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The Effect of Abolishing Milk Quotas

- A study of comparative advantages amongst European member states

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Abstract

The European Union provide 27 % of total volume raw milk produced in the world. This number is steadily decreasing due to that the world milk production increase is more rapid than EU production growth. The growing middle-class change the demand for food, a higher standard of living increase the demand of milk products as well as other various animal products. Since 1984 the EU milk quota has limited the supply from EU, but the quota will expire April 1st 2015. The European Milk Board expect that the removal of quotas will make the farm gate price decline. The fundamental question today is if European dairy producers can sustain a lowered milk price.

The purpose of this study is to investigate anticipated effects from the removal of milk quotas April 2015. In this study export data gathered from the Eurostat database (EU-commission) and from FAO (Food and Agriculture Organization) together constituted the basis for a quantitative study. Five essential dairy commodities were selected; fresh milk, butter, cheese, yogurt and skim milk powder (SMP). In order to explain the current positioning with a quota restriction on supply, different indices were used to create a better understanding of likely outcomes. Normalized revealed comparative advantage index (NRCA) is applied when investigating comparative advantages for dairy products. The normalized nature of the NRCA-index allowed it to be utilized when investigating comparative advantages over a period of time. In this study export data over a period of 14 years was used, from year 1999 until 2013. Net export index was used in order to understand the flow of selected commodities in and out of each member state. Data regarding quota utilization were found to be a key factor when performing a cluster-analysis with purpose to group member states into clusters that share similarities with each other. Above mentioned indices along with data for deviance from allocated dairy quota were used for constructing a cluster-analysis and identifying similarities between member states.

The result of this study provide incentives for an expected increase in milk volume and dairy products short after the removal of quotas, which will impact the market price. It is presumed that the market price of dairy commodities will drop. The concluding remark is that the individual effect on each member state will be determined by the current positioning and the ability to adapt according to the reformed dairy market. In this study it was established that countries with comparative advantage, history of high quota utilization and keeping a positive net export are generally better equipped to the deregulation of the market.

Sammanfattning

Ungefär 27 % av världens mjölk produceras av EU. Volymen mjölk producerad i världen jämfört med Europa ökar snabbare än Europas producerade volym. Nyligen genomförda studier indikerar att när mjölkkvoterna tas bort kommer priset till mjölkbönder minska. En relevant fråga är vilka som kommer kunna klara av en sådan minskning.

Denna studie har genomförts för att undersöka hur marknaden kommer påverkas utav avregleringen av mjölkkvoter som sker i april 2015. Detta kommer att innebära förändringar på den svenska såväl som den europeiska mjölkmarknaden. Den kvantitativa data som använts består av exportdata från fem utvalda grupper av mjölkprodukter; färskmjölk, yoghurt, smör, ost och skummjölk pulver (SMP). För att mäta olika länders komparativa fördelar har indexet NRCA har använts. NRCA index valdes på grund av dess normaliserade natur, vilken gör den användbar vid applicering på data som löper över en längre tidsperiod. Exportdata samlades in för perioden år 1999 fram till 2013 och data för detta hittades främst på EU-kommissionens hemsida genom Eurostat databas men även från FAO (Food and Agriculture Organization). Utöver NRCA har även nettoexportindexet (NEI) använts för att undersöka medlemsländernas nivå av nettoexport respektive nettoimport av ovanstående fem mjölkproduktgrupper. Från SJV erhölls information om kvotutnyttjande av tilldelade mjölkkvoter bland medlemsländerna för perioden år 1999 fram till 2013. En klusteranalys, baserad på framtagna värden, visar att avvikelserna från använda kvoter utgör en väsentlig skillnad. Detta bevisade att effekten av att överskrida tilldelad kvot har varit en avgörande faktor när likheter mellan medlemsländers komparativa fördelar har analyserats.

I denna studie återfinns belägg för att volymen av producerad mjölk inom EU förväntas öka till följd av mjölkkvoternas avreglering. En ökad produktionsvolym av mjölk inom unionen tros leda till att mjölkpriset sjunker. Hur denna förändring av mjölkmarknaden förutsägs påverka respektive medlemsland beror till stor del på rådande positionering på marknaden i dagsläget. Ett samband som påträffats är att medlemsländer som har komparativa fördelar, hög kvotutnyttjande och positiv nettoexport antas bättre kunna bemöta den stundande marknadssituationen.

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1 Introduction

In the year 1992, the member states in the European Union decided to abolish all duties, tariffs and quotas, on trade within the union to create a formal intra-EU barrier. The reason was to increase the free movement of capital, labour, goods and services. The effect of the tariff removal was a decreased transaction cost within the Union (DEFRA, 2007). The estimated value of dairy products produced in EU were, in 2011, worth approximately 53.1 billion Euro, which is 14% of agricultural output of the union. The total amount of milk produced in EU were 156 million tons, where most of the milk were collected by dairies or collection centres (91%) (Marquer, 2013), with exception of Bulgaria and Romania where most milk were used on farms (Lukkarinen & Lannhard Öberg, 2012).

In year 2011, the European Union imported 500.000 tons milk from non-member countries and exported 280.000 tons to countries outside the Union. The domestic trade within the union were 5.5 million tons (year 2011) and the largest importer were Italy with 30% of the total import into the EU (Marquer, 2013, p. 3).

Dairies collected, during year 2011, 142.1 million tons of milk, which were essentially used for cheese (67 million tons), butter and other yellow products (42 million tonnes) and drinking milk (31 million tonnes). The rest were used to produce cream, yoghurt, concentrated milk, buttermilk et cetera (Marquer, 2013, p. 3).

The piechart below illustrate how much milk were colleted in the union, divided into different countries. This figure below illustrate the allocated market shares among the european countries.

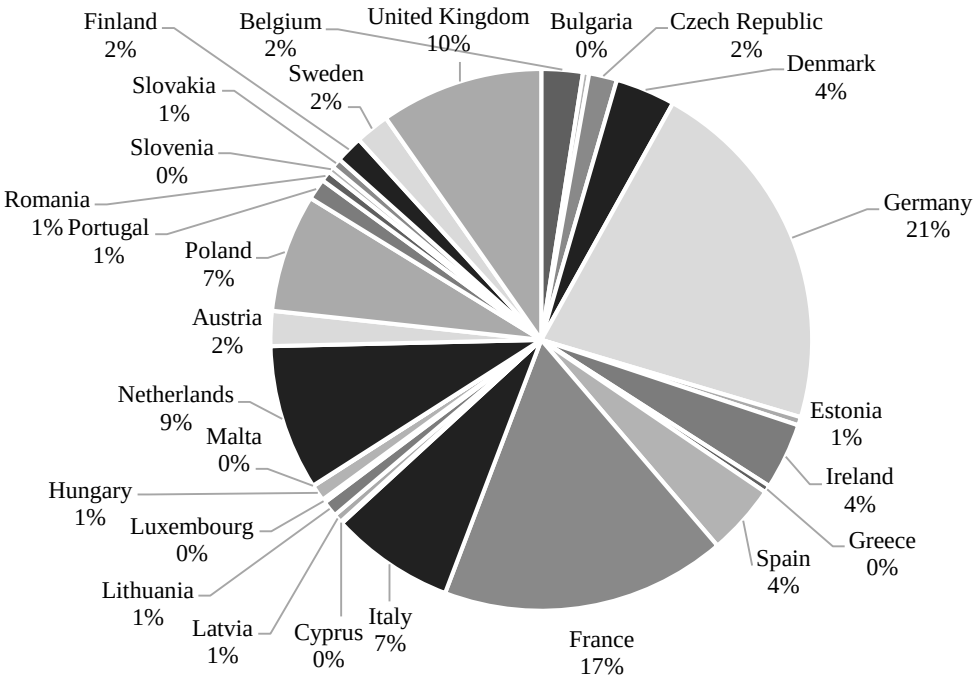

Figure 1. Cow milk collected in EU27 year 2013 (Eurostat, 2014)

If excluding countries that produce between 0-2% of volume collected milk, those left are Germany, France, United Kingdom, Netherlands, Italy, Poland, Spain, Ireland and Denmark. These countries, with exception of Poland, all belong to the EU-10 countries. Their aggregated production is 70% of the total production in EU (Marquer, 2013).

April 1st year 2015, the milk quotas in EU will be removed. This is predicted to affect the milk market, and the market will become fully liberalized (Sckokai, 2013). Europe has a major share of the world market for milk and is at this time producing 27% of the raw milk production in the world. Europe is also one of the leading exporters of milk and milk produce in the world (Dairymarket, 2014). With a constant growing demand for milk in the world imply good market opportunity for European dairy farmers (Sckokai, 2013).

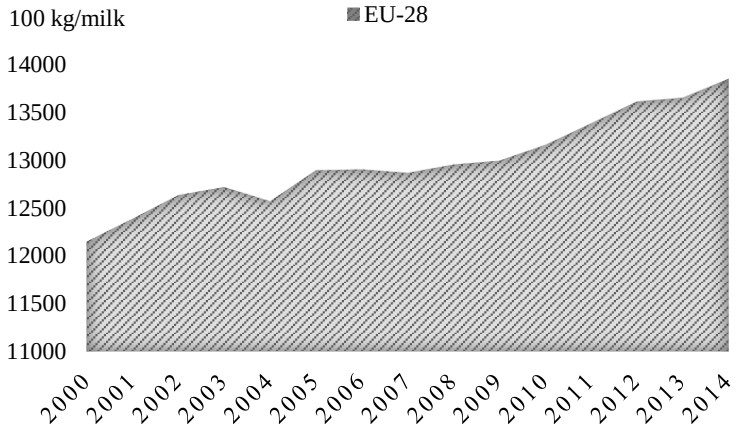

Figure 2. Quantity of milk produced in million 100kg units (OECD-FAO, 2014)

This figure illustrate the production of milk during the period year 2000 until 2014. The combined production among the member states has been relatively stable since year 2003. But still the number of dairy cows have gradually decreased, while the production level been kept stable (Lukkarinen & Lannhard Öberg, 2012).

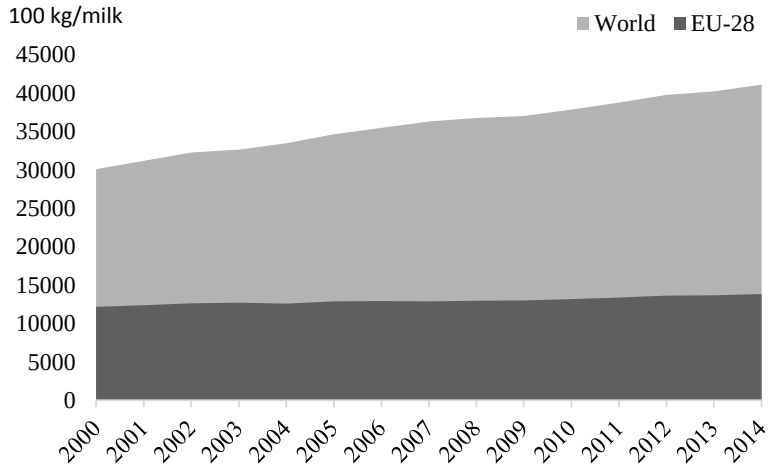

Figure 3. Quantity produced in EU compared to rest of the world, units in million 100kg produced (OECD-FAO, 2014)

Figure 3 show how the quantity of produced milk for EU have changed in correlation to the rest of the world. Milk quotas were initially introduced in year 1984 under the Dairy produce quota regulation, which was a part of the predecessor European Economic Community before the Common Agricultural Policy, more commonly referred to as CAP. Originally, the milk quotas were supposed to be in effect until the 1989, under a five year period. This was later

extended several times. In April 2015, milk quotas in the European Union will be removed, after that, the European dairy market will no longer be limited (Breen, et al., 2008).

As a result of the deregulation of milk quotas, prices are expected to become increasingly impulsive (Réquillart, 2008). In order to identify if a nation will increase or reduce its production, information about the competitiveness amongst the countries is relevant. An approach to compare nations with each other is by analysing the revealed comparative advantage.

1.1 Problem background and research problem

The agricultural sector is competitive and with volatile prices, and increased influence from the world market, a major threat for actors within the industry. It is a challenge for countries with less favourable market conditions and with inferior export quantities to be competitive and maintaining economic growth in the agricultural dairy sector. The market conditions also reflect on producers and their production of dairy products (Réquillart, 2008). In order to assess competitiveness on the European dairy market a comparative advantage index can be used (Yu, et al., 2008).

A key objective for the EU is to foster economic cooperation within the union (EU, 2015). By creating an interdependence between countries also influence competitive positioning of each member state. It is therefore highly anticipated that abolishing milk quotas in the EU will affect the internal dairy market as well as the world market. Dairy production, both within and outside EU, is an area that is constantly growing and constitutes to a substantial part of economy in the agricultural trade market. (Commission, 2015)

Recent studies, (Haller, 2014), (Breen, et al., 2008) and (Bouamra-Mechemache & Jongeneel, 2008) shows different scenarios of what are likely to happen after the abolishment of the milk quota. It exist limited research concerning the link between quota abolishment and comparative advantage and it is relevant to fill that knowledge gap. Such research is expected to shed light on the importance of comparative advantage and economic improvement as a result of policy changes. Previous studies in other industries have used other comparative advantage indices in order to understand the effects caused by a reform, predominantly Belassa's revealed comparative advantage index often referred to as BRCA. As of now, no one have applied the normalized revealed comparative advantage index (NRCA) on the European dairy sector. While NRCA is being of a normalized nature, it bring superior capabilities for studies over a period of time compared to other revealed comparative advantage indices. The following questions will be examined in this thesis.

- What are the comparative advantages among the EU27 countries for milk products; fresh milk, cheese, butter, yoghurt and SMP (skim milk powder)?
- How will the volume milk produced in EU be affected after the reform?

1.2 Aim of study

This study examine the comparative advantages for five milk products (milk, butter, cheese, yogurt and SMP) in Europe. By evaluating the European member states competiveness in milk production, explain what is expected to happen after the abolition of milk quotas in April 1st year 2015. By investigating revealed comparative advantages among European member

states, using historical data from Eurostat, understand how the market will adopt to the deregulation of milk quotas.

The aim is to investigate cost competitiveness using comparative advantage, at sector level on the basic product fresh milk and SMP, as well as finished product like butter, yoghurt and cheese. A general definition of industry competitiveness is the capability to offer services and products that meet quality standards, at competitive prices and with acceptable returns (Business Dictionary 1, 2014). But also to endure the ability to compete with foreign equals under the conditions of free trade (Banterle & Carraresi, 2006). Competitiveness is linked to comparative advantage. Comparative advantage is the idea that a country should focus their production only on the goods and services that they are most efficient in producing and export the excess (Business Dictionary 2, 2014)

The reason for investigating comparative advantage, regarding milk in Europe, is to get a better estimation about which countries that are expected to gain from the reform. Relevant questions are; What is likely to occur after the abolishment? What are the market effects for European milk producers? Will the farm gate price rise or drop? Will the process industry gain from this policy reform? Will the overall cost competitiveness become affected by the abolishment of the EU milk quota?

1.3 Delimitations

This study does not include the effects of EU milk quota abolishment on markets outside of European Union. It is not feasible to include that, due to the limited time and amount of pages. The comparative advantage can be investigated in various ways. There are numerous models that show the existence of comparative advantage (Vollrath, 1991). This study focuses on the comparison of trade changes and the relative quota utilization in the past and will only use one revealed comparative advantage tool and also does not contain in-depths analysis of individual member states.

Since the initial implementation of milk quotas in year 1984, many countries have since then joined the EU. Last join country are Croatia, in 2013, as the 28th member state. The research use data from the timespan of year 1999-2013, since not all countries where members of the union year 1999, a limitation of the EU15 countries have to be done. Nevertheless, an effort to include the EU27 data was kept throughout the thesis and later limited to EU15 where it revealed necessary.

There are several social factors that have not been taken into account. Aspects like, the age of farmers, location of production facilities, the number of people involved per farm and family farms versus industrial production plants. There are also socioeconomically relevant characteristics, such as private collaboration between farmers and the availability of farmers' cooperation organisations.

It is important to remember that domestic legislation is plausible to influence the competitiveness between countries. Also other political reforms impact the domestic corporate climate for dairy farmers. This is unfortunately not something that is possible to thoroughly investigate in this thesis but nevertheless very relevant to the topic. Theoretically, this study is limited to the theoretical framework used. For example, the focus has been on export data and models that shown applicable on such selection have been used. The economic theory are based upon classical economic framework. Chosen research questions could get another answer if it was bases upon some other theory, but this is not likely in this particular case. The reason to use quantified approach for this thesis is to maintain a high

validity for results since real unbiased data is accessible. It is up for discussion if quantitative methodology was the right research approach. However, given theoretical framework defined it was found suitable in this study.

2 Theoretical framework

Chapter two provides a literature review which attempts to give the reader a concept of what is going on, what is about to happen and why, this is called a conceptual framework, which was initially concluded by Maxwell in 1996 as cited in Robson 2002. This chapter elucidate absolute and comparative advantage, international trade, balance of trade and about utilization of tariffs. Furthermore, the literature review provide the reader with the foundation for what the authors based their research on and also offer a summary of prior work in the subject.

The arguments for free trade are, Economic profit from free trade, because the opportunity to specialization and social profit as sharpen of competition and increases choice for consumers and improvement on products and service qualities. But also indirect advantage as promotion of peace and a decline in corruption (WTO, 2008).

The arguments against free trade are about the unfairness. The protectionists argue that employment in developed countries will decline because of low salaries in undeveloped countries. The unfairness of free trade is explained as, rich countries and large companies have a superior position relative to undeveloped countries, a prominent cause leading to poor countries being exploited (Svenskt näringsliv, 2013, p. 18).

Analysis of competitiveness varies vastly and depend on the levels of examined economy, generally individual firm level, sector level and whole economy level, but also on the different definition of competitiveness which diverge the considered level. Firm level analysis, cost advantage and differentiation (profitability, competitive strategy and competitive advantage), sector level analysis competitive performance of the specified sector on the international market and whole economy level analysis national productivity growth, trade performance and composition of domestic output (Banterle & Carraresi, 2006).

In order to know who will benefit from a market change, but also how much a nation/industry/firm loses, depends how strong a nations industry is compare to other countries industries (Husted & Melvin, 2001, p. 165).

2.1 Comparative advantages and International Trade

The classical theory of international trade was initially revealed by Adam Smith in 1776, in his book *"The Wealth of Nations"* where he explained interaction of nations (Husted & Melvin, 2001, p. 54). The frame of comparative advantage was written by David Ricardo, in 1817, where he developed the principal of comparative advantage. Ricardo showed that a nation will specialize in the production and export the excess, if having comparative advantage. Ricardo elucidate that countries have different costs when producing a product, because of labour, machinery and capital. The lower commodity costs, the higher comparative advantage (Ricardo, 1821).

2.1.1 Heckscher-Ohlin model

In 1919 Eli Hechscher published (Nationalencyklopedin, 2014) a supplement to Ricardo's comparative costs theory and later on developed the commonly used theory with Bertil Ohlin, named Hechscher-Ohlin theory (Nationalencyklopedin, 2014). Hechscher-Ohlin theory the production have eight variables (compare to Ricardo that have four), a country will specialize

production if they have lower cost on labour or commodity then other countries, and will trade with those in less favourable conditions. This will lead to a higher standard of living for all countries involved (Nobelprize, 2014).

The explanation of why countries trade is explained by the theory of absolute and comparative advantage. If a country has absolute advantage in a service or a good, it means that it is the most efficient producer of that product. If all countries have the same amount of input, the country with the best advantage will gain the most.

A simplified example of absolute advantage is seen in the table below. Two countries that produce two goods and both countries entail both products. The found problem is which country should produce what product. The country which is able to produce at the lowest cost will produce the most products and able to sell at the cheapest price. This provide an incentive to buy more goods and therefore become even better off economically.

Table 1. Illustration of absolute and comparative advantage

	Country 1	**Country 2**
Product 1	40	8
Product 2	8	4

Source: own illustration

For absolute advantage, country 1 will focus its production on the product it is best equipped to manufacture in above seen case product 1. Country two also hold absolute advantage in production of product 1 and will focus its production of that. For this reason low incentive for trade between the two countries exist.

Analysing this from a comparative advantage perspective a specialization according to trade will occur. Country 1 is able to produce five units of product one for each product two (40/8=5). Country 2 is able to produce 2 units of product one for each product 2. According to the theory of comparative advantage country 1 will continue to produce product 1 and is able to do that at a lower cost than country 2. Country 2 has lower alternative cost (4/8=0.5) compared to country 1 (8/40=0.2) in producing product 2 hence country 2 will specialize its production in product 2. This lead to trade between countries and that both countries inhabitants are better off.

2.1.2 Balassa's Revealed Comparative Advantage index

Comparative advantage attempt to explain the source of trade. A frequently used revealed comparative advantage index is Béla Belassa's index, referred to as BRCA. Béla Balassa (1965) presented in the article "Trade Liberalization and Revealed Comparative Advantage" a method to calculate an index of revealed comparative advantages often referred to as RCA. The index gives an indication of differences between countries comparative advantage.

Balassa summarize his index as *"Comparative advantages appear to be the outcome of a number of factors, some measurable, others not, some easily pinned down, others less so. One wonders, therefore whether more could not be gained if, instead of enunciating general principles and trying to apply these to explain actual trade flows, one took the observed pattern of trade as a point of departure".* (Balassa, 1965, p. 116)

The formula for Belassa's Revealed Comparative Advantage index, BRCA-index, is shown below.

$$BRCA_j^i = (E_j^i / E_j)/(E^i/E)$$

The BRCA-index constitute the relation between export market share in a country for a defined product or sector and the export market share out of the total trade amongst countries (Banterle & Carraresi, 2006).

The BRCA index has several inconsistences especially when analysing different commodities over time (Yu, et al., 2008). If a country have limited shares on the market, the BRCAs', E^i small compared to total export E, it tend to present unrealistically strong comparative advantages. The same weakness is seen for products with limited shares on the market (Yu, et al., 2008).

As a result of the asymmetric nature as well as the variable mean of the BRCA index, several attempts to develop a revealed comparative advantage index that achieve to normalize the index around an inflexible mean having a symmetric distribution (Vollrath, 1991). To avoid that specific issue other indices have been developed to take that issue into account. One of these indices that have proven itself useful is the Normalized Revealed Comparative Advantage index, also known as NRCA index (Yu, et al., 2008).

2.1.3 The Normalized Revealed Comparative Advantage index

Yu et al. (2008) developed the NRCA index, which made it possible to create a comparison between countries, regarding a specific commodity over time, offering several advantages compared with other RCA-indices. NRCA index has shown to be more efficient at identifying the extent of comparative advantage. The NRCA is a useful tool for quantitative regional research, especially for studies on regional comparative advantages (Yu, et al., 2008). The equation for the NRCA index is seen here below.

$$NRCA_j^i \equiv \frac{\triangle E_j^i}{E} = \frac{\triangle E_j^i}{E} - \left(E_j E^i\right)/EE$$

In the formula above the total export is seen as E. The total export of a specified country i is defined as E^i. The export of a specified commodity j can be seen as E_j. The export of commodity j in a specific country i is seen as E^i_j. Knowing these elements, a NRCA-index can be calculated. The total export will consist of the total export of the agricultural sector and not the total export for all goods.

The NRCA-index measure the deviance of a country i export and its comparative advantages in a normalized level, which correlates to its relative scale on the defined market. The crucial mechanism with NRCA-index is the comparative advantage unbiased positioning (Yu, et al., 2008).

The export market size for each defined product and country in a theoretical comparative advantage unbiased situation ought to be the same as in reality. This present itself as;

$$\sum i \triangle E_j^i \equiv \sum i \left(\hat{E}_j^i - E_j^i\right) = 0$$

$$\sum j \, \Delta E_j^i \equiv \sum j \left(\hat{\mathrm{E}}_j^i - E_j^i \right) = 0$$

The interpretation of $NRCA_j^i > 0$ or $NRCA_j^i < 0$ is a country *i's* actual export of a commodity *j*. If country *i's* export function E_j^i is higher than the theoretical unbiased neutral point $\hat{\mathrm{E}}_j^i$ it present itself as comparative advantages in commodity *j*. If the export function of country *i's* export of commodity *j* would be lower than the neutral point it would result in negative comparative advantages for commodity *j*.

As a result of the comparative advantage being a relative concept, the elucidation of the magnitude of the NRCA-index is more meaningful within a comparative context of relative strength of comparative advantages (Yu, et al., 2008). This make the NRCA-index interesting since it is possible to measure the degree of comparative advantage between countries and commodities. An example of this correlation between commodities would be $NRCA_j^i = 0{,}015$ and $NRCA_k^i = 0{,}045$. The NRCA-index tells us that the comparative advantage for commodity *k* is three times of its comparative advantage of commodity *j*. As shown in equation 2 and 3, the NRCA-index indicates that no country has comparative advantage or disadvantage in all commodities, and this strongly support the relative nature of comparative advantage.

The wanted attribute of the NRCA is its appliance on empirical studies. The sought after correlation of the NRCA-index is the explanation to why comparative advantage for a specific commodity in a country decreases if it increases in another country. This correlation is revealed in equation 3 and 4. The mean value and sum in a country's or commodity's NRCA-value is constant or equal to zero. The correlation between derived products is that a country can gain comparative advantages in some commodities while losing comparative advantages in other commodities (Yu, et al., 2008).

"*Therefore, the NRCA index indicates that each country or each commodity as a whole is comparative-advantage-neutral; and no country has comparative advantage (or disadvantage) in all commodities. This nicely reflects the relative nature of comparative advantage."* (Yu, et al., 2008, pp. 271-272)

2.2 Balance of trade

Balance of trade is the difference between total export of a nation and the total import during a certain period of time. This makes it possible to view a surplus, were export exceed import. This measurement is often used by firms and labour unions to justify a need to protect the domestic market from foreign competition (Husted & Melvin, 2001, p. 326).

Net export index

Net export index, often referred to as NEI, take the influence of exports and imports into account within a sector, product or country, in order to evaluate the competitiveness.

$$NEI_j^i = (X_j^i - M_j^i) \,/\, (X_j^i + M_j^i)$$

A negative NEI value states that import is greater than export, and if the NEI value is positive the export is larger. In total, a self-sufficient country has a NEI value of 1.0 (Banterle & Carraresi, 2006).

There are four ways to evident the analysis: Positive NEI and over 100 RCA, negative NEI and high RCA, positive NEI and RCA less than 100 and negative NEI and RCA less than 100. The countries with positive NEI along with a high RCA can be seen as competitive and specialised. Countries with negative NEI and RCA less the 100 show that they are not competitive and not specialised in the sector. Countries with positive NEI and RCA less than 100 got a good export flow while not being specialised (Banterle & Carraresi, 2006).

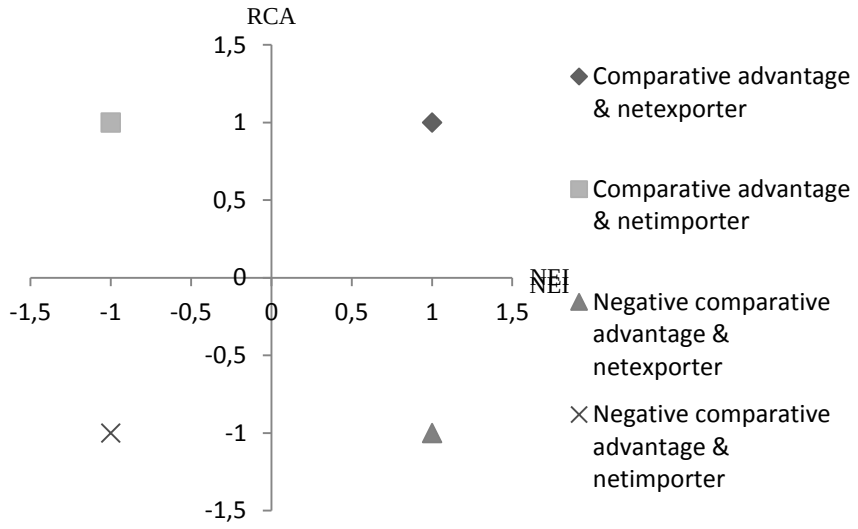

Figure 4. Illustrations of RCA and NEI (Source: own illustration)

In this figure origo is set to zero, which is not the case in the article of Banterle & Carraresi (2006). They used another comparative advantage index. The NRCA index used in this research utilize the value zero as origo. In order to avoid confusion origo is set to zero. However the foundation of argument and interpretation remain alike.

Countries are divided according to trading position, viewed on the size on export market shares (EMS) and import market share (IMS). Strong EMS indicates that the country is export orientated, but they can at the same time have a high IMS, indicating that they also are big importers in the sector. A good performance are viewed with a high EMS and a low IMS (Banterle & Carraresi, 2006).

3 Literature review

This chapter consist of a literature review with the basic groundwork necessary to answer the research questions, but it also provide the reader with an overview in order to comprehend the data collected in this thesis, later leading to the discussion.

There are different ways for a government to protect the nations export or gain from the nations export. Depending on if the country is a net importer or net exporter a tariff will result in welfare improvement or as an extra economic burden. This is because of tariffs will force the world market price up or down. A quota works as a supplement to tariffs, but where the cost will be spread on more than part in the economy (Husted & Melvin, 2001).

3.1 Quota and literature about abolishing the quotas

Most applied quotas works as a control tool for managing production growth, high price support and producer price stabilisation. But can also be used as a rural development policy. A quota system reallocate part of the price support benefits through quota rent, which leads to an increase of the market price (Vavra & Martini, 2005). The reason for a trade barrier is to increase the domestic production by restricting foreign competition, by increasing domestic profit for producers (Husted & Melvin, 2001). On the other hand this could lead to different undesirable effect:

- Fractions between countries; when one country that has been expected to sell on another country's market cannot do it, this leads to an economic loss for the foreign companies (Husted & Melvin, 2001, pp. 184-185).
- Companies able to purchase quotas will have advantages over other companies which cannot (Husted & Melvin, 2001, pp. 184-185).
- The welfare effect; higher domestic price for the loss of the customer surplus. The import barrier lower the competition on the domestic market, leading to a raise of prices (Husted & Melvin, 2001, pp. 184-185).
- Inefficiencies, especially on consumer costs and increase government administration costs. (Vavra & Martini, 2005, p. 47)
- Difficulties with setting a quota level that matches the production under free trade condition. (Vavra & Martini, 2005, p. 47)
- The value of quota will, with time, be incorporated into the cost structure of dairy farms. Instead of reflecting the value between an underlying cost of production and the milk price at production level. (Vavra & Martini, 2005, p. 47)

As a result, quota are in the initially favourable, but resulting in sub-consequents like higher cost structure, caused by remaining interests and inefficient cost structures leading to a locked market. In order to resolve the market problem a complicated reform is needed (Vavra & Martini, 2005). However, the milk quota in EU was imposed to stop overproduction of milk in Europe (Dairy Reporter, 2014). This type of quota is called a supply quota.

Quota rent and quota price

If a quota is binding, it will create a quota rent. The quota rent is the difference between farm gate price and marginal cost evaluated at the quota level, also known as shadow price for a product. This together sets a minimum market price, which is the lowest price the producer need in order to produce at the restricted quantity. If market price is lower than the shadow

price, the amount milk produced will be lower than the quota, which makes it not binding. If the market price is higher than the shadow price, the amount produced equal to the set quota. (Réquillart, 2008)

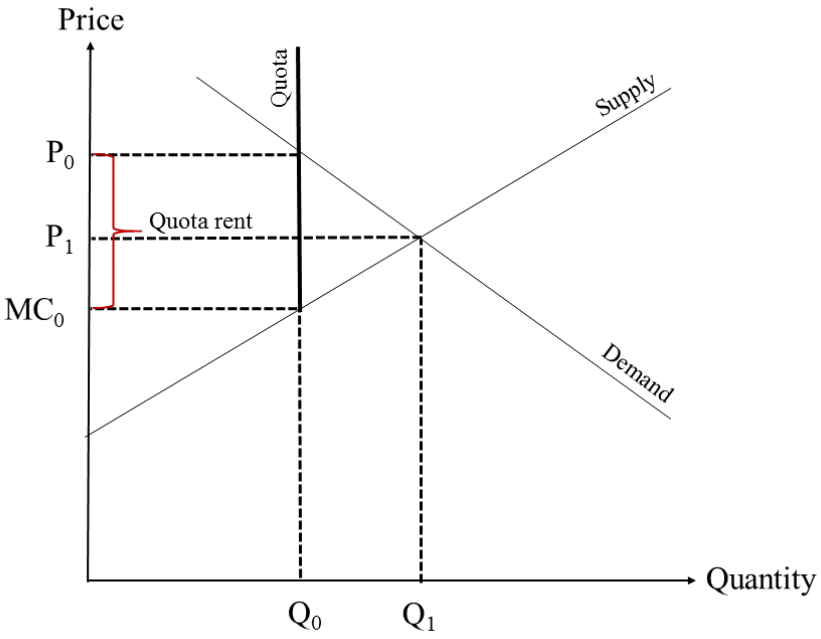

Figure 5. Impact of a supply quota, (Source: own illustration)

In the graph above, the effect on supply caused by a supply quota, such as the dairy quota in EU. The difference between the marginal cost (MC_0) and P_0 is price of quota rent. P_1 is projected price in case of no quota. In the graph the limitation of quantity is shown as the difference between Q_1 and Q_0.

After the reform a new balance will occur on the market, where supply is equal to demand as presented in figure 5. This will lead to an increase in volume milk produced, because no quota rent lead to no difference between the shadow price and the market price. Producers will react to the price increase signal with increasing in their production, based on that price signal for farmers is an evolution of the shadow price. In total, the increased production causes a decrease in market price of raw milk (Réquillart, 2008).
The increase in production depends on quota rent, the elasticity in supply curve and the elasticity on the demand curve. A higher rent, more elastic supply curve and demand curve, the larger the increase will become. Furthermore, the supply curve will move downwards when removing of the quota. Hence, at a given price a producer will increase quantity, since producers with lower production cost does not have production restrictions (Réquillart, 2008).

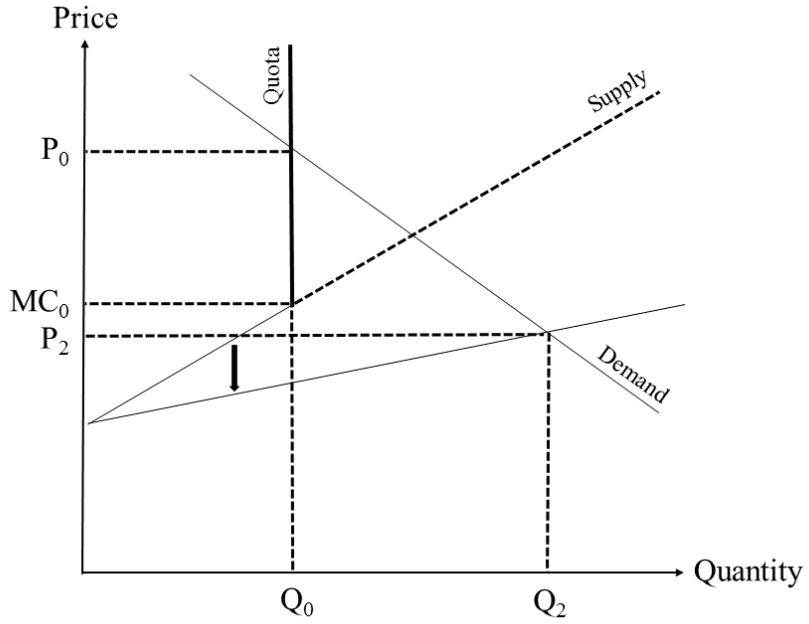

Figure 6. Effect on supply when removing the quota (Source: own illustration)

In the graph above, the scenario of a quota removal is shown. When the quota expire a downshift in supply is anticipated to occur. The impact on supply is seen as the increase of quantity produced at a lower price per unit.

If the market for milk quotas is perfectly competitive, the price of the quota rent and leasing price would be the same. There are no evidence that the market will work perfectly but there are a strong link between the leasing price and the quota rent (Réquillart, 2008).

Implementation of the quotas and tradability.

In the EU, if a producer exceed its allocated quota, the surpassing volume produced will be penalized. Over the years an observation of systematic overproduction in some EU countries has been revealed, this give an insight that different countries got diverse application on the system. If producers really need to pay a penalty, or a part of a penalty, which give an understanding about if they got an incentive to over produce compared to the estimated quota level (Réquillart, 2008).

Tradability of the quota are necessary for the quota management. There are different level of inflexibility of trading milk quotas in different countries, for example certain countries got less restrictions on trade compared with countries. A trade restriction could be a limitation with quota transfers to certain regions, distribution of quotas only to certain politic favoured groups for example young farmers and producers in specific areas. The reason for this restriction is often to make the supply less competitive by preventing reallocation of production rights from inefficient farms to efficient farms. This can explain why, when removing quota, the supply curve shifts downwards more on certain countries than others. If producers have not had the opportunity to trade quotas, a removal of the quota will give them an interest in overproducing when their own quota rent is higher than the levy (Réquillart, 2008).

When quotas are freely tradable, the cost inefficiency inflicted by a quotas system vanish because both the efficient and the inefficient producers have interest in trading quotas. The outcome of this is that the supply curve is similar before and after the removal of the milk quota. As a result of this overproduction is more likely to occur in those countries where quota trade has been limited. Consequential that they will get a higher drop in farm-gate price.

A key issue is the changes in demand. Previous research have shown that a models result are sensitive to demand characteristics. An increase in derived demand in milk with 1% results in an increase in milk price with 3% (Réquillart, 2008, p. 37).

Abolishing the milk quota

Moro et al. (2005) evaluate what happened when the milk quotas changed between the years 1996 to 2001. The study showed that in the short run, when the quotas decrease that countries with the high production will achieve the highest economic rent and the countries with small scale production will get a lower economic rent. It is difficult to anticipate what will happen in the long run, because the majority of the countries show a quota rent that is negative, their research also observe a minor change in the estimated marginal costs (Moro, et al., 2005). As seen in figure 5.

Réquillart (2008) argue after the abolishing of milk quotas, the countries with not binding quotas (the EU-10 states, Bulgaria and Sweden) will have an increase in milk production caused by an increased farm gate value. After the abolishment, the value of EU production will remain stable. The production of the dairy products expected to increase, but the cost of industrial products will decline. The EU export is presumed to gradually decrease. The collected production will intensively with 5%, which anticipated to decrease farm gate value with 10,3 % (Réquillart, 2008).

Breen et al. (2008) discuss how milk producers will adapt after an expansion of the milk quota of 3% and what competitiveness European milk producers will have on the international market. Countries with low cost input, for example grass-feed based production and underutilized production resource, compared with other countries in Europe will enhance their competitiveness. An increase milk quota with 3 % will not be favourable at farm level, because of the increase in volume in the end would decrease price for the producers (Breen, et al., 2008).

Production elements that effects the competitive advantage

Jansik & Irz (2014) review current competitive advantage between different Scandinavian countries in Europe. Competitiveness is crucial for the future, especially when current supply control mechanism is removed. Dairy farms in the Baltic area got a lower level of labour productivity compared to older member states of EU (Finland, Denmark, Sweden and Germany). Total factor productivity for milk producers grow more rapidly in the old member states, while being the opposite for the dairy industry. These findings suggest that the transfer of technologies and management technics are easier apply to the industry sector than on farm sector (Jansik & Irz, 2014).

Competitiveness in the dairy supply chain is determined by productivity enhancement, number of production factories, farms and the structure of the industry chain. But also determined by the transaction between actors in the supply chain, the growth on the domestic market, export market and innovations. To determine future competitiveness in a dairy supply chain a key factor is the growth of potential milk production. During the last year most countries have increased their milk production volume, with exception for Sweden and

Finland. The basic condition for dairy processors growth is sufficient raw material, which will improve the competitiveness in supply chain in domestic dairy sector. (Jansik & Irz, 2014)

According to Ramsbottom & Clarke (2007), there are clear reasons to why new technologies were adopted. Successful adoption of new technologies must be clearly beneficial, as it improve income or reduce workload. New technology needs to be relatively cheap to implement and easy to use (Ramsbottom & Clarke, 2007). This means that countries able to become more effecient with small amount of investment are likely to gain more.

In the future, most cost of production will be associated with the area of farmed land, number of cows in herd, amount persons employed. High cash surpluses need to be generated in order to ensure high level of milk production per hectare, per cow and per labour unit. A successful farm has to optimize output per hectare and gain profit margin per unit of output efficiently. (Shalloo, et al., 2007)

Key economic principle

The key economic principle is to optimize economic performance by maximizing profit per unit with limited factor of production (Shalloo, et al., 2007). The demand for dairy products in EU is inelastic (Jansson, 2002) and the decline of obtained price is limited, an increase in dairy production result in a substantial increase of export (Réquillart, 2008). When the EU export increase, it is presumed to affect the world market price, causing the market price to decline with the same value within as well as outside of EU (Réquillart, 2008).

An abolishment of the quota will lead to a substantial shift in surplus from producers to consumers, resulting in loss for farmers since negative prices initiating economic gain among consumers. Processors gain through expansion of production. As a result, no significant net welfare will be gained in total (Réquillart, 2008). The realistic outcome of this scenario is that it will be a lot slower than presented in the analysed model. The reason for this slow adaptation in the primary milk supply, compared with the model, is because of the dynamic factors at farm level. For example, herd size, delay of the price impact but also difficulties with foreseeing how dairy producers behavior change. This is caused by a major structural change in the policy system of milk quotas (Réquillart, 2008).

Other static elements are likely to adapt over time as a result of the policy regime reform. One of these factors is foreseeing changes in agricultural land prices, another is expectancy in increased price for crop production with decoupled payments. This could result in a decrease of milk production volume for at least two reasons, the direct effect seen on the cost of feed and because of the alternative cost of agricultural land utilization. The circumstances mentioned before are potentially over estimating the increased milk production. It is important to remember that the demand for milk is price inelastic and would argue for an raised milk price. The increased milk price alone might boost the production. When the milk quota is abolished the European dairy industry will depend on the world milk prices and subject to price volatility and fluctuation (Réquillart, 2008).

Supply elastic affect market when abolishing the quota

When the supply is elastic, firms can adapt rapidly to a change in demand. When supply is inelastic there are factors limiting the supply reaction for a given period of time.

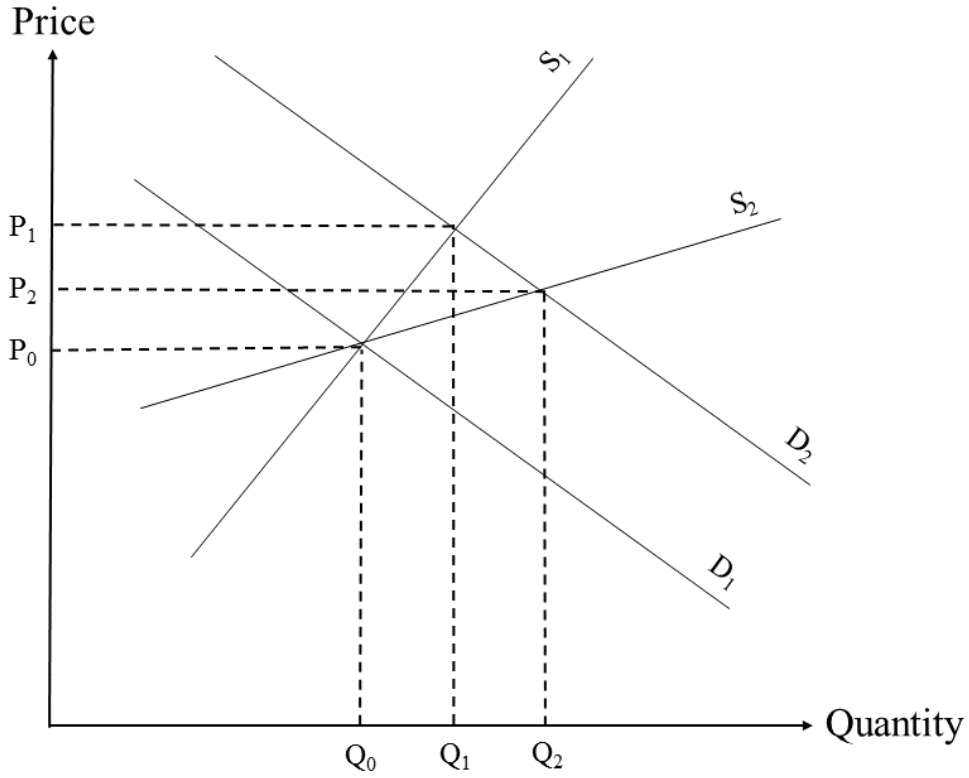

Figure 7. Price elasticity for supply (Source: own illustration)

In figure 7, the impact of price elasticity is illustrated. The original supply (S_1) is inelastic compared to supply (S_2). The change impacted by an elastic supply curve on quantity may be severe. The supply quota is influencing the price elasticity and when removed it is predicted to become more elastic.

Bourmra-Mechemache and Réquillart (2000) discuss that the milk price is inelastic because export cannot significantly increase and that the final demand is relatively inelastic. Based on that EU is a large exporter which mean that a drop in subsidised exports will be welfare improving. The prices in EU will be significantly affected with a main redistributive effect of consumers and taxpayers, but at a cost for producers. In total, the welfare in the world is more substantial than the loss for producers. (Bouamra-Mechemache & Réquillart, 2000)

Boumra-Mechemache & Réquillart (2000) shows that policy reforms have different effect on final product markets. With a 1% increase in milk production which lead to a decrease with 4.5% in milk price. Where products with high protein content are presumed to have a larger effect on the price compared to products with a high fat content, caused by a more restricted export. Furthermore, the reform will not improve welfare in EU, because it does not reduce subsided export. (Bouamra-Mechemache & Réquillart, 2000)

Results from other countries milk quota abolishment

Switzerland had a similar quota regime in affect until year 2009. What happened when they removed milk quotas give an indication on probable outcome when applied in the EU year 2015. It is not feasible to transfer the results in the case of Switzerland directly to the EU.

However, Romauld Schaber, president of EMB (European Milk Board), see parallels between the cases*: "Without effective mechanisms–without cost-covering prices–large numbers of farmers in the EU will also have to give up very quickly. In the end, entire regions will simply be left without any milk production."* (EMB, 2014, p. 1). This provide an insight that an efficient instrument is needed to get economic support for producers if a crisis would occur, in order to prevent farmers from being wiped out of the market. The Swiss case did also show that the promised growth in consumer surplus did not happen. (EMB, 2014)

In a study by Haller (2014) the expected effects from the quota abolishment is an rise competitiveness. Before year 2009, some Swiss farmers were not able to expolit their maximum production capacity, caused by trade barriers of quotas. After the abolishment, the overall production increase and the cost per produced unit decreased as well as farm-gate price. Haller also found a correlation between the farm-gate price and the elasticity in supply for milk. After the abolishment the Swiss industry lost about 24% of its value between year 2010 and 2012, cheese dairy milk lost 15% of its value and organic milk lost 19%. Unstable farm gate prices with sometime poor prices have forced producers to quit. The overall position for producers on the market has worsened while the four primary processors in Swiss have increased their processing volume with 38%. (Haller, 2014)

As a result of the reform the gap between mountain and valley regions have widened, leading to decreasing farming in the Alps (EMB, 2014). The number of farmers in Switzerland have decreased especially in the Alp region, which also impacted the income from tourism. The producers with lower production cost were able to adapt to the new market conditions better.

3.2 Summary of literature review

In this chapter a broad view has been described for the reader, describing the theoretical groundwork of this thesis. The first subheading is about different control tools introduced by government for producers to handle volatile world market prices. Initially show what type of tariffs that are out there and then further present quotas including both the positive and negative aspects that occur when a quota is utilized. Notable is that a tariff is consequentially good for producers but got sub-sequential effects that are hard to estimate. The quota if binding limit efficient producers to a smaller volume than they are able to produce, resulting in that some producers are not able to produce at their maximum level. With an efficient quota trade this volume can be accessible, but this is depending on free trade of quotas. Several studies found that when the abolished are done, an increasing production will occur with a lower farm-gate price for producers and a higher produced volume in the industry. Productivity depend on, among other factors, technological innovations. Furthermore, a correlation between farm-gate price and elasticity in supply for milk was found.

Chapter 4 describe what research methods that are used and where the quantitative data is gathered from. This will give the reader and understanding for the approach.

4 Empirical approach and methods

The purpose of this chapter is to create an understanding for the conditions and approach for the methodological decision made during the process, but also to conduct a basic framework in order to understand how the result are established and where the data is collected.

4.1 Research approach

The base for the literature review was gathered by searching the following databases: Google Scholar, Web of Science, Scopus, Primo, European Commission, Agecon and AgrarEurope. The frequently used keywords used were: 'Quota*', 'milk trade', 'comparative advantage', 'advantage' and 'Europe' in various variety, as while as printed text book in the subject International Trade. A qualitative approach to a literature review with purpose to study the presumed national effects of the abolishing of the European milk quota after April year 2015.

The quantitative data used in the data collection consist of public data available from Eurostat, FAO and FADN. All databases contain statistical data. Eurostat is a Directorate-general by the European Commission. The Farm Accountancy Data Network, FADN, is a European system with sample surveys conducted on the agriculture sector in EU in order to evaluate the common agricultural policy. The difference between Eurostat and FADN is that FADN provide accountancy data to establish the income and business analysis of agricultural holdings. The FADN data comes from sample of farms and represent the five million farms in EU (FADN, 2013). Eurostat is the European Commisions statistical database which gather data from countries and regions. Their collected data material is used for all kind of research (Eurostat, 2014).

The data collected in this study measure current and historical level of utilization of the milk quotas and calculate current and historical comparative advantage. The quantitative data consist of five relevant dairy products (raw milk, fresh milk, yoghurt, butter and cheese) from 27 countries (Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Germany, Estonia, Finland, France, Great Britain, Hungary, Ireland, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and Greece) during a fifteen year period (1999-2013). Even though the milk quotas were initially introduced in year 1984, a limitation to the past fifteen years were done to account for the increased number of member states and the general policies governed by the EU. The five products from the dairy sector were chosen because they represent relevant items and are traded both within and outside of EU. Even though this thesis focus on changes at farm level, most of the produced milk in EU is collected by the process industry. The process industry is able to change production according to the demand on the market.

The purpose with this research topic is to investigate the real world, and because of that data from the real world is essential, but also to gather sufficient knowledge about the area to make theoretical and reasonable conclusions. Qualitative research is performed to gain knowledge while quantitative research is to interpret what market affects the milk quotas currently have for different regions in Europe.

The research approach has developed during the process of this thesis, but the aim has remained the same. The reason why no to have a fixed research question is avoid linear thinking, which often ends up as clean and tidy but not generating significant results (Robson, 2002).

4.2 Data collection

There are different types of data sources that ought to be considered. One will find both primary data and secondary data commonly used in all kind of research. Of importance is that primary data always is unknown in advance of the research taking place. It is always acquired for a specified research project. Secondary data consist of gathered data that initially was compiled for another purpose. By using both primary and secondary data it is possible to perform successful study. To procure general data outside of the primary and secondary data, the use of tertiary data are necessary. In short, tertiary data can be described as information which is a refinement of both primary and secondary data. (Robson, 2002)

4.2.1 Collection of data from Eurostat database

Eurostat offer an immense selection of data in many different forms. In this study data concerning international trade of dairy products was relevant. Eurostat provided data in several different nomenclature systems. Five dairy products were chosen initially to be investigated in this study and the Harmonized System, called HS6, was found to provide adequate broad variety of sub-classes. For fresh milk the HS6 nomenclature had it divided into five sub-classes, with different fat content. Similar classification structure were found for the rest of the products; cheese, SMP, yogurt and butter. Once the data was extracted from Eurostat, the data was merged into those five initial product categories.

When attempting to use the data, the first step was to investigate what data was available and under which period of time. As a result of this investigation, a limitation to the period of year 1999 to 2013 was decided. Data preceding year 1999 was found to be unreliable and in some cases absent. In order to keep this study feasible within the timeframe, a limitation to only include the EU27 member states were found relevant. Some of the EU27 member states became members (Estonia, Lithuania, Latvia, Malta, Poland, Slovakia, Slovenia, Czech Republic, Hungary, Bulgaria, Rumania and Croatia) during the period of 1999 to 2013. However, most data was still available during the period.

The data necessary to create a NRCA-index is export data. In the database the 27 member states were added as *partner* and EU27 as a group was chosen as *reporter.* The time span was limited to annual data. The output value was chosen to be in 100kg per unit instead of being in monetary form Euro per unit. The reason for keeping the output value in 100kg per unit is that it is more easily comparable over time which is desired in this study.

The extracted data was imported into .xls files (Microsoft Excel 1997-2003 file format), the sheets were then immediately locked to prevent any mishaps during the oncoming calculations of different indices.

4.2.2 Data for distributed milk quotes among member states

Data regarding the allocation of milk quotas between member states was not available in the Eurostat database. Procuring the statistical data of milk quota utilization in correlation to gross milk production on a national level was found to be problematic without help from other sources. The Swedish board of agriculture was able to provide us with a summary of that information.

4.2.3 Cluster analysis using Ward's method

In order to illustrate similarities between countries a cluster analysis was performed. The cluster analysis provide a graphical interpretation of the data collected. The cluster grouping

gained from the analysis is supportive when looking for resemblances among the EU27 countries.

Initially a selection of years to investigate were decided upon. The earliest data available in the study was from year 2000 and the most recent from year 2013. Four years seemed reasonable to look at during the timespan of year 2000-2013. In order to do that, data for year 2000, 2004, 2008 and 2013 were exported and compiled into an excel worksheet. The data consisted of EU27 NRCA-indices for each studied milk products (SMP, fresh milk, yogurt, butter and cheese) and additional numbers for net export index and quota usage. These seven parameters were exported from excel into a .csv file (comma separated value) and imported into the mathematical application MATLAB R2014a.

In MATLAB the numerical data was imported as matrix data for each defined year. In the matrix for year 2000 and 2004 some data regarding quota utilization were missing. In order to account for that a fixed value of -0.5 (-50% from maximum allocated quota) were given to those countries. Given the nature of the effected countries, all of them new members or soon to be members of the EU, a fair assumption seem to be a milk quota utilization of half of the assigned quotas. Leaving the value blank would have distorted the cluster analysis. The alternative would have been to discard the countries with missing data which would have left only the EU15 member states. As a result of that it seemed reasonable to keep all of them with assigned dummy-values as described. A cluster-analysis with only EU15 included was also performed.

Ward's method was chosen for generating the cluster analysis. The actual steps for generating these dendrograms is found in appendix 3.

Hierarchical grouping in cluster analysis using Ward's method

In the hierarchical cluster analysis, Ward's minimum variance method, is a part of the objective function, which was presented by Joe Ward in year 1963. His approach was a general agglomerative hierarchical clustering formula, where the principal of selecting a pair of clusters to combine at each stage is centred on the ideal value of an objective function. Ward illustrated this in his example, often referred to as Ward's minimum variance method, where he used objective function as the error sum of squares. (Ward, 1963)

The minimum variance criterion does minimize the total within cluster variance. In each stage clusters with a minimum in between distance are merged. In order to apply this method it is necessary to discover the pair of clusters that lead the minimum rise within cluster variance after being merged. This enlargement is a weighted square distance between cluster hubs. (Ward, 1963)

Ward's minimum variance function is defined as below (Murtagh & Legendre, 2011). In the function d_{ij} delineate the distance between two clusters.

$$d_{ij} = d(\{X_i\},\{X_j\}) = \|X_i - X_j\|^2$$

Ward's method allow for forming a cluster of hierarchical groups based on their similarity and correlation to stated characteristics. By using a computerized program, the hierarchical structure of the subset sequences can be illustrated and sorted into groups. (Ward, 1963)

4.3 Correlation analysis

This analysis was performed in order to identify connections between the different types of data used in this study. The program excel was used to interpret and graphically identify such correlations. It did provided the study with an additional interpretation of the data for net export index, quota utilization and the NRCA-indices. While this graphical correlation analysis did not essentially bring something new to the study, it provided a modest illustration of similarities and dissimilarities between the European member states.

4.4 Bias analysis

In order to explain what bias is and how it could impact the validity of results, a definition about bias is helpful. Bias is defined inconsistencies in scientific research results caused by a systematic error in the research process regarding gathering of data, processing material or by an inadequate analysis of results (Nationalencyklopedin, 2015).

A general understanding is that a researcher try to be objective at all times, but will inexorably hold minor biases. If deviating from a true value, it is likely to result in unwanted effects, for example an overestimation or underestimation of the value. It is important to interpret a result without exaggerating what it actually show. In this study an attempt to limit the impact has been done by exclusively using real world data from reliable sources and by finding similar research approaches in other, peer-reviewed and published, works. Also, deliberately questioned each choice and being constantly aware for any inconsistencies.

5 Results

This chapter present a summary of the data gathered through the thesis process. It provide the reader with the calculated NRCA, quota use, NEI and composed form a statistical data analysis in order to understand the relationship between the different variables. Together with chapter three it provide the necessary toolset required for the following discussion chapter.

5.1 Milk quotas use among EU15 member states

The milk quota utilization amongst the EU15 countries revealed a couple of important results. The data showed that eight of the fifteen member states produced close to their allocated quotas and sometimes even exceeded the limit. During the period of year 2000 to 2013 only two of the EU15 countries did not exceed the limit at any point and that were Sweden and United Kingdom (pers. Message, The Swedish board of agriculture, SJV, 2014-10-10). When analysing the data, tendencies for stagnation in milk production are seen for a couple of countries, especially for Finland, United Kingdom, France, Greece, Portugal and Sweden. These six countries showed that the quota utilization declined during the period. They initially produced roughly around maximum of their allocated quotas to later drop in quota usage. Most noteworthy are Sweden, Finland, Greece, Portugal and United Kingdom. These five countries all diminished their quota utilization by exceeding 10% during the period.

Table 2. (1/2) EU15 quota utilization year 2000/2005/2010/2013

Year	Austria	Belgium	Germany	Denmark	Spain	Finland	UK
2000	3,8	-0,5	0,9	0,4	-3,6	1,1	-2,0
2005	2,8	-0,1	0,7	-0,1	0,2	-1,6	-1,9
2010	0,7	-0,3	-0,7	0,7	-4,5	-11,0	-9,7
2013	3,2	0,0	1,9	2,1	-2,2	-12,8	-10,6

Source: SJV, 2014

In year 2000, all of the above countries produced in the near proximity of their allowed quota. Austria, Germany, Denmark and Finland did exceed their quotas while Belgium, Spain and United Kingdom produced just below their limit. In year 2005, only slight shifts in quota use occurred. Between year 2005 and 2010 every country decreased the use of allocated quota, especially Finland and United Kingdom. In year 2010 both Finland and United Kingdom used less than 90% of their quota. In year 2013, Austria, Germany and Denmark exceeded their quotas. The same year Belgium used 100% the quota while Spain, Finland and United Kingdom did not reach their limits. Also, Finland and United Kingdom continued to produce less than 90% of their quotas.

Table 3. (2/2) EU15 quota utilization year 2000/2005/2010/2013

Year	France	Greece	Ireland	Italy	Luxemburg	Netherlands	Portugal	Sweden
2000	-0,7	2,4	-0,3	4,0	0,3	-0,8	-3,0	-0,4
2005	-1,4	-5,3	-1,8	6,2	1,1	-0,1	0,0	-4,5
2010	-5,1	-20,3	-0,4	-2,4	1,3	1,2	-10,1	-19,7
2013	-6,9	-28,9	0,6	-1,1	1,0	4,0	-14,6	-21,4

Source: SJV, 2014

In table 3, the utilization of allocated dairy quotas for year 2000, 2005, 2010 and 2013 are provided for the second part of the EU15 member states. In year 2000 it is found that Greece, Italy and Luxemburg exceeded their quota limits. In year 2005 only Italy and Luxemburg exceeded their quotas, while in year 2010 it were Luxemburg and Netherlands. In year 2013 Ireland, Luxemburg and the Netherlands overstepped their quotas.

5.2 Net export index

The net export index for each of the EU27 member states is found in the table below. Negative values for NEI are marked in grey, while positive values are unmarked.

Table 4. Net Export Index for dairy product trade intra EU27

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Austria	-0,76	-0,75	-0,70	-0,67	-0,57	-0,62	-0,61	-0,63	-0,62	-0,64	-0,60	-0,57	-0,60	-0,60	-0,60
Belgium	0,01	0,02	0,04	0,08	0,09	0,10	0,12	0,08	0,06	0,08	0,08	0,09	0,05	0,05	0,07
Bulgaria	0,99	0,91	0,50	0,33	0,33	0,38	0,03	0,23	0,10	0,14	0,40	0,34	0,41	0,41	0,49
Cyprus	0,60	0,51	0,46	0,32	0,47	0,35	0,45	0,42	0,33	0,38	0,39	0,37	0,33	0,31	0,18
Czech Rep	0,03	-0,02	0,06	0,23	0,20	-0,15	-0,49	-0,61	-0,60	-0,58	-0,62	-0,58	-0,58	-0,57	-0,55
Germany	-0,41	-0,37	-0,37	-0,36	-0,35	-0,34	-0,24	-0,18	-0,18	-0,16	-0,17	-0,18	-0,16	-0,16	-0,15
Denmark	-0,64	-0,29	-0,38	-0,55	-0,47	-0,36	-0,34	-0,43	-0,46	-0,56	-0,57	-0,48	-0,40	-0,48	-0,46
Estonia	-0,64	-0,35	-0,57	-0,57	-0,18	-0,36	-0,65	-0,87	-0,75	-0,75	-0,46	-0,67	-0,58	-0,78	-0,74
Spain	0,43	0,39	0,31	0,35	0,40	0,50	0,50	0,49	0,49	0,47	0,49	0,47	0,48	0,45	0,47
Finland	-0,16	-0,22	-0,20	-0,32	-0,22	-0,14	-0,05	0,02	0,03	0,13	0,23	0,32	0,47	0,50	0,48
UK	0,02	0,22	0,45	0,17	0,16	0,21	0,22	0,26	0,32	0,35	0,35	0,26	0,21	0,24	0,29
France	-0,11	-0,11	-0,13	-0,21	-0,19	-0,26	-0,32	-0,31	-0,33	-0,33	-0,26	-0,31	-0,37	-0,35	-0,36
Greece	0,77	0,76	0,77	0,78	0,77	0,75	0,71	0,72	0,64	0,63	0,75	0,51	0,59	0,61	0,57
Hungary	0,00	0,37	-0,24	-0,18	-0,06	0,16	-0,01	-0,08	-0,17	-0,12	-0,08	-0,08	-0,09	-0,11	-0,06
Ireland	-0,16	-0,32	-0,52	-0,44	-0,13	0,01	0,28	0,21	0,19	0,16	0,15	0,04	0,09	0,15	0,09
Italy	0,91	0,91	0,92	0,90	0,90	0,87	0,87	0,86	0,84	0,85	0,85	0,84	0,84	0,84	0,82
Lithuania	-0,24	-0,52	-0,43	-0,47	-0,61	-0,77	-0,03	0,23	0,24	0,42	0,34	0,45	0,52	0,38	0,37
Luxemburg	-0,51	-0,47	-0,29	-0,13	-0,30	-0,38	-0,35	-0,33	-0,32	-0,31	-0,24	-0,28	-0,30	-0,28	-0,31
Latvia	0,36	0,09	-0,07	0,04	-0,01	-0,17	-0,43	-0,31	-0,55	-0,52	-0,69	-0,51	-0,68	-0,53	-0,45
Malta	1,00	1,00	0,92	1,00	1,00	0,99	1,00	0,99	1,00	1,00	0,99	1,00	0,97	0,96	0,98
Netherlands	0,04	0,01	-0,02	-0,16	-0,27	-0,10	-0,01	-0,01	-0,07	-0,09	-0,11	-0,04	0,01	0,01	-0,03
Poland	-0,54	-0,12	-0,30	-0,43	-0,53	-0,84	-0,85	-0,71	-0,49	-0,65	-0,53	-0,43	-0,34	-0,37	-0,27
Portugal	-0,19	-0,34	-0,01	-0,09	0,11	-0,05	-0,12	-0,07	0,01	-0,01	0,02	0,15	0,18	0,14	0,15
Romania	0,82	0,44	0,41	0,63	0,67	0,46	0,44	0,60	0,88	0,88	0,94	0,87	0,79	0,72	0,68
Sweden	0,22	-0,01	0,07	0,30	0,34	0,20	0,48	0,56	0,55	0,60	0,55	0,39	0,35	0,45	0,44
Slovenia	-0,71	-0,71	-0,77	-0,65	-0,74	-0,56	-0,60	-0,53	-0,54	-0,40	-0,43	-0,44	-0,41	-0,38	-0,40
Slovakia	-0,24	-0,31	-0,44	-0,59	-0,61	-0,53	-0,29	-0,16	-0,27	-0,16	-0,17	-0,05	0,00	-0,01	0,10

Source: own calculations based on Eurostat database

Here is an assessment of the period year 1999 and 2013 among the EU27 countries. Austria is a net import country, starting their NEI at 1999 at a NEI of -0.76 but decreased their net import to -0.60. Belgium has a slight positive NEI that increased from 0.01 to 0.07 during the

period. Bulgaria has a positive NEI that decreased during the period, from 0.99 to 0.49. Cyprus has also decreased its positive NEI from 0.60 to 0.18. Czech Republic started in year 1999 with a positive NEI of 0.03, then in year 2000 decreased its NEI to -0.02 and increased between year 2001 and 2003, to a positive value and after year 2004 to a negative NEI, ending up with -0.55. Germany has during the last fourteen years been a net import country, but it has decreased to -0.15 in year 2013. Denmark has been a net import country with a negative NEI, from -0.64 to -0.46. Estonia is a net importer with fluctuating net export indices, from -0.64 up to -0.18 in year 2003, and down again to -0.74 in year 2013. Spain has a positive NEI that has been fairly stable since 1999 with 0.43 to 0.47 year 2013. Finland elevated from being a net import country in 1999 to in 2005 being a net export country and in 2013 with a NEI of 0.48. The United Kingdom has been a stable net export country and increased its NEI from 0.02 to 0.29. France had a negative NEI that did decrease from -0.11 to -0.36. Greece has one of the highest NEI and went from 0.77 to 0.57. Hungary did a major increase in its NEI between year 1999 and 2000 with 0.37 units, after that it decreased between year 2002 and 2004 to a negative value, while increasing to -0.06 in year 2013. Ireland has a negative NEI between year 1999 and 2003, after that it changed to a positive NEI from year 2004 until 2013 with a value of 0.09. Italy has one of the highest NEIs among the EU27 countries, during the period it made a minor decline from 0.91 to 0.82. Lithuania has a negative NEI during 1999 to 2005, after year 2006 Lithuania had a positive NEI with a major increase in 2013 to 0.37. Luxemburg has a negative NEI that has been slowly increasing from -0.51 to -0.31. Latvia started with a positive NEI of 0.36 to a value of -0.45 in year 2013. Malta has the highest NEI among the member states with values in the span of 0.98 to 1.00. The Netherlands have a neutral NEI in the span of 0.04 to -0.03. Poland has steadily increased its NEI from -0.54 to -0.27. Portugal had between year 1999 and 2002 a negative NEI during year 2003 and thereafter increased to a NEI of 0.11. Poland had a decline in NEI between year 2004 and 2006, after that steadily increased to 0.15 in year 2013. Romania has a positive NEI which declined during year 2000 and 2005. In year 2013 Romania had a NEI value of 0.68. Sweden started in year 1999 with a positive NEI value of 0.22. During a period the NEI declined for Sweden but in year 2013 it was 0.44. Slovenia has increased from a negative NEI value of -0.71 to -0.40. Slovakia did decreased its NEI for a while and in year 2013 it had a NEI of 0.10. Distinguished are following countries: Bulgaria, Italy, Malta, Romania, which all have a high positive net export indices.

5.3 Normalized revealed comparative advantage

In figure 10, the NRCA value among EU15 is revealed for year 2013. The NRCA is aggregated which mean that each NRCA for fresh milk, butter, yoghurt, SMP and cheese are composed together creating a single aggregated value. That value indicate the comparative advantage for each domestic milk industry.

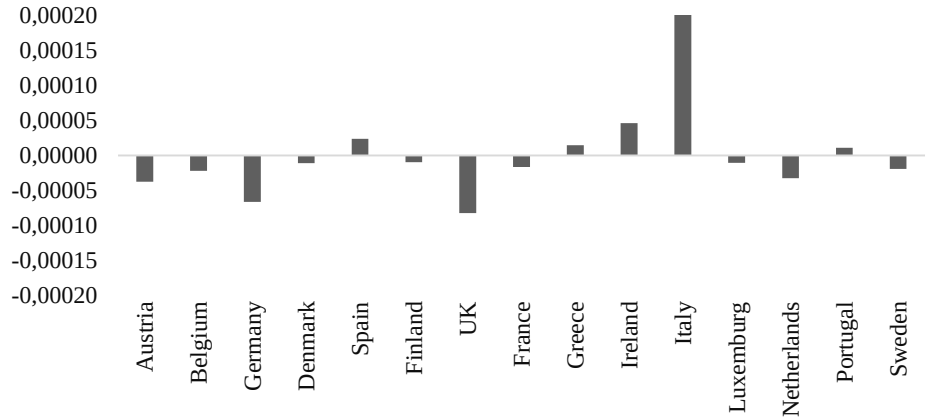

Figure 8. Aggregated NRCA EU15 year 2013 (Source: own illustration)

Here five countries have a positive NRCA for year 2013, and those are Spain, Greece, Ireland, Portugal and Italy. The two countries that have the highest NRCA are Italy and Ireland. In total, ten countries have a negative NRCA for year 2013, and those are Austria, Belgium, Germany, Denmark, Finland, UK, France, Luxemburg, the Netherlands and Sweden. Among them Austria, UK and Germany have the lowest NRCA values. In Table 3, the NRCA (value multiplied by 10^6) is presented among the EU27 countries, each divided into the five milk products: SMP, butter, cheese, fresh milk and yoghurt.

Table 5. NRCA for milk products in EU27 year 2013

	SMP	Butter	Cheese	Fresh milk	Yogurt
Austria	-9,0	-7,4	-19,9	-160,7	-11,8
Belgium	-8,5	2,6	-89,1	-81,5	-22,0
Bulgaria	11,7	0,6	-0,3	-7,4	-1,0
Cyprus	-0,4	0,0	2,8	-5,1	0,2
Czech Rep	-8,6	1,3	-4,0	-94,2	-5,8
Germany	-60,3	-15,6	-92,8	-143,8	-113,7
Denmark	3,0	4,7	15,4	-61,9	-1,8
Estonia	-0,5	-0,6	-5,5	-14,9	-0,5
Spain	13,5	-6,2	51,7	31,7	79,1
Finland	-6,5	-4,8	11,8	-45,8	8,6
UK	1,6	4,0	47,2	-416,2	-2,2
France	6,7	48,5	10,2	-113,9	-24,2
Greece	4,8	0,6	45,8	65,9	2,6
Hungary	-3,2	-1,9	-2,2	34,5	-0,8
Ireland	12,4	-2,0	2,3	214,3	7,3
Italy	15,7	-6,2	161,9	970,6	45,5
Lithuania	-0,1	-0,9	-4,2	218,7	0,3
Luxemburg	-3,9	-2,1	9,3	-42,3	-4,5
Latvia	-0,4	0,8	-0,1	24,8	0,8
Malta	-0,3	-0,3	0,7	-4,1	-0,3
Netherlands	52,7	1,4	-89,0	-192,0	-24,9
Poland	-2,9	-8,4	-51,8	-111,0	-16,9
Portugal	-2,6	-2,0	-8,6	4,5	54,2
Romania	-1,9	-1,5	-0,2	14,5	-1,4
Sweden	-8,3	-3,4	17,0	-115,0	30,4
Slovenia	-1,8	-1,6	-2,7	5,4	1,7
Slovakia	-2,9	0,1	-5,6	24,9	1,3

Source: own calculations based on Eurostat data

Noteworthy is that the NRCA for fresh milk is clearly more fluctuating than the rest of the milk products. Some of the countries have a positive NRCA for fresh milk while the rest are negative, and some do have the opposite way around, for example negative NRCA for fresh milk and positive for the other products. The single country with overall positive NRCA values is Greece. Countries with no less than four positive NRCA values are Spain, Ireland and Italy. Distinguished here is that all of the countries do have a very small negative value for butter. The countries with at least three positive NRCA values are Denmark, UK, France and Slovakia. The member states with neutral NRCA are Bulgaria, Cyprus, Estonia, Hungary, Luxemburg, Latvia, Malta, Romania, Slovenia and Slovakia. Countries with high NRCA compared to others on certain products, are Spain (cheese, fresh milk and yoghurt), Greece (cheese and fresh milk), Ireland (fresh milk), Italy (cheese, fresh milk and yoghurt), Lithuania (fresh milk) and Portugal (yoghurt). Once again, NRCA for fresh milk distinguish itself.

Countries with low NRCA value on some of the milk products are Austria (fresh milk), Belgium (cheese and fresh milk), Czech republic (fresh milk), Germany (SMP, cheese, fresh milk and yoghurt), Denmark (fresh milk), Finland (fresh milk), UK (fresh milk), France (fresh milk and yoghurt), Luxemburg (fresh milk), Netherlands (cheese, fresh milk and yoghurt), Poland (cheese and fresh milk) and Sweden (fresh milk). If fresh milk is disregarded, countries with high NRCA (compared with other) are Spain, UK, France, Greece, Italy and Portugal. Countries with low NRCA are Belgium (cheese), Germany (SMP, cheese, yoghurt), Netherlands (cheese) and Poland (cheese).

Figure 8 found below illustrate the correlation between an aggregated NRCA and the NEI between EU15 member states in year 2013. This indicate how NRCA is in correlation to NEI.

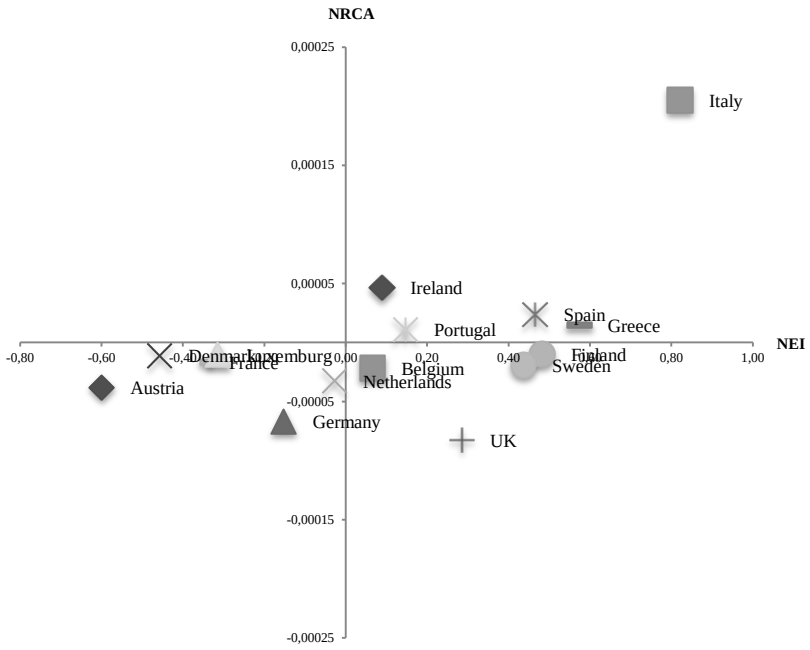

Figure 9. EU15 aggregated NRCA in correlation with NEI year 2013 (Source: own illustration)

In the figure, a correlation between NRCA and NEI is shown, the figure can be divided into four quadrants. Top left and right, and bottom left and right. In the top left there would be countries with positive NRCA and negative NEI. As seen, there are no such countries with positive NRCA and negative NEI. The second quadrant (top right), here countries with positive NRCA and positive NEI exist, and these are Italy, Ireland, Portugal, Spain and Greece. The third quadrant (bottom left), which contain those countries with negative NRCA as well as negative NEI. These countries are Austria, Germany, Denmark, France, Luxemburg and Netherlands. In the fourth quadrant, member states with negative NRCA while having positive NEI find themselves. And found in that quadrant are Belgium, United Kingdom, Sweden and Finland.

In comparison of year 2008 (see appendix table 19) the first quadrant contain France. The second contain Portugal, Ireland, Spain, Greece and Italy. The third quadrant, Denmark, Austria, Luxemburg, Germany and Netherlands. And finally the fourth quadrant contain Belgium, Finland, UK and Sweden. The variations seen between year 2008 and 2013 are that Italy have moved from the third quadrant into the first. The second and forth quadrant contain the same members as in year 2013.

The NRCA-NEI table from 2004 (see appendix table 20) comprise following alterations. Portugal is here in the first quadrant, Belgium is in the second, and Finland is in the third. The rest of the countries positions are unchanged.

In the NRCA-NEI table from 2000 (see appendix table 21) following changes are found. Ireland is in the first quadrant. Portugal and Sweden are in the third while the Netherlands are in the fourth quadrant.

5.4 Cluster model

A cluster group comprising different countries and distance depend on dissimilarities between countries. This cluster-analysis illustrate graphically the found resemblances between the EU27 countries.

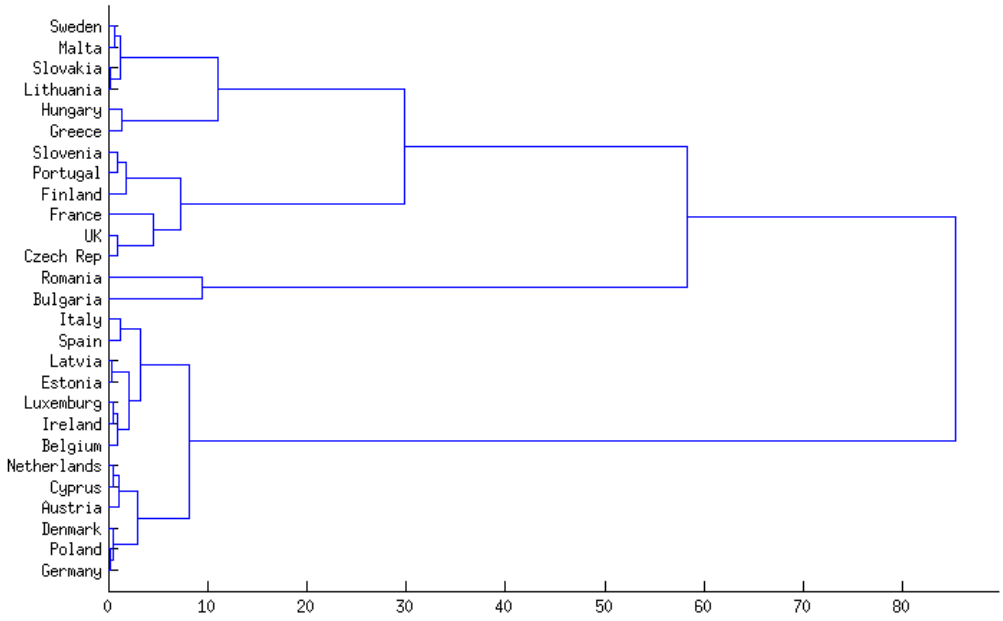

Figure 10. Dendrogram cluster-analysis year 2013 (Source: own illustration)

The above generated dendrogram arrange a statistical clustering of the EU27 countries. An increased distance between groups estimate the level of discrepancy between them. According to the clustering seen in the dendrogram, it divide the countries into four larger groups at a deviation level around 10-12. Below in table 4, these cluster groups are listed in a more comprehendible fashion.

Table 6. Grouping of EU27 countries year 2013

Group 1	**Group 2**	**Group 3**	**Group 4**
Sweden	Slovenia	Romania	Italy
Malta	Portugal	Bulgaria	Spain
Slovakia	Finland		Latvia
Lithuania	France		Estonia
Hungary	UK		Luxemburg
Greece	Czech Republic		Ireland
			Belgium
			Netherlands
			Cyprus
			Austria
			Denmark
			Poland
			Germany

Source: illustration based on own results

Group 1 include: Sweden, Malta, Slovakia, Lithuania, Hungary and Greece. Group 2: Slovenia, Portugal, Finland, France, UK and Czech Republic. Group 3: Romania and Bulgaria. Group 4 include: Italy, Spain, Latvia, Estonia, Luxemburg, Ireland, Belgium, Netherlands, Cyprus, Austria, Denmark, Poland and Germany. If applying a delimitation to EU15 member states, the following countries are represented in group 1: Sweden and Greece. Group 2: Portugal, Finland, France and UK. Group 3: None found here. And finally in group 4: Italy, Spain, Luxemburg, Ireland, Belgium, Netherlands, Austria, Denmark and Germany.

Table 8 contain an improved synopsis about how the EU15 countries are categorized, in which category of NRCA versus NEI they appear in. The exact NRCA, quota usage and a cluster analysis, with and without the variable quota utilization, during year 2013 as well as year 2004. The purpose is to highlight competitiveness factors and the similarities found amongst the member states. It also give an indication of the importance of quota utilization when performing a cluster analysis upon data regarding comparative advantage. The desired outcome is it to be supportive when attempting to evaluate the effects implied by a quota on comparative advantage and find support for what is to be expected when the EU milk quota regime is removed in year 2015.

Table 7. Summary of composed data year 2013

	Cluster with quota	**NRCA/NEI**	**NCRA*10^{-6}**	**Quota deviance from max**	**Cluster no quota**
Austria	BE DE DK ES IE IT LU NL	- advantage & + net	-37,8	3,2%	DK FR LU
Belgium	AT DE DK ES IE IT LU NL	- advantage & - net	-21,9	0,0%	DE IE NL PT UK
Germany	AT BE DK ES IE IT LU NL	- advantage & + net	-66,7	1,9%	BE IE NL PT UK
Denmark	AT BE DE ES IE IT LU NL	- advantage & + net	-11,2	2,1%	AT FR LU
Spain	AT BE DE DK IE IT LU NL	+ advantage & - net	23,6	-2,2%	FI GR SE
Finland	FR PT UK	- advantage & - net	-9,7	-12,8%	ES GR SE
UK	FI FR PT	- advantage & - net	-82,6	-10,6%	BE DE IE NL PT
France	FI PT UK	- advantage & + net	-16,6	-6,9%	AT DK LU
Greece	SE	+ advantage & - net	14,8	-28,9%	ES FI SE
Ireland	AT BE DE DK ES IT LU NL	+ advantage & - net	46,4	0,6%	BE DE NL PT UK
Italy	AT BE DE DK ES IE LU NL	+ advantage & - net	205,1	-1,1%	
Luxemburg	AT BE DE DK ES IE IT LU	- advantage & + net	-10,5	1,0%	AT DK FR
Netherlands	AT BE DE DK ES IE IT LU	- advantage & + net	-32,6	4,0%	BE DE IE PT UK
Portugal	FI FR UK	+ advantage & - net	10,8	-14,6%	BE DE IE NL UK
Sweden	GR	- advantage & + net	-19,3	-21,4%	ES FI SE

Source: own calculation

In table 7 the following is observed, there is no indication of the quota effecting the NRCA/NEI indices. However, an effect of cluster analysis and grouping is found. After removing quotas as a parameter in the cluster analysis, the following clustering occur: Austria, Luxemburg, France and Denmark formed a group while Belgium, Germany, Netherlands, UK, Portugal and Ireland formed another one. Finland, Greece, Spain and Sweden were grouped together while Italy was in its own.

The countries that are still clustered together are Austria, Denmark and Luxemburg (negative NRCA and positive quota usage). Belgium, Germany, Ireland and Netherlands (negative NRCA except Ireland, all positive quota usage). United Kingdom and Portugal (not close values for NCRA -82.3 and 10.8, negative quota usage). Greece and Sweden (not close in NRCA, 14.8 and -19.3, negative quota usage).

Completely transformed countries are Spain and Finland (not close in NRCA, not close in NRCA, 23.6 and -9.7, negative quota usage, both with negative NEI). These countries appear to be even more affected by the quota utilization level compared to the others. This advocate for a potentially increased market effect in these countries.

Table 8 present the same relevant data as found in table 7, but for year 2004. The reason for analysing data regarding year 2004 is that year 2000 was established to be too far back in time. While the reason for not using year 2008 was because of the economic instability that occurred about that time. In order to avoid any unnecessary discrepancies, year 2004 was found appropriate to use.

Table 8. Summary of composed data year 2004

	Cluster with quota	NRCA/NEI	NCRA*10^{-6}	Quota deviance from max	Cluster no quota
Austria	BE DK ES GR IE LU NL	- advantage & + net	-33,0	1,4%	DE DK FR LU
Belgium	AT DK ES GR IE LU NL	+ advantage & - net	16,3	0,7%	SE UK
Germany		- advantage & + net	-72,7	1,5%	AT DK FR LU
Denmark	AT BE ES GR IE LU NL	- advantage & + net	-6,5	0,0%	AT DE FR LU
Spain	AT BE DK GR IE LU NL	+ advantage & - net	19,8	1,1%	IT GR
Finland	FR PT SE UK	- advantage & + net	-17,5	-2,0%	IE NL PT
UK	FI FR PT SE	- advantage & - net	-92,8	-1,1%	BE SE
France	FI PT SE UK	+ advantage & +net	32,7	-1,1%	AT DE DK LU
Greece	AT BE DK ES IE LU NL	+ advantage & - net	14,9	-11,9%	IT ES
Ireland	AT BE DK ES GR LU NL	+ advantage & - net	21,5	0,8%	FI NL PT
Italy		+ advantage & - net	281,9	4,0%	GR ES
Luxemburg	AT BE DK ES GR IE NL	- advantage & + net	-9,2	0,9%	AT DE DK FR
Netherlands	AT BE DK ES GR IE LU	- advantage & + net	-38,9	0,6%	FI IE PT
Portugal	FI FR SE UK	+ advantage & +net	7,0	-0,8%	FI IE NL
Sweden	FI FR PT UK	- advantage & - net	-32,0	-2,9%	BE UK

Source: own calculation

Following countries have been clustered together: Group 1: Austria, Denmark, Germany, France and Luxemburg. Group 2: Belgium, Sweden and UK. Spain, Italy and Greece. Group 3: Finland, Ireland, Netherlands and Portugal.

Those member states still clustered together after the quota are: Austria, Denmark and Luxemburg (negative NRCA, -33, -6.5, -9.2, positive quota usage). Spain and Greece (positive NRCA, 19.8 and 14.9, diverts quota). Finland and Portugal (diverts NRCA, -17.5 and 7, negative quota). UK and Sweden (negative NRCA, -92.8 and -32, negative quota

usage). Greece and Spain (positive NRCA, 14.9 and 19.8, diverts quota usage). The Netherlands and Ireland (diverts NRCA, -38.9 and 21.5, positive quota usage).

Completely rearranged group is: Belgium, Germany, France, Ireland and Italy. All of them have high NRCA, except Germany that has a low NRCA. This group is found to be reasonably neutral, just above and below zero, with exception of Italy.

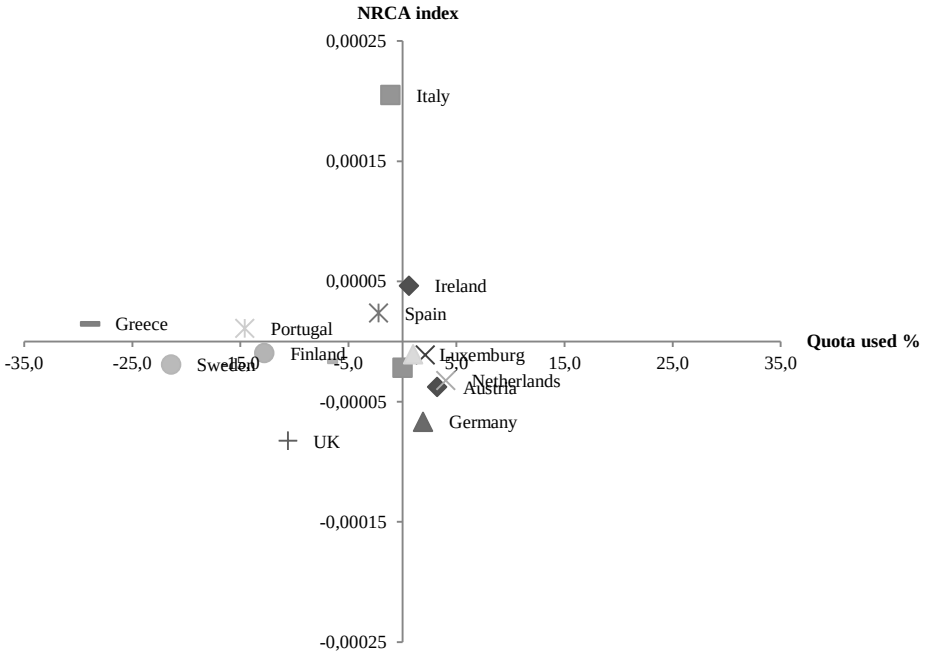

Figure 11. Correlation between NRCA and quota utilization year 2013 (Source: own illustration)

Figure 14 illustrate the correlation between comparative advantage and the amount of allocated milk quota used, among the EU15 countries. Countries found with positive comparative advantage are Italy, Ireland, Spain, Greece and Portugal. The countries that overstepped their allowed quota limit year 2013 were Ireland, Luxemburg, Netherlands, Austria and Germany.

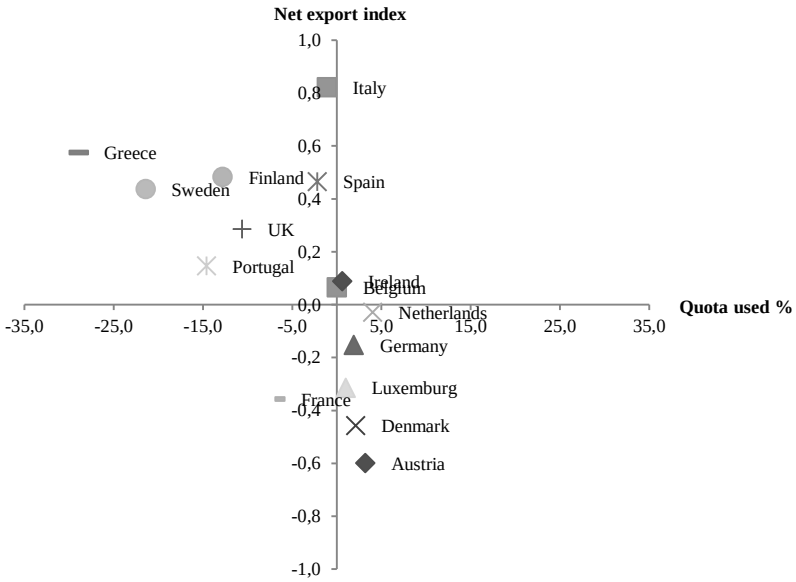

Figure 12. Correlation between NEI and quota utilization year 2013 (Source: own Illustration)

In figure 15, the relationship between net export and quota utilization is seen for each of the EU15 member states. It is seen that Italy, Spain, Finland, Greece, Sweden, United Kingdom, Portugal, Ireland and Belgium all have a positive net export index which mean that they export more of the dairy commodities studied than they import. It is also seen that Netherlands, Germany, Luxemburg, Denmark, France and Austria were net importers of the five dairy products. According to the graph it seem to be a connection between being a net importer and exceeding allocated dairy quota year 2013.

6 Discussion

The purpose with this chapter are to address the theoretical base and data from NRCA together to be able to answer the research questions. The following questions are asked:

- *What are the comparative advantages amongst the EU27 countries for skim milk powder, butter, fresh milk, cheese and yoghurt?*
- *How will the volume milk produced in EU be affected after the reform?*

When examining the result of the cluster-analysis it is clear that it makes a substantial difference if quota use was included or not. The grouping of countries differentiated considerably because of that, which indicate that the quota removal will implicate major changes in competiveness for member states. Along the anticipated change in competiveness a comprehensive alteration of the European dairy market is to be expected. Member states that previously had high comparative advantage will be able to use that for their own advantage and expand upon their dairy production. It is plausible that the expected raise in total production of dairy products within the EU will increase its world market share.

One of the primary reason for introducing a limitation on produced milk was due to the constant overproduce of dairy in EU. In year 1984 when the restriction was introduced the European Union only consisted of ten member states. Evaluating NRCA of the original ten member states today it is found that most of them have a high revealed comparative advantage. This evolvement is seen when looking at the clustering of countries during the period of 1999 to 2013. Currently the EU milk production constitute 27% of the world market and this number is steadily decreasing. In the EU, only a few members have a substantial share of the market. They are all older member states, with exception for Poland. In order to maintain the same level on the world market, an increase in export outside EU is crucial.

It is found that countries that recently joined the EU cannot compete side by side with older member states. One particular reason for that being approved limit of dairy established when a country entered the union. Along with the improved technology and the restriction of trade it constitute a problem for new member to compete with long time member states.

The NRCA-index indicate the international competitiveness across industry sectors and because of its normalized nature is possible to make comparison between subjects over a period of time. NRCA use genuine export data of a commodity and compare it to the entire market. The results given present an indication of the levels of comparative advantages found among participants on the market. The NRCA index is a comparative tool but only a relative concept and must be used with caution. Corresponding to what is concluded in the article by Benedicts & Tamberi (2001), a good comparative advantage tool should not differentiate a lot over time.

Using Ward's method for cluster analysis, positivism and criticism against it. The positive aspect of using Ward's method is that it is able to combine several comparative tools. Together they form a further reliable measurement of market competitiveness. When grouping different subjects together with the characteristic of different comparative tool a synopsis of how the current market appear occur. The found negative aspects are that the different parameters may depend on each other and as a result of that be vulnerable to double counting when forming cluster of the different parameters included. A good measure of competitiveness remain even over time. Minor fluctuations are acceptable. However, if a country's total competitiveness make a major change the parameters indicate a less ideal toolset for measurement.

In the study of Switzerland's removal of dairy quotas, Haller found that the overall production increased while the cost per produced unit decreased, and also that the farm-gate price declined. This caused a decline in volume of milk produced and inflicting economic loss to the dairy industry. However it is not possible to directly interpret these effects found in Switzerland regarding milk quota abolishment and apply it in the case of EU. The EMB indicate that after the abolishment there will be a large need for efficient instruments to reduce strong price fluctuations.

Swiss quota abolishment compare with the possible effects of quota based on Husted and Melvin list of effects are that the value is incorporate within the underlying cost of production. This lead to difficulties in setting a quota level that matches the production level which will follow in free trade together with probable substantial effect after removal, which also shown in the cluster analysis when calculating with and without quota. There are possibilities to have vast effect on future competitiveness between countries in EU but also on the EU share of the global market. Those member states that can compete with lowered production cost, good market stabilizing tools, refined well implemented supply network management and marketing will gain the most out of the dairy quota free market. Countries that have in the past proven to be prosperous at it are most notable Germany, Netherlands and Denmark.

Réquillart indicated a strong connection between leasing price and quota rent. In market where quotas are easily tradable the quota price is expected to follow the actual impact of quota rent. A fair assumption is that the trade markets for quotas are diverse among member states, which Réquillart point out that countries with complex restrictions of trade are likely to even further increase their production in the short run. The previous domestic tradability of quotas will influence the adaptation of each national market when quotas are removed.

Quota rent is not only dependent on the market price but also associated to the producer attitude toward trading quota and how easy the trade principles are. Due to the uncertainty of producer attitudes and possibilities the impact on shadow price remain unknown. There is also an unevenness in current the quota system reliant on that fact that countries joined the EU at different times. This show that newer member states may not be as competitive as long-time members. A market without quota may lead to that the newer member states could become more competitive than calculated.

Jansik and Irz studied the connection between level of technological and managerial development within the dairy industry and farm sector. Their research disclosed that the dairy industry sector is more adaptable to new technologies and management and therefor is anticipated to adjust more easily to a market without quota constraints. As a result there is reason to consider countries with high level of technology on farm level being in a better position when quotas are abolished.

However, it remain some uncertainty about how the quota penalties are implemented based on the fact that some countries maintain a constant overproduction. This indicate that those countries possess very high competitiveness of dairy production or that penalties are not executed effectively. If a fine for a country is not successfully implemented it has an unnatural competitiveness towards other countries. And if the fine is fully implemented, the country with overproduction has a very strong competitiveness. This result in a substantial increase in volume produced and a change of the market caused by the milk industry not being equipped to handle the new production level. The milk market is shown to be very adaptable, where a 1% decrease in demand lead to a 4.5% decrease in price.

According to Réquillart countries with high quota rent are more likely further increase their production compared to other countries. The reason for this being an improved profitability at farm gate price in the short run. The effects due to initial increase of profit, seen amongst producers, drive the production levels up to later result in a large drop of the farm gate price due to overproduction. The increased price volatility caused by the occurrence of bullwhip effect points toward a decrease of the amount of famers in the sector while the production volume is not as volatile.

A delimitation to only include export data within the EU were done in order to answer the research questions. The reason for not including the rest of the world is that the data are not necessary for the research questions. The EU is eager for an increase in export after the quota abolishment. The projected outcome is an increased price of dairy within EU. If the expected increase of export is not as high, an overproduction will occur due to a greater price drop than expected.

In the result an aggregated NRCA are presented. This is possible because the normalized nature of the comparative advantage index used in this study. If the index would not have been normalized an aggregated NRCA had not been feasible. The positive effect of an aggregated index is that it allow for an improved and more even view of the milk market, which provide a good foundation for conclusions. A negative aspect is that it is not as easy to detect specialization in certain export commodities. In order to detect this more than the five different product groups have to be comprised. The research question does not include specialized products, resulting in this limitation to five of the major dairy product groups.

7 Conclusions

The aim of this study is to examine the market for milk products in Europe and investigate the anticipated changes in dairy production after the abolition of milk quotas in April 2015. This is done in order to evaluate the competitiveness and investigate the comparative advantages for basic commodities fresh milk, SMP and finished products butter, yogurt and cheese. Here below the initial research questions are repeated once again.

- *What are the comparative advantages amongst the EU27 countries for milk products; fresh milk, cheese, butter, yoghurt and SMP (skim milk powder)?*
- *How will the volume milk produced in EU be affected after the reform?*

The study provide an indication of an anticipated boost in the volume of milk produced in the European Union when a dairy quota regime no longer restrict supply on the market. The result of a sudden increase in total produced volume will only temporary be produced and sold at current market prices. When the market is flooded a new supply curve will appear with lower market prices for each commodity because of a shift in price elasticity. The member states with positive NRCA-indices are projected to have a better positioning in the deregulated dairy market. An observed pattern is that long-time members of the union often are found to have higher NRCA-indices than those that more recently became members. However, it is not possible to draw confident conclusions from the NRCA data alone because of factors that could not be included in the model. One important factor that would have improved the validity is information regarding the domestic tradability of quotas for each member state.

An analysis of the comparative advantages of the five commodities studied here gives an insight into the predicted changes, due to the deregulation of the market. Countries with developed strategies and specialized production seem to be more likely to benefit from the reform.

When examining the outcome of the combined cluster analysis, it is evident that it is a useful tool for assessing long-time members, which here consist of EU15 member states. However, the result with more recent addition to the EU15 countries included is not as pleasing because of a less distinct grouping established. The content of the results in this cluster-analysis appear to be consistent with what is observed in the literature review. An interesting remark is that the presence of data regarding deviance of quota utilization or not, appear to be vastly relevant. Whether deviance of quota utilization or not is comprised, the grouping vary considerably. This provides a reason to consider the choice to exceed the allocated quota level, which is an important factor with close links to calculated comparative advantages. Countries that have exceeded the allocated dairy quota are assumed to have economic incentives in order to act in such way. The alternative interpretation of their action is to assume they neglect set quotas since the penal system is not effective in applying penalties.

Suggestion to future research

What we found to be a missing factor that would have contributed a lot to our study is information regarding the domestic tradability environment of dairy quotas in each member state. We did find it curious to see how the tradability differentiate between member states. In our study it was regrettably not possible to investigate the impact. However, we observed an indication of different tradability which is recognised to affect the positioning on the reformed market.

It would be interesting to investigate the impact of the European dairy quota abolishment actual influence on the world market, both regarding shift of volume produced and occurring price fluctuations. The European Union is a key competitor and produce about 27% of all milk products in the world which suggest that it will alter the market after to the reform. However, the fact that the ratio between total produced milk in the world is increasing and the total produced milk in Europe is lag behind, is alone an interesting topic.

It would also be of interest to examine the trade possibilities arisen with a single market, for example China. For the past decades the Chinese market for dairy commodities has increased extremely fast and is currently alone responsible for importing about 8-10% of the total export in EU. What impact will the European dairy quota abolishment have on the trade with the Chinese?

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Personal messages

The Swedish board of agriculture, Web based support forum, 2014-10-10

Appendix 1: Dendrogram year 2000, 2004 & 2008

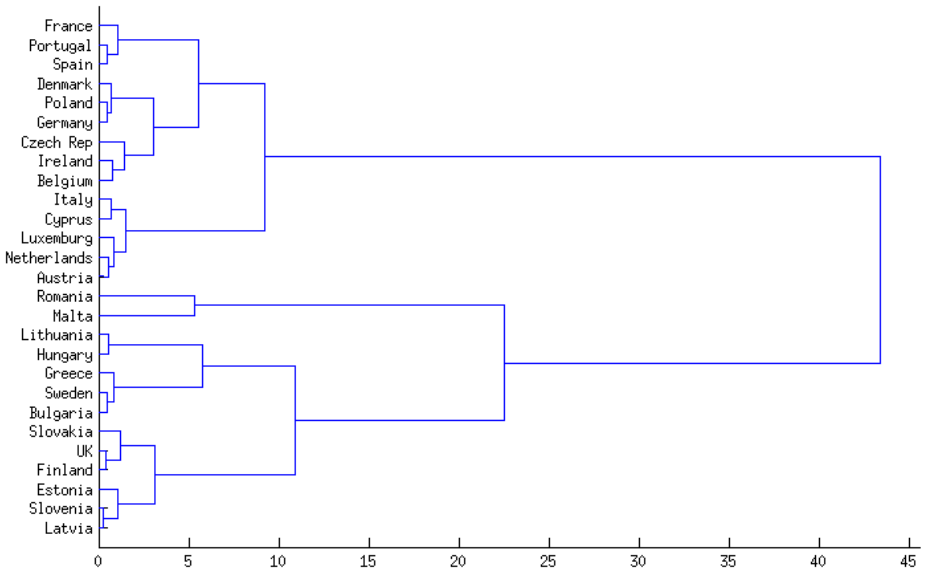

Figure 13. Dendrogram cluster-analysis year 2008

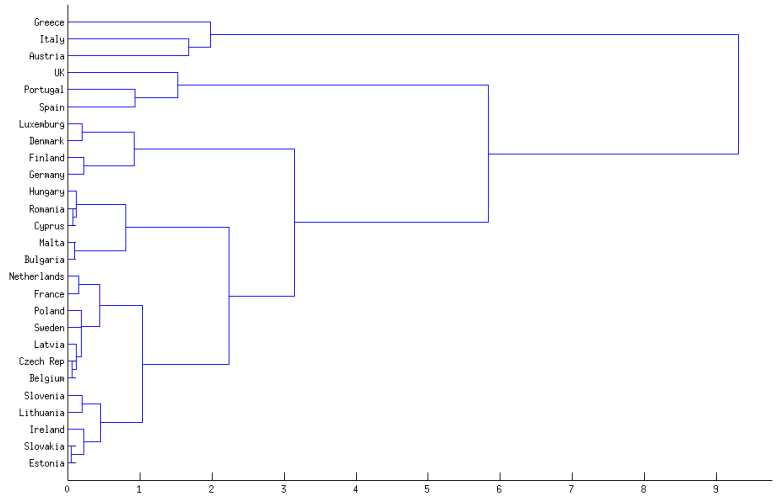

Figure 14. Dendrogram cluster-analysis year 2000

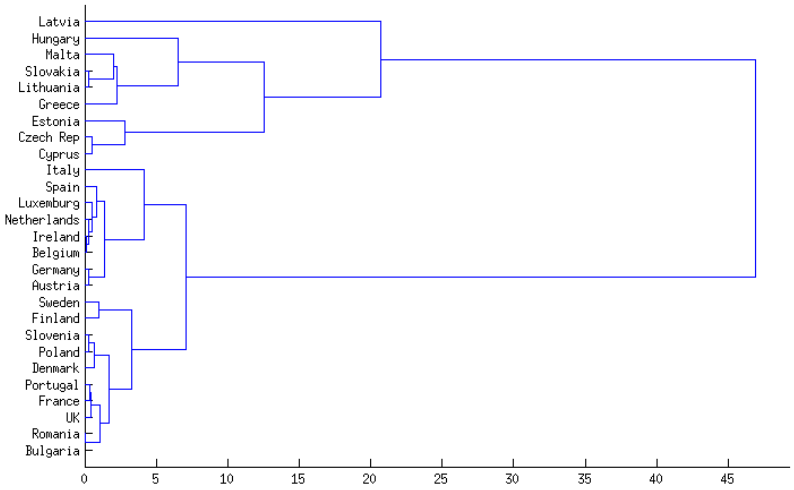

Figure 15. Dendrogram cluster-analysis year 2004

Appendix 2: correlation between NRCA/NEI

NRCA (aggregated) EU15 in correlation to NEI for year 2000, 2004 & 2008

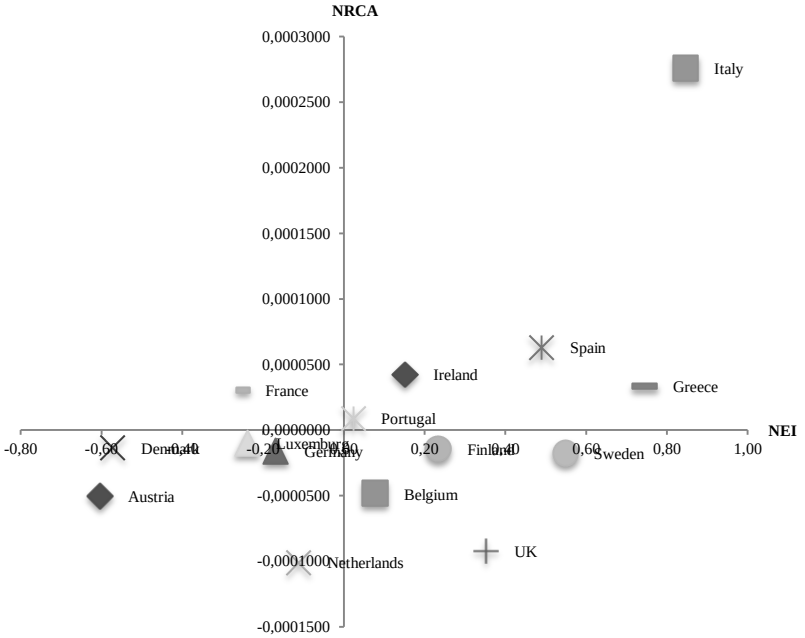

Figure 16. EU15 NRCA (aggregated) in correlation to NEI year 2008

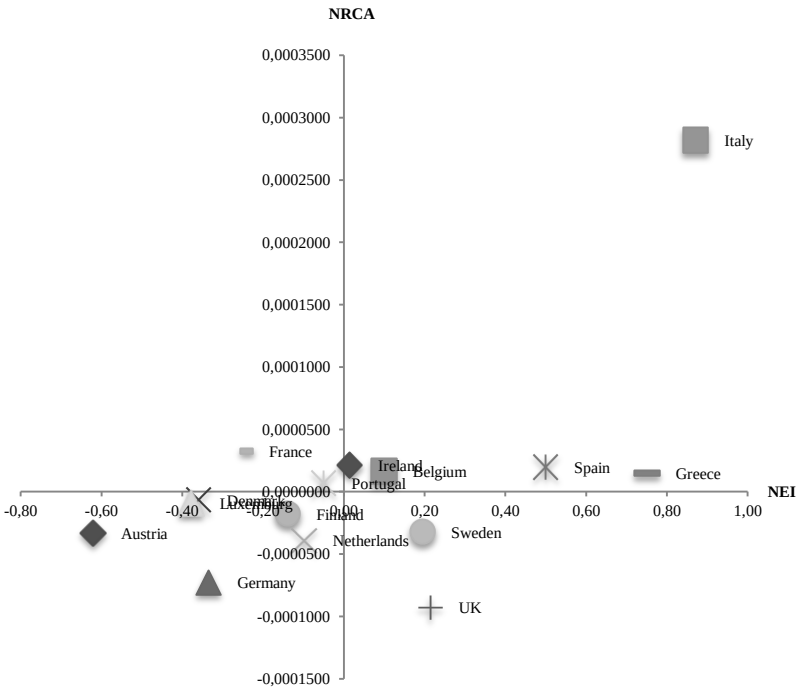

Figure 17. EU15 NRCA (aggregated) in correlation to NEI year 2004

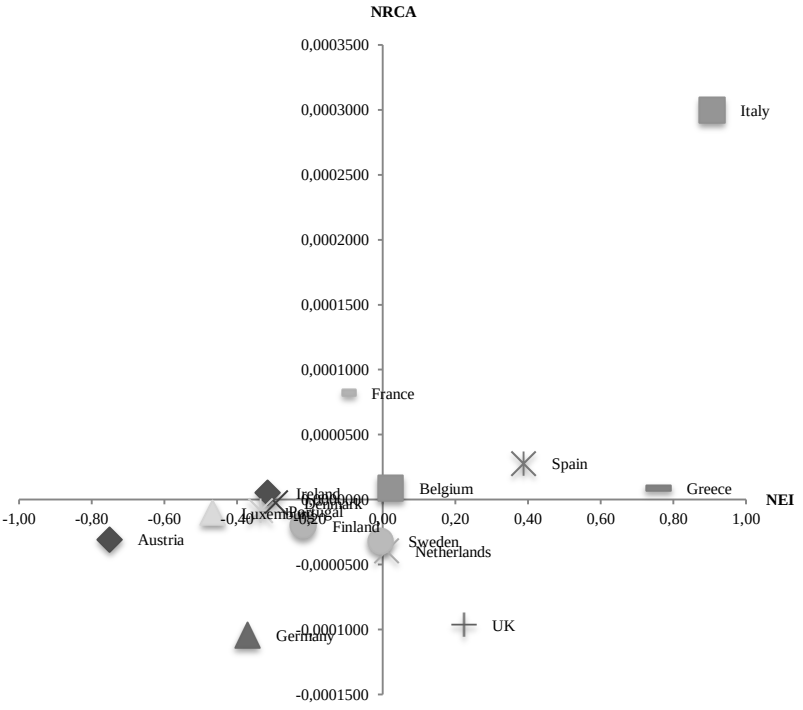

Figure 18. EU15 NRCA (aggregated) in correlation to NEI year 2000

Appendix 3: Matlab Dendrogram

Matlab forumulas for linking each year to a variable with chosen method assigned.

```
>> Z = linkage (year2000,'ward')
>> X = linkage (year2004,'ward')
>> Y = linkage (year2008,'ward')
>> U = linkage (year2013,'ward')
```

Compiling the imported data using Ward's method for each year and lists each function as a Z, X, Y, U variable. The dendrograms were drawn according to names and with a 90 degree tilt to the right, keeping the country labels on the left side.

```
>> dendrogram (Z,'labels',names,'orientation','right')
>> dendrogram (X,'labels',names,'orientation','right')
>> dendrogram (Y,'labels',names,'orientation','right')
>> dendrogram (U,'labels',names,'orientation','right')
```