diverts existing imports by $\overline{Q_B Q_A}$. Total welfare change for A can be positive or negative and comprises losses in tariff revenues of $a_1 + a_3 + a_4$ and gains in consumer surplus of $a_1 + a_2$. B unambiguously gains from a FTA namely, the area $a_3 + a_5$. To conclude, the joint impact is ambiguous and can be calculated by $(a_2 + a_5) - a_4$. The withdrawal of net imports by A is likely to result into a decline of P^* and thus, ROW will be negatively affected. However, if P^* declines sufficiently enough ROW will gain competitiveness and A

and B will reopen their markets and start importing from ROW again. (KENDALL & GAISFORD 2007).

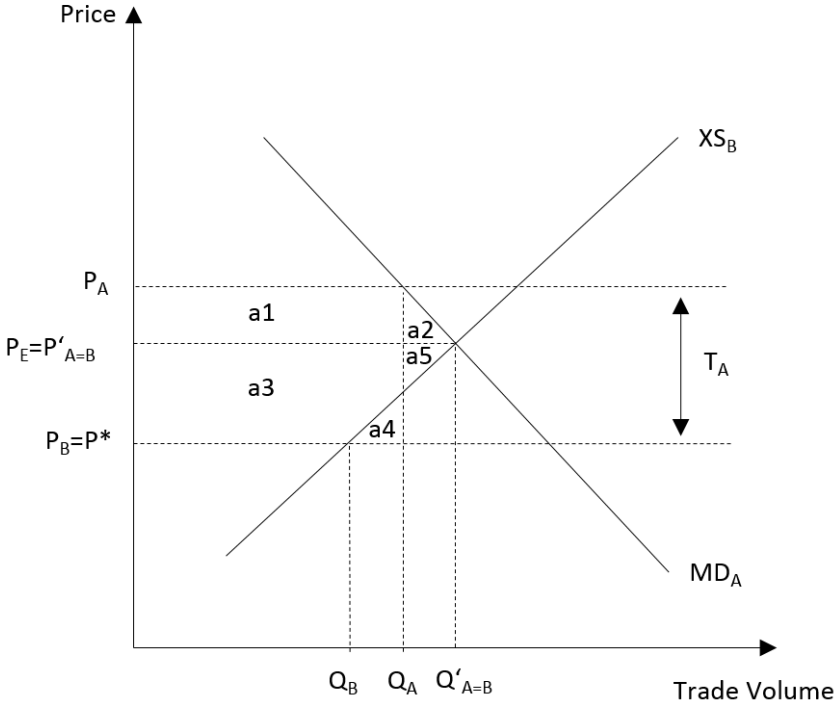

Figure 11 Graphical Analysis of Contemporaneous Trade Creation and Trade Diversion

Source: Own graph based on KENDALL & GAISFORD (2007)

2.5.4. Dynamic Effects of Regional Trade Agreements

The preceding sections described the static effects of forming an RTA. Additionally, RTAs have a dynamic impact. The elimination of barriers leads to more competition such that existing monopolist are weakened and firms are forced to use their inputs more efficiently. Furthermore, through the enlargement of the market firms may acquire economies of scale effects and find it easier to export to other member markets. Another benefit of an RTA is the increase in bargaining power against non-members. Besides these economic effects an RTA has a political dimension too. Through linking their economies member states become more interdependent which is supposed to reduce the potential of conflicts between them. The current EU is based, amongst other factors, on the idea of linking the French and German economy in order to guarantee long-term peace. Moreover, the founders of the EU wanted to create an economy that is able to challenge the US industry. A similar objective is stipulated by the T-TIP negotiators who want to strengthen the economic position of the EU and the US against emerging economies such as China, India, Russia or Brazil. Dynamic effects of an RTA can be negative as well. The creation of

an RTA may provoke retaliatory policies by non-members which may result in the reduction of world welfare. Furthermore, it remains ambiguous if RTAs help to overcome issues in multilateral negotiations or if they impede them further (PERDIKIS 2007b).

3. Methodology

An international trade model is used to assess the impact of a T-TIP on the dairy sector. In general, two categories of methods are applied for modeling international trade focused on the agricultural sector. These are partial equilibrium models – PE – and economy-wide general equilibrium models – GE. The objective of both methods is to determine equilibrium prices and quantities on given markets. Economic agents such as consumers and producers adjust their behavior according to changing prices or costs. Simultaneously, prices and costs adjust to external shocks such as the reduction of tariffs or the changing of consumer preferences. PE models focus on a specific sector and omit any linkages to the rest of the economy. Thereby, they allow a more detailed simulation of certain policy changes but are unable to simulate the adjustment process of resources. GE models overcome this issue by representing the whole economy including factor markets and inter-sector relations. Albeit this limitations, PE models are useful tools for relative rapid and transparent analysis of policy changes by focusing on a limited set of factors. Commonly applied PEs for the agricultural sector are AGLINK-COSIMO, CAPRI, GLOBIOM and ASM. An example for a GE is GTAP (VAN TONGEREN ET AL. 2001).

3.1. Examples for PE and GE Models

Even though the underlying structure of simulation models are similar, they can be distinguished according to several criteria such as their geographical scope – global or regional – and their treatment of time – dynamic or static. The following models are frequently applied to assess policy changes and are therefore briefly described.

AGLINK-COSIMO has been built by merging models from the OECD and the FAO. The OECD's AGLINK project started in 1992 to provide an analytical framework for its medium-term outlook. The focus of AGLINK lies on all OECD members and four non-members, namely China, Brazil, Argentina and Russia. The COSIMO – Commodity Simulation Model – project was started by the FAO to replace its World Food Model. In 2004 the two organization decided to merge their models in order to enhance

their medium-term commodity outlook. The programing structure is based on AGLINK and the behavioral parameters stem from the FAO model. AGLINK-COSIMO is a recursive dynamic model with a net trade approach. Thereby it captures only inter-industry trade and cannot simulate bilateral trade flows. Results of the model are evaluated by the staff of both organizations as well as country experts (ADENÄUER 2008).

CAPRI – Common Agricultural Policy Regionalized Impact – is a model to analyze the impact of the EU's Common Agricultural Policy. Its development has been supported by the European Commission and is now coordinated by the University of Bonn. It belongs to a group of more recent models which aim at combining economic analysis with bio-physical aspects such as land use and environment. CAPRI consists of two modules, the supply module for the EU which is highly disaggregated and the global market module. Both are linked through supply, demand and prices. Figure 12 schematically demonstrates the link between the regional models – supply module – and the global market module. The supply module consists of around 50 activities and a similar amount of in- and output possibilities for 280 regions. Each regional model maximizes the farm income and its results steer supply and feed demand for a country in the overall modeling system. Supply and feed demand serve as behavioral parameters in the market module and are sequentially updated. Prices are determined by the market module which is characterized as comparative static and spatial. Trade is based on the Armington assumption, i.e. goods are heterogeneous (Anonymous 2014a).

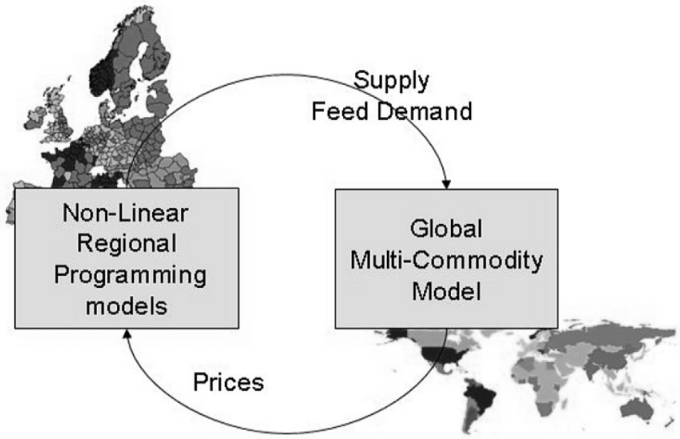

Figure 12 Linkage between Supply and Demand Modules in CAPRI

Source: http://www.capri-model.org/dokuwiki/doku.php?id=capri:concept:market (04.09.2014)

Another example for a regionalized PE model is the US Agricultural Sector and Mitigation – ASM – model. This model assesses the impact of political decisions on markets, environment and trade. The regional scope of ASM covers 63 production regions in the US as well as 27 international regions. The ASM model maximizes the economic welfare surplus under given constraints such as the supply and demand balance or the crop mix. To assess the environmental impact a coefficient is assigned to each agricultural management alternative such as the choice of the tillage system or the type of livestock production (SCHNEIDER ET AL. 2007).

Similar to CAPRI, GLOBIOM – Global Biosphere Management Model – combines economic analysis with bio-physical aspects. For instance, it is applied to measure the impact of the increased biomass use for energy production on the ecosystem. GLOBIOM is a global, recursive dynamic PE model with a bottom-up approach. Through its recursive dynamic specification, changes in one period affect the situation in the next period. Its supply side is built from the bottom – land use, land cover, management system – to the top, i.e. production and markets. Therefore it requires a detailed description of the supply side including data on soil, climate, topography, land cover, land use as well as information on the management system such as irrigation. GLOBIOM computes a market equilibrium by maximizing the sum of the producer and consumer surplus. The modeler is able to choose various land use and management options which are subject to resource, technology and policy constraints. Other than GSIM it assumes homogenous goods. However, the simulation of bilateral trade is possible through indexing trade flows by the region of origin and destination. More specific data from GLOBIOM, for instance on food demand, are used by models such as CAPRI. On the other hand, CAPRI provides detailed information on areas and production in the EU which can be adopted for GLOBIOM (IIASA 2013).

A commonly applied GE model is GTAP – Global Trade Analysis Project. This model together with a database has been developed by a network of researchers in the field of agricultural economics. GTAP is coordinated by the Purdue University, US. Its standard version is a static, multi-region, multi-sector GE model with perfect competition and constant returns. The Armington assumption allows the simulation of bilateral trade. The newest version of the GTAP database contains 57 commodities and 129 regions. Several GE models are based on the GTAP-database such as GLOBE developed by the USDA or MIRAGE – Modeling International Relationships in

Applied General Equilibrium – a model developed by the Centre d'Études Prospectives et d'Informations Internationales – CEPII (Anonymous 2014b). The later has already been used to simulate the long-term impact of a T-TIP. Intriguingly, the study conducted by FONTAGNÉ ET AL. (2013) predicts the largest trade increase following the reduction of tariffs in the dairy sector.

3.2. Model Description of the Global Simulation Model

This thesis aims at simulating the impact of trade liberalization in the dairy sector between the EU and the US as part of a comprehensive T-TIP. For this purpose, GSIM developed by FRANÇOIS and HALL (2002) is applied on the dairy sector.

GSIM is a static comparative, multiregional, partial equilibrium model which assumes that goods produced in different countries are imperfect substitutes. This so-called Armington assumption allows the simulation of bilateral trade with tariffs being the source of differentiation. Moreover, by assuming a heterogeneous nature of goods GSIM enables the simulation of intra-industry trade. Models which assume homogenous goods only capture inter-industry trade.

The model defines functions for global import demand and export supply. According to these, demand and supply for each good are specified. The impact of a trade reform is estimated by solving for the new world price that re-equilibrates demand and supply. The notation is summarized in Appendix 3.

3.2.1. Demand Side

Crucial elements of this modeling approach are the own- and cross-price demand elasticities which are derived from the import demand, MD, function. For country v import demand of good i exported by country r is defined as a function of

- the domestic price in country v of good i exported by country r,
- the domestic price in country v of good i exported by other countries s,
- and the total expenditures of country v on imports of good i.

$$MD_{(i,v)r} = f\left(P_{(i,v)r}; P_{(i,v)s}; Y_{(i,v)}\right) \quad (1)$$

The latter results from the assumption of weakly separable[11] import demand functions (JAMMES & OLARREAGA 2005).

To arrive at the own- as well as the cross-price elasticity of demand the equation (1) is differentiated by applying the Slutsky decomposition of partial demand. Through this, the change of demand due to a change in prices is explained by the substitution and income effect. As a next step, homotheticity of preferences is assumed and thus, a constant ratio between the demanded goods independently from the level of income. This implies that the income elasticity of demand equals 1 hence, the change in demand is merely driven by the substitution effect. The assumption of homothetic preference together with the assumption of weak separability, is sufficient to apply the concept of two-stage budgeting. In this consumption optimization process the consumer chooses the level of spending on a composite good and on different varieties of this good. This concept allows the definition of aggregate demand according to price and quantity indexes. Finally, the own-price (2) and cross-price elasticity (3) is derived as follows:

$$N_{(i,v),(r,r)} = \theta_{(i,v)r}\varepsilon_m - \sum_{s \neq r} \theta_{(i,v)s}\varepsilon_s = \theta_{(i,v)r} - \left(1 - \theta_{(i,v)r}\right)\varepsilon_s \qquad (2)$$

$$N_{(i,v),(r,s)} = \theta_{(i,v)s}(\varepsilon_m + \varepsilon_s) \qquad (3)$$

With $\theta_{(i,v)r}$ being the demand expenditure share of country v on imports of good i originated from r, ε_m the elasticity of import demand, $\theta_{(i,v)s}$ the demand expenditure share of country v on imports of good i originated from s and ε_s the elasticity of substitution. For more details on the calibration of these two parameters refer to FRANÇOIS and HALL (2002). The change of import demand, $\widehat{MD}$, of country v for good i exported by r is given by

$$\widehat{MD}_{(i,v)r} = N_{(i,v),(r,r)}\hat{P}_{(i,v)r} + \sum_{s \neq r} N_{(i,v),(r,s)}\hat{P}_{(i,v)s} \qquad (4)$$

[11] In demand theory, the concept of separability allows the estimation of demand for a group of goods without any reference to other parts of the consumption.

where ^ denotes a proportional change, such as $\hat{x} = \frac{dx}{x}$. $\hat{P}_{(i,v)r}$ and $\hat{P}_{(i,v)s}$ represent the change of the domestic price of good i from region r as well as s imported into region v.

3.2.2. Supply Side

Correspondingly, we define export supply, $XS_{i,r}$, of good i originated from country r as a function of the world market price, P^*.

$$XS_{i,r} = f\left(P^*_{i,r}\right) \quad (5)$$

Equation (5) can be differentiated and rearranged in percentage terms so that the change in export supply, $\widehat{XS}$, of country r is explained by:

$$\widehat{XS}_{i,r} = \varepsilon_{x(i,r)}\hat{P}^*_{i,r} \quad (6)$$

With ε_x being the elasticity of export supply and $\hat{P}^*_{i,r}$ the change in the world market price for exports of good i from region r. Import demand will be affected if tariffs on products from other countries change because of the cross-price elasticity. This interdependency of import demand and export supply becomes clear when looking at the basic relationship between supply and demand. This relationship is described by the domestic price of good i exported by country r which equals the tariff t of country v on good i exported by r times the world market price that r receives. $T_{(i,v)r}$ is the power of the tariff $T = 1 + t$ of country v on good i exported by r.

$$P_{(i,v)r} = \left(1 + t_{(i,v)r}\right)P^*_{i,r} = T_{(i,v)r}P^*_{i,r} \quad (7)$$

3.2.3. Market Equilibrium

The import market is described through the change in the domestic prices $\hat{P}_{(i,v)r}$ and $\hat{P}_{(i,v)s}$ as well as the own- $N_{(i,v),(r,r)}$ and cross price $N_{(i,v),(r,s)}$ elasticity. Therefore, **we** substitute equations (2), (3) and (4) into (7) and sum over import markets. By which

$$\begin{aligned}\widehat{MD}_{i,r} &= \sum_v \widehat{MD}_{(i,v)r} = \sum_v N_{(i,v),(r,r)}\hat{P}_{(i,v)r} + \sum_v \sum_{s\neq r} N_{(i,v),(r,s)}\hat{P}_{(i,v)s} \\ &= \sum_v N_{(i,v),(r,r)}\left[P^*_r + \hat{T}_{(i,v)r}\right] + \sum_v \sum_{s\neq r} N_{(i,v),(r,s)}\left[P^*_s + \hat{T}_{(i,v)s}\right]\end{aligned} \quad (8)$$

is obtained. P_r^* and P_s^* represent the export price in country r and s.

Equation (8) is now set equal to a modified version of (6) which defines the market clearing conditions of GSIM. The change of import demand of good i originated from r equals the change in export supply of good i originated from r.

$$\widehat{MD}_{i,r} = \widehat{XS}_{i,r} \Rightarrow \varepsilon_{X(i,r)}\hat{P}_{i,r}^* = \sum_v N_{(i,v),(r,r)}\hat{P}_{(i,v)r} + \sum_v \sum_{s \neq r} N_{(i,v),(r,s)}\hat{P}_{(i,v)s}$$
$$= \sum_v N_{(i,v),(r,r)}\left[P_r^* + \hat{T}_{(i,v)r}\right] + \sum_v \sum_{s \neq r} N_{(i,v),(r,s)}\left[P_s^* + \hat{T}_{(i,v)s}\right] \quad (9)$$

Equation (9) is the core equation of GSIM. Under the condition that the change in export supply equals the change in import demand **we** can solve for the new world price. Export quantities are determined by solving equation (6) and import quantities by solving (8).

The welfare effects can now be approximated by the combination of the change in producer surplus, ΔPS, and consumer surplus, ΔCS, as well as the change in import tariff revenues, ΔTR. The producer surplus approximates the change in the area between the export supply curve, XS, and the price line. This is represented by the trapezoid $abcd$ in Figure 13. $X_{(i,r)}$ represents the export quantity of country r and $\mathrm{P}_{i,r}^{0*}$ the initial world market price for exports from region r. Formally, this is calculated by

$$\Delta PS_{i,r} = \left(R_{i,r}^0 * \hat{P}_{i,r}^*\right) * \left(1 + \frac{\varepsilon_{X,(i,r)} * \hat{P}_{i,r}^*}{2}\right) \quad (10)$$

where $R_{i,r}^0$ represents benchmark export revenues, either bilateral or in total.

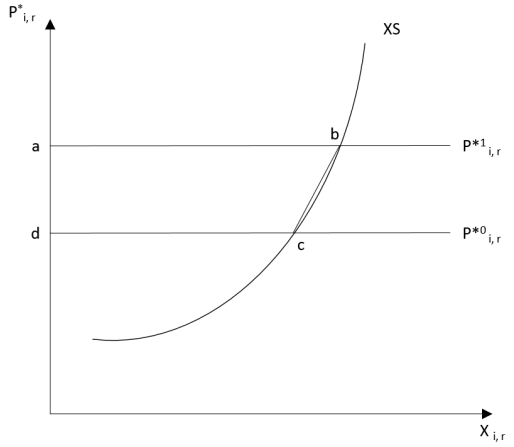

Figure 13 Export Markets and Producer Surplus

Source: Own graph based FRANÇOIS & HALL (2002)

Figure 14 illustrates the change in consumer surplus represented by the trapezoid $abcd$. The change in consumer surplus is defined by the change in the area between the composite import demand curve, MD, and the composite good price, P^*. $M_{(i,v)}$ represents the import quantity of country v of good i. It is calculated using the following formula:

$$\Delta CS_{i,v} = \left(\sum_r R^0_{(i,v)r} * T^0_{(i,v)r}\right) * \left(\frac{1}{2}\varepsilon_{M,(i,v)}\hat{P}^2_{i,v} * sign\left(\hat{P}_{i,v}\right) - \hat{P}_{i,v}\right) \quad (11)$$

where

$$\hat{P}_{i,v} = \sum_r \theta_{(i,v)r}\,\hat{P}^*_r + \hat{T}_{(i,v)r}$$

In equation (11) $P_{i,v}$ represents the price for the composite imports and $R^0_{(i,v)r} * T^0_{(i,v)r}$ the initial expenditure at domestic prices.

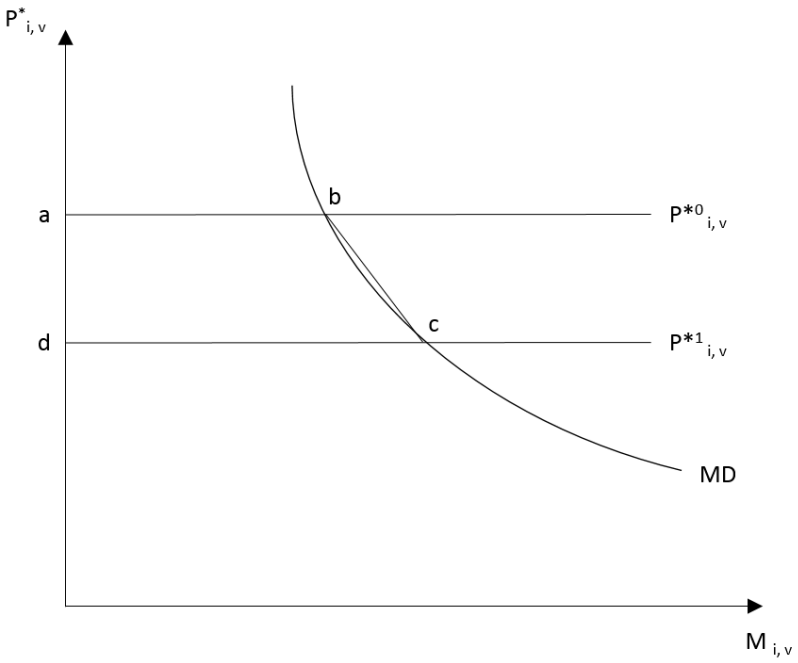

Figure 14 Import Markets and Consumer Surplus

Source: Own graph based FRANÇOIS & HALL (2002)

Finally, the change in tariff revenues is approximated by:

$$\Delta TR_{(i,v)r} = t_{(i,v)r} MD_{(i,v)r} P^*_{(i,v)r}\left(\left(\hat{t}_{(i,v)r}\right) + \hat{P}^*_{(i,v)r}\left(1 + N_{(i,v),(r,r)}\right)\right) \quad (12)$$

3.3. Scenario Description

Considering the early stage of the T-TIP negotiations details about any tariff reduction commitments are unavailable or insufficient. Therefore, the two scenarios are based on a complete liberalization and on a recent agreement. The study by FONTAGNÉ ET AL. (2013) on the impact of a T-TIP assumes four different scenarios with the complete elimination of all tariffs being one. The other three scenarios include the elimination of NTMs as well as possible spill-over effects on other industry sectors.

The first scenario of this thesis assumes a complete liberalization of trade in dairy products between the EU and US. It implies that all tariffs as well as TRQs are eliminated. Thus, a value of zero is assumed for tariffs as well as for its equivalents of TRQs. The calculation of tariff equivalents of TRQs follows in section 4.2. The impacts of the elimination of other barriers such as the Grade A certification are excluded from the model. This scenario, although rather unrealistic, provides an insight into the specific **impacts** of a bilateral liberalization of the dairy sector **on the welfare of trading partners**.

The second scenario is based on the Comprehensive Economic and Trade Agreement – CETA – between the EU and Canada. This is the first RTA of the EU with a G-8 member. Moreover, Canada and the US share a deep economic and cultural relationship thus, CETA is likely to be an adequate proxy for a T-TIP. In October 2013 the political breakthrough has been achieved and details about the impact on the dairy sector have been published (EC 2013c; GC 2013). Following this agreement it is assumed that the EU provides duty-free and quota-free access to all US dairy exports while the US merely provides better access to their cheese market. This implies that the quotas for all cheese varieties are considerably enlarged and thus, the in-quota rates apply instead of the out-quota rates. This scenario might become possible if the EU receives a better market access in a different sector in exchange or is able to impose the EU regime of geographical indications on the US.

4. Data

The analysis of the regional trade liberalization in the dairy sector includes four regions. Alongside the EU and the US, New Zealand and ROW, as an aggregated region, are included. New Zealand was chosen due to its status as a major exporter of dairy products and its importance as a trading partner to the EU as well as to the

US[12]. The data requirements of GSIM are bilateral trade values, a bilateral tariff matrix as well as the elasticities of export supply, aggregated import demand and substitution. Data are derived from international organizations such as the WTO, the FAO and the UN and are complemented by data from EUROSTAT and USDA.

This analysis includes the whole dairy sector as defined by the WTO (2012b) i.e. six headings of the HS nomenclature namely, HS 0401 to 0406, thus comprising 20 tariff lines at the HS 6-digit level. Appendix 1 provides a detailed list of products included in the analysis.

In general, data for the analysis stem from 2011 because of the limited availability for more recent years. For this base year trade and tariff data are provided for the EU, the US and New Zealand. In 2011 trade and tariff data for ROW are missing for 32 respectively, 84 countries. However, all major exporting and importing countries are included.

4.1. Bilateral Trade Matrix

Trade flow data at the HS 4-digit level are obtained from the United Nations Commodity Trade Statistics Database – UN COMTRADE – which can be accessed through WITS[13]. UN COMTRADE includes import and export statistics of nearly 200 countries starting from 1962. A major caveat is that trade between the EU and the ROW is biased by EU intra-trade. This problem is solved by creating a specific world group which excludes EU member states. This group is then used as the partner country of the EU.

4.2. Initial Tariff Matrix

Bilateral tariff data originate from the Market Access Map database – MAcMap – which has been developed in collaboration of the International Trade Center and CEPII. The advantage of MAcMap is that it includes ad-valorem equivalents – AVE – for specific tariffs and TRQs. In his detailed description of MAcMap BOUET ET AL. (2004) acknowledges that TRQs "cannot perfectly be summarized through an AVE (BOUET ET AL. 2004: p. 19)". However, the method used in MAcMap allows the incorporation of

[12] In 2012 dairy imports from New Zealand ranked second in the EU – after Switzerland – and first in the US (WITS, 05.05.2014).

[13] WITS is a software developed by the World Bank that provides access to tariff and trade data.

data on TRQs in economic models. To calculate an AVE, a fill rate for each TRQ is calculated by which three market regimes are distinguished. Depending on the market regime the in-quota, out-quota or a simple average of both rates is assumed. An AVE is defined as a tariff that results in the same level of imports as under the TRQ. Following this definition an AVE for each TRQ is calculated. A trade-weighted average of applied tariff rates for the HS 4-digit level is calculated according to the methodology proposed by MAcMap[14]. Tariffs for ROW were calculated using an export-weighted average as the information on imports is missing for some countries. A similar approach has been chosen in a study by MUTAMBATSERE (2006) on the liberalization of the cereal market. To calculate the export-weighted average, the tariff schedules of major export destinations were consulted. The selected destinations cover around 90% of the export value of the three regions. The aggregation process is described in the following section.

4.2.1. Aggregation of Tariff Data

The tariff rates for the six HS groups – HS 0401-0406 – were aggregated using a trade-weighted average. The three standard weighting methods for tariffs are:

(1) National imports – weighted by the national import value,
(2) Reference group imports – weighted by the trade pattern of a reference group the country belongs to, and
(3) Global imports – weighted by the total value of global imports.

In a hypothetical situation of free trade the first method would be the best choice. However, as this is not the case the national imports method underestimates a country's level of protection due to an endogeneity bias, i.e. a high tariff might lead to low imports and thus, an underestimation of the tariff's protection. The simple average method is avoided as it includes high tariffs on products which are hardly traded anyway. Thus, it tends to bias the level of protection upwards. **In this thesis** the import value of a reference group, of which the country is part of, is used to weight tariffs. Thereby, it is possible to control for the endogeneity bias[15]. The

[14] For more information refer to http://www.macmap.org/SupportMaterials/Methodology.aspx (04/08/2014).

[15] For more details on the calculation of the reference group's import value refer to http://www.macmap.org/SupportMaterials/Methodology.aspx#method_D (21/07/2014).

reference group consists of all high-income members of the OECD listed in Appendix 4.

4.3. Elasticities of Supply, Demand and Substitution

Finally, the three elasticities are partly derived from a literature review and partly calculated. For this purpose, studies who applied GSIM as well as seminal works on this issue were scrutinized and the most appropriate elasticities were selected. By default GSIM is estimated with the values proposed by FRANÇOIS & HALL (2002). These are 1.5 for the export supply elasticity, -1.25 for the import demand elasticity and 5 for the elasticity of substitution. Table 4 provides an overview of the values for different elasticities which are applied in this thesis.

Elasticity	Country			
	US	EU	ROW	NZ
Import Demand	-2.91	-1.07	-1.50	-4.71
Export Supply	0.42	0.34	0.40	0.48
Substitution	5.00	5.00	5.00	5.00

Table 4 Summary of Values for Different Elasticities

Source: Own calculation.

4.3.1. Elasticity of Import Demand

The composite import demand elasticity, ε_m, reflects the degree of responsiveness of the import demand to price changes. An elasticity of -1.25 means that a 10% increase in the price reduces imports by 12.5%. In their seminal work, KEE ET AL. (2004) developed an estimation method – the GDP approach – for this elasticity at the HS 6-digit level. Based on the same rational BURKITBAYEVA & KERR (2013) estimated the import demand elasticity for aggregated regions such as the EU and ROW. The sector specific elasticities of import demand for this thesis were obtained by using the import demand elasticities provided by WITS[16] as well as import volumes at the tariff line level. The trade-weighted average for the dairy sector was calculated as follows:

[16] http://wits.worldbank.org/referencedata.html (29/07/2014)

$$\varepsilon_m = \sum_i \theta_i, \varepsilon_i \qquad (13)$$

Where, ε_i is the elasticity of demand for good i and θ_i is the weighting factor of this good. For ROW a value of -1.5 is assumed. Table 5 summarizes values of the import demand elasticity obtained through a literature research. The values differ considerable according to several factors such as the level of aggregation, the year, the region or the sector. According to KEE ET AL. (2004) goods become more elastic, i.e. more negative, if they are homogenous, estimated at a more disaggregated level and if the country is large. However, they become less elastic in a high income country.

Source / Country	FRANÇOIS & HALL (2002)	KEE ET AL. (2004)[17]	NICITA & OLARREAGA (2006)[18]	BURKITBAYEVA & KERR (2013)	Own calculation
EU	-1.25	-1.53		-3.00	-1.07
US	-1.25	-3.39	-1.40	-1.40	-2.91
New Zealand	-1.25	-1.56	-1.08	-1.08	-4.71
ROW	-1.25	-1.67		-1.5	

Table 5 Estimations on Import Demand Elasticities

4.3.2. Elasticity of Export Supply

Similar, the export supply elasticity demonstrates the responsiveness of export suppliers to changes in the export price. By default it is set at a value of 1.5 which implies that all four regions have the same ability to respond to demand changes. Again a 10% increase in the price increases exports by 15%. According to HOLZNER (2004) this corresponds to the *large country* assumption. A similar approach was chosen by LEDJOU (2012) who uses this value for all major exporting regions. Other studies (HOLZNER 2004; BURKITBAYEVA & KERR 2013) assume a relatively elastic export supply function for large countries and a relatively inelastic function for small

[17] Values are simple averages. The EU value represents the mean of all member states. The ROW value stands for the simple average over all countries and sectors.

[18] Values stem from the Trade, Production and Protection 1976-2004 database and are estimated at the ISIC 311 – Food products – level. Austria has a value of -1.08.

countries. A more recent study by TOKARICK (2010) estimates the following global values for the EU, the US and New Zealand: 1.69, 1.56 and 1.01. Finally, values from ATPSM – Agriculture Trade Policy Simulation Model – an agricultural model developed by UNCTAD, provides export supply elasticities for certain dairy products. This calculation is based on data from the FAO. For this thesis, an export-weighted average of the ATPSM estimations was calculated which yields values between 0.34 and 0.48. These values were used as a proxy for the dairy sector.

4.3.3. Elasticity of Substitution

The third behavioral parameter to run GSIM is the elasticity of substitution which determines the rate of substitution between imports and domestic products. The value of 5 was adopted for all regions of the model. This value is proposed by FRANÇOIS & HALL (2002) and according to FUJITA, KRUGMANN & VENABLES (2000) this value is often applied in literature. Similar, GTAP as well as the model applied by the USITC – US International Trade Commission – adopt an elasticity of substitution of 5 for dairy products (DONNELLY ET AL. 2004). Considering the responsiveness of results to the selection of these three elasticities, a sensitivity analysis is conducted in section 5.4.

5. Results

Through the application of GSIM, a new market equilibrium is obtained, i.e. the results of the scenario analysis. The world market clearing price is used to calculate changes in trade flows and welfare. This section summarizes the outcome of two possible scenarios of a T-TIP as described in section 3.3. Scenario one assumes a complete liberalization of the dairy market, whereas in scenario two only parts of the dairy market are liberalized.

5.1. New Market Clearing Price

The impact of the new market equilibrium on export prices, i.e. the price received by producers of a country on the world market, and on the output is summarized in Table 6. In this model the export price of dairy products from any country differs from the domestic price due to tariffs. Through a T-TIP exporters in the EU and the US receive a higher price on the world market and thus, a higher welfare. The higher price is driven by more demand between the members of the trade agreement. In other words, consumers in the US are interested to purchase more products from EU-producers at an exclusive price, rather than paying the higher tariff-ridden price of

countries outside the trade area. As suggested by theory, this price increase is higher if trade is completely liberalized such as in scenario one. A partial liberalization, i.e. scenario two, leads to an attenuated impact on prices. However, the tendency of the price development remains identical. Contrary to exporters in the EU and the US, producers in ROW face a decline of their export prices. This is explained by less import demand from the EU and the US which puts a downward pressure on the market price for exporters in ROW. Through a T-TIP the relative market conditions of ROW erode and its products become disadvantaged due to prevailing tariffs. Thus, existing imports from ROW are diverted to exporters from the EU or the US. The export price for New Zealand's dairy products marginally increases due to more demand from ROW. As the bilateral trade volume between the EU and the US rises, their supply to the world market is reduced. This gap on the world market is partly filled by producers from New Zealand. Output is driven by the export price and the elasticity of supply. As the latter is more or less symmetric in all regions – see Table 4 – the different output values are driven mainly by the market price. All major exporting regions, i.e. the EU, the US and New Zealand, receive higher prices for their products on the global market. This results in more supply and thus, an increase in output in these regions. On the other hand, producers in ROW reduce their output due to a price fall on their export markets. Again, the magnitude of change is larger if a T-TIP leads to a complete liberalization. A partial liberalization reduces the growth in the output change as new trade creation is limited.

The elimination of tariff barriers results in a slight drop of domestic prices in the signing countries of the FTA. The decline of the domestic price is explained by the following example. Without a T-TIP consumers in the US pay the world market price plus the tariff for EU-products. By eliminating the tariff US-consumers are able to purchase EU-products at an exclusive and cheaper price. This rises the demand and thus, the export volume from the EU increases. EU-producers are unable to satisfy this increase of demand at the former price level, i.e. the US-domestic price minus the tariff, and thus, the export price for EU producers increases[19]. However, the increase of imports, even at a higher price for EU-products, lowers the domestic price in the US.

[19] If we assume a perfectly elastic supply by the EU, i.e. an infinite elasticity of export supply, then prices would remain the same and only the output of EU-producers would adjust to the new market situation.

Obviously, a change in the domestic price affects producers too. However, their loss in welfare is more than compensated by the increase in the consumer surplus. Following this example we return to the results of GSIM. A complete liberalization results in a drop of domestic prices in the EU, the US and New Zealand. The highest drop can be observed in the US where the price level falls by 9% compared to 4% in the EU. Since the value of imports by the EU from the US is lower than vice versa, the reduction of the consumer price is less pronounced in the EU. While consumers in these regions will gain, they suffer a small price increase in ROW. The latter occurs because of less supply by the EU and the US which is insufficiently compensated by New Zealand. This seemingly small price increase of 1% results in a large reduction in the consumer surplus of ROW. With respect to a partial liberalization, the price decrease becomes identical in percentage terms in the EU and the US. This suggests that US-consumers my gain noticeably more through a complete liberalization. Furthermore, a partial liberalization hardly affects the domestic price in ROW because the reduction of supply by the EU is less pronounced. The composite domestic price in New Zealand drops due to cheaper supply by ROW which partly diverts its exports from the EU and the US to New Zealand at a lower price.

Other than welfare results in %			
Country	Change in domestic price	Change in export price	Change in output
US	-9.0 (-3.0)	1.3 (0.8)	0.6 (0.34)
EU	-4.0 (-3.0)	1.8 (0.53)	0.6 (0.2)
ROW	1.0 (0)	-2.8 (-1.8)	-1.1 (-0.7)
NZ	-1.0 (-1.0)	0.5 (0.1)	0.2 (0.1)

Table 6 Summary of the Results of a Complete Liberalization (Scenario One) and a Partial (Scenario Two)

Note that values for the second scenario are in parenthesis.

Source: GSIM

5.2. Change in Trade Flows

Both scenarios show that changes in trade flows are consistent with theory, i.e. freer trade leads to more trade between the members of the agreement. Consequently, substantial gains are observed for the EU and the US due to the tariff elimination. In percentage terms the US is able to increase the value of trade by over 150% in both scenarios. A complete liberalization increases the EU-trade by 52%. An increase of merely 14% is observed if trade is partially liberalized. The relative large increase in US trade is partly explained by the initial low level of trade before forming a FTA. However, regarding the absolute values the EU is able to raise their trade value more than the US in both scenarios and thus, maintains its trade surplus in the dairy sector.

As the relative market conditions for ROW and New Zealand erode, their trade with the EU and the US decreases. In the complete liberalization scenario, the reduction is higher with -2.2% for ROW and -6% for New Zealand. Albeit these changes seem minor, they reflect major shifts. For instance, absolute trade between ROW and the new FTA diminishes by five times the initial export volume of the US to the EU. In the case of New Zealand a T-TIP has an overall positive impact. Due to less supply of the signing partners to the world market it is able to export more to ROW. These newly created trade possibilities are higher than the losses through trade diversion. A partial liberalization reduces the scale of these changes by approximately one-third.

From the analysis in section 2.5.3 trade creation occurs if new trade possibilities between the EU and the US are created due to the elimination of tariffs. Trade diversion takes place if trade is diverted from a low-cost supplier outside the FTA to a high-cost supplier with a preferential market access. The results of both scenarios suggest that creational effects are larger than trade diversion. This implies that both partners complement each other quite well as has been suggested by the Grubel-Llyod index. Table 7 shows selected parts of the trade volume changes in a complete liberalization scenario. US-imports from the EU increase considerably more than they decrease from other trading partners. The main part of this decrease is carried by New Zealand as its market access conditions erode relatively more than those of ROW, i.e. it faces a higher tariff. In addition, New Zealand's initial trade volume was higher than ROW's. In total, New Zealand's gains through exports to ROW are higher than its losses to the EU and the US. In a global scale more trade in

dairy occurs if a T-TIP is agreed on and the impact is higher if trade is completely liberalized between the EU and the US.

Exporter	Importer	Quantity change in %	Value change in $ 1000
US	EU	154.2	93291.5
EU	US	52.1	516990.8
US	ROW	-2.1	-28222.6
EU	ROW	-4.4	-263697.7
ROW	US	-4.7	-25668.7
ROW	EU	-0.4	-22925.9
NZ	US	-21.5	-61236.6
NZ	EU	-17.2	-51307.9

Table 7 Summary of Changes in Trade Flows following a Complete Liberalization

Source: GSIM

Figure 15 compares a complete and a partial liberalization in terms of changes in export values. The export origin is given on the horizontal axis and the colored bars represent the export destinations. In general, the impact of a T-TIP on the trade flows is similar in both scenarios with merely the magnitude varying. The increase of exports from the EU to the US diminishes considerably if trade is only partially liberalized. However, even in this scenario the change in exports is higher for the EU than for the US. The tendency of change between both scenarios is identical with one exemption concerning exports from ROW to the US. Intriguingly, if the dairy market is only partially liberalized, ROW is able to increase its exports to the US despite higher tariffs compared to the EU. This is partly explained by the rise of US-demand due to a lower domestic price which cannot be satisfied by the EU alone as well as the higher competitiveness of ROW. The export value of New Zealand is marginally affected by a T-TIP. The decreased value of exports to the EU and the US is compensated by more exports to ROW. In total, New Zealand is able to marginally increase its export value in both scenarios.

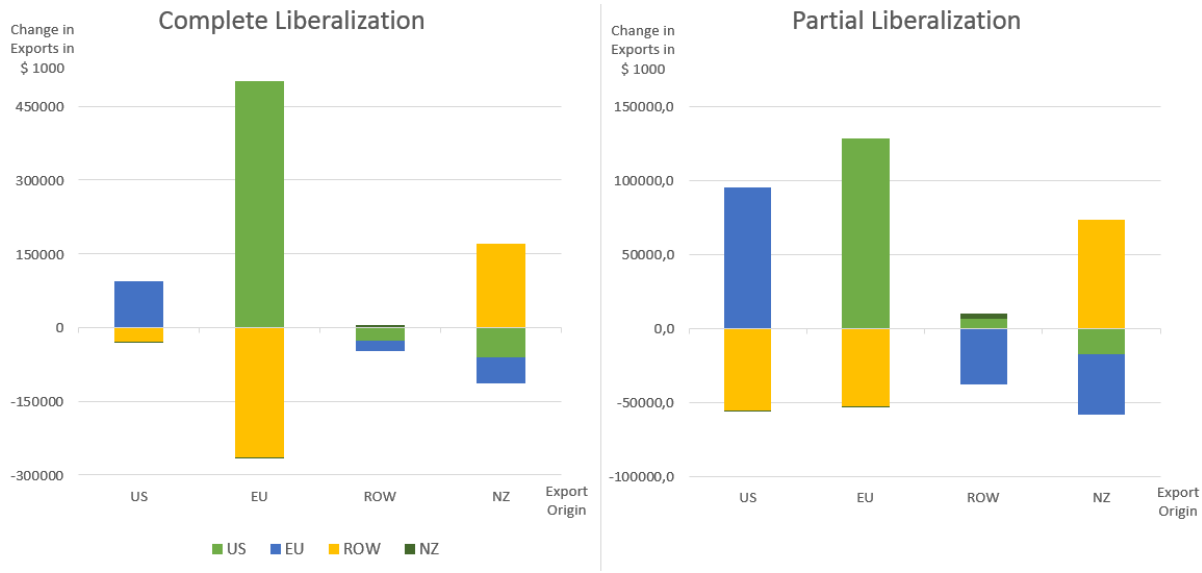

Figure 15 Comparison of Changes in the Export Values

Source: GSIM

5.3. Impact on Welfare

As expected by the hypothesis the EU and the US benefit from a reciprocal tariff reduction. Table 8 provides an overview of welfare effects of the two T-TIP scenarios analyzed in this thesis. Regarding total net welfare effects, the EU distinctly gains more if trade is completely liberalized. This alters if the US only liberalizes parts of its dairy sector as described in scenario two. With regard to this scenario, the US achieves a higher total welfare gain than the EU by keeping the majority of its tariff revenues. It is assumed that New Zealand is able to profit from a T-TIP too, whereas welfare in ROW severely deteriorates. The impact of a T-TIP on the global welfare is negative mainly due to the large decrease of tariff revenues. The majority of this decrease originates from the elimination of tariffs through forming an RTA. A smaller part originates from ROW where a reduced trade volume results in less tariff revenues. The increase of New Zealand's tariff revenues is negligible. FRANCOIS (2009) suggests to subtract tariff revenues to obtain net consumption benefits[20]. This would result in a positive global impact of a T-TIP.

[20] A main effect of imposing a tariff is that the "consumer pays a tax to the government, whose revenues increase correspondingly" (LAIRD 1997: p. 38). Thus, the net consumer benefits are obtained by netting revenue losses against the consumer surplus.

Examining the welfare effects of a complete liberalization more carefully it becomes obvious that the EU and the US face a massive decline of their tariff revenues. However, this drop in revenues is out-weighted by the increase of producer and consumer surplus. With respect to the EU, it is mainly the producer surplus which generates an overall positive impact. On the other hand, the US surplus is largely driven by gains of consumers. With regard to a partial liberalization, the positive surplus of US-consumers continues to be the main driver of the increased welfare in the US. In the EU, however, consumer and producer surplus become almost equally important in the case of a partial liberalization. While its producer surplus is reduced by two-thirds, its consumer surplus remains more or less the same.

As has been indicated above, the total welfare impact of a T-TIP is negative for ROW. Consumers have to bear the main part of this welfare reduction. Their surplus decreases significantly in both scenarios as the supply from the EU and the US is decreased and only insufficiently compensated by New Zealand. In the case of a partial liberalization the consumer's loss in surplus is reduced by two-thirds. However, this result has to be assessed carefully as different countries are aggregated in ROW. Exporting countries such as Argentina and Australia may gain similar to New Zealand while importing countries are supposed to suffer negative welfare effects.

The impact of a T-TIP on New Zealand is presumably marginal compared to other regions of the model. The majority of its welfare changes results from an increased producer surplus. This indicates that producers in New Zealand are able to gain from enhanced export possibilities to ROW. New Zealand is even less affected if trade is only partially liberalized. In the latter case it preserves its market conditions in the US for all products except cheese. Contrary, the EU exports less to the US and more to the global market thereby limiting New Zealand's export expansion.

	Welfare Changes in $ 1000			
Country	Producer surplus	Consumer surplus	Tariff revenues	Net welfare effect
US	44707.6 (27442.8)	195603.2 (50263.3)	-194548.3 (-31336.4)	45762.6 (46369.7)
EU	187671.8 (56005.9)	54677.1 (47710.9)	-64173.6 (-62464.8)	178175.4 (41252.0)
ROW	-30962.2 (-20068.8)	-300191.1 (-106468.1)	-36012.0 (-20174.9)	-367165.3 (-146711.8)
NZ	38778.3 (10289.1)	733.0 (607.1)	23.9 (21.0)	39535.2 (10917.2)
Global welfare effects	60048.5 (73668.9)	-49175.8 (-7886.8)	-294709.5 (-113955.1)	-103691.4 (-48173.0)

Table 8 Summary of Welfare Effects - Scenario One and Two

Note that values for the second scenario are in parenthesis.

Source: GSIM

5.4. Sensitivity Analysis

In order to evaluate the responsiveness of the results a sensitivity analysis is performed by using alternative values of the elasticities of (1) import demand, (2) export supply and (3) substitution. Furthermore, (4) different tariff rates obtained from the aggregation methods described in section 4.2.1 are applied. The purpose of the sensitivity analysis is to examine if the results are sensitive to the selection of elasticity values and aggregation methods. Moreover, it provides a better understanding of these key parameters. The results of selected simulations are presented in the appendix. The alternative values of the three elasticities are identified through a literature research. In order to assess the robustness of the results either the lowest or the highest value is chosen for the simulation.

(1) Using the lowest or the highest values for the elasticity of import demand, ε_m, alters the magnitude of change, whereas the tendency remains identical. Lower values result in less trade and higher values in more trade. Simulation results for the lowest values can be found in Appendix 5.

(2) A lower elasticity of export supply, ε_x, leads to less changes in prices and higher changes in output – see Table 9. Consequently, trade in dairy increases compared to the original, i.e. lower, values. Changes for New Zealand are less pronounced as the difference between the original and the alternative value is minor. Changes in welfare have the same tendency with merely the magnitude differing.

Country	Change in %			
	Export price – lowest ε_x	Change in supply – lowest ε_x	Export price – highest ε_x	Change in supply – highest ε_x
US	1.1	0.6	0.8	1.3
EU	1.8	0.6	1.2	1.9
ROW	-2.8	-1.1	-2.4	-3.3
NZ	0.5	0.2	0.2	0.2

Table 9 Sensitivity Analysis (2) Comparison of the Lowest and the Highest Elasticity of Export Supply

Source: GSIM and own calculation

(3) No alternative values for the elasticity of substitution, ε_s, have been found in the literature. Other studies which applied GSIM and conducted a sensitivity analysis simply multiplied this value – see MUTAMBATSERE (2006) and THANH (2013). Doubling the elasticity of substitution is consistent with a higher quantity and price response and hence, higher changes in welfare. The tendency of change is maintained by doubling the value of ε_s from 5 to 10. If ε_s is increased even further the positive welfare effects of the EU and the US become negative – see Table 10. This is explained by smaller changes in prices than in quantities. As the volume of trade increases with higher ε_s the loss in tariff revenues surpasses the gain in consumer and producer surplus. This tendency can already be observed if ε_s is merely doubled – see Appendix 6.

	Change in the EU export price in %	Change in % to previous ε_s value	Change in EU-US bilateral trade in %	Change in % to previous ε_s value	EU total welfare in $ 1000
ε_s	1.8		52.1		178171.8
$2 * \varepsilon_s$	1.9	5.9	74.6	43.2	157156.2
$5 * \varepsilon_s$	2.1	11.3	138.1	85.1	44319.5
$10 * \varepsilon_s$	2.4	15.5	264.0	91.2	-197423.3

Table 10 Results of Different Levels of the Elasticity of Substitution

Source: GSIM and own calculation

(4) Different tariff aggregation methods result in negligible changes of the protection level. The simple average method results in slightly higher tariff rates, i.e. less than 10%. The difference in tariff rates is even weaker if tariffs are weighted by the global trade value. Consequently, simulating a complete liberalization with different tariff rates provides no substantial change. In summary, the higher the initial tariff rates the higher the total welfare gains for the EU and the US after the liberalization.

The sensitivity analysis reveals the responsiveness of the results. Using different values of certain key parameters, i.e. elasticities, leads to the same tendency of change with a different magnitude.

6. Discussion

The formation of an RTA is positive for members of the agreement, whereas countries outside are discriminated. Can such an agreement be positive for the global economy at large? Economic literature argues that, given that more trade is created than diverted, an RTA has a positive impact. Thus, "a trade creating RTA is … a positive move towards an open multilateral trading system" (PERDIKIS 2007a: p. 89). The results of the GSIM analysis clearly support the creation of a T-TIP based on this indicator. On the other hand, the total global welfare effect is negative due to the large decrease of consumer surplus in ROW as well as the reduction of tariff revenues. However, if the loss in tariff revenues is netted against consumer surplus, in order to obtain net consumption benefits, the global impact of a T-TIP becomes

positive. Hence, the issue whether RTAs contribute to the multilateral trading system or not remains ambiguous.

The results suggest that the consumer and producer surplus in the EU and the US increase considerably. GSIM assumes a single representative agent framework. Thus, it remains unclear how this increase is distributed. A model with the assumption of heterogeneous firms reveals that the benefits of trade liberalization are unequally spread. Firms who are more productive and who can afford the entrance into the export market will gain while less productive – and probably financial less potent – firms are driven out of the market (MELITZ 2003).

The consequences of a T-TIP have been discussed in other studies as well. The following subsection compares the results of two GE models with the outcome of this thesis. MIRAGE a GTAP-based GE model developed by CEPII predicts an increase of bilateral agricultural exports of over 150% for both regions. The study conducted by FONTAGNÉ ET AL. (2013) forecasts the highest increase in the dairy sector. This increase is similar to the rise of US exports – 154% – predicted by GSIM, whereas EU exports rise by 52%. Trade flow changes to ROW are less than 5% which corresponds to the values simulated by GSIM. However, the comparability of these results is limited as the whole agricultural sector is compared to the dairy sector.

An earlier study by ERIXON & BAUER (2010) estimates the impact of a complete liberalization through a T-TIP in a GE analysis too. This study predicts an output change of -0.3% for the EU compared to an increase of 0.6% estimated by GSIM. Other than the GSIM analysis, this study excludes TRQs which might be a possible explanation for this adverse tendency of the output. Output changes for the US are similar with 0.3% compared to 0.6%. Export changes are identical in direction but different in magnitude. ERIXON & BAUER (2010) predict an increase of 15.0% for the EU and 223.0% for the US compared to the GSIM values of 50.0% and 150.0%.

6.1. Limitations of this Thesis

The results of this thesis are limited by the assumptions of GSIM as well as the study design itself. Firstly, the limitations related to GSIM include the representative agent assumption, i.e. an identical demand and supply elasticity for all groups of consumer and producer. This implies that all agents have the same degree of responsiveness independently from their income and geographic location. Secondly, a complete price transmission is assumed to estimate the welfare impact of a policy change.

However, if the changes in the equilibrium price are transmitted only partly to the household and producer level this may lead to an overestimation. Thirdly, as GSIM is a partial equilibrium model it omits any inter-sectorial linkages that might exist between the dairy market and other parts of the economy. Thus, the actual response to the new equilibrium might be over- or underestimated. Moreover, GSIM is unable to predict income and resource reallocation effects. Fourthly, GSIM is a static model as such it compares results at a given point of time and fails to assess dynamic effects during the transition period.

In addition to GSIM, the study framework itself has certain limitations. (1) Information on production and export subsidies are excluded from the analysis. The agricultural sector in the EU as well as in the US is heavily subsidized, hence any reduction commitments in the course of a T-TIP potentially affects international trade. Moreover, diminishing tariff revenues could lead to less subsidies as the spending of the government is reduced[21]. However, this thesis assumes that the creation of a T-TIP has no influence on domestic agricultural policies. (2) ROW as an aggregated group includes various countries which differ considerably in terms of income, production possibilities, trade balance etc. Each individual country will respond differently to the new situation on the world market, thus the estimated results are merely a rough prediction for the aggregated countries. (3) In this thesis different dairy products have been aggregated to a single sector – the dairy sector. This implies that changes in the average price might differ significantly from the individual product price changes. (4) The quantitative analysis assesses only welfare effects of the tariff reform. Thus, it is unable to capture effects neither of trade facilitation such as improved coordination of trade policies, nor reforms of NTMs. The latter have the potential to multiply welfare effects and a comprehensive T-TIP might be a possibility to reform these kinds of measures. For instance, accounting EU-standards equivalent with the requirements for the Grade A certification will considerably facilitate trade in dairy products. Therefore, the results of GSIM might underestimate the effect of a comprehensive trade agreement.

[21] However, it is assumed that the importance of tariffs on dairy products for government funds is minor. For instance, in total merely 12% of the EU budget derives from tariffs.

6.2. Future Research

Further research could include other trade distorting factors such as production and export subsidies or NTMs other than TRQs. Besides the version of GSIM implemented in this thesis, an extended version is available. This extension has additional features such as the inclusion of domestic production subsidies or export subsidies. In the extended version domestic and export prices differ according to a combination of tariffs and subsidies (FRANCOIS 2009). Obviously, the implementation requires more data. Nevertheless, agricultural subsidies play an important role in the international trade policy and the inclusion of them is likely to yield promising results. NTMs such as different production standards seriously impede trade and thus, have the potential to change the outcome of model estimations. Moreover, disaggregating ROW into smaller regions or even countries would improve the analysis too. The creation of a T-TIP might influence countries differently, depending on their income level or trade balance, i.e. importing or exporting countries. Another issue is the forming of scenarios. As the negotiations progress new information, for example on tariff commitments, are expected to become available. Including this information into the forming of more realistic scenarios improves the outcome of the model. Finally, the shortcomings embedded in GSIM could be improved by developing a GE. However, this process would require time as well as other resources and it is questionable if this effort is justified by possibly new insights.

7. Conclusion

In July 2013 the negotiations on a comprehensive T-TIP have started between the EU and the US. T-TIP is supposed to create jobs and growth through harmonizing standards and liberalizing trade. This thesis contributes to existing literature as it assesses the impact of a T-TIP focused on the global dairy sector. Its objective is to determine changes in world prices as well as trade flows. For this purpose a partial equilibrium approach is chosen. GSIM is based on the Armington assumption of heterogeneous goods and provides an insight into possible outcomes of a new trade policy. This approach enables a rapid and transparent simulation even if it comes with certain limitations. The main results of a complete regional trade liberalization indicate that the EU and the US increase their total welfare as consumers face lower domestic prices and producers receive higher export prices. While New Zealand faces merely minor, positive welfare effects, ROW is supposed to

suffer from a T-TIP. This is explained by higher consumer prices due to less supply as well as less export since its market conditions erode. The global trade volume in dairy products increases considerably mainly due to more trade between the EU and the US as well as new export possibilities for New Zealand. The second scenario assumes a partial liberalization of the dairy markets in the EU and the US. It predicts similar changes in tendency but less strong in magnitude. Gains for the EU are reduced considerably while the US profits from better market access conditions. Due to more supply by the EU to the world market the reduction of the consumer surplus in ROW is less than two-thirds compared to a complete liberalization. Changes for New Zealand become negligible in the second scenario. A sensitivity analysis with alternative parameters suggests that the results are robust in terms of the expected tendency of change. To conclude, the EU and the US gain considerably through a T-TIP. However, due to fewer exports to the world market consumers in ROW face a decline of their welfare. Therefore, policy recommendations depend on the different weights given to national and global welfare impacts. A complete liberalization produces higher benefits for the EU and the US while through a partial liberalization the consumers in ROW would lose less.

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Appendix

Product Code	Product Description
0401	Milk & cream, not concentrated nor containing added sugar or other sweetening matter.
040110	Milk & cream, not concentrated/sweetened, fat content by weight not >1%
040120	Milk & cream, not concentrated/sweetened, fat content by weight >1% but not >6%
040130	Milk & cream, not concentrated/sweetened, fat content by weight >6%
0402	Milk and cream, concentrated or containing added sugar or other sweetening matter.
040210	Milk in powder/granules/other solid form, fat content by weight not >1.5%
040221	Milk in powder/granules/other solid form, unsweetened, fat content by weight >1.5%
040229	Milk in powder/granules/other solid form, sweetened, fat content by weight >1.5%
040291	Milk & cream, concentrated (excl. in powder), unsweetened
040299	Milk & cream, concentrated (excl. in powder), sweetened
0403	Buttermilk, curdled milk and cream, yogurt, kephir and other fermented or acidified milk and cream, whether or not concentrated or containing added sugar or other sweetening matter or flavoured or containing added fruit, nuts or cocoa.
040310	Yogurt
040390	Buttermilk/curdled milk & cream/kephir & other fermented/acidified milk & cream, whether/not concentrated/sweetened/flavoured/containing fruit/nuts/cocoa
0404	Whey, whether or not concentrated or containing added sugar or other sweetening matter; products consisting of natural milk constituents, whether or not containing added sugar or other sweetening matter, not elsewhere specified or incl.
040410	Whey & modified whey, whether/not concentrated/sweetened
040490	Milk products of natural milk constituents, whether/not sweetened, n.e.s.
0405	Butter and other fats and oils derived from milk; dairy spreads.
040510	Butter
040520	Dairy spreads
040590	Fats & oils derived from milk, other than butter & dairy spreads
040130	Milk & cream, not concentrated/sweetened, fat content by weight >6%
0406	Cheese and curd
040620	Grated/powdered cheese, of all kinds
040630	Processed cheese, not grated/powdered
040640	Blue-veined cheese
040690	Cheese (excl. of 0406.10-0406.40)

Appendix 1 Product Description of the HS 4-Digit and 6-Digit Level

Source: WITS (31.07.2014)

Rank	NTM faced by the EU	NTM faced by the US
1	Direct and indirect government support by means of subsidies, protective legislation and tax policies to US farmers	EU product standards – SPS – which are higher than international standards
2	Container Security Initiative, causing delays for all sea cargo	Custom surcharges
3	US product standards which differ from international standards	EU labeling requirement laws
4	Custom surcharges	Double certification need caused by the European Union's AOE program
5	US prohibition to register or renew a trademark or a trade name which is identical or similar to a trademark or trade name used in connection with a confiscated business	Direct and indirect government support by means of protective legislation and tax policies to EU farmers
6	Threat of 100% container scanning	Traceability and labeling of biotechnology foods
7	Double certification need caused by the US Customs-Trade Partnership against Terrorism – C-TPAT	Maximum limits on mycotoxins for a variety of foodstuffs – including cereals, fruit and nuts
8	US Customs Refusal of "Made in EU"	US product requirement to classify them as "organic"

Appendix 2 List of the Most Important NTMs faced by the EU and the US

Source: BERDEN ET AL. (2009)

Indexes	
v	Importing Region
r, s	Exporting regions
i	Good
Parameters	
$\varepsilon_{m,(i,v)}$	Import demand elasticity Defined for aggregated imports $M_{(i,v)}$ and composite price $P_{(i,v)}$ $= \frac{\partial M_{(i,v)}}{\partial P_{(i,v)}} * \frac{P_{(i,v)}}{M_{(i,v)}}$
ε_s	Elasticity of substitution
$\varepsilon_{x,(i,r)}$	Export supply elasticity = $\frac{\partial X_{(i,r)}}{\partial P^*_{(i,r)}} * \frac{P^*_{(i,r)}}{X_{(i,r)}}$
Calibrated coefficients	
$N_{(i,v),(r,r)}$	Own-price elasticity
$N_{(i,v),(r,s)}$	Cross-price elasticity
$\theta_{(i,v)r}$	Demand expenditure share at internal prices of country v on imports of good i originated from r $\theta_{(i,v)r} = M_{(i,v)r}\, T_{(i,v)r} / \sum_s M_{(i,v)s}\, T_{(i,v)s}$
$\theta_{(i,v)s}$	Demand expenditure share of country v for imports of good i originated from country s
$T_{(i,v)r}$	Power of a tariff, $T = 1 + t$
Variables	
M	Import quantity
X	Export quantity
$P^*_{(i,r)}$	World market price for exports from region r
$P_{(i,v)r}$	Domestic price for goods from region r imported into region v
$t_{(i,v)r}$	Import tariff for goods from region r imported into region v

Appendix 3 Summary of the GSIM Notation

Reference Group	
All high-income (OECD plus non-OECD)	
Aruba	Ireland
Australia	Iceland
Austria	Israel
Belgium	Italy
Bahrain	Japan
Bahamas	Korea, Rep.
Bermuda	Luxembourg
Canada	Macao
Switzerland	New Caledonia
Cyprus	Netherlands
Germany	Norway
Denmark	New Zealand
Spain	Portugal
Finland	French Polynesia
France	Singapore
United Kingdom	Slovenia
Greece	Sweden
Greenland	United States
China	

Appendix 4 Members of the Reference Group for Calculating the Trade-weighted Average

Source: WITS (31.07.2014)

	Welfare Changes in $ 1000			
Country	Producer surplus	Consumer surplus	Tariff revenues	Net welfare effect
US	37158.1 (44707.6)	196444.6 (195603.2)	-207549.1 (-194548.3)	26053.6 (45762.6)
EU	138948.9 (187671.8)	69819.1 (54677.1)	-65360.5 (-64173.6)	143407.5 (178175.4)
ROW	-46746.9 (-30962.2)	-209321.3 (-300191.1)	-23631.8 (-36012.0)	-279700.0 (-367165.3)
NZ	11632.6 (38778.3)	1620.2 (733.0)	-2.6 (23.9)	13250.2 (39535.2)

Appendix 5 Sensitivity Analysis (1) Lowest Elasticity of Import Demand

Note that results of the original version are in parenthesis.

Source: GSIM and own calculation.

	Welfare Changes in $ 1000			
Country	Producer surplus	Consumer surplus	Tariff revenues	Net welfare effect
US	55980.7 (44707.6)	203054.0 (195603.2)	-230501.4 (-194548.3)	28533.3 (45762.6)
EU	197923.3 (187671.8)	70312.4 (54677.1)	-111075.2 (-64173.6)	157160.6 (178175.4)
ROW	-50647.7 (-30962.2)	-338759.4 (-300191.1)	-62718.4 (-36012.0)	-452125.5 (-367165.3)
NZ	50754.0 (38778.3)	1584.0 (733.0)	45.1 (23.9)	52383.2 (39535.2)

Appendix 6 Sensitivity Analysis (3) Doubling the Elasticity of Substitution

Note that results of the original version are in parenthesis.

Source: GSIM and own calculation.