8-2011

Changing Dairy Market Environment: Effect on Cooperative Organization, Competition, and Price Risk Management: Comparative Analysis Between Germany and the United States

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CHANGING DAIRY MARKET ENVIRONMENT: EFFECT ON COOPERATIVE ORGANIZATION, COMPETITION, AND PRICE RISK MANAGEMENT. COMPARATIVE ANALYSIS BETWEEN GERMANY AND THE UNITED STATES

CHANGING DAIRY MARKET ENVIRONMENT: EFFECT ON COOPERATIVE ORGANIZATION, COMPETITION, AND PRICE RISK MANAGEMENT. COMPARATIVE ANALYSIS BETWEEN GERMANY AND THE UNITED STATES

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science in Agricultural Economics

By

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Bachelor in Bioscience Engineering, 2008

August 2011
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ABSTRACT

The dairy market environment in the United States of America and in Europe is changing partially due to a change in policies supporting free markets. The effect of the change in the dairy market environment in the United States and Germany on cooperative organization, competition, and price risk management is elaborated in this thesis by means of a literature survey including governmental documents, industry documents, and published scientific articles.

The thesis provides a closer look to the interaction between two players within the dairy market chain, i.e. the farmers and the processors. Both players are confronted with increasing accessibility of the markets which increases the importance of trade and increases the volatility of the price. Dairy cooperatives transform their organizational structure in order to adapt strategies to cope with the increasing international competition. However, the consolidation present on the procurers' side of the market puts dairy farmers in a weak bargaining position. Policy makers are aware of these malfunctions within the market and are suggesting alternative policies that are conform to the World Trade Organization negotiations. The stimulation of producer organizations, interbranch organizations and the use of futures markets and contracting to reduce price risk are advised by the European Commission and the United States Department of Agriculture. The market changes and policy changes create opportunities for farmers and processors in both countries to diversify and to increase production. Processors have the opportunity to become world players.

This thesis is approved for recommendation

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ACKNOWLEDGEMENTS

When I chose this topic, I was eager to know more about the changes taking place on the dairy market. As student in agricultural economy and rural development and also as son of dairy farmers in Belgium, I wanted to use my knowledge to investigate the market. I discovered the complexity and the involvement of a lot of players in foreign market areas previously unknown to me. The comparable study provided me insight in the increasing global character of the dairy sector and a reference point to compare the dairy market of my homeland with, in which my parents and several friends take part. It was a long journey but an enrichment for my knowledge and person.

I would like to express my appreciation to Dr. Silke Hüttel, for being my promoter. The patience and valuable comments provided, kept me on track with my work.

I also want to thank Prof. Dr. Eric Wailes, for providing me access to information in the United States and sharing time with me to discuss the topic.

Further I want to express my gratitude to Dr. Vanessa von Schlippenbach for providing information regarding the German dairy sector and for giving me guidelines and knowledge on industrial organization theory.

I express sincere gratitude to several persons within the industry and to scholars for providing me with information and for sharing their knowledge.

I would like to thank the secretariats involved at the Humboldt University of Berlin, the University of Arkansas and the University of Ghent for their assistance during this program. The provision of information regarding classes, paperwork and other is highly appreciated. Also the faculty and staff at the different Universities involved, I would like to thank for contributing to my education within this international master.

To all my classmates and friends, the time spent with you enriched my person and will be highly missed.

To my family and friends back home, I thank you for your visits and encouragement. Without the support from your side, this would not have been possible to achieve. I cannot thank you enough!

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LIST OF ABBREVIATIONS

AMS: Aggregate Measure of Support

BMELV: Bundesministerium für Ernährung, Landwirtschaft, und Verbraucherschutz/ Federal Ministry of Food, Agriculture and Consumer Protection.

CAP: Common Agricultural Policy

CCC: Commodity Credit Corporation

CEO: Chief Executive Officer

CME: Chicago Mercantile Exchange

CSCE: New York Coffee, Sugar and Cacao Exchange

Cwt: hundredweight

CWT: Cooperatives Working Together

DEIP: Dairy Export Incentive Program

DFA: Dairy Farmers of America

DPPSP: Dairy Product Price Support Program

EC: European Commission

EU: European Union

FAPRI: Food and Agricultural Research Institute

(F)MMO: (Federal) Milk Marketing Orders

HLG: High Level Group on Milk

IOF: Investor Owned Firm

ME: Milk Equivalent

MILC-Program: Milk Income Loss Contract Program

MMO: Milk Marketing Orders

NASS: National Agricultural Statistics Service

NFD: Non-fat dry milk

SMP: Skimmed Milk Powder

TRQ: Tariff Rate Quota

U.S.: United States of America

USDA: United States Department of Agriculture

WTO: World Trade Organization

1 Introduction

The dairy sectors in Germany and the United States of America are at the break of a new era. From closed, protected markets, marked by a surplus, an evolution is taking place to open markets aiming to supply an increasing world demand.

The dairy sectors in Germany and the U.S. are highly regulated by several policies and programs. The most famous of these programs in Europe is the quota system. In the United States, Milk Marketing Orders provide farmers with a pooled price and provide consumers with access to milk. These and other policies and programs highly influence the market environment. In the context of the agreements within the World Trade Organization, dairy policies have been adapted and revised towards green box compatibilities. Change in dairy policy induces future uncertainty for the players involved.

Due to changes in policy, production structure is changing. Small scaled family farms in Germany and the U.S. became more capital intensive. Due to technological and scientific innovations, the production and efficiency level of production has increased, resulting in fewer farms with a higher production. The market conditions for dairies also changed over time. The competition on the market became harder. Dairies restructure organization and adapt new strategies in order to keep up with more concentrated retailers and with competition in the processing sector. Dairies also concentrate more and more on the international market by not only exporting but also through direct investments. Traditionally cooperatives played an important role in procuring farmers milk. The increase of competition and the requirement of dairies to adapt quickly to market changes

changed the cooperative organizational form. Cooperatives restructured to enhance efficiency by increasing capital access and decreasing the transaction cost of the decision making process.

An increase of concentration in the processing sector and the characteristics of milk introduce the importance of space in the procurement market. This affected the coop-member relationship which was observable during the dairy crisis of 2009 when members decided to not deliver milk anymore to their own cooperatives.

With the opening of markets, an increase in price volatility is observable. This induces opportunities as well as threats for the players on the market. In order to reduce the price risk several options are available, that is private initiatives by hedging risk on a futures market or public initiatives by introducing new policies that stimulate the dairy sector to adapt and take a strong position in the new market environment.

This thesis aims to provide a closer look into the implications of changing policy and market structure on the procurement market for raw milk in the United States and Germany. It seeks to investigate the interrelationship between two parties in the dairy value chain; farmers and processors, and their future opportunities. To achieve this, insight in the present market policies, market structure evolution, cooperative organization, competition and contracting as a means to reduce price risk is provided.

The study uses secondary information through a literature survey. Theoretical models are used to understand the implications of certain policies, to discuss the transformation of cooperatives to more entrepreneurial business forms and to explain competition and the influence of space on the procurement market for raw milk. Official reports are used to produce an insight in the objectives of the parties involved.

The succeeding parts of the study are organized as follows. In Chapter 2, a description of important policies influencing the dairy market is provided. The policies discussed in this chapter are reduced to the ones that influence the market directly. In Chapter 3, the market and the changed structure of producers and dairies is discussed. In Chapter 4, the importance of cooperatives on the dairy market is shown and the change of cooperative organization and strategies is investigated. In Chapter 5, the discussion is based on competition between dairies and its effect on the price paid to producers using industrial organization theory. Chapter 6 deals with the use of contracts on the market. A closer look to the U.S. futures market is provided. Chapter 7 looks at the future prospects for the players on the dairy market and the responses of the policy makers towards the changing market conditions. Chapter 8 provides the conclusions of this study.

2 Dairy Policy

Dairy policies, implemented by government, regulate the market for milk in the U.S. as well as in Germany. The Common Agricultural Policy (CAP) legislated by the European Commission determines the ground rules of intervention in the market in Germany. The CAP was last reviewed in 2008, under the so-called "Health Check". The next review of the CAP is planned for 2013. In the U.S., the Farm Bill contains the ground rules of intervention in the market. The Farm Bill is legislated by the Federal Government and was last reviewed in 2008. Traditionally the Farm Bill is reviewed every four years; the next review is planned in 2012.

2.1 EU Dairy Policy

The common organization of the market in milk and milk products was established in 1964. This was substituted during the Agenda 2000-reform by Regulation (EC) No 1255/1999. The policy article comprises several market instruments for dairy products, such as the public intervention, private storage, export refunds, internal disposal aids, tariffs and the milk quota.

During the Health-Check in 2008, the Common Agricultural Policy of the EU was reformed. The idea was to open up the agricultural markets to world trade according to the WTO agreements. For that reason, market intervention systems are reduced in their impact. Export support is reduced, intervention stocks are

reduced, milk premiums as income support are no longer connected to production and the quota system will be abolished with the method of the soft-landing.

Overall the goals of the CAP for dairy are (European Court of Auditors, 2009):

- stabilize the milk market
- stabilize the prices for milk
- provide farmers a decent standard of living
- improve the competition level of the dairy producers on the international markets

In the next subchapters, the policies under the first pillar "Agricultural Markets" of the CAP will be discussed. The second pillar is dealing with rural development. As the policies under the second pillar do not influence the market directly, these will be left out of the discussion.

2.1.1 Quota

The quota system was implemented in the member states of the EU in 1984. The EU was dealing with overproduction. Storing this overproduction became more and more expensive so reducing production became necessary. Based on historical production, quotas were distributed among the member states. Germany was allocated 23.487 million tonnes[1] in 1984/85 (Kleinhanss et al., 2010). After the unification of West- and East Germany in 1991/92, 6.804 million tonnes were

[1] 1 tonne [t] = 1 metric ton; 1 pound [lb] = 0.4536 kilogram [kg]; 1 hundredweight [cwt] = 100 pounds.

allocated to the farmers in the new federal states. The member states distributed the quota among farmers based on former production minus the necessary reductions in order for the national quota not to exceed. As the production in the EU was still exceeding the domestic consumption, the quotas were reduced by 10.5% in 1992/93 compared to the level of implementation. The change of quota over the years 1984-2006 is shown in Figure 2-1.

Different quota trade systems were established on member state level in order to make quota acquisition by efficient farmers possible. In Germany, when the quota was implemented, it was attached to the land. This involved that transfer of quota was only possible when the land was transferred too (Hüttel et al., 2005). In 1990/91 farmers had the possibility to lease milk quota. In 1992/93 milk quota transfer without land was introduced. In 2000 the German milk quota system was reformed. Leasing was not possible anymore and a regionalized auction system was introduced to trade quota. A small amount of the transferred quota is taken by government and kept in a national reserve and can be reallocated to young farmers or farmers in hardship.

To make the quota binding a levy was implemented. This involves a fine for an individual farmer when the national quota and the individual quota are exceeded. The levy decreased over the last years being EUR 33.27 per 100kg milk overproduced to EUR 27.83 for 2007/08 and thereafter (European Commission, 2011a).

In order to fulfill the WTO agreements on free trade, the EU policy for dairy needed some adjustments. During the Health Check, it was decided to phase out

the quota by means of a "Soft Landing". This involved a gradual increase of the quota system with 2% in 2008 and a yearly increase with 1% over the next five milk years until 31st March 2015 when the policy will be terminated.

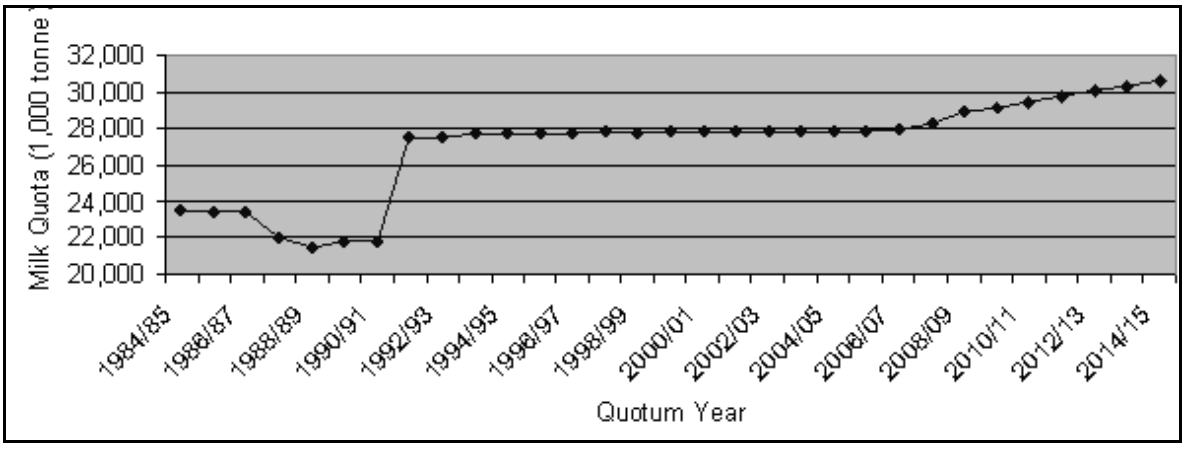

Figure 2-1: National German milk quota.

Data: Germany, Federal Ministry of Food, Agriculture and Consumer Protection (2010) and German Dairy Association (2011).

The quota system was implemented to balance out supply and demand. In Figure 2-2 the effect of the implementation of quota on the market is illustrated.

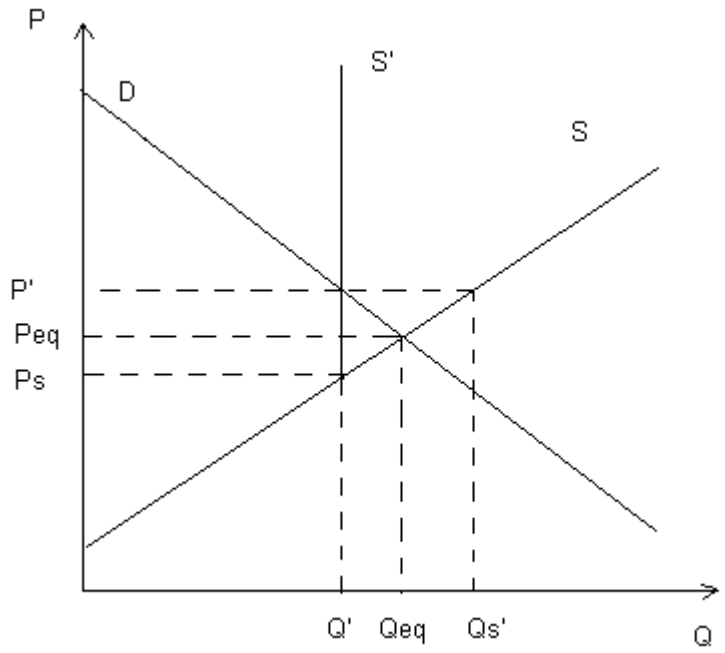

Figure 2-2: Quota effect.

The implementation of a quota results in an inelastic supply, i.e. curve S'. This has an augmenting effect on the price for producers and consumers. The equilibrium price Peq rises to P'. However, at such a price producers would produce Qs'. To avoid this, a levy was implemented. In order to hold the level of the quota, the levy should be higher than the difference of the price obtained with the quota, i.e. P', and the producer's marginal cost price at the level of production under the quota, i.e. Ps. This is also called the "quota rent" as it is the additional profit for the farmer. The closer the quota level is to the market equilibrium, the lower the rent. Importers are attracted due to the higher price on the domestic market. To avoid import and stimulate export, protectionist measures, as import taxes and export subsidies, are implemented. It is obvious that, when the world

market price is lower than the domestic price, the cost for the consumer and government is positive. However, for the producer it generates additional profit and creates stable prices as it protects the domestic price from fluctuations of the world market price. When the quotas were implemented, they were distributed to farmers based on their traditional production. Nowadays, when a farmer wants to start a dairy business, he has to purchase quota. The price of quota on the regional auctions in Germany is based on supply and demand. Since April 2000, it became the only possible way to transfer quota, exceptions are allowed in cases of transfer of whole farms or parts thereof, by inheritance or between direct relatives (Kleinhans et al., 2011). The transfer of quota without land resulted in a price increase, particularly at the end of the quota year when quota was purchased in order to prevent paying a super levy. Prices were between 0.65 and 0.90 EUR/kg. Due to these high prices, transfer of quota through the auctions stayed limited (2.4 million tonnes) and most of the transfer was done between relatives (2.6 million tonnes) (Kleinhans et al., 2011). The transfer of quota without land gave more flexibility to farmers to manage expansion of their production. Due to rising production per cow, quota purchase was needed even when the herd did not expand. The transfer without land made it possible to allocate quota to more efficient (low marginal cost) dairy farmers. Transfer without land resulted in eliminating the initial quota allocation inefficiency (Jongeneel et al., 2008). In a study by Alvarez et al. (2006) in Spain, it was shown that under a good functioning quota market the efficiency influences the willingness to buy quota the most, whilst the size of the farm had even a negative effect. Out of interviews

with farmers and experts in Germany, it was indicated that the main effects of the milk quota scheme and the restrictions on quota mobility are a slower and stunted development of the farms and their production (Kleinhanss et al, 2010). Quota transfer without land, and since 2007, quota transfer through auctions with only two trading zones, i.e. West- and East-Germany, benefits the competition level of the dairy sector in Germany.

However, as shown in the graph in Figure 2-2, a quota system results in a higher price than the equilibrium price which results in a higher cost for the consumer as well as for government as they need to protect the market by subsidizing net exports. In order to fulfill the WTO agreements, the EC decided to abolish the quota with the procedure of the Soft Landing. By gradually increasing the quota, the EC wants to phase out its effect. One indicator to look at the effect of the quota is the price of quota. The price of quota is influenced by several indicators. In an auction, however, where supply and demand define the price, we can assume that the price is close to the quota rent, that is the benefit farmers can get out of it. In Germany this price has been decreasing since 2006. When it used to be approx. 0.50 EUR/kg in 2006, it was approx. 0.10 EUR/kg in 2010 (Kleinhanss et al., 2010). Whether there is overproduction or not, could indicate the binding character of the quota. Figure 2-3 shows an underproduction for the quota years 2008/09 and 2009/10. Following the European trend, the method of the Soft Landing had its impact by phasing out the effects of the quota system on the German dairy market. The quota is not binding to production in Germany.

However it must be mentioned that due to the super levy farmers could have been precautious and produced less than they would when there was no super levy.

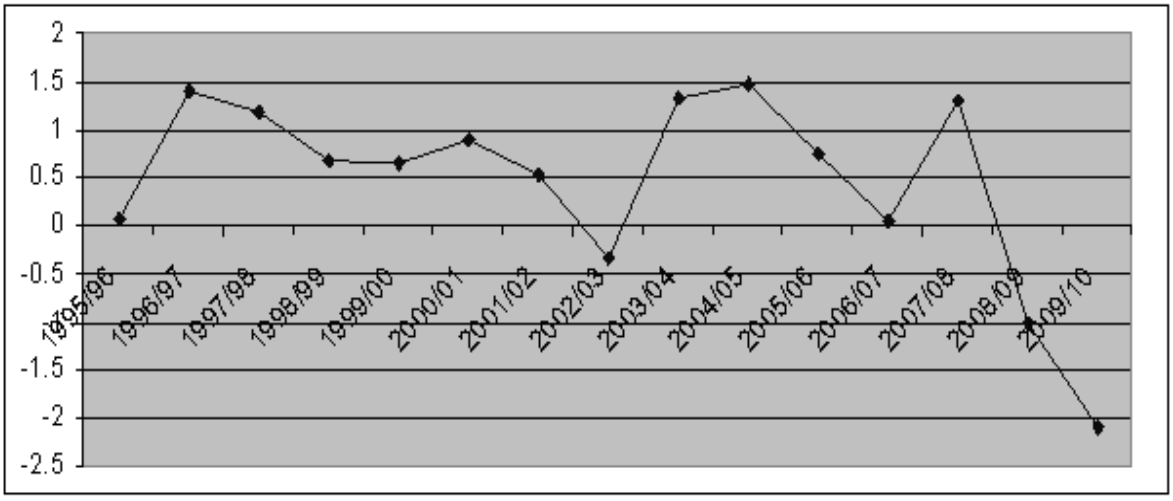

Figure 2-3: Percentage of deviation of production to quota in Germany. Data: European Commission (2010d) and Kleinhanss et al. (2010).

Several studies examined the effect of the abolishment of the quota. In a study by Bouamra-Mechemache et al. (2008) the effects of the gradual increase of the quota in the EU are a price decline and a production increase. However, the production increase is not filling the quota increase. This is because the price decline results in a smaller increase of production, making the quota less relevant. The effect of a price decline is accelerating the abundance of the quota. In a study by Lips et al. (2004) the same effect on the European level was concluded for the milk price and the production quantity when the quota system would be abolished in 2002. In Germany a production decline instead of a production increase was

predicted due to a high price decline for raw milk in comparison with the quota rent.

2.1.2 Intervention for Butter and Skimmed Milk Powder

The EU intervenes in the market by buying butter and skimmed milk powder (SMP) when the price on the market is below the minimum price of 246.39 EUR/100kg for butter and 169.80 euro/100kg for SMP. The intervention of butter is limited to 30,000 tonnes and to 109,000 tonnes for skimmed milk powder (European Commission, 2011a). The minimum prices for these dairy products have a milk equivalent (ME) price of 215 EUR/tonne (European Commission, 2009a).

This measure has a direct impact on the price for dairy products on the market. By intervening, the government is increasing the demand, which results in a price increase on the market. The budget of the government can suffer under long periods of overproduction. Limits on the intervention quantities rule out unwanted large budget expenditures but also limit the intervention strength of the measure.

2.1.3 Direct Payments

In order to fulfill the WTO agreements, market measures are reduced. However in order to meet the goals of the CAP direct payments were installed. To maintain these goals direct payments are increased. In 2006, 36% of the income of German farmers consisted of subsidies (European Court of Auditors, 2009). During the CAP-reform of 2003 it was decided to decouple the payments from production. In 2009 87% of the support was decoupled (Iván, 2009). The EU wanted to decouple

payments from production in order to prevent production support. Direct support lowers the marginal production cost which has an effect comparable to an export subsidy on the market. Fixing the direct payments (based on historical payments per individual farmer or per region) can then be regarded as an income support that is not influencing production. This support is called "Single Payment Scheme". The main aim, according to the European Commission for Agriculture and Rural Development, is to guarantee farmers a more stable income and to financially compensate farmers for the high standards of environmental protection, animal welfare and consumer protection in the EU compared to the production requirements in non-EU countries (European Commission, 2011b). A fixed payment does not lower marginal costs; however it can be regarded as lowering the average costs. As economic theory teaches us, this does not influence production on short term as producers produce until the marginal cost is equal to the price of their product. However, a simulation carried out by Helming and Peerlings (2003), shows that when the quota is abolished, decoupled direct payments influence production positively in the Netherlands.

Due to the extreme low raw milk price in the beginning of 2009, an additional one time payment to dairy farmers was made. For Germany this was an amount of EUR61.20 million, which the German government had to divide among its dairy farmers by June 2010 (Capreform, 2011).

2.1.4 Export Refunds

Export refunds for dairy products (butter and SMP) were reintroduced in January 2009. This market measure was reintroduced due to the low prices for dairy products on the world market in combination with the financial crisis resulting in difficult times for exporters and farmers. In order to encourage farmers to continue production, the amount between the world price and the domestic prices is bridged to traders depending on the country of destination (European Commission, 2011a). Export refunds stimulate production directly as they increase the domestic price for producers.

2.2 United States of America Dairy Policy

The U.S. dairy policies are many and are dealing with different issues. Some policies are implemented to provide a stable price, some are supporting fluid milk supply in areas where the demand is high, some help dairy farmers in difficult financial situations by one time payments and some are promoting the export of dairy products. The dairy programs can be federal or state programs. Two major federal dairy programs are the Federal Milk Marketing Orders and the Milk Price Support Program (U.S. Department of Agriculture, 2010a).

2.2.1 Federal Milk Marketing Orders

Federal Milk Marketing Orders were established by the Agricultural Marketing Agreement Act of 1937. They have been subject to many changes since then. The 2008 Farm Bill established 10 Federal milk marketing orders (Figure 2-4). Of the

total U.S. fluid milk, Federal Milk Marketing Orders regulate 80 percent. 15 percent is regulated by the California Milk Marketing Order.

Figure 2-4: Milk Marketing Order Areas U.S.

Source: U.S. Department of Agriculture (2010b).

These orders are implemented to benefit producers and consumers by marketing the milk over state levels by the U.S. government. The orders include fluid milk and manufactured products. Due to geographical price differences and geographical production differences the marketing orders divide common revenues among producers and provide dairy products to consumers in the U.S.

on a stable basis. Farmers deliver fluid milk (Grade A milk[2]) which is processed and sold as manufactured products or fluid milk. The milk price varies according to the product it is manufactured in. This classified pricing system is set up by government (State of California or Federal) to set minimum prices processors have to pay to farmers according to the use of the raw milk. The classified pricing system has four classes:

- Class I. Grade A milk used in all beverage milks.
- Class II. Grade A milk used in fluid cream products, yogurts, or perishable manufactured products (ice cream, cottage cheese, and others).
- Class III. Grade A milk used to produce cream cheese and hard manufactured cheese.
- Class IV. Grade A milk used to produce butter and any milk in dried form.

Source: U.S. Department of Agriculture (2010c).

Due to the marketing orders, government makes it possible to combine revenues of farm milk sales and divide them more equally among producers by blending the price of milk for the different classes. This is referred to as revenue pooling (U.S. Department of Agriculture, 2010a).

[2] Grade A milk: The Food and Drugs Administration developed, along with the 50 States and Puerto Rico, a model document called the Pasteurized Milk Ordinance that is adopted as the Grade "A" milk law in the 50 States and Puerto Rico. All Grade "A" products must come from dairy farms and dairy plants that meet the requirements of the Pasteurized Milk Ordinance in order to be shipped interstate. At State level permits for producers to have the right to deliver Grade A milk are distributed if the producer provides certain qualities (low bacteria level, absence of antibiotics …) for the milk. (Michigan Government, 2010)

2.2.2 Price Support Program

The Agricultural Act of 1949 made it possible to support dairy farmers by government purchase of dairy products to reduce supply on the market and guarantee a minimum price for raw milk to farmers. The Farm Bill of 2008 made a change in the milk support purchase program by specifying the support prices of purchased manufactured products, not the price of raw milk. The name of the price support program changed from Milk Price Support Program to Dairy Product Price Support Program (DPPSP). This change was made in order to reduce the impact of this policy on the Aggregate Measure of Support (AMS) calculated by the World Trade Organization (WTO). In 2007, the Milk Price Support Program contributed 25% of the AMS for all U.S. agriculture (Jesse et al., 2008). The Commodity Credit Corporation (CCC) buys butter, cheddar cheese and nonfat dry milk. The support purchase prices are:

- not less than $1.05 per pound for butter,
- not less than $1.13 per pound for cheese in blocks,
- not less than $1.10 per pound for cheese in barrels, and
- Not less than $0.80 per pound for nonfat dry milk.

The CCC can sell the inventory back on the market under the restriction of selling 10 percent above purchasing price. In order to prevent net removals by the CCC to be very high, net removal[3] triggers are implemented. This involves that at a certain quantity of net removals by the CCC, the purchase price may be reduced.

[3] Net removals equal price support purchases plus DEIP removals minus unrestricted sales back into the market (Jesse et al., 2008)

These support prices have the equivalent of $9.90 per hundredweight of milk for producers as under the former Milk Price Support Program legislated in the Farm Bill of 2002 (Jesse et al., 2008). However the CCC purchase prices are so low that if reached, the farm milk price would be below production cost resulting in a quick response of supply. The only significant purchase since 1990 by the CCC is the purchase of nonfat dry milk (Jesse et al., 2008). The idea to abolish or replace the program is discussed as it is also in contradiction with the WTO agreements. However farmers and cooperatives are afraid that by taking out the minimum safety net, prices could drop below $9.90 per hundredweight (Jesse et al., 2010).

2.2.3 Export subsidies and Import Tariff Rate Quotas

The Dairy Export Incentive Program (DEIP) supports exporters of dairy products to meet prevailing world prices for specific dairy products and specific foreign markets. This support is monetary making it possible for exporters to sell dairy products below purchasing cost. The aim of the program is to establish foreign markets for U.S. dairy products where there is a reduced competition level due to protectionist measures of the foreign countries.

The DEIP was reauthorized by the Food, Agricultural, Conservation and Trade Act of 1990, the Uruguay Agreement Act of 1995 and the Federal Agricultural Improvement and Reform Act of 1996. However, due to the WTO agreements, the U.S. has established ceilings for annual export subsidies and export subsidized quantities by commodity (U.S. Department of Agriculture, 2010d). The 2008 Farm Bill emphasized the use of DEIP to its maximum taking into account the U.S. trade agreements.

The DEIP subsidies did not play an important role in the export of butter and cheese. In the export of nonfat dry milk the DEIP-program was important. Since 2003 however the prices for nonfat dry milk on the world market are often above the CCC purchase price and often above the wholesale prices in the U.S. making the DEIP subsidies unnecessary (Jesse et al. 2008).

Import is also controlled. Before the U.S. was a member of the WTO this happened with import quota, however when the U.S. became a member of WTO they established the tariff rate quota. These TRQs are administered through licenses for imports of specific products from specific countries or regions (U.S. Department of Agriculture, 2010e). The TRQs set a low tariff for a certain quantity. When more is imported then the set quantity, a higher tariff is applied.

2.2.4 Direct payments

The Milk Income Loss Contract program (MILC-program) was reauthorized by the 2008 Farm Bill and is in act until September 30 2012 (U.S. Department of Agriculture, 2010f). The program provides countercyclical payments to the dairy farmers on a monthly basis. The amount of monetary support is based on the Boston Federal Milk Marketing Order Class I price for fluid milk. The benchmark price is $16.94/cwt. If the price is below the benchmark price, government provides payments to milk producers. These payments are adapted to changing feed costs and certain per year per operation pound limits apply [4] (U.S. Department of Agriculture, 2010f). The MILC-payments are production

[4] Payments are to be made on up to 2.985 million pounds of milk per fiscal year per operation during October 1, 2008, to August 31, 2012, using a rate of 45 percent of the difference noted above (U.S. Department of Agriculture, 2010f).

connected until a certain limit. Jesse and Cropp (2008) estimated that 44 percent of the U.S. milk production was covered and 83 percent of the U.S. dairy herds were covered in 2007. During 2010, only in April a MILC-payment of 0.2115 $/cwt was made to farmers. For the other months the Boston class I price was higher than the adjusted MILC benchmark price.

The Dairy Economic Loss Assistance Payment program also supports the income of farmers. This program assists dairy farmers who incurred low milk prices from February through July 2009 by providing them with a one time payment. The payments intend to compensate the farmers for selling below production cost due to the low prices on the market that period. The Agricultural Appropriations Act for fiscal year 2010 provides $290 million in direct payments to dairy producers. This program can be benefited by producers who have an annual nonfarm income of $500,000 or less. The payment for each producer will be calculated by dividing the total available fund by the total marketed pounds during February 2009 until July 2009, multiplied by the double of the total marketed pounds of the producer taken into account a 6 million pounds limit (U.S. Department of Agriculture, 2010g).

These programs can be regarded as direct payments, partly decoupled as limits on quantity are set. They are put in place to support small scale producers.

2.2.5 Effect of Government Programs on Producer Price.

In an article by Manchester and Blayney (2001), the milk pricing system in the U.S. is explained. Several programs, especially the FMMO, make this a complex matter. Prices used to be very stable and farmers could rely on the federal Dairy

Price Support Program that guaranteed farmers a basic price for their milk. The only thing farmers had to take into account was which dairy gave more and which extra benefits did the dairy offer. But since the nineties, prices became more volatile. Farmers need now to incorporate risk management tools and rely on futures, options and forward contracts in order to reduce price risk.

Firstly a distinction on the market has to be made between manufactured dairy products and beverages. Manufactured dairy products are priced according to the law of supply and demand. The market determines the price of the raw milk to process these except when the federal dairy price support program is intervening. Milk beverages however are priced differently. The minimum price for raw milk, set by federal and state MMO to process Class I products, is determined by the price of milk to process manufactured dairy products.

Looking at the share of milk used to supply manufactured dairy products, an increase in cheese demand since the late seventies results in a share of 70% of the total milk supply volume in 2007. This results in a close relationship between the wholesale price of manufactured dairy products and the price of raw milk.

Dairy products have different components. A division between fat and non-fat milk solids is made. Cheese production, for example, accounts for the use of 40% of the butterfat and only 15% of the non-fat milk solids. When the demand of cheese drops, more fat than non-fat solids have to find an alternative way to the consumer. Also, there is a difference in demand according to regions. Dense

populations demand more fluid milk which results in a higher share of Class I and Class II milk marketing orders for those regions.

A small quantity of butter (only 1.7% of total butter production in 2007) is traded by brokers on the Chicago Mercantile Exchange (CME)[5] daily, except during weekends and holidays. The price of the CME market is used as reference price for selling butter throughout the U.S. The idea is that companies buy butter on the CME if they cannot purchase it anywhere else for a certain price equal or lower than the CME market price. However companies sell butter when they cannot sell it at a certain price equal or higher then the CME market price. This concludes that the CME market price is the real market value of butter. Cream and other butter based products are tied to the CME butter price.

Also cheese is traded on the CME. 0.4% of all cheese production is traded on the CME. Here the price is used also as the reference price of the cheese trade in U.S.

The price support program installs a minimum market price for these dairy commodities.

The marketing orders have three purposes:

- guarantee supply of milk beverages to consumers at a reasonable price
- to create greater producer price stability
- to create adequate producer grade A milk prices in order to guarantee a certain production

[5] The Chicago Mercantile Exchange (CME) is an American financial and commodity derivative exchange based in Chicago.

They address these objectives by a classified pricing system and by revenue pooling. These marketing orders are not obligatory, producers vote to approve them. The milk marketing orders do not have an effect on the whole market, however 70% of the grade A milk produced in the U.S. is regulated through the program. 20% is regulated through the California milk marketing orders. The orders regulate the milk plants, called handlers. The handlers are required to account to the federal order pool at the established minimum class and component prices. There are three types of handlers:

- Distributing plants: processing, packaging and selling beverage milk products within designated marketing areas.
- Supply plants: carrying fluid milk reserves to supply other dairies for fluid milk purposes. These plants are usually processing cheese and other dairy products. However when there is a shortage of fluid milk they are obliged to supply the distributing plants with fluid milk.
- Cooperatives: These have several purposes like procuring milk, processing milk, providing services to farmers like milk quality testing. The dairy coops serve the milk marketing orders with efficiency contribution in the dairy chain. These coops are not obliged to pay the farmers the minimum class prices as coops are regarded as an extension of the farm. The coops share their profits with their member-farmers. In order to attract suppliers they need to pay-out a competitive price.

Classified pricing

The milk price varies according to the product it is manufactured in. This classified pricing system is set up by government (State of California or Federal) to set minimum prices processors have to pay to farmers according to the use of the fluid milk. The classified pricing system knows four classes:

- Class I. Grade A milk used in all beverage milks.
- Class II. Grade A milk used in fluid cream products, yogurts, or perishable manufactured products (ice cream, cottage cheese, and others).
- Class III. Grade A milk used to produce cream cheese and hard manufactured cheese.
- Class IV. Grade A milk used to produce butter and any milk in dried form.

The minimum prices show the minimum value of milk used to manufacture products within a certain Class. The price for farmers is calculated differently based on this classified pricing system.

The prices for Class II, Class III and Class IV are the same over the 10 different orders, the price for Class I differs over these 10 orders. Minimum prices for Class III and IV are announced in the beginning of the following month to which they apply, minimum prices for Class I and II products are announced at the end of the month prior to which they apply.

The formula used to set the minimum Class prices is of the following form:

Component price/lb = (Product price/lb – Make allowance/lb)*Yield

The dairy product prices are based on monthly averages of the USDA's National Agricultural Statistics Service (NASS) weekly surveys of the wholesale prices for Grade AA butter, block and barrel cheddar cheese, non-fat dry milk and dry whey. The NASS collects weekly sales prices and reports every Friday the average prices of the preceding week. The prices of Class III and Class IV products are highly correlated with the CME prices of the preceding week. The correlation between NASS prices and CME prices for butter has a value of R^2 0.99 and for cheese R^2 is 0.98. This confirms the use of CME prices as reference prices.

Make allowance are the assumed costs per pound to manufacture the dairy product. The price of raw milk is not included. By subtracting the make allowance price from the product price the value of the milk components is generated. The higher the make allowance value the lower the value of the milk components. It is important to balance this out as farmers will not supply the handlers if the estimated value for the component price is too low and manufacturers will not process milk anymore if the make allowance price is too low resulting in paying out farmers a too high share of the value of the dairy product.

The yield factor indicates how many pounds of product can be made from a pound of the associated milk component.

The following step to determine the Class III and IV prices is to link the skim milk price to the component prices. This calculation requires standards for the

skim milk composition according to the Class these are used for. A hundredweight of Class IV skim milk is assumed to contain 9 pounds non-fat solids and Class III skim milk is assumed to contain 3.1 pounds of protein and 5.9 pounds of other solids. The price of skim milk according to Class is calculated as many times the component price as the component is present in the skim milk used to manufacture the Class products. Raw milk is assumed to consist of 3.5% butterfat and 96.5% of skimmed milk so in the last stage the skim milk price is multiplied by the factor 0.965 and the butter by the factor 0.035 to calculate the Class IV price. In essence the Class IV milk price is only depending on the NASS calculation of the price of butter and the price of non-fat dry milk.

Class IV price/cwt = 4.2*NASS butter price/lb + 8.5982*NASS non-fat dry milk price/lb – 1.847

The Class III price is calculated in a similar fashion which results in the following formula:

Class III price/cwt = 9.6393*NASS cheese price/lb + 0.4199*NASS butter price/lb + 5.8643*NASS dry whey price/lb -2.8189

The constants 1.847 and 2.8189 can be interpreted as the make allowance per hundredweight to produce butter and respectively cheese.

Class I and Class II milk prices are calculated in advance using data from the previous month. The reason for that is that Class I and II dairy plants are producing products that are traded quickly after procurement of the raw milk so they need to know the cost of raw milk prior to selling their products to the retail chain. The Class I and II prices are calculated with the same product price formulas as the Class III price however using a different price for the components; the previous month price. To calculate the Class I price an additional aspect is involved. A Class I differential is added, based on the location of the plant receiving the milk. Class I differentials are specific to the county of each marketing area. This is to stimulate supply of fluid milk in areas where the demand is high by compensating for the transportation cost.

Pooling

Handlers pay out their suppliers a uniform price. They pay in or take out of a producer settlement fund according to the value of their milk receipts relative to the average market value. Handlers' price obligation to their suppliers is at the average market value. The value of their milk receipts is adjusted with a producer price differential (PPD), a producer location adjustment, protein value, butterfat value, other solids value and a somatic cell count adjustment. The PPD is a measure of how much the average value of the handler's receipts over the entire market exceeds the average value if all milk were priced at Class III. In other words the value of the PPD calculates the excess value of products belonging to other Classes than the Class III products relative to products of Class III. The

PPDs are adjusted according to the county wherein the farmer produces. These location adjustments are set by Congress to stimulate the supply of fluid milk close to consumption areas.

In essence by pooling the revenues of different products, the milk marketing orders provide farmers with an equal price, called the uniform price, regardless of the purpose for their raw milk. So a farmer supplying a cheese plant gets the same price for his milk as a farmer providing a fluid milk plant.

The price producers get at the end is the uniform price adjusted according to the butterfat, other solids, protein content, the producer price differential, and the number of somatic sells. However there are also other milk check components that can be plant specific or uniform across all plants. Plant specific premiums are often associated with milk characteristics like quality, producer characteristics like volume premiums or can be the result of a higher efficiency of the plant and their willingness to pay producers a higher price than the obliged uniform price for Class I and Class II prices. Cooperatives organize marketing-agencies to negotiate with the handlers for a higher price; the premium achieved is then called a super-pool premium. A portion of the premium is used to cover the cost of this negotiation process; the rest is paid out to the farmers. These super-pool premiums can be controlled on state level as is the case in Pennsylvania.

2.3 Comparison of Policies Affecting the German and the U.S. Dairy Market.

Both markets are highly protected. There are many similarities in the policies to regulate the U.S. and the EU/German dairy market.

A first similarity is that both markets set base prices for dairy products. The base prices for these dairy products result however in a milk price of 9.90 $/cwt, approx. 218 $/t. The base price in EU is 215 EUR/t. When the price for certain dairy products in the U.S. and the EU is below the benchmark price, intervention occurs by government purchase of dairy products. In both countries criticism on the support of certain dairy products is present as they temper product innovation. The dairy industry is focusing more and more on consumer preference. This involves that supporting commodities by government, as a mean to support producer price, is not in line anymore with the current market developments (International Dairy Foods Association, 2008).

An additional similarity is the presence of direct payments. In the EU the trend to decouple the payments from production is present with already 87% of the payments decoupled. In the U.S., these payments are partially decoupled due to a cap on the total quantity eligible for a direct payment. Also it depends on the price of the market if these payments occur or not. They can be seen as a safety net generated to support farmers' income when milk prices are low, so called countercyclical payments. In Germany however farmers get direct payments regardless of the price on the market. They form an important share of the farm income.

A third similarity is the presence of export support. This export support is necessary for both countries to be competitive on the world market when world

market prices are low[6]. With rising world market prices for milk these export subsidies are of little importance nowadays.

The main policies involving the dairy market in these two countries are different. In Germany the quota system regulates the market highly and in the U.S. the Milk Marketing Orders are of high importance. The quota system regulates the supply by fixing quantity. The Milk Marketing Orders have as main consequences a uniform base price for farmers and access to fluid milk nationwide for consumers. The minimum price, however, is not fixed. It has a lower limit implemented through the DPPSP and depends on the market price.

The MMO and the quota system in particularly influence the farmer-dairy relationship. Dairies in the U.S. are obliged to pay the farmers a minimum price based on the market price (cooperatives are exempt of this rule). In Germany the quantity of milk produced is limited due to the quota system. This involves a stable supply to the dairy from the farmers, quantity agreements are not necessary to make (especially not in a coop-member relationship). Additionally, the combination of the quota system, export subsidies and implementation of a base price result in a stable price on the German dairy market which makes price agreements between dairies and farmers less complicated. However, due to the reduction of the impact of these policies, price fluctuations are more prominent making a price agreement between both parties necessary in order to reduce price risk.

[6] During the price drop in 2009, as a consequence of reduced demand due to the financial crisis, export subsidies and also intervention by purchase gained importance.

2.4 WTO and the Doha Round

During the Doha Round negotiations (2001-…) a reduction of protectionist policies and the development to more open markets stood high on the agenda. Due to particular interest of member countries, a full agreement is until today not achieved. However, a framework for modalities for further agricultural negotiations was reached in 2004 (Dobson, 2005). The framework includes following three pillars:

- Progress towards eliminating export subsidies
- Increase market access
- Reduce trade distorting domestic support

Under these trade negotiations the EU export subsidies and the U.S. DEIP program will be abolished in time. The U.S. trade negotiators proposed in 2002 to terminate the export subsidies five years after agricultural trade liberalization measures became effective under the Doha Round, the French proposed a phase-out period until 2015 or 2017 (Dobson, 2005). The increase of market access will be obtained by reducing tariffs. This holds especially for the U.S. where TRQs regulate import. The WTO classifies domestic support in three boxes, i.e., the Green, the Amber and the Blue box. The amber box contains all domestic support measures considered to distort production and trade. The blue box contains subsidy measures as described for the amber box, but the support demands additionally to limit production. The Dairy Price Support Program is regarded as the U.S. number one policy distorting trade. Countercyclical payments, as the

MILC-program, are also regarded as amber box measures. In the framework, set up in 2004, it was set that the amber box measures could not exceed 5% of the value of a country's agricultural production during a base period to be negotiated (Dobson, 2005). Green box measures are regarded as non-trade distorting and will be accepted. The Single Farm Payments in the EU and other direct payments in the U.S. are regarded green box measures. As the implementation of quotas only makes sense in a closed market and is a blue box measure, the EU decided to phase out its quota in order to prepare the players in the market for an open market environment.

The effects of trade liberalization are discussed in many papers. Some of these studies were discussed for the case of Germany with the abolishment of the quota system (see section 2.1.1 Quota). In a study by Langley et al. (2003) it was found that trade liberalization in the dairy market would result in a reduction of supply, increase of the value of dairy traded and raise world prices. The higher world prices are achieved due to a reduction in supply of highly subsidized regions as the EU and the U.S. (3 to 6% decrease of production). The U.S. milk price is predicted to decline over a range of 0.4% to 5% (Langley et al., 2003; Cox et al., 1999); the price in Europe however is predicted to decline by 25% to 26% (Langley et al., 2003; Cox et al., 1999). These studies predict a higher negative impact for the EU dairy market than for the U.S. dairy market. The real impact of liberalization depends on many factors as to which extent policies will be adapted,

how the global demand will develop, how production structure will change and to which extent free trade implies a higher competition on the market.

3 Description of the Markets

Like any other market, the market for milk is determined by supply and demand. As seen in Chapter 2 Dairy Policy, policies interfere with the market. Structural policies shift supply or demand, while price policies only lower or raise the price by means of a tax or subsidy. Many changes occurred on the production side of the market. Farmers expand their business as an answer to price pressure. On the processing side the same trend is observed. Due to increasing competition, structural changes take place rapidly. The number of processing plants decreases, while the capacity increases.

These changes are of course only possible due to the development of technology, science and the access to capital. Adaptation to modern techniques increases the profit margin for the early adaptor. Pressure on the price has as a consequence that more businesses adapt, which results in the necessity of the implementation of a new technology to induce a higher profit margin. This process is ongoing and is called the technological treadmill. These new technologies induce a higher production per cow and the possibility to manage larger herds. Increased efficiency in combination with economies of scale makes modern farms more competitive in comparison with small family farms. The same holds for dairies. Implementation of new technologies makes it possible to increase the market and increase the plant capacity. The possibility to share information directly, make it possible to manage several plants regional, interregional or even international.

Demand is also a driving force for structural change. When demand increases, opportunities rise on the market. Entry in the market is stimulated, as so is

production by players already involved. When demand is decreasing the opposite is true.

An additional factor is demonstrated by Sutton (1991). Sutton argues that in addition to demand and technology changes, the characteristics of sunk costs[7], the characteristics of the product market and the willingness of firms to cut prices in order to maintain market share are determining factors for the number of firms the market can sustain. Sunk costs can either be endogenous or exogenous. Exogenous sunk costs include fixed investment for plant and equipment, while endogenous sunk costs include investment in research and development and advertisement. Sutton shows some interesting relationships between the concentration level and these variables. In homogeneous markets when sunk costs are exogenous the level of concentration increases with price competition toughness. However, it declines when the market size increases relative to the amount of exogenous sunk costs. The same holds for a differentiated market; the maximum number of firms increases as the market size increases. Sutton also argues that an increase in endogenous sunk cost results in an increase of the market and firm size. The main finding in this study is that the level of endogenous sunk cost determines a lower bound of concentration on the market. Increased endogenous sunk costs have as a consequence a rise in the lower bound of market concentration. The higher the responsiveness of the consumer, the higher the lower bound of equilibrium concentration levels in the industry. The interaction between exogenous and endogenous sunk cost result in the rejection of

[7] Sunk costs are costs that can only be used for one purpose. Investment in milking machine is an example of sunk costs.

the following statement: when market size rises, concentration levels drop. Advertising industries counteract the decrease of concentration as a consequence of lower exogenous sunk costs relative to the market size.

3.1 German Dairy Market

In order to describe the German dairy market, a closer look to trends in domestic demand, trade, supply, raw milk price, farm structure and processing structure is provided.

3.1.1 Demand

Figure 3-1 shows the per-capita consumption in Germany of various dairy products. An overall slightly increase per-capita consumption of dairy products over the last 13 years is noticeable. The consumption of cheese grew steadily and is an important contributor to the overall consumption of milk. An increase of consumption of hard cheese, soft cheese and sliced cheese, particularly feta and mozzarella contributed to this trend. Also the consumption of curdled milk and mixed milk products had a steady increase over the last years, with as main contributor a 36% increase in consumption of yoghurt.

The per-capita consumption of butter shows a decreasing trend. In 1996 the average German consumed 7.3kg butter while in 2000 this was reduced to 6.6kg. Since 2005 the consumption of butter was 6.4kg. The consumption of butter in Germany was stable over the last 9 years.

The consumption of milk is stable, however slightly increasing the last 9 years with 2008 and 2009 as the best years in that period with a per-capita consumption level higher then 66kg milk.

The per-capita consumption in Germany may be increasing; the total amount of the population is decreasing since 2005. Germany counted in 2009 around 82 million people. The decline in population is expected to continue as Germany has an old population. Germany's population pyramid has a small base and a broad top. The Statistical Office of Germany expects a decrease of the population to 69-74 million by 2050 (Germany, Federal Statistical Office, 2006).

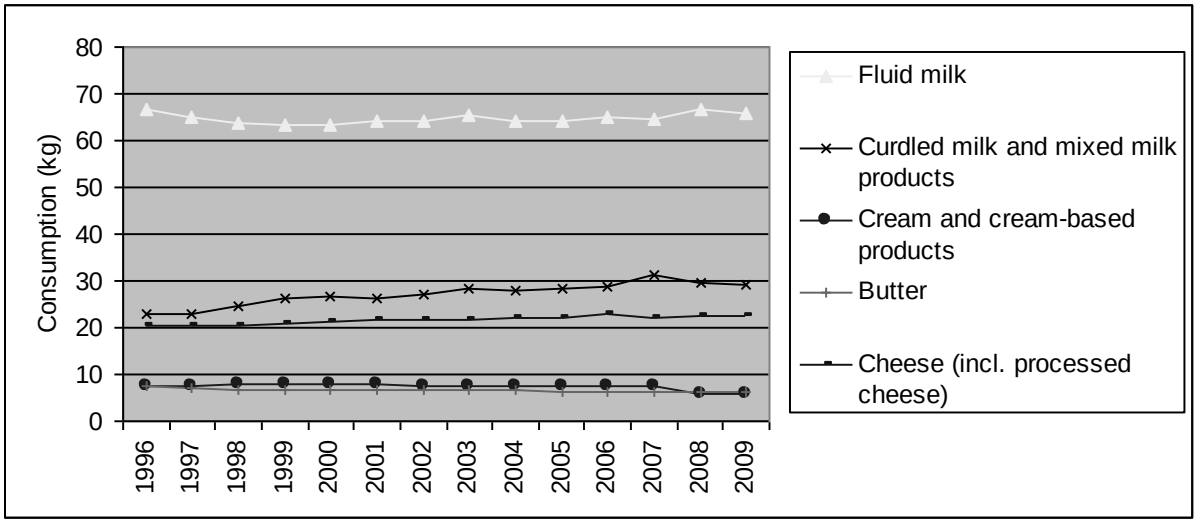

Figure 3-1: Per-capita consumption of dairy products in Germany, 1996-2009.

Data: German Dairy Association (2011).

Germany was a net exporter for fluid milk, skimmed milk powder (SMP), whole milk powder and cheese in 2009. The country is a net importer for butter. 46% of the German milk production is exported. Around 90% is exported within the EU; the next biggest market is Asia that receives 5% of the total exports (German Dairy Association, 2011). Cheese is highly exported to non-EU countries with a value of 945,357 tonnes of export of cheese in 2009 to non-EU countries (German Dairy Association, 2011). 2,461,480 tonnes of fluid milk were exported within the EU. Cheese contributes to half of all imports. European specialty cheeses are the largest part of this import (German Dairy Association, 2011). The trade balance for German dairy products is shown in Figure 3-2. The importance of trade is increasing over the last decades.

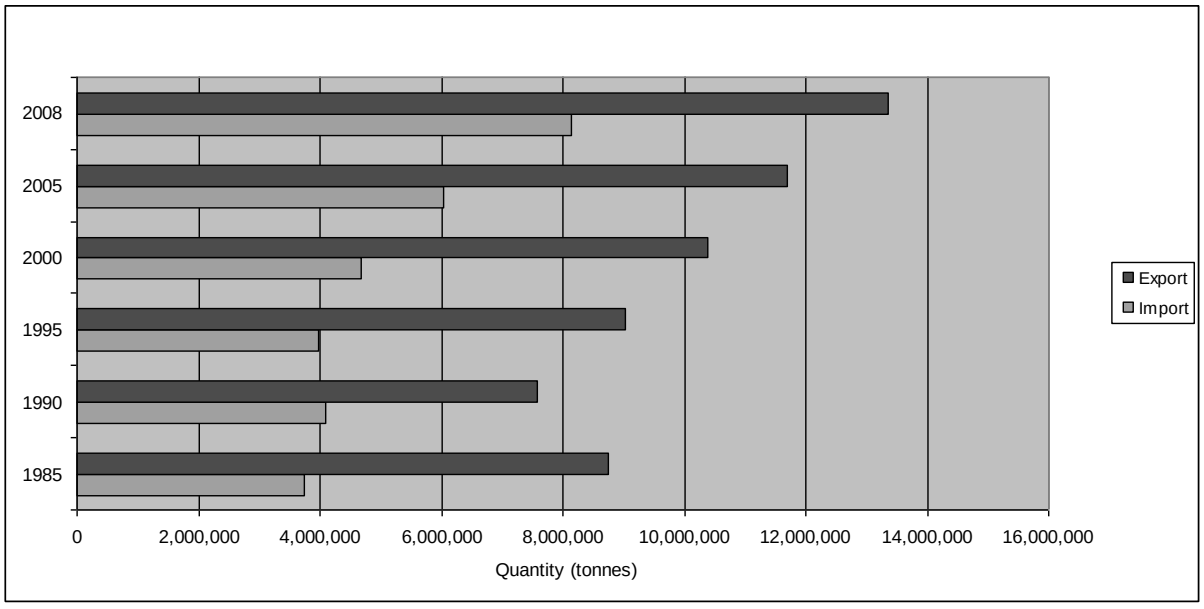

Figure 3-2: Trade balance in volume milk equivalent for Germany for selected years.

Data: United Nations, Food and Agriculture Organization (2010).

3.1.2 Supply

From January to March 2010 the milk deliveries in Germany decreased by 82,200 tonnes compared with the same period in 2009 (German Dairy Association, 2011). Overall the milk production in Germany in 2009 came close to its allowed quota but did not complete it. Two reasons could explain this. First of all the quota could not be binding anymore for German production of milk. This involves a zero quota rent and a farm gate price equal to the production cost. On the other hand this slight underproduction could be a result of individual farm underproduction due to the adverse risk attitude towards the super-levy.

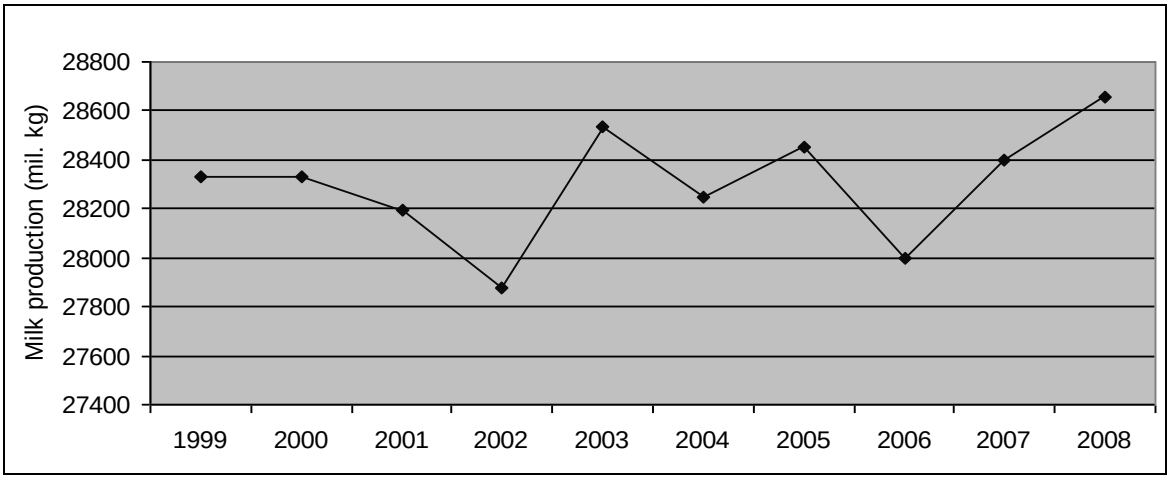

Figure 3-3: Annual German national milk production.

Data: Germany, Federal Statistical Office (2010).

The production of milk was stable over the last ten years as shown in Figure 3-3. According to the Federal Statistical Office Germany the total production in 1999

was 28,334 thousand tonnes. In 2008 the total milk production in Germany was 28,656 thousand tonnes. In 2002 and 2006 the total milk production was slightly lower than 28,000 thousand tonnes. The quantity delivered to dairies increased from 94.5% to 96% for the years 1999 and 2008. In 2008 4% of the produced milk was used in the farmers household, processed into farm butter and farm cheese, fed, sold as certified milk, etc (Germany, Federal Statistical Office, 2010).

In a report of the EC on price volatility an increase in price variation in international and EU commodity markets was mentioned (European Commission, 2010a). The price variation on the world market is higher than on the European commodity markets. Figure 3-4 shows the price for raw milk in Germany. An increase of price volatility over the last 10 years can be observed. The price ranged over the period 1991-2009 between a minimum of 240 EUR/t in 2009 to 345 EUR/t in 2001. The standard deviation of the price over the period 1991-2009 is 25 EUR/t. The increased price volatility could be explained by a reduction of protectionist policy measures.

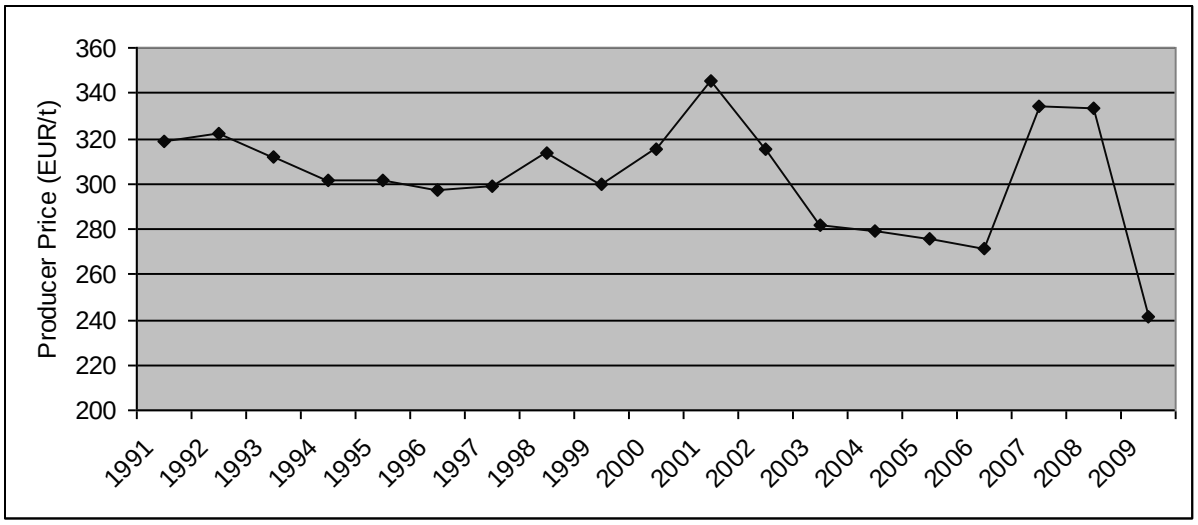

Figure 3-4: Producer price for milk in Germany.

Data: 1991-2008: United Nations, Food and Agriculture Organization (2010); 2009: German Dairy Association (2011).

3.1.3 Structure of Production

Germany consists of several states called "Bundesländer". Because of historical reasons and environmental reasons, the dairy production and structure of the dairy farms varies. Figure 3-4 shows a map of the different states in Germany and their share to the national production of milk.

Figure 3-5: Share of milk deliveries of German states in 2009.

(Hessen, Rheineland-Pfalz and Saarland; Niedersachsen and Bremen; Berlin and Brandenburg; Schleswig-Holstein and Hamburg together)

Data: German Dairy Association (2011).

Bayern is the major contributor to the total volume of milk deliveries in Germany. 26% of all milk deliveries come from Bayern. Also Niedersachsen is one of the main producing areas with 17% of the milk deliveries. These two are also the largest states, regarding the surface area and have a low population density, 177/km² and167/km² respectively, compared to the densely populated state Nordrhein-Westfalen, 524/km². A shift of production from southern states to northern states is observed the last years. This shift is made possible by trading

quota in two regions. The 33rd quota auction that took place on April 2011 the first confirmed this trend (Deutscher Bauernverband, 2011).

East Germany has an average of 179 cows per farm in 2005, while North Germany counts 47 cows per farm and South Germany only 26 cows per farm.
Also noticeable out of the data presented in Table 3-1, is the evolution to a larger herd per farm. This is a trend present in all producer milk markets as farmers try to benefit from economics of scale. Due to high technology cost (milk machine, specialized stable, feeding machine …) farmers try to spread the cost over a larger production. The incentive to specialize the production process works hand in hand with increasing production. However due to the milk quota farmers have a disincentive to enlarge their herd as the cost of quota has to be taken into account.
Looking at the percentage change in herd size between the years 1999 and 2005 we see the highest increase for states in the North. The South and the East have the same herd growth rate. Comparing herd sizes in 2005 with the sizes in 2008 gives a different result. Over this recent time interval states in the South have the highest growth percentage. Saarland is leading with 20%, followed by Bayern and Baden-Württemberg with respectively 12% and 11%. Rheinland-Pfalz and Hessen have a lower recent herd growth rate around 5%. The growth rate in the Northern states is around 10% except for Nordrhein-Westfalen where it is only 2%. A reason could be the high population density in this state which results in a high competition for land and less opportunities for farmers to expand their farm. The herd size for dairy farms in East Germany is declining more than 9%.

Table 3-1: Number of milk cows per farm per state over period 1999-2008 in Germany.

State	1999	2001	2003	2005	2008*	Change 1999-2005	Change 2005-2008
Schleswig-Holstein	50	55	57	59	64	0.18	0.08
Niedersachsen	35	40	43	46	51	0.31	0.11
Nordrhein-Westfalen	30	35	37	41	42	0.37	0.02
North	36	41	44	47	N.A.	0.31	N.A.
Hessen	23	27	29	32	34	0.39	0.06
Rheinland-Pfalz	32	37	39	41	43	0.28	0.05
Baden-Württemberg	20	23	24	27	30	0.35	0.11
Bayern	21	23	23	25	28	0.19	0.12
Saarland	36	42	44	46	55	0.28	0.2
South	22	24	25	26	N.A.	0.18	N.A.
Brandenburg	187	196	202	223	202	0.19	-0.09
Mecklenburg-Vorpommern	164	172	179	199	164	0.21	-0.18
Sachsen	126	129	138	145	115	0.15	-0.21
Sachsen-Anhalt	161	163	167	172	157	0.07	-0.09
Thüringen	136	143	149	176	155	0.29	-0.12
East	152	157	164	179	N.A.	0.18	N.A.
Germany	31	35	36	38	42	0.23	0.13

Data: German Dairy Association (2011).

Data*: Germany, Federal Statistical Office (2009).

The milk production per cow increased in Germany due to technological and scientific innovations that go hand in hand with a more specialized production system. The yearly production per cow rose from 5,510kg to 6,849kg over the ten

year period of 1996-2006. This involves an increase of 24%, as shown in Figure 3-6.

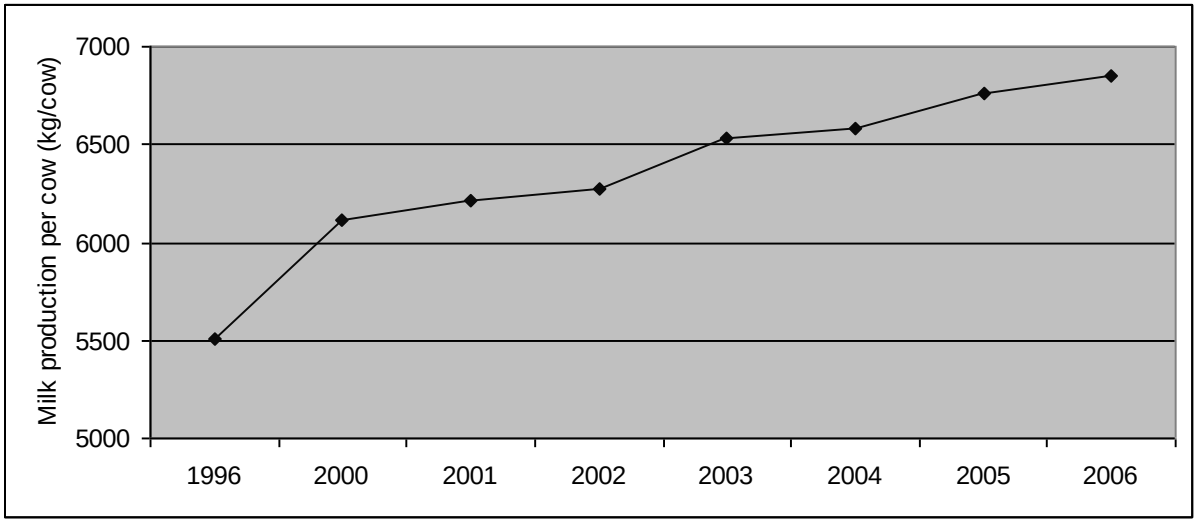

Figure 3-6: Milk production per cow in Germany.

Data: German Dairy Association (2011).

In Figure 3-7 the change of the number of producers and the change of the average herd size is graphed. The number of producers declined rapidly over the period 1990-2006 with 62%. The herd size increased from 23 cows per farm to 38 cows. In 2010 the average herd size was 45 cows per farm (German Dairy Association, 2011)

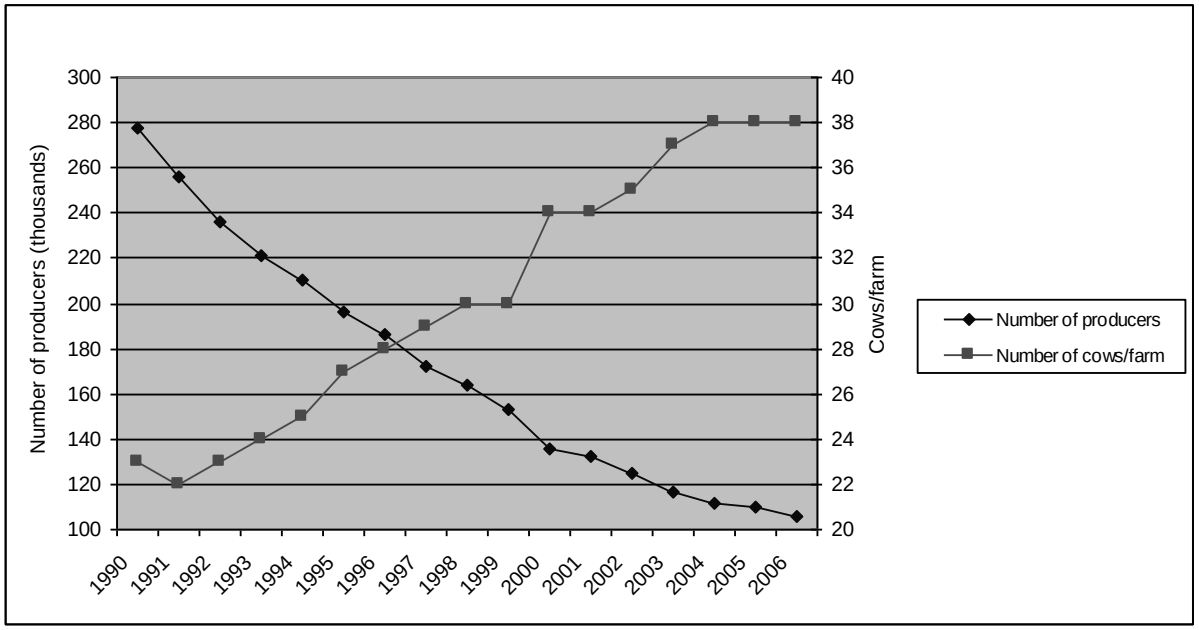

Figure 3-7: Evolution of the number of producers and herd size in Germany over the period 1990-2006.

Data: Wocken et al. (2008).

The amount of dairy farms in 2005 was 110.4 thousand. In 2007 this was 101.2 thousand (Germany, Federal Statistical Office, 2009). Over two years the number of dairy farms decreased by 8.3%. Figure 3-8 shows that the decline occurs due to the disappearance of smaller farms with a herd size below 100 cows. This offsets the increase of dairy farms with herds larger than 100 cows. However the majority of German dairy farms have a herd smaller than 100 cows. In 2005 36.6% of the farms had a herd smaller than 20 cows, 41.7% had a herd between 20 and 49 cows, 17.3% had a herd between 50 and 99 cows while only 4.4% had a herd over a 100 cows. In 2007 these percentages were accordingly 35.4%, 40.7%, 18.8% and

5.1%. The average production per farm increased from 114 tonnes in 1990 to 262 tonnes in 2006 (Wocken et al, 2008).

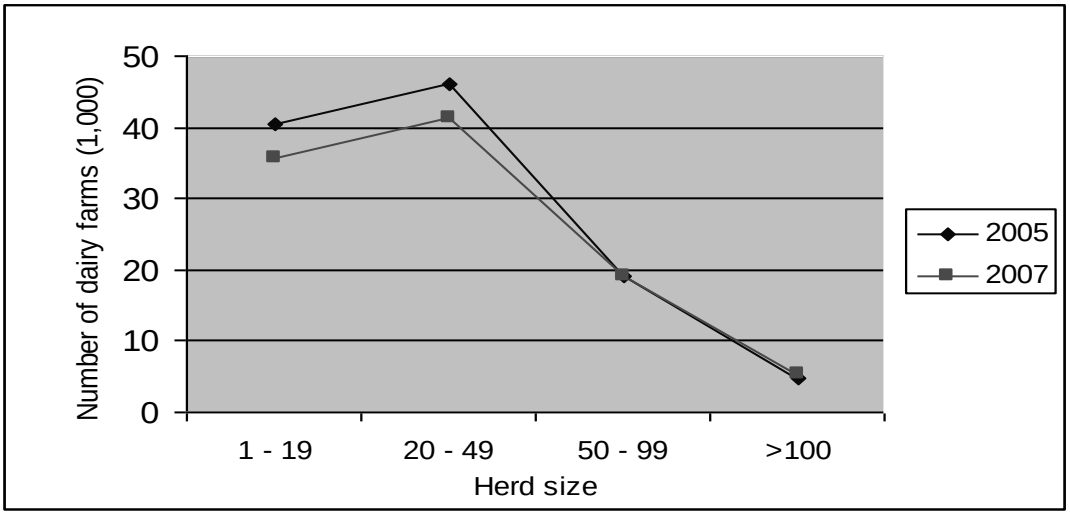

Figure 3-8: Number of dairy farms in Germany according to the herd size. Data: Germany, Federal Statistical Office (2009).

Figure 3-9 shows the relationship between production and size of the farm. Farms with a herd size between 1 and 19 cows contribute little to the national production. 35% of the farms milk only 9% of the national herd. 41% of the farmers have a herd size between 20 and 49 cows, good for 32% of the national herd. 24% have a herd larger than 50 cows and they account for 58% of the national herd. Relating production to number of cows, the percentage share of the national herd size gives us an idea of the contribution to the national production. However, it must be said that if we would use the percentage of the national production, we might see an even higher share towards farms with a larger herd size, as these tend to have a higher production per cow.

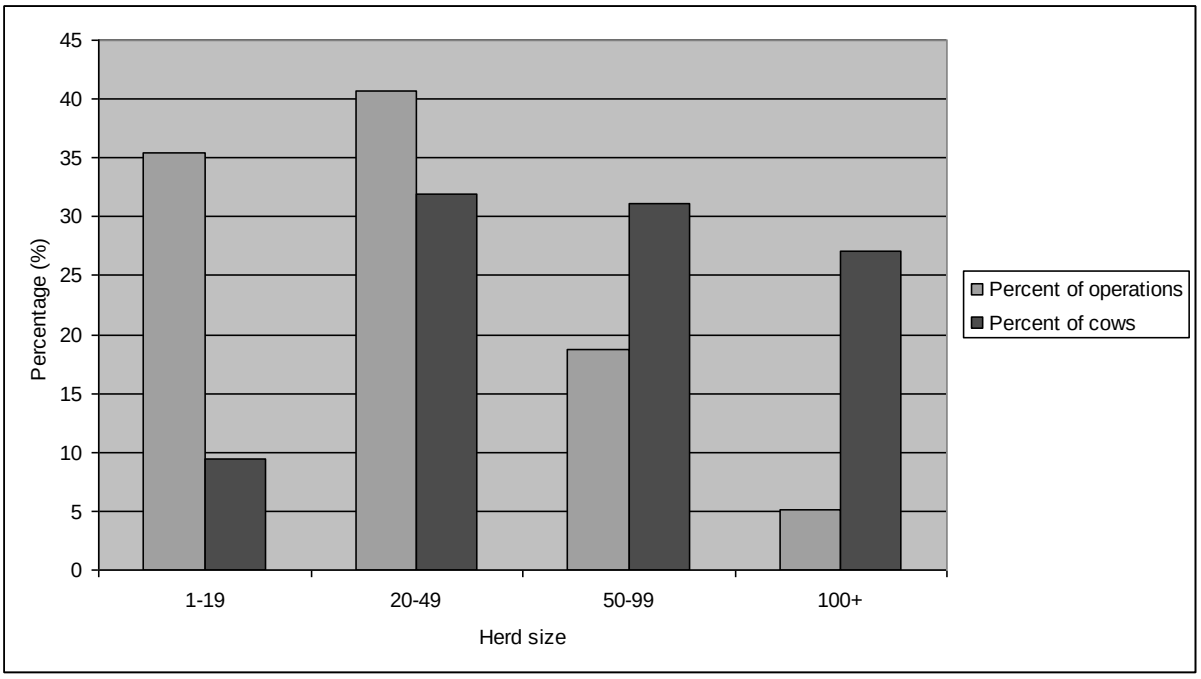

Figure 3-9: Size structure-production relation for Germany in 2007.

Data: Statistische Jahrbuch (2009); German Dairy Association (2010b).

3.1.4 Processing Structure

The dairy industry in Germany is traditionally populated by small and medium-size enterprises. However due to an increased competition on the market dairies merge, form joint ventures, and divest. The two largest dairy cooperatives of Germany, Nordmilch and Humana, merged their sales department in 2010 under the new company NordContor. Both have a 50% share in the new company. This merger involves around 30% of the German milk production (Wenk, 2009). Other mergers on the market happened between Friesland Foods and Campina. These two Dutch companies merged in 2009. The new company FrieslandCampina has a market share of around 80% in the Netherlands and is an important player on the

German market with a milk turnover of 983 million kilograms. A list of the German processors is provided in Appendix 1. 70% of the milk produced in Germany is procured by cooperatives, but they only have a share of 45% in the processing market. In Germany a lot of bargaining cooperatives are present. They sell the milk of member-farmers without actually procuring it. In 2007 139 bargaining cooperatives were present in Germany (Germany, Federal Ministry of Food, Agriculture and Consumer Protection, 2010). Out of Figure 3-10 we can see also a decrease in the number of plants. In 1991 there were 508 plants, while in 2006 there were 281 plants. Taking into account that these plants processed 35,083 million kilogram milk (Germany, Federal Ministry of Food, Agriculture and Consumer Protection, 2008), the average plant size for Germany is around 125 million kilogram of milk.

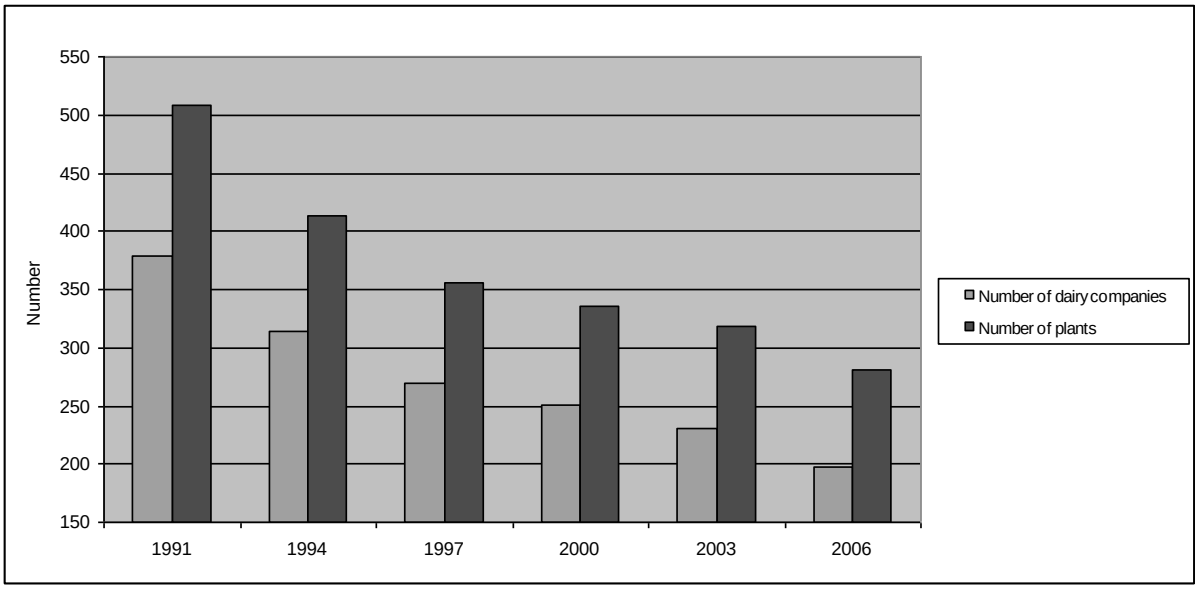

Figure 3-10: Evolution of the number of dairy companies and plants in Germany over selected years.

Data: Germany, Federal Ministry of Food, Agriculture and Consumer Protection (2008).

Of the 198 dairies that were processing milk in 2006, 39 did not procure milk directly from farmers. 57 of the dairies were cooperatives, 141 were private companies. The share of cooperative organized firms dropped from 43% in 1994 to 29% in 2006. The cooperatives processed 45% of the total amount of processed milk in 2006. Their share has been decreasing over time however only with 10% from 55% to 45%. The average amount of milk processed per dairy is 177 million kg a year. An increase in size of the dairy companies is observable. This follows out of the fact that the total amount of milk processed increases and the number of companies decreases. Around 7.1% of the German dairies process more than 500 million kg milk a year. However 50% of the dairies process less than 50 million kg a year. Figure 3-11 provides a closer look at the structure of the plants and the dairy companies. Only a relative small number of dairies have a plant with a capacity larger than 300 million kg a year. The large plants represent a large share of the processing, however a small share of the processors (Germany, Federal Ministry of Food, Agriculture and Consumer Protection, 2008).

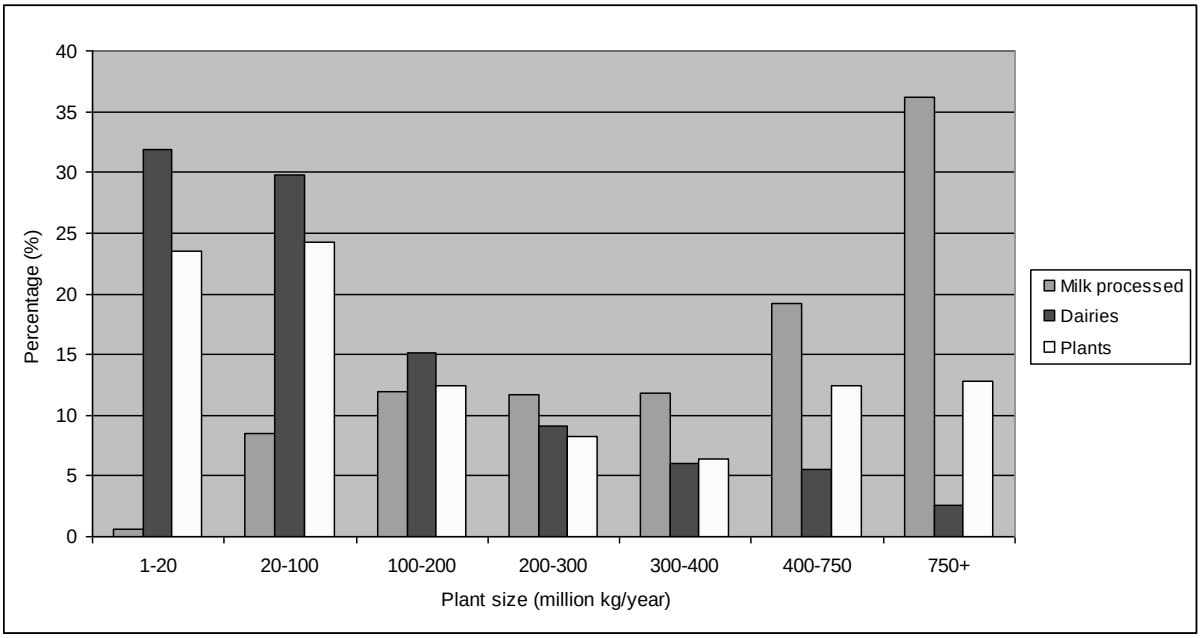

Figure 3-11: Size structure-production relationship for German dairies in 2006.

Data: Germany, Federal Ministry of Food, Agriculture and Consumer Protection (2008).

The number of plants for processing certain dairy products is shown in Figure 3-12. The majority of the dairy firms are processing fluid milk and cheese. Also butter is processed in 96 plants of the 281 plants in Germany. In total 36% of the produced milk in Germany is used in the processing of fresh dairy products, from which 40% is fluid milk. 30% is used to make butter, 22% is used to make cheese (German Dairy Association, 2010b).

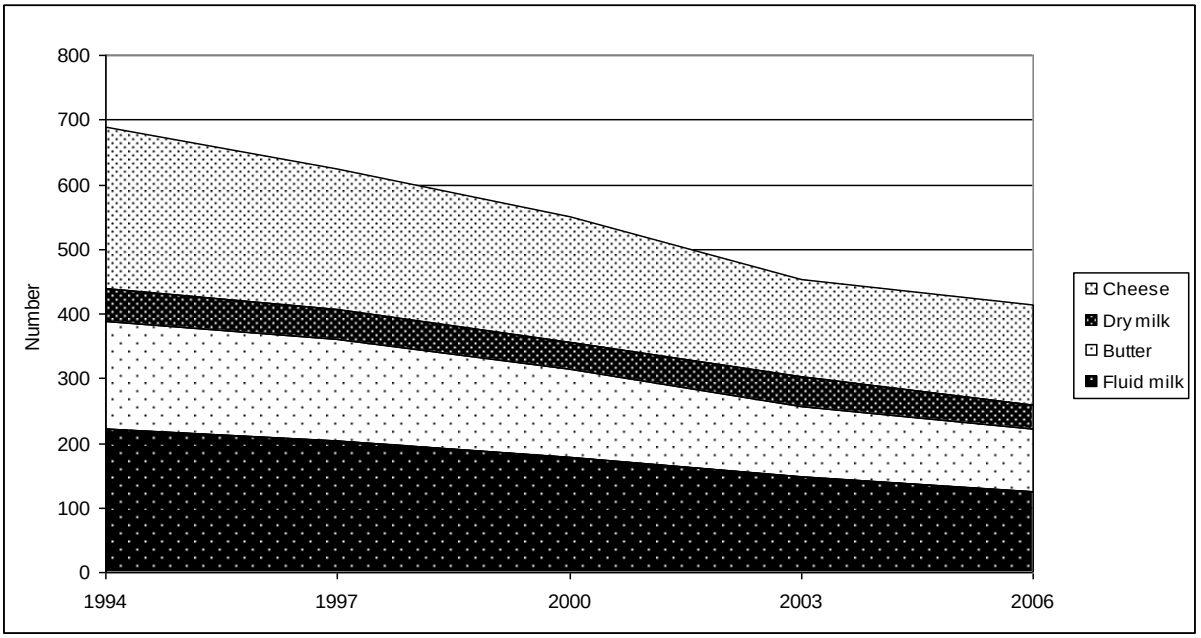

Figure 3-12: Number of plants for selected dairy products for 1994-2006 in Germany.

Data: Germany, Federal Ministry of Food, Agriculture and Consumer Protection (2008).

Consolidation in the German market is present and is continuing. Fewer firms control an increasing share of the milk procurement and processing. In 2006, only five dairy companies processed 36% of the total market volume. This trend seems to be stronger among cooperatives then private firms. The average size of cooperatives was in 1994 134.1 million kg/year, in 2006 this was more then doubled to an amount of 280.9 million kg/year. Private firms are smaller with an average size increase of 30% to 135.2 million kg in 2006 compared to 1994 (Germany, Federal Ministry of Food, Agriculture and Consumer Protection, 2008).

3.2 U.S. Dairy Market

In order to describe the U.S. dairy market, a closer look at trends in domestic demand, trade, supply, raw milk price, farm structure and processing structure is provided.

3.2.1 Demand

Since the 1970s the per-capita consumption rose slightly (Gould, 2010). In Figure 3-13 the per-capita consumption of various dairy products is shown over the period 1990 to 2009. The most important contributor to this growth is cheese consumption. The per-capita cheese consumption doubled in the last three decades and shows no sign of a weakening demand. This increase of cheese consumption can be explained by a wider variety of cheeses, an increase in out-door eating and a greater popularity of ethnic food that has cheese as a main ingredient. Fluid milk and frozen dairy products dropped in recent decades. A drop in fluid milk consumption can be explained by the higher competition level it faces on the market from other beverages. Evaporated and condensed milk and dry dairy products consumption also decreased. Consumption of butter has been steady since the early 1970s (U.S. Department of Agriculture, 2004). In the FAPRI Agricultural Outlook 2011[8], per-capita consumption of fluid milk is estimated to keep on decreasing over the next years, while consumption of cheese

[8] "The Food and Agricultural Policy Research Institute is a unique, dual-university research program, established in 1984 by a grant from the U.S. Congress, to prepare baseline projections for the U.S. agricultural sector and international commodity markets and to develop capability for policy analysis using comprehensive data and computer modeling systems of the world agricultural market." (Food and Agricultural Research Institute, 2011)

is expected to keep on increasing. Consumption of butter and non-fat dry milk is projected to be stable (Food and Agricultural Research Institute, 2011).

Next to the per-capita consumption, the total population in the U.S. is also increasing. In 2010 the U.S. counted approx. 309 million Americans. In a report from the U.S. Census it was projected that the U.S. population would keep on increasing in the future (U.S. Census Bureau, 2011). The population pyramid of the U.S. has a broad base and a small top. The U.S. has a relatively young population compared to Germany. This will result in an increase of the domestic demand.

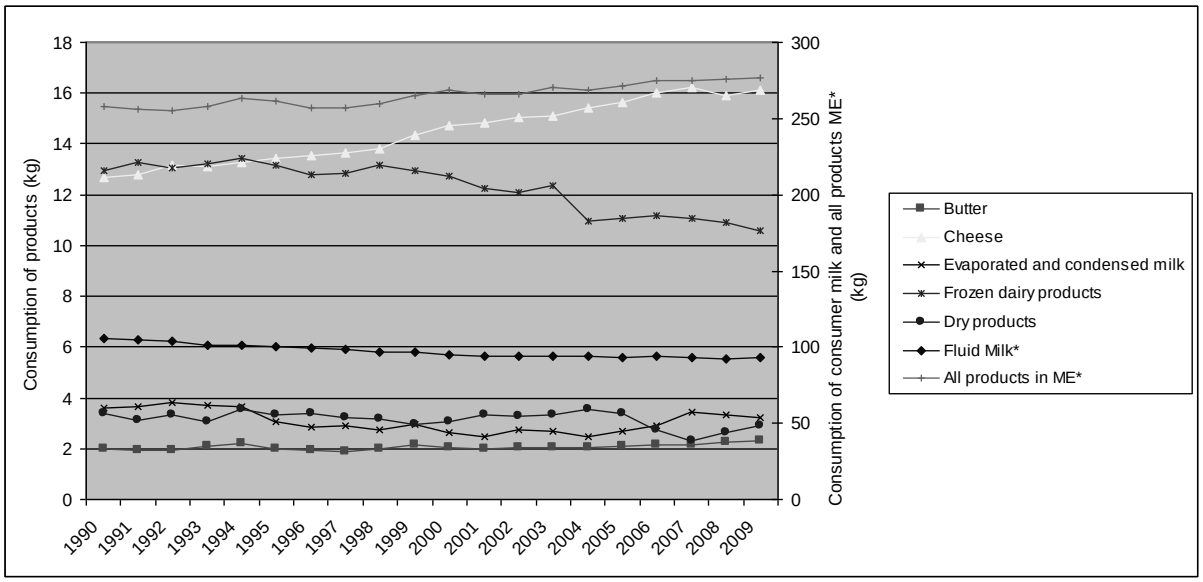

Figure 3-13: Per-capita consumption of dairy products in U.S., 1990-2009.

Data: U.S. Department of Agriculture (2011a).

Figure 3-14 shows the trade balance of dairy products for the U.S. The U.S. is a net exporter for dairy products. Since 2003 the net export level increased sharply

resulting in a positive net value for trade of dairy products in 2007. An increase of trade in dairy products is expected to continue as protectionist policies like the TRQs are reduced and export is stimulated with a rising world market price for dairy products. Overall, the share of milk exported is small, i.e. around 9% in 2008. Cheese is the main imported product in the U.S. The main exported product is non-fat dry milk.

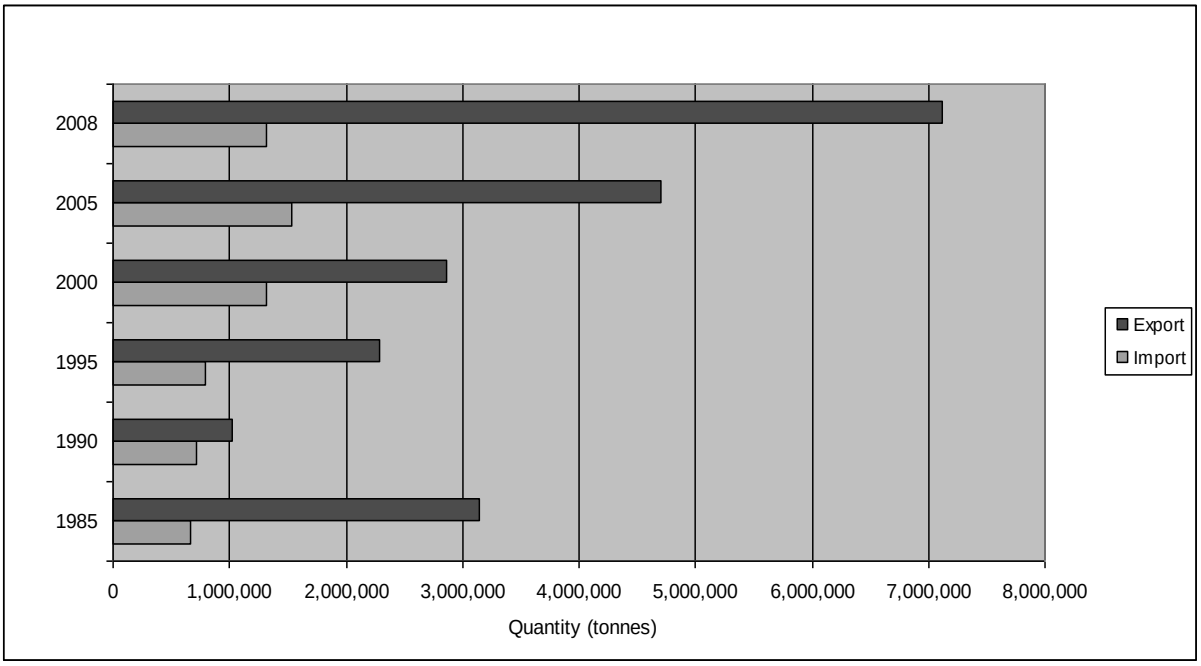

Figure 3-14: Trade balance in volume milk equivalent for U.S. for selected years.

Data: United Nations, Food and Agriculture Organization (2010).

3.2.2 Supply

With increasing consumption and increasing net exports the creation of an increasing demand occurs. The supply answered as shown in Figure 3-15. In the

period 2004-2008 milk production quantities increased rapidly to approx. 86 million tonnes in 2008. This trend follows the general trend since the 1980s of an increase in production (Gould, 2010). An increase in production from the 1980s to 2008 is partly due to a higher price as consequence of a higher demand and government support.

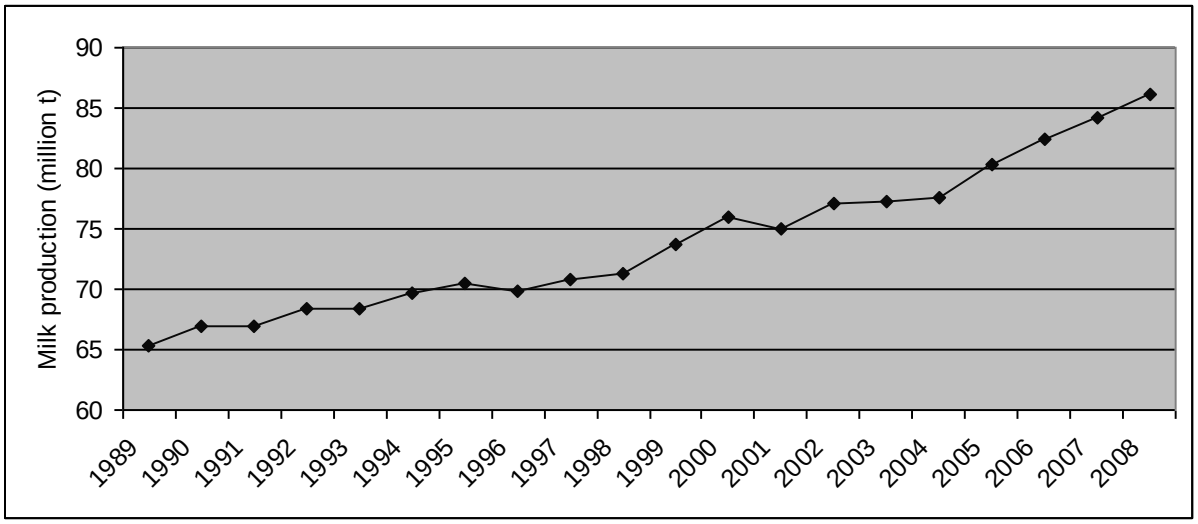

Figure 3-15: Annual U.S. national milk production.

Data: Gould (2010).

The producer price for milk is shown in Figure 3-16. The price in the U.S. rose over the period 1991-2008, and varied between 269 $/t in 2002 to 450 $/t in 2008. An increase of price fluctuation is noticeable over the last years. The standard deviation of the price over the period 1991-2008 is 51 $/t. In 2009, a major price drop occurred partially due to a reduced demand due to the financial crisis. The increased price volatility occurs, as the U.S. dairy policy changes reduce the protection rate, which makes the market more vulnerable to fluctuations on the

world market. Noticeable is also the cyclical price fluctuations. This can be explained by the cobweb theorem (Keane et al, 2009). When there is a lag between production and price change, cyclical variations in price and production occur. The MILC-program and Cooperatives Working Together-program (CWT-program; see Appendix 2) are programs established to deal with these cyclical variations.

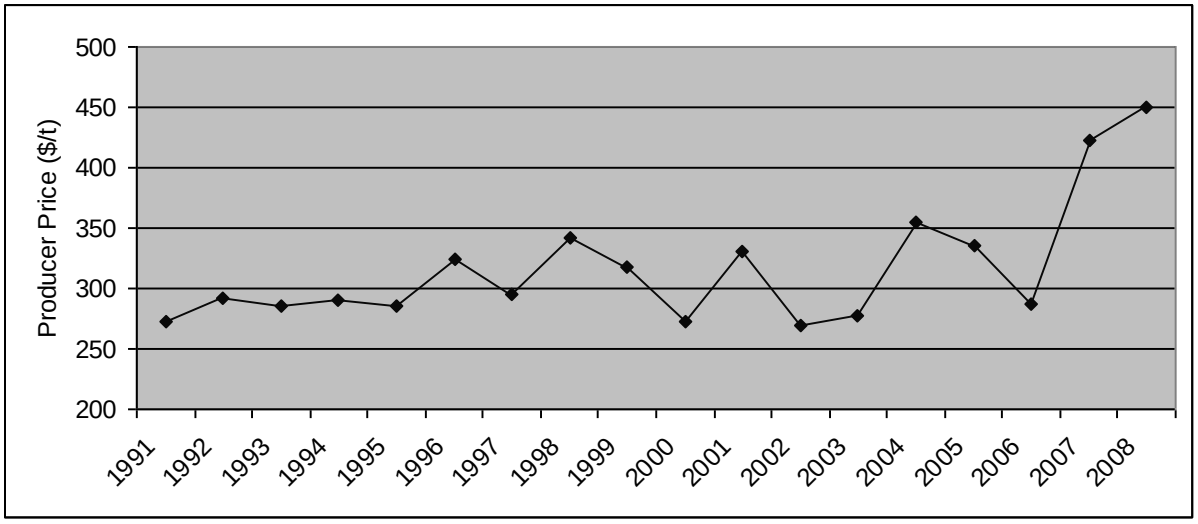

Figure 3-16: Producer price for milk in the U.S.

Data: United Nations, Food and Agriculture Organization (2010).

3.2.3 Structure of Production

There is a lot of regional variability in milk production in the U.S. Milk is produced in all 50 states, however the amount of production and the organization of the dairy farms changes between states. The top ten states in milk production in 2009 were (Gould, 2010):

- California (20.9%)
- Wisconsin (13.3%)
- New York (6.6%)
- Idaho (6.4%)
- Pennsylvania (5.6%)
- Minnesota (4.8%)
- Texas (4.7%)
- New Mexico (4.2%)
- Michigan (4.2%)
- Washington (2.9%)

Figure 3-17 shows the distribution of milk cows in the U.S. in 2007. There is a high presence of milk cows around the Great Lakes States, like Wisconsin and Michigan, at the North East Coast States, like New York and Pennsylvania and in Western Coast States, like California and Washington. The relative importance of the Western areas has grown over the last years due to beneficial organizational and climatic reasons.

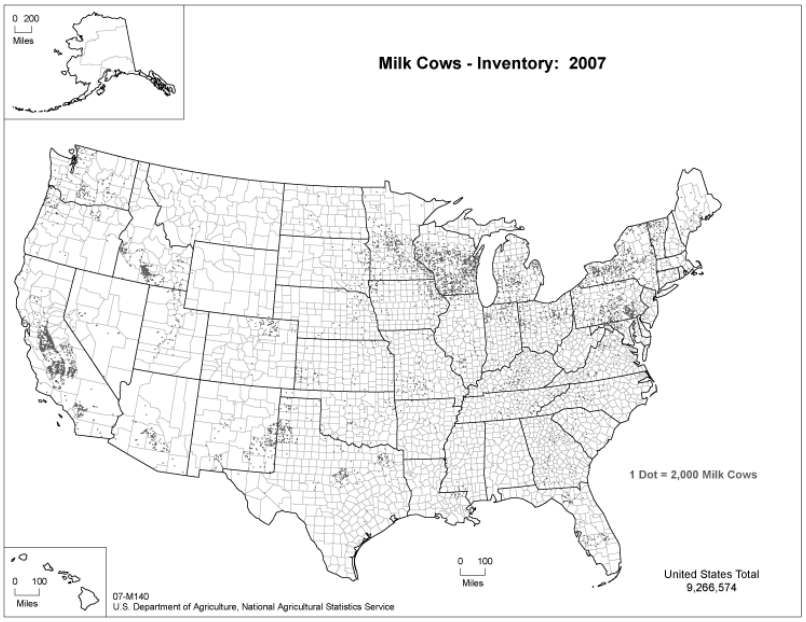

Figure 3-17: Milk cow distribution U.S. 2007.

Source: U.S. Department of Agriculture (2009).

Figure 3-18 shows the share of dairy farms in several USDA Farm Production Regions.

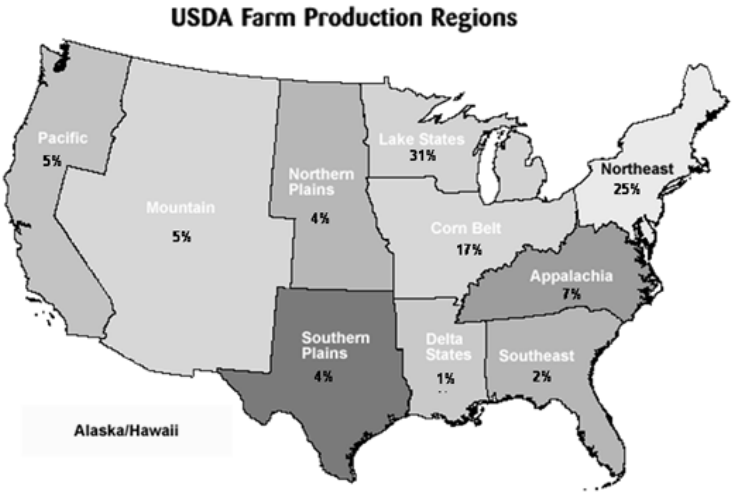

Figure 3-18: Percentage of total dairy farms in the U.S. 2007.

Source: University of Massachusetts (2010).

Taking into account Figure 3-17, one can derive an idea about the farm size in the different production areas. The Pacific area contains only 5 percent of the dairy farms while this area contains two states that are in the top ten of dairy production as mentioned before. The average size of farms in this region is relatively high, i.e. more than 500 cows. A high share of the number of dairy farms is observed around the Great Lakes and the North East Coast. These are also the main dairy producing areas but the farm size is relatively smaller than in the Pacific area.

An evolution of changing structure of dairy farms from small scale dairy farms towards large scale dairy farms is noticeable in the U.S. dairy scene (Blayney,

2002). This translates in fewer farms with a higher production capacity. Between 1970 and 2006 the number of dairy farms (i.e. farms who have dairy production present, this does not exclude farms who have as main income some other activity) fell from 648,000 to 75,000. This consists in a drop of 88.4% over a 36 year-span. Also during that period the total amount of dairy cows in the U.S. dropped from 12 million to 9.1 million. This results in an increase of average number of cows per farm from 18.5 in 1970 to 121.3 in 2006. This evolution is illustrated in Figure 3-19 (MacDonald et al., 2007).

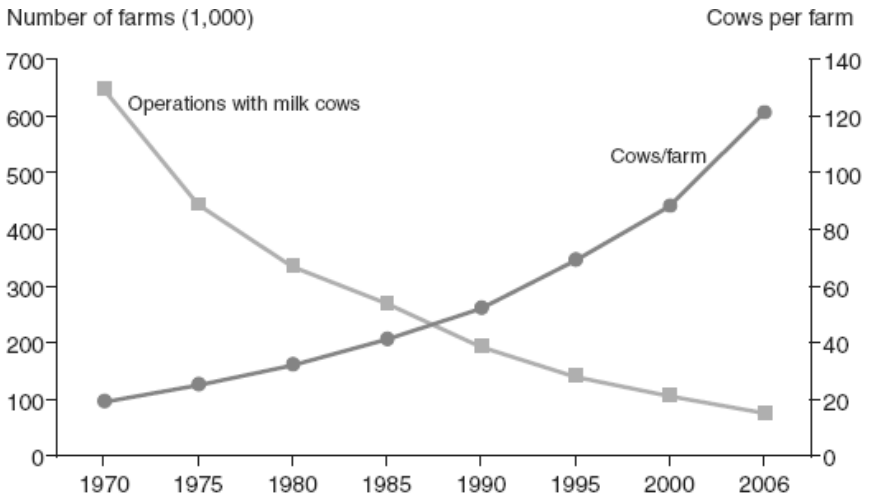

Figure 3-19: Evolution of the number and size of dairy farms in the U.S.

Source: MacDonald et al. (2007).

Nowadays, the size of the dairy farms varies from over 15,000 cows to just a few cows. The average size of the U.S. dairy farms is between 50 and 100 cows. 23% of the dairy farms have a herd larger than 100 cows with a production share of

79.6% and 47% of the farms have a herd smaller than 50 cows with a production share of 6.1% (MacDonald et al., 2007). Figure 3-20 shows the size structure-production relationship. It is obvious that the 'percent of operation' is skewed to the left while the 'percent of production' is skewed to the right. Farms with a herd over 2000 cows have a production share of 23.4% while this entails only 0.7% of total operations. These numbers refer to the situation in 2006.

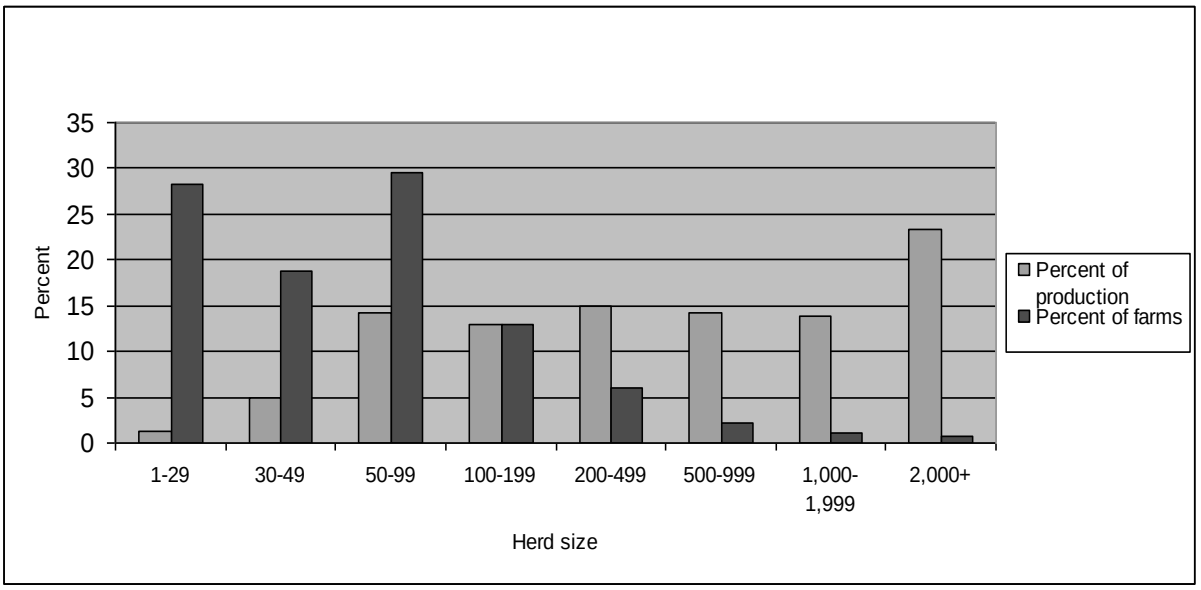

Figure 3-20: Size structure-production relation of the U.S. dairy farms in 2006.

Data: MacDonald (2007).

However, it must be noticed that large dairy farms and small dairy farms are organized in different ways. Small dairy farms tend to breed their heifers on farm and tend to use own farm grown feed, while larger farms buy feed and contract with other operations to raise their heifers. Large farms keep there herd usually in

large barns or drylot feed yards while small farms tend to pasture their cattle. Both types of farms are family owned but the labor provided on large farms is mostly hired labor, as compared to a small farm with family labor.

The milk production per cow in the U.S. rose with 41 % over the period 1991 to 2010. The average yield per cow in 2010 was 9,593 kg. Figure 3-21 shows this evolution. The dairy herd retirement program, implemented by the organization CWT, could enhance the increase of average production per cow, as the less productive are the first to be eliminated through the program.

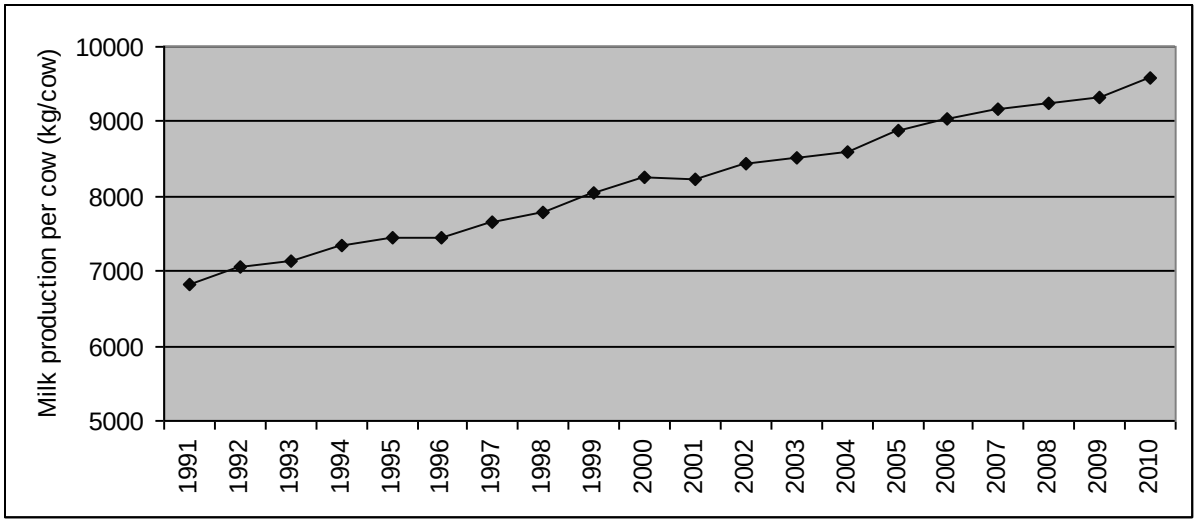

Figure 3-21: Milk production per cow in the U.S.

Data: Gould (2010).

3.2.4 Processing Structure

In a paper of the USDA structural changes in the dairy industry are discussed (Ollinger et al., 2005). The study explains how due to technological changes the processing structure in the U.S. changed drastically. Plant size grew while the number of plants dropped. This evolution is shown in Figures 3-22 and 3-23. In the processing market, three types of organizations are engaged, i.e. dairy cooperatives, supermarkets and convenience store chains, and large proprietary dairy companies. None of them escaped the consolidation. The fluid milk processing structure underwent major changes. The implementation of cool trucks, replacing glass bottles by plastic bottles and having consumers go to the shop to buy milk all contributed to an increase in plant size and a reduction of the number of plants. In the 1930s cooperatives played an important role in the fluid milk market. Nowadays, they only control around 7% of this market. In the 1970s supermarkets played an important role in manufacturing fluid milk. However, due to low profits, they sold their plants. Nowadays the role of large proprietary companies in fluid milk processing is of particular interest. Dean Foods, the U.S. number one dairy company (see Appendix 1) accounted for 35% of the fluid milk market after a merger with Suiza Inc. in 2001. Land O'Lakes, a dairy cooperative mainly active in the dairy belt and California, sells around 40% of all the U.S. butter (Land O'Lakes, 2011). In the cheese processing industry cooperatives have a share of 40%.

Most of the farmers' milk is procured by cooperatives. In 1992, 82% of the U.S. raw milk was handled by cooperatives, 68% of the cooperatives were bargaining only coops. Of all milk marketed by cooperatives in 1992, 43% was processed in owned plants; in 2002 this was reduced to 38% (U.S. Department of Agriculture, 2005a). Dairy Farmers of America, the U.S.'s largest dairy cooperative with 18,000 members, procures around one third of the U.S. milk production (Dairy Farmers of America, 2011a). Dean Foods and DFA have an agreement that all milk supplied to Dean Foods is procured by DFA. Such an agreement raises questions about the market power of these two companies towards consumers and producers. Consolidation in the U.S. dairy industry is an important factor to the structural change. Consolidation happens among the proprietary firms as well as among the cooperatives. The share of large cooperatives and large proprietary firms[9] of the total U.S. dairy sales changed from 16.9% and 39.3% respectively in 1975 to 26.9% and 42.2% in 1998 (Blayney et al., 2000).

The number of plants declined drastically during the last decades. Figure 3-22 shows the decline of plants for several dairy products. In 2008 the total number of manufacturing plants in the U.S. was 1,178 and the number of milk bottling plants was 319. Wisconsin has the largest number of manufacturing plants, i.e. 211. New York counts 112 plants and California 107 plants (Schultz, 2010). It must be noticed that the number of manufacturing plants increased over the last few years. This increase is due to an increase of cheese processing plants. From 2008 to

[9] Minimum sales for a large firm changed from 250 million dollars in 1975 to 800 million dollars in 1998 (Blayney et al., 2000).

2009 45 new cheese plants were in operation. In 2009 32 new plants were opened in the state of Texas. An increase of plants in North Atlantic states like Vermont and Pennsylvania was also present the last few years (U.S. Department of Agriculture, 2010/NASS). The amount of fluid milk bottling plants decreases, in 2004 there were still 367 milk bottling plants. A continuous increase of plant size combined with the possibility to transport milk in cooling tanks could explain this trend.

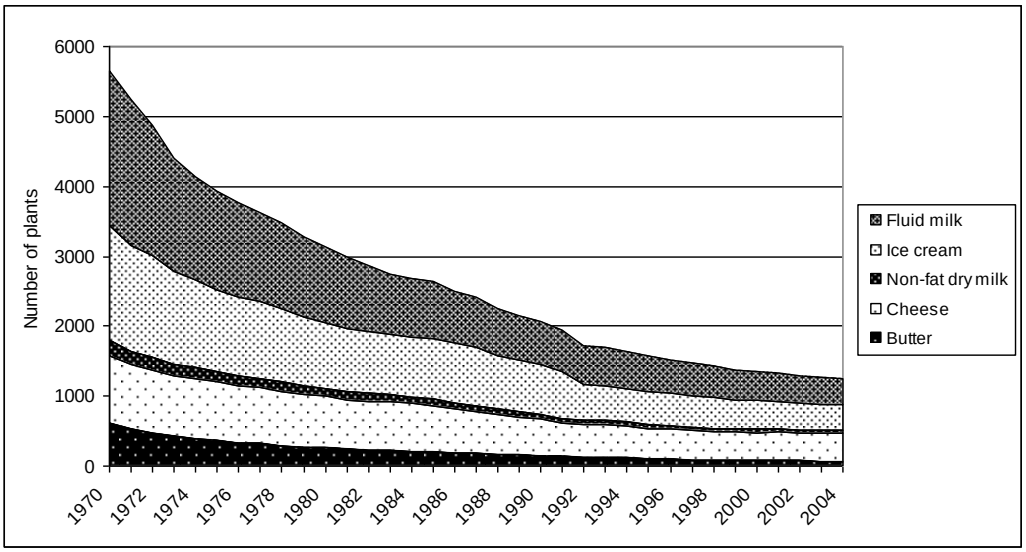

Figure 3-22: Number of plants for selected dairy products in U.S., 1970-2004. Data: U.S. Department of Agriculture (2011b).

The plant size in U.S. grew rapidly to 94 million kg in 2004 as shown in Figure 3-23.

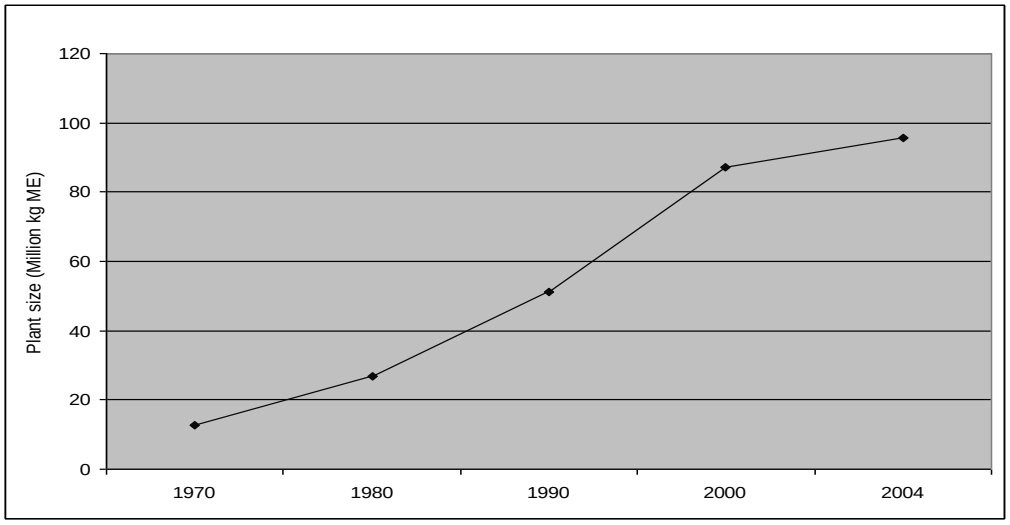

Figure 3-23: Evolution of plant size in U.S. for selected years.

Graph based on the milk equivalent of the production of cheese, butter, non-fat dry milk and fluid milk in U.S. plants for selected years.

Data: U.S. Department of Agriculture (2011b); Bailey (1997).

3.3 Comparison

The demand for American as well as German milk increases due to an increase in domestic demand and also an increase in the international demand. The supply increases accordingly. However, this increase in supply is stronger in the U.S. This can be explained due to the effect of the quota system that limits a supply response in Germany. The U.S. has a younger population than Germany. Increasing population in U.S. will result in an increasing domestic demand which is of high importance for the U.S. dairy industry. The German dairy industry is less dependent on the domestic demand. An increase in international demand can offset the decreasing domestic demand as a result of the population decrease.

Both producer markets show a trend to fewer producers that produce more. In absolute figures, calculated from the data above for the year 2006, the U.S. dairy producers are larger in scale with an average herd size of 121 cows and an average production of 1,093 tonnes compared to 41 cows and 272 tonnes for German producers. The difference between farm structures is greater in the U.S. than in Germany. In the U.S. around 1% of producers produce around 25% of the national production, while in Germany 5% produces around 26% of the national production (see Figures 3-9 and 3-20). The increased yield per cow indicates specialization in the milk production, a higher yield results in lower cost of production. The U.S. cows have far larger yields than German cows, approx. 31% in 2006. This could be due to the breed choice (in Bayern a breed for meat as well as milk production is common), the use of milk stimulating hormones (bovine somatotropin; permitted to use in U.S., not in Germany), intensive breeding, balanced feeding, and other production related parameters.

Both markets have regional differences of production. This results in heterogeneity among farmers. The northeast of the U.S. has smaller farms compared to states like California and Texas. The same for Germany exists; Bayern has smaller farms than states in East and North-Germany. However, Bayern has the largest share of production state wise in Germany, in the U.S. California has. This can be explained with the policy measures influencing the markets in both countries. The quota and direct payments temper the trend to more specialized production, resulting in protecting less efficient farmers in the state of Bayern. Quota contributes to maintain territorial spreading of milk

production (European Court of Auditors, 2009). In the U.S., the MMOs provide farmers with a uniform price. The location adjustment of the PPD also stimulates the production of fluid milk in counties further from the market. The MMOs have an effect that production is stimulated nation wide; however farmers that have a lower cost of production are able to overcome periods of low market prices. The trend of milk production shifting to states where a lower cost for production is achieved, such as Texas and California, is however prominent (Gould, 2010; Blayney, 2002). In Germany a similar trend is observable, with a shift of share of the national production to the Northern States, made possible by the two region auction of quota.

In the processing sector structural changes also took place. In both countries the number of processing plants declined as well as the number of dairies while the plant size increased. In Germany, the average plant size is larger than in the U.S. In recent years an increase of the number of plants in the U.S. is observed. This can be explained due to an increase in demand, especially for cheese products. Cooperatives play in both countries an important role in the procurement of raw milk. Coops procure more than 70% of the market, though process less then 50%. This indicates the role of cooperatives in the market as bargaining cooperatives. In the U.S. the processing role of coops is of relative less importance as the amount of milk processed by coops is 38% of the total milk marketed by them in 2002. Plants are clustered in regions with a high production traditionally (Bayern, Wisconsin). A shift of plants to regions where milk production is becoming important is observable, especially in the case of Texas. In Germany the main

players on the market invest in plants in East Germany, an area with a lower density of plants (Friedrich, 2010).

In an article of the International Dairy Foods Association[10] (2011) the position of the dairy industry towards future prospects is described. The main focus of the dairy industry until now was on the domestic market providing commodities such as non-fat dry milk, butter and cheddar cheese. This was stimulated by government due to the Dairy Product Price Support Program. With the reduction of the intervention prices and a rise of the world market price, international markets are accessible for the U.S. dairy industry. The importance of trade increases. Also the market gets more and more consumer oriented. The dairy industry develops new products oriented on consumer demand. The development of new products is not stimulated by government as support was only given to commodities. The Federal Milk Marketing Orders are regarded as out of date as they provide minimum prices based on calculations with the prices for commodities. The German dairy industry developed similarly. Compared with other European players investment in innovation to create new products fell behind. Though, in the period 2003-2008 Nordmilch, one of Germany's leading dairy cooperatives, invested EUR400 million in restructuring the company to be more oriented on high value added products (Nordmilch, 2011a). With a reduction of the dairy market supporting measures, dairy companies adapt to new demand markets, i.e. consumer preference driven and international markets

[10] The International Dairy Foods Association represents the U.S. dairy manufacturing and marketing industries and their suppliers.

instead of the demand of government. The dairy industry seems to have taken the challenge and restructure in both countries. On the farmers side though, the U.S. farmers are far ahead of German farmers to produce at low cost.

4 Cooperatives on the Dairy Market

The cooperative structure of dairies is important as many dairies seem to be organized into a cooperative. 60-70% of all German milk is purchased by dairy coops (Schlecht and Spiller, 2009), in U.S. 83% of farmers milk was marketed through dairy cooperatives in 1991 (Jacobsen and Cropp, 1995), in 2007 this share increased to even 86% (International Dairy Foods Association, 2011). In Appendix 1, a list of the top 20 dairy companies in Germany and the U.S., according to processing quantity and product sales respectively, is presented. In Germany 10 dairies listed are coops, in the U.S. 7 are. However it must be noticed that the sales accounted for do not include the trade of raw milk from one dairy to another. This results in lower sales for bargaining cooperatives like Dairy Farmers of America that markets approximately one third of the U.S. milk production. The leading processor in Germany is the cooperative Nordmilch, in U.S. the publically traded company Dean Foods is the number one. The stronger competition on the market forces cooperatives to adapt in order to stay competitive. The organizational structure of the cooperatives is changing, which makes them able to adapt to new strategies. In this section only cooperatives are discussed as they are the major procurers of farm milk in both countries.

4.1 Changing Reasons to Cooperate

There is a vast literature available on cooperative transformation. The main idea of cooperative transformation is to adapt to market changes. Cooperatives need to adapt their strategies and organization in order to eradicate the traditional

cooperative problems[11] also called the cooperative baggage. Cook developed a dynamic theory of cooperative transformation in which he provides five stages of transformation (Cook, 1995). In this theory Cook shows how a cooperative adapts due to changing market conditions. He argues that a cooperative is founded to deal with low prices and market failures[12]. As the economic environment changes cooperatives have three options at the end of the ride, i.e. turn into an IOF, continue, or transform into a value added marketing cooperative also called New Generation Cooperative. Cook and Iliopoulos develop five characteristics of the New Type Cooperative. These characteristics are implemented to reduce the effect of the traditional cooperative baggage. The characteristics are; transferable equity shares, appreciable equity shares, defined membership, legally binding delivery contracts and minimum up-front equity investment requirement (Cook and Iliopoulos, 1999).

Cooperatives were originally founded for five reasons according to van Dijk:

- Create market power to countervail monopoly power of IOF.
- Get access to industrial input factors (goods and services). Important is the access to credit at favorable interest rates because this is a highly influential factor in the development of agriculture. In the case of dairy

[11] A summary of the classical cooperative problems is provided in Appendix 3.
[12] Market failures are present because of three reasons according to Bijman and Hendrikse (2003); asymmetric market power between processor and farmer, incomplete and asymmetric information between the processor and farmer and investment related transaction costs in the processor-farmer relationship (risk of being held up by the processor is high when the product traded is perishable and the sunk costs are relatively high compared with the total costs).

farmers, milk testing and animal feed are examples of services and goods provided.

- Efficiency by economics of scale (bulk goods). Accumulation of supply generates accumulation of demand that results in more competition.
- Risk management. The risk to be cheated on the market is lower when the co-operative deals with the farmer's products. This is because there is solidarity between the members of the cooperative and there is trust in the cooperative to obtain a fair price. This results in less risk and makes investment decisions easier.
- Improvement of members' income and rural economy. The common mechanism to improve income is to implement supply control by the cooperative.

(Nilsson et al., 1997)

Due to the changing market environment in the last years, the five classical reasons to create a cooperative transformed.

The first reason of obtaining countervailing market power changed by the concept of the cooperative as an interface between the complex, specialized and globalized food industries and the regional farms. Coops have to compete on this market where competition is strong. They are part of the vertical chain with high market power downstream. Coops are not suppliers of the local market anymore; instead they are players in this dairy marketing chain.

The second reason is transformed also due to the operation of highly sophisticated input providers. Dairy coops provide farmers with services that have regional specificity. In that way cooperatives are more regional bounded than IOF. The new characteristic of the second reason is the provision of a well working network between members and the cooperative to provide the efficient service of management to farmers.

The new element to the third reason is the system integrated production since the demand of consumers changed to products that offer variety, quality and convenience at low cost. To implement the expensive and complicated technologies at farm level to provide these new products, the cooperative plays a new role.

The changing market conditions have changed the risk profiles of cooperatives and their members. There are high risks involved with the expansion of the cooperatives. Expansion realized by vertical integration and the creation of value added products and by geographical market share. On the other hand it reduces also the risks since value added products have a higher margin and benefits are more secure. To manage risk new structures are set up within the cooperatives.

In the dairy sector the fifth reason keeps on playing an important role. In the U.S. the Cooperatives Working Together (CWT) deals with supply control. When the prices on the market are too low, CWT buys cows of farmers according to bids and slaughters them in order to adjust supply and induce an increase of the price (see Appendix 2). In Germany however, the improvement of income through dairy coops is of limited effect. Associations like Deutsche Milchviehhalter

Verband and on European level the European Milk Board, try to represent farmers through unifying the voice of dairy farmers towards the policy makers. The leading milk cooperatives in Germany have as strategy to improve farmers' income through becoming an important player on the market, which can raise some concerns thinking about the first transformed reason.

The transformation of the five classical reasons to cooperate gave rise to the description of the sixth reason to cooperate by van Dijk.

The sixth reason to set up a cooperative involves the need for new member strategies as a consequence of the transformation of the five historical reasons. It involves the necessity of creating new market opportunities under the conditions of investor-driven membership, diversified membership and market fragmentation (Nilsson and van Dijk, 1997). These new market opportunities must be created so members of the cooperative have the opportunity to add value to products with the use of their production factors. In essence, the sixth reason is the combination of all five historical reasons but in a state of flux. That is because the market situations nowadays are not static or slowly changing but also constantly changing. Constant adaptation and innovation is thus required and the cooperative function is to guide farmers in this process.

4.2 Cooperative Strategies

Three strategies are adopted by cooperatives according to Nilsson and Ohlsson (2007) as a consequence of the changing market conditions.

Differentiation strategy:

Due to changing market conditions, such as growing competition due to the liberalization of agricultural markets, increasing retail power and changing consumer preferences (increasing diversification of demand) cooperatives change their market strategies.

A first reaction of cooperative governances is the so called differentiation strategy (Porter, 1998). Using this strategy, competition is avoided by offering different products than their competitors. Cooperatives provide the consumers with what they demand instead of just marketing what their producers supply. This strategy demands investment in research and development and advertisement. Investing in member farmers to supply milk with a certain quality (characteristics, like omega-3 containing milk) and quantity can also result in offering a value added product. To obtain heterogeneity in milk supply, a differential treatment of members may be required. This implies a gradual shift in the power balance from the membership to the management (Nilsson and Ohlsson, 2007). Differential treatment of members results in a more complex governance which in turn makes it harder for member farmers to control or direct management (Nilsson and Ohlsson, 2007).

Also due to the high investment requirement to differentiate the products produced by the coop, governance problems and capital problems can occur. Collective investment by members is undesired as some members are unsure to benefit their investment. Also with large investments trust in the management is important as they have control over the decision in which projects will be invested.

In order to meet this need for capital, cooperatives that follow the differentiation strategy change their organizational structure to a more entrepreneurial form. External financers are invited as co-owners, either in the cooperative itself or in some subsidiaries which are devoted to far-reaching processing. Financial instruments are implemented in order to make members' investment voluntary and with an ownership entitlement for the appropriate capital returns. This induces also a higher level of control on the management as the investors are keen to know that their capital is wisely used.

Focus strategy:

The focus strategy entails the concentration of the production of a product that is different of the product of competitors. By using this strategy a coop tries to target a specific market so they can dominate this market segment. This strategy is also capital intensive though less than the differentiation strategy as the product range is narrower and the market segments fewer. The farmers have individual ownership to their money and have strong control over the cooperative. They accept supply and quality rules put on by the cooperative and are willing to make large investments in the coop.

Overall cost leadership strategy:

This is the strategy followed by traditional coops. By being cost effective and reaping the economies of scale, the coop competes on the market of undifferentiated dairy products like whole milk, butter and cheese. This strategy

needs access to the possibility to enlarge the milk volume processed. In order to obtain that there is open membership, delivery rights, per member votes and other traditional coop principles. The collectively owned equity capital is used to make new investments and to pay out members a higher price. This gives members an incentive to produce more as it also attracts new members which results in a higher volume processed by the coop. Equal rights for all members is also appealing for member candidates.

4.3 Cooperative Organization

Organizational theorists have found that an organization's structure is linked to its strategy (Miles et al., 1978). Also writers on cooperative organization say that cooperatives tend to follow different organizational principles depending on their market conditions (Nilsson, 2001). Changing market conditions through to the deregulation of the dairy market induces a change in the organizational structure of the dairy cooperatives (Nilsson and Ohlsson, 2007).

Cooperatives have undergone a transformation over time. They used to have all more or less the same structure with characteristics as collectively financing, collectively governing and equal treatment of the members. This gave rise to several problems a cooperative had to deal with in order to be competitive on the market. To keep up with the competition level induced by IOFs, the cooperatives modified their organizational form. Today, agricultural coops have external equity capital, financial instruments which allow members to invest voluntarily, closed

membership. Also cooperatives evolve to have a differential treatment of their member-farmers (Nilsson and Ohlsson, 2007).

Due to these transformations, classifications are made for cooperatives. Nilsson and Ohlsson (2007) divide cooperatives in two main groups: traditional coops and entrepreneurial coops. The differences between them are based on the degree of collectivism versus the degree of individualism in various dimensions as in financial, governance and transactional dimensions.

According to van Bekkum and van Dijk (1997), Nilsson and Ohlsson (2007) show how these three dimensions can be expressed. In Table 4-1 an overview is given.

Table 4-1: Collective vs. individualized attributes according to cooperative organizational structures.

	Collective structure	Individualized structure
Investments		
Financial entry conditions	Free and costless entry.	Closed membership or subject to members' ownership of production rights.
Financial instruments	Collective reserves without any individual rights, risks, obligations or benefits; member loans with no or limited interests.	General reserves (minor); member loans; capital accounts; voluntary, long-term, tradable, non-voting, risk-bearing and high-interest-bearing bonds or subordinated member loans; etc.
Distribution of residual surpluses	Addition to reserves (major), price supplements.	Addition to reserves (minor); dividend payment on production right basis.
Nature of the right to residual claims	Held by the membership as a collective; permanent; non-tradable.	Held by individual members; permanent but the attachment to transactions restricts duration of individual ownership; voting; tradable within the membership and hence appreciable.
Governance		
Voting rule	One member, one vote.	Proportional to production rights.
Decision making rights and monitoring	Decision management and decision control in the hands of the Board of Directors.	Separation of residual risk-bearing (members individually) from decision management, with decision control delegated to the Board of Directors.
Transactions		
Pricing policy	Uniform pricing for all members, with some minimum criteria.	Differentiated pricing in terms of volume and quality to reflect handling costs and market returns.
Supply management	Unrestricted deliveries. Intake obligation from members. No significant entry barriers for non-members.	Delivery volumes are dependent on marketing needs, through obligatory purchase of production rights tradable among members. Some raw materials may be purchased from non-members as market opportunities call for.

Source: Nilsson and Ohlsson, 2007.

The change in organizational structure makes the adaptation of different strategies possible. A relationship between organizational structure and strategy is given in Table 4-2.

Table 4-2: Connections between the organizational models and the strategies of agricultural cooperatives.

Main strategy (Porter 1983)	Traditional cooperative	Entrepreneurial cooperative with external co-owners	Entrepreneurial cooperative with closed membership
Overall cost leadership	*Good prospects because of large volume (economies of scale) and limited need for investments as well as simple and easily controllable operations*	Investors would hesitate to accept volume maximization as a goal as the profits become too small	The cooperative's volume is not sufficient to gain competitiveness
Differentiation	Governance problems and capital problems may occur	*Good prospects for a differentiation strategy because of access to capital and involved owners*	The cooperatives has not sufficient capital to act on large markets
Focus	Governance problems and capital problems may occur	A focus strategy is appropriate but only for a minor part of the cooperative's business operation(s)	*Good prospects due to involved owners, while the limited access to capital is acceptable due to small volume and specified market*

Source: Nilsson and Ohlsson, 2007.

The division made in this table is not binding, different strategies and the different organizational models can be combined. Many successful traditional coops apply a differentiation strategy. This is so because other factors can explain the success of a certain organizational coop with a specific market strategy. The factors can pertain to the capital problem, for example the assets used in non-core business

activities can increase in value so capital is available to invest in core business activities and another reason can be that the coop is so dominant at a specific market that it enjoys success even though it does not fit in a box in Table 4-2. Other factors can reduce the governance problems, for example the members can be satisfied with a specific cooperative model and also the managers of the coop can be very skilled and motivated so to reduce the necessity of control by the members. A last factor is the characteristics of its members. If the members are not competitive on the market so thus cannot produce at low cost, the coop cannot be competitive as well (Nilsson and Ohlsson, 2007).

The sixth reason of cooperation as described above is adopted by Entrepreneurial Cooperatives or also called New Generation Cooperatives. They have two characteristics. The first is that their major focus is on value added processing. With doing this they are more focused on the consumer and they try to get higher margins. The other characteristic is to step away from open membership. Tradable and appreciable shares are established and they are linked with delivery rights. Democracy is maintained as much as possible. The cooperative gets more profit oriented, and these profits are distributed on the basis of share capital.

Confronted with this sixth reason, cooperatives evolve in two ways. They convert into an IOF or the cooperative memberships are strengthened. Strengthening of the memberships occurs especially in situations were the dependency of members and the cooperative is high. An increased dependency results out of more risk in the market. With a decrease in protectionism with as result a more fluctuating

price, the dependency of farmers and dairies increases, farmers are more dependent on a stable price and dairies are more dependent on a stable supply.

4.4 Three Prominent Strategies among Large Cooperatives

Three prominent strategies can be observed comparing the strategies of the large cooperatives in the U.S. and Germany, which are the focus on production of value added products, merging and internationalization.

The focus on value added products is a differentiation strategy as well as a focus strategy. Mergers and joint ventures made it possible for some major players to exist on the market. They are of importance as they are geographically strong on the market and have a large share of the market. Internationalization is another strategy adapted more recently. With the expansion of the European Union, West European dairies invest in East European countries. With rising income for people in Asian countries, foreign direct investments by western dairies are seen as a good strategy. Both these strategies can be seen as overall cost leadership strategies. Internationalization is also a differentiating strategy, not in the sense of product differentiation, but market differentiation. By investing in a foreign market the dairy can reduce the risk it incurs by dealing with an unfavorable exchange rate and the risk of natural hazards is also reduced.

These three strategies are of increasing importance due to the reduction of protectionist policies which increases international competition. By applying these strategies the dairy cooperative strengthens its position and presence on the market.

4.4.1 Value Added Products

Cooperatives are traditionally processing their milk in commodities as government was providing a base price for these products. However, as this support price is decreasing due to changes in policy (ref. Chapter 2: Dairy Policy), the cooperatives see the opportunity in the production of value added products. Creating value to products demands investment in research and development. Also investment in advertisement is important as the generated value has to be promoted in order to be able to ask a higher price for the product. This strategy is thus capital intensive and highly consumer oriented.

4.4.2 Mergers and Joint Ventures

Mergers between processors on the dairy market have been an important strategy to increase market power. Two reasons for mergers are observed; to create countervailing bargaining power for the concentrated retail sector downstream and to lower cost of production (increase efficiency) to compete with rivals. For the U.S. dairy processors, the major strategy to grow is through mergers and acquisitions. Additional capacity and volume were usually available at lower cost by acquisition than by building new capacity and competing for sales (Manchester and Blayney, 1997).

Also Germany knew a wave of mergers by dairy processors (Tozanli, 1998). One of the latest mergers announced on the German market is one between the Danish cooperative Arla Foods and the North German cooperative Hansa-Milch Mecklenburg-Holstein eG in early 2011. The new entity will be called Hansa Arla Milch eG (Arla Foods, 2011).

Mergers and acquisition of production facilities have been followed up by government, i.e. by the Department of Justice in the U.S. and by the Bundeskartellamt in Germany. Also the European Commission is investigating mergers as some have a transnational impact. In Appendix 4 the investigation of the EC on the merger between Friesland Foods and Campina is discussed. The method applied to define the relevant markets is of major importance to evaluate the effects of mergers. In 2003 a hearing before the Committee on the Judiciary United States Senate took place regarding monopsony issues in agriculture in the U.S. (U.S. Senate, Committee on the Judiciary, 2003). A deeper discussion on monopsony power and competition is provided in Chapter 5.

Joint ventures are also a way to increase market power by unifying resources. However it is also a tool to reduce the companies risk and transfer it to the partner. A joint venture between two dairies can be an agreement to use the facilities of a coop by the other dairy but also the obligation to use the coops' members' milk in these facilities. In that way the coop reduces its risk of marketing and processing the milk and the other dairy can enlarge its market share towards the retail sector. The agreement between DFA and Dean to provide all fluid milk by DFA to Dean's plants and merging the sales departments of Nordmilch and Humana are examples of joint ventures.

4.4.3 Internationalization

Buccola et al. (2001) mentioned three reasons for agricultural cooperatives to internationalize, i.e. increasing the firm's market share, enhancing average sale price and reducing or diversifying risk. The major problem for agricultural cooperatives to internationalize is the capital problem (Donoso, 2002).

In a study by Ebneth and Theuvsen (2005), internationalization of dairy cooperatives in Europe is investigated. They assess the degree of internationalization by using the Foreign Sales Index and the Network Spread Index as also a balance sheet analysis. By analyzing the balance sheets, Ebneth and Theuvsen get information about the economic health of the company and the capital structure. Financial resources are very important in the course of planning and implementing internationalization strategies.

Under internationalization Ebneth and Theuvsen understand the process by which an economy, industry or company becomes increasingly integrated into international economic activities. The degree of internationalization measures to what extent this economic integration has taken place. To determine the degree of internationalization, activities on foreign markets are compared to home-market or worldwide activities (Germann, Rurüp, and Setzer, 1996).

The measures used in the paper are defined as follows:

-Degree of Internationalization: DoI = (FSi + NSi)/2, with:

Foreign Sales Index (FSi): Ratio of foreign sales (exports and subsidiaries) to total sales.

Network Spread Index (NSi) with n* = 191 (United Nations, United Nations Conference on Trade and Development, 2004): NSi = n/n* = n/191 (the ratio of the number of countries in which the enterprise maintains subsidiaries divided by the total number of countries that received direct investments in 2003).

By adding the NSi in the formula for DoI, the measure tells us more than just the amount of foreign sales as most companies in the beginning phase of internationalization only have exports contributing to foreign sales. By adding the NSi to the formula, the effect of subsidiaries, which involves longer term and more stable internationalization, is counted in.

-Determining Corporate Success:

This is done by a balance sheet analysis with the focus on some financial ratios to have insight in the liquidity (equity ratio, net debt to equity ratio, fixed assets per tonne milk processed) and profitability (return on equity, return on assets, net profit ratio, and added value index).

The results of the investigation for several European dairy coops are that the three largest coops are also the most internationalized ones. At the time of the

investigation Friesland Foods and Campina were not merged yet, resulting in the following European top three:

Friesland Foods (40%), Campina (40%) and Arla Foods (36%). The German dairy coops have a very limited degree of internationalization due to a low NSi. The DoI consist mostly out of exports. Nordmilch and Humana had no subsidiaries in 2005 compared with Arla Foods and Friesland that had more than 20. Figure 4-1 shows the Degree of Internationalization for several European dairy coops.

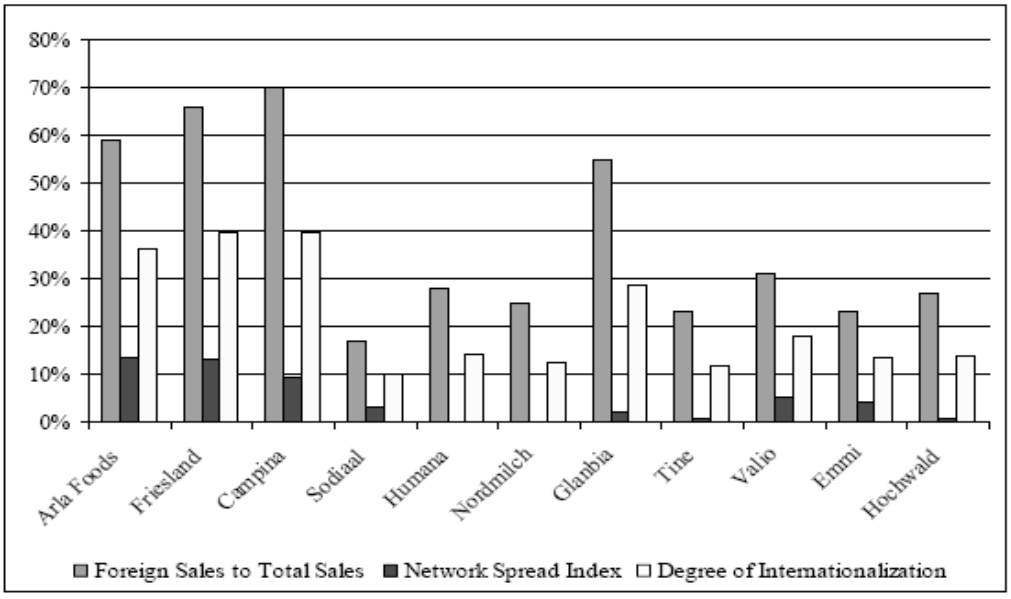

Figure 4-1: Degree of internationalization of several European dairy coops.

Source: Ebneth and Theuvsen, 2005.

The balance sheet analysis showed several characteristics of the German dairy coop. The fixed assets to tonnes of milk processed are relatively low for German coops. This could be explained by low investment in new assets and the use of

depreciated facilities. This low intensity of investments leads to a backlog demand of future investments. Looking at the turnover per kg milk processed Nordmilch as well as Hochwald have a relatively small ratio. This is caused by the fact that German dairy coops usually focus on standardized low-cost and low-price mass market products like milk, milk powder and butter. A coop like FrieslandCampina (in 2005 Friesland Foods and Campina) has a diversified product range with higher value added resulting in a higher turnover per kg milk processed. The profitability ratios for Friesland and Campina show above average performance while these ratios for Nordmilch and Hochwald show relatively low performance.

We can conclude that German cooperatives are less internationalized and less successful financially. The competitive position of German coops is relatively weak compared to many European competitors. A relative large number of dairies results in a high competition level compared with the situation in the Netherlands, where Friesland Foods and Campina had a combined market share of 70 to 80% in 2008 (de la Mano et al., 2009). Strong price competition and a highly concentrated retail sector results in low margins. Another reason why German dairy coops perform worse is because they focus on processing low-cost and low-price market articles instead of brands for which the margins are higher. The low performance of the German coops gives rise to a lack of financial resources to establish international business activities. Dutch and Danish dairies are confronted with a small home market. Specialization result in various value added products. The degree of specialization is mainly determined by the size of the

market (Stigler, 1951). In order to be cost effective, dairy coops with small home markets are obliged to internationalize. However, this does not explain totally why German dairy coops do not internationalize. It is often argued that perishable products like milk have a low possibility to be traded on the world market. But exports are only a part of the internationalization. Founding subsidiaries is another and an even more stable and intensive[13] way of internationalization. This results in worldwide competition among dairies. Some authors expect that at the end of the consolidation process in the dairy sector only 10 to 20 companies will have survived (Krijger, 2004). Some characteristics of the governance of German coops could contribute to the low degree of internationalization. As seen in the low assets to tonnes milk processed an investment problem could be the reason (Appendix 1). This due to ill-defined property rights which results in free riding and also none or low tradable property rights. When property rights are ill-defined the incentive to invest in the coop is reduced which results in no financial resources to internationalize. When property rights are hard to trade, members who are not economically connected anymore, for example retired farmers, hold their property rights. These members are less interested in long-term returns, as for example the investment that internationalization generates. Further the transaction cost problem and the control problem could explain a delay of response to a changing market environment on the European dairy market. The

[13] For example, a subsidiary of Friesland Foods, Friesland Romania, entered the Romanian market in 2000. Three years later the company purchased milk from approx. 40,000 small farmers through 1,050 collection points and from approx. 600 larger farmers. Five factories processed the milk. Friesland Romania owns the collection points and upgraded them with cooling and inspection facilities (Dries et al, 2009).

delay could be reinforced by the human resource problem which involves people on decision making positions with low managerial know-how.

To address these problems coops like Campina, Arla Foods and Friesland Foods changed their governmental structure and transformed to holding companies by outsourcing their daily business activities to a professional management team (see Structure FrieslandCampina, Appendix 5).

Internationalization through the establishment of subsidiaries abroad can reduce also the effect of currency appreciation to total turnover. If the euro is appreciated, export volumes drop resulting in a lower turnover and higher stocks on the local market. This leads again to a higher supply so lower domestic prices. However if a company decides to invest abroad in local milk production and consumption, then this part of the companies activities is not harmed by an appreciated euro, it can even benefit from it.

The German dairy coops have, due to an inefficient organizational structure which leads to low flexibility to adapt to the changing market situation and high competition in the home market, a worse position on the international market in comparison with their European competitors. It must be noted that they are catching up, by changing their organizational structure and investing in the strategies as described before (see Appendix 5/Nordmilch).

International trade has been historically of less importance for U.S. processors (U.S. Department of Agriculture, 2011c). The main export country for SMP is Mexico. In 2006 exports of the United States accounted 3.4% of the production with a total value of 2.8 million tonnes milk equivalent (UN, Food and Agriculture Organization, 2008). For the EU this was 9.1 million tonnes, which is a share of 6.2% of total production in 2006 (UN, Food and Agriculture Organization, 2008). The domestic market of the U.S. is big which reduces the desire to internationalize. None of the U.S. cooperatives have plants abroad which implies that direct investments in foreign markets is very limited (Dairy Foods, 2010). Dean Foods, a public traded company, has five international plants located in Belgium, the Netherlands, United Kingdom and France. Fonterra and European dairies dominate the world market for export (Blayney and Gehlhar, 2005). The U.S. dairy market is seen as an opportunity for EU dairies and Fonterra. These dairies made already considerable direct investments in the U.S. (Blayney and Gehlhar, 2005 & Dairy Foods, 2010). However with rising global prices it has been expected that U.S. dairies will play a more important role on the international market (Blayney and Gehlhar, 2005). In a study of the Innovation Center for U.S. Dairy, a strategic analysis of the global dairy landscape was provided with focus on the challenges, opportunities and threats posed by increasing globalization to the U.S. dairy industry (Innovation Center for U.S. Dairy, 2009). They concluded that a dairy firm should transform from a "Fortress USA" firm to a "Consistent Exporter". This involves looking at the global opportunities for U.S. milk supply, broad efforts to improve commercial focus

and align product portfolio, collective effort to reform the marketing orders and price support program, efforts to improve forward contracts and futures markets (see Chapter 6), strong domestic market as a basis for global trade and joint industry efforts to build insight and capabilities. A change of the policies that temper the activities of the dairies internationally and domestically by preventing a consumer oriented approach is seen as an important step to stimulate the adaptation of new strategies. To achieve the strategy of being a "Consistent Exporter" the Innovation Center recommended seven programs. These are listed according to priority of execution:

- Reform of the regulated milk pricing systems and the price support mechanisms

-Development of better mechanisms for risk management and reduction of volatility

-Continued pursuit of trade treaties that provide net export benefits

-Analysis and prospective redirection of industry's global, pre-competitive sales and marketing investments and capabilities

-Build on existing food safety assurances and traceability as a competitive strength

-Develop better ability to meet customer product specification requirements globally

-Encourage increased product and technology innovation

(Innovation Center for U.S. Dairy, 2009)

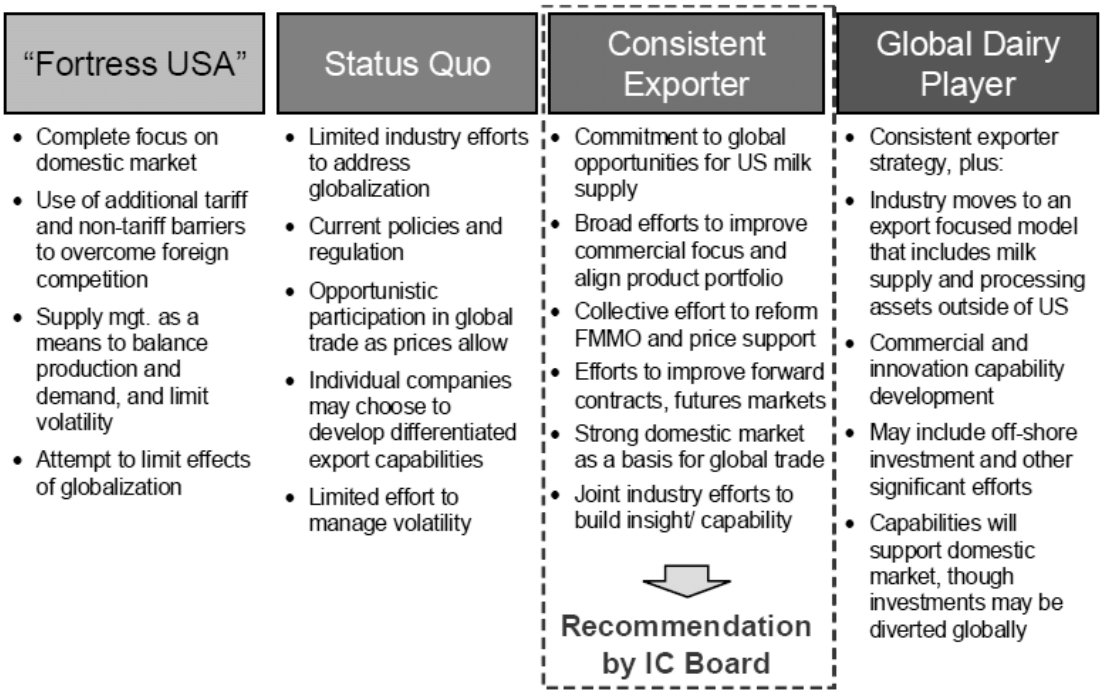

Figure 4-2: Evolution from Fortress USA towards a Consistent Exporter by the U.S. dairy Industry.

Source: Innovation Center U.S. Dairy, 2009.

4.5 4 Examples of Cooperative Organization and Strategy

In this section 4 dairy cooperatives will be discussed. FrieslandCampina and Nordmilch as they are important players on the German market (Appendix 1), Dairy Farmers of America as it is an important player on the U.S. market (Appendix 1) and the New Zealand coop Fonterra will also be discussed as it is a good example of cooperative structure and strategy in a liberalized dairy market.

For a detailed look at the discussed cooperatives' organizational structure and strategies, see Appendix 5.

In Table 4-3 characteristics of the cooperatives' organization is given and also the strategies they implement.

Table 4-3: Examples of coops' organizational structure and strategies.

	FrieslandCampina	Fonterra	Dairy Farmers of America	Nordmilch
Investments				
Financial entry conditions	members must invest to receive delivery rights: 4,00EUR/100kg	member must invest to receive delivery rights	member must invest to receive delivery rights: 1,75$/cwt	members must invest to receive delivery rights: 4,00EUR/100kg
Financial instruments	issuing bonds to members/retained earnings/Equity gain through entry fee/member loans	tradable and appreciable shares/retained earnings	retained earnings/ Equity gain through entry fee	equity gain through entry fee
Distribution of residual surpluses	75% is retained/ 25% is distributed to farmers.	small part is retained for reinvestment/appreciation of shares	71% is retained in the form of member equity accounts/ 29% is paid cash	paid out to farmers

Table 4-3: Examples of coops' organizational structure and strategies

(Continued).

Nature of the right to residual claims	based on quantity delivered	Individual right based on ownership of the share/ based on quantity delivered	based on quantity delivered	based on quantity delivered
Governance				
Voting rule	one member one vote/proportional to production areas	Proportional to production of member	one member one vote/proportional to production areas	one member one vote
Decision making rights and monitoring	Executive Board under supervision of the coop Board of Directors/ coop Board of Directors	Coop Board of Directors under supervision of Shareholders' Council	Board of Directors under supervision of member delegates	Management Team under supervision of Supervisory Board Nordmilch eG.
Transactions				
Pricing policy	Uniform Pricing/extra for quality	Uniform Pricing	Uniform pricing	Uniform Pricing
Supply management	unrestricted delivery (though restricted by individual farmer's quota + delivery rights)	Delivery based on shares that are tradable amongst members	unrestricted delivery (though restricted by delivery rights)	unrestricted delivery (though restricted by individual farmer's quota + delivery rights)
Strategy applied				
Differentiation	Highly	Limited	Limited	Limited
Focus	Medium	Limited	Limited	Limited

Cost Leadership Strategy	Highly	Highly	Highly	Highly
Internationalization	Highly	Highly	Limited	Limited
Merger	Highly	Highly	Highly	Highly

Source: Based on collected data as presented in Appendix 5.

These leading dairy cooperatives adapted their organizational structure from a collective one to a more individualized one. In order to raise capital, all dairies applied the requirement of an initial investment in the cooperative in order to join it. In the case of Fonterra, these are shares that are tradable amongst member-farmers. FrieslandCampina has a variety of investment possibilities for farmers. Instead of paying farmers the profits in cash, the coop is issuing bonds to members that are tradable. The major gain of capital for Fonterra comes from issuing shares (Fonterra, 2010). Residual claims are based on the quantity delivered for members of FrieslandCampina and paid through bonds. Members of Nordmilch are entitled to residual claims also based on the quantity delivered and through a guaranteed interest on the capital invested in delivery rights. Members of Fonterra are paid through appreciation of the shares and for DFA they are paid cash based on the quantity delivered.

FrieslandCampina and Fonterra have a highly individualized member investment scheme. FrieslandCampina present different financial instruments to its members while Fonterra provides farmers with tradable shares. The effect is capital availability which makes the adaptation of differentiation strategies, internationalization strategies, mergers and acquisitions possible.

The structure of governance is mixed between a collective structure and an individualized structure. Member involvement is a very important issue for cooperatives. Fonterra has a very individualized voting rule. According to a private firm, a farmer has a weight in the voting according to its shares. FrieslandCampina and DFA both adopted an intermediate voting rule. Every farmer has one vote, but according to the production in the region the number of delegates is determined. Nordmilch applies the one man-one vote principle. The cooperative Board of Directors is in all cooperatives the decision taker when investments or mergers are discussed. The day to day business decisions are taken by CEOs. These CEOs are not elected by the members for the case of Nordmilch, FrieslandCampina and DFA. The CEOs are the head of a private company, 100% owned by the cooperative. For the case of Fonterra, however, the cooperative Board of Directors is accompanied by three experts to run the day to day businesses. The cooperative Board of Directors is watching if the interests of member farmers are guaranteed. This organizational hierarchy makes decision making easier and quicker, however the decision making is happening far from member-farmers' control. Investing in foreign markets would maybe not be approved by members as they would prefer the capital to be invested in their region. By reducing the governance problem through limiting the involvement of members in the decision making process enables coops to make foreign direct investments.

The pricing policy is for every dairy uniform pricing. Additional payments may exist for additional quality. FrieslandCampina pays a higher price for milk

containing omega 3. In that way, FrieslandCampina tried to apply the focus strategy by creating/supplying a niche market. Unrestricted deliveries are still a core characteristic of dairy cooperatives. FrieslandCampina announced that even after the abolishment of the quota system it will procure all the milk the member-farmers produce. However we see that Fonterra applied restricted delivery rights. A farmer needs to purchase extra shares if extra milk wants to be delivered. By issuing delivery rights, large cooperatives are able to gather capital in line with milk deliveries.

We see that the leading dairy cooperatives already adapted to the changing market conditions. These New Generation Cooperatives or Entrepreneurial Cooperatives seem to be able to deal with global competition through effective capital gathering and efficient governance.

4.6 How do Changing Cooperative Strategies change Farmer-Coop Relationship?

The International Cooperative Alliance defines a cooperative as an *"autonomous association of persons united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly owned and democratically controlled enterprise"* (International Cooperative Alliance, 2010).

The dairy sector is determined by a stationary downstream flow. Cooperative organizations form a specific relation between supplier and costumer. In order to be able to offer a "fair" price to suppliers the coop has to be efficient and competitive in their downstream markets. However with the recent market

deregulations in the EU and the U.S., the economic environment is somewhat destabilized, which in turn affects the supplier-coop relationship. Members become more heterogeneous due to the nationalization and internationalization of coops which results in members with a different cultural background and a different structure of production (ref. Chapter 3). The members have also more individualistic goals, which increase the difficulty for collective action (Hovelaque, Duvaleix-Tréguer, and Cordier, 2008). Member heterogeneity gives rise to classical cooperative problems as the investment problem, control problem, influence problem, etc. In order to address these problems dairy cooperatives change their structure more and more into entrepreneurial cooperatives with a management board existing out of experienced business men who run the day to day activities of the cooperative.

Normark (1996) states that proposal of strategic changes are often evaluated from the viewpoint of effectiveness within the cooperative, without paying much attention to the member-perspective. This can give rise to a negative relationship between the cooperative and members. Several studies investigated loyalty of farmers towards their dairy. Zeuli andd Betancor (2005) found that 27% of dairy farmers in Wisconsin switched dairies in the period 1997-2001. By means of a survey among the suppliers of a dairy in Southern Germany, Schulze, Wocken, and Spiller (2008) found that only approx. 18% of the dairy's supply was not threatened. Important factors for farmers' loyalty were commitment and trust towards their dairy. Commitment was strongly effected by the switching cost to

another dairy, by extension and communication, and satisfaction as also price satisfaction; trust was strongly influenced by communication and extension, and satisfaction. Some previous examples of farmers' disloyalty towards their dairy were observed when 500 out of 2,100 milk suppliers of the German subsidiary of the Dutch dairy coop Campina switched dairy. An other example is Nordmilch, it is reported that in 2006 alone, 1,200 suppliers of the approx. 10,000 suppliers from which Nordmilch procures raw milk, switched to an other dairy (Schulze, Wocken, and Spiller, 2008). However Zeuli and Betancor (2005) concluded in their study that members of dairy cooperatives are less likely to switch dairies. The affiliation to cooperative ideology or the larger switching cost (taking the horizon argument into account) could explain loyalty of farmers to their cooperative.

In 't Veld (1996) stated that values should not be isolated from a cooperative business as they are the foundations of the cooperative form. Fulton elaborates on the importance of cooperative ideology and member commitment (Fulton, 1999). He states that member commitment is a necessary factor for coops to exist (next to the presence of market failure) and additionally to have a strong performance on the market. Member commitment results from an additional value the coop offers its members. This valuable factor can be that the members have an opportunity to invest further down the supply chain, that they have a voice further down the supply chain or the expression of cooperative ideology. Cooperative ideology is defined by Fulton as a preference for certain types of outcomes.

Cooperative formation historically was in a context broader than the economic motivation of achieving a higher price. It was about the larger economic, political and social environment of which farmers were part. Cooperative ideology however is subject to changes over time. The role of ideology in today's economic environment in the dairy sector can be found in the general focus of the society towards sustainability. Grassroots movements like farmers markets have increasing attention of producers and consumers and are supported by this sustainability ideology. Biological dairy products can be seen within this context and are widely produced in Germany.

The importance of member commitment is modeled by Fulton using a variation of Hotelling's spatial model. The market is a duopoly market with a coop and an IOF. Figure 4-3 shows the commitment model by Fulton.

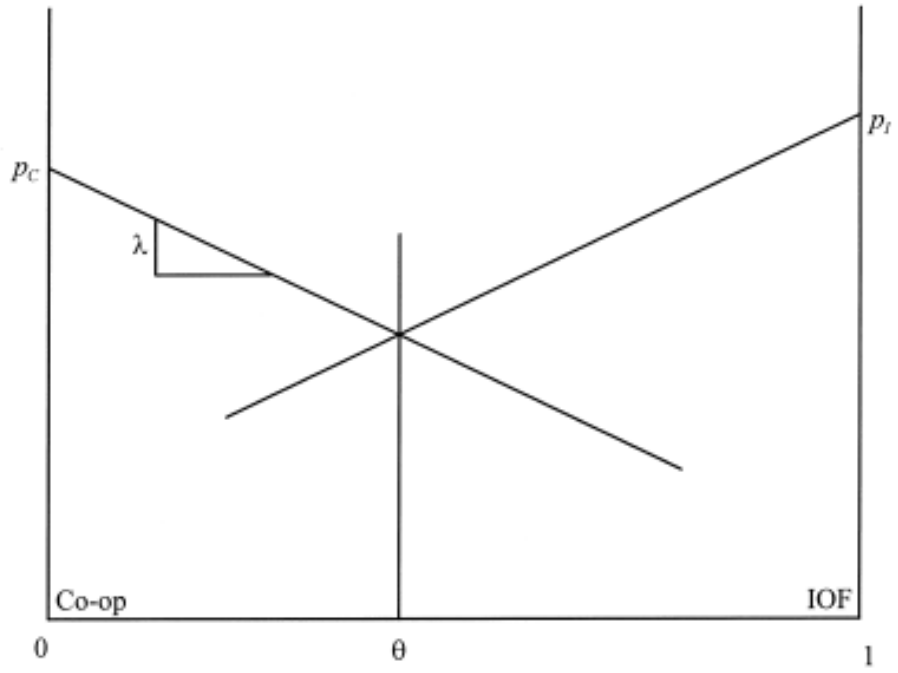

Figure 4-3: Cooperative commitment model.
Source: Fulton, 1999.

The horizontal axis θ represent the preference of the producers towards an IOF. The vertical axis represents the price the coop, p_c, or the IOF, p_i, offers. λ is a measure for member commitment towards the coop. A farmer that only wants to do business with the coop is located on the left side of the model and gets a price p_c that represents the full value for the farmer. This value includes the value the farmer has by doing business with the cooperative. The further the preference of the farmer away from cooperative organization the more the cooperative price is discounted, the same holds for farmers doing business with an IOF. The more their preference is towards a different type of organization, the lower the value of the price they get for their product. On the market an equilibrium exist, θ, where a certain number of farmers will deliver to the coop and another number will

deliver to the IOF. If λ is zero, than the highest price paid is the decision making factor for farmers. However when member commitment is present, a certain number of farmers with preference for cooperative organization will deliver to the coop even when the price of the coop offered is lower than the price offered by the IOF. In order to enlarge market share, coops and IOF move closer to each other on the preference line. This involves that coops take over IOF values and that IOF take over cooperative values. One could think, the older the cooperative, the more it shifts to the middle. This fits the theory of Cook of five reasons to transform discussed in section 4.3 Cooperative Organization. The leading cooperatives in the dairy sector seem to be headed that way. This however, creates room for new cooperatives to emerge on the left hand side of the preference line. The question is: how will these cooperatives create an additional value for its members? It must be noticed that the leading cooperatives like Nordmilch in Germany and DFA in the U.S. are aware of the importance of member commitment. Several activities for members and ways for communication with members are established. However looking at the definition of a cooperative according to the International Cooperative Alliance, we can say that entrepreneurial cooperatives seem to reduce the importance of the cooperative values when changing the organizational structure to an individualized one. It seems that the changing organizational structure of the dairy cooperatives gives rise to less involvement of member-farmers; the decision making is more and more controlled by managers with a market oriented view, which is making profit. Member-farmers are increasingly regarded as

shareholders. The relationship with the cooperative becomes twofold; supplier and investor. An individualized treatment of members also reduces the cohesion among members, which in turn enforces member differentiation. Without member commitment the supplier is drawn to the business with the highest price for his product and as an investor he chooses the investment with the highest return. If investment tools in a cooperative become increasingly tradable, the possibility for members to reallocate their capital becomes easier.

5 Competition

Competition on the dairy market is highly discussed. Concerns about unbalanced market power are expressed by the Bundeskartellamt in Germany (Germany, Bundeskartellamt, 2010) and in the U.S. a senate hearing regarding monopsony power in agriculture markets was held in 2003 (U.S. Senate, Committee on the Judiciary, 2003).

On the dairy market, cooperatives and investor owned firms compete for the procurement of raw milk. The next section will provide some insight into this competition, including the oligopsony potential on the market for raw milk procurement and the influence of cooperatives on competition in the market[14].

5.1 Oligopsony Power and Collusive Behavior

The dairy market, like other agricultural markets for non-storable goods, is characterized by certain conditions which enhance the possibility of oligopsony power of processors.

Rogers and Sexton (1994) define three characteristics of agricultural markets explaining why they are prone to oligopsony power. These characteristics are converted for the case of milk:

- Milk is a bulky and perishable, causing shipping costs to be high, restricting the products' geographic mobility, and limiting farmers' access to only those buyers located close to the production site.

[14] The aim of the equations used in this chapter is merely to provide insight in certain relationships. This chapter does not provide empirical models.

- The input of milk for processors is very important; milk in the process is not substitutable by an other input, also other processing plants, for example a orange juice plant, can not switch from one day to the other to start processing milk.
- Farmers are specialized in the production of milk; this goes together with specialized knowledge and high fixed cost to produce milk. These assets represent exit barriers, entry barriers, for farmers, respectively non-farmers, and cause milk supply to be inelastic.

Markets with high transportation cost are by definition "spatial markets" (Rogers and Sexton, 1994). High buyer concentration in the market coupled with an inelastic supply jointly constitutes compelling evidence of buyer market power (Rogers and Sexton, 1994). In the following subchapters we will have a look at the spatial effect of milk procurement.

Appendix 6 provides a map with the location of the plants of the major dairy processors in U.S. and Germany. We notice that plants in both countries are regionally located for most processors, although in the U.S. the nationwide position of Dean Foods is observable. Regionally located processors contribute to the spatial character of the procurement markets and spatial competition between processors.

An additional characteristic of the dairy market is the high rate of merging dairies (Jacobson and Cropp, 1995). Dairies merge to increase the countervailing bargaining power towards retailers, to lower production cost and increase

efficiency in order to stay competitive towards its rivals. However, mergers increase the concentration of processors which raise the possibility of oligopsony power in a spatial market. Tozanli (1998) indicated that as the result of mergers and acquisitions the number of European dairy firms is getting smaller and this concentration process is ubiquitous in the European dairy industry where the major tendency leans toward an undeniably oligopolistic market structure. In both Germany and the U.S. the market concentration of the processors increases over time (ref. Chapter 3).

The effects of oligopsony power can be limitation of entry[15] by other processors and a lower price offered upstream to farmers. The latter effect will be looked at more closely due to its relevance on the dairy market today and due to its relevance in contract formation as will be discussed in Chapter 6.

Next to exogenous factors (market power of retailers, technology, and regional character of dairies) that contribute to the formation of the oligopsonistic character of the procurement market for milk, there can be also endogenous factors, which can be regarded as tools decided to be used by the processor to increase its oligopsony potential. These tools have only an effect in a collusive environment. This can be tacit or explicit. When explicit, competition authorities intervene as this does not conform to competition policy. Tacit collusion, however, is hard to prove. An example of tacit collusion is a type of reference pricing, when

[15] Fonterra is accused for paying out a high "notional" milk price compared with its competitors in order to prevent farmers from switching to another dairy and lessen competition (Fox, 2011).

a company sets its price in function of its competitors. This is also called price matching. The effect is the possibility of monopsonic behavior for the companies involved. In a paper by Ivaldi et al. (2003) on the economics of tacit collusion prepared for the European Commission, the relevant factors for collusion are discussed. These are:

- Collusion is more difficult when there are more competitors.
- Market share asymmetry may reflect more profound and relevant asymmetries that tend to make collusion more difficult to sustain.
- Collusion cannot be sustained in the absence of entry barriers and it is more difficult to sustain, the lower the entry barriers.
- Frequent interaction and frequent price adjustments facilitate collusion.
- The lack of transparency on prices and sales does not necessarily prevent collusion completely, but makes it both more difficult to sustain and more limited in scope.
- For a fixed number of market participants, collusion is easier to sustain in growing markets, where today's profits are small compared with tomorrow's ones.
- Demand fluctuations hinder collusion, and more so when fluctuations are deterministic rather than random.
- The more likely innovation is, the more difficult it is to sustain collusion.
- With an asymmetric cost structure, and the most effective collusive conducts will involve asymmetric market shares, reflecting firms' costs, there is less scope for collusion.

- Asymmetries in capacity constraints hinder collusion.
- Multi-market contact facilitates collusion.

(Source: Ivaldi et al., 2003)

The dairy market has several of these characteristics that facilitate tacit collusive behavior:

- The amount of competitors is decreasing and a spatial factor limits the market area.
- Entry barriers are present due to the high fixed cost requirement, specific know-how and the strong competition and merger activities. Entry in the processing market is observed to be low in both the U.S. and the German market.
- There is a high frequency of interaction on the market as dairy products are flow products.
- Transparency is increasing on the market due to an increasing monitoring of the sector by government. Also the leading cooperatives recognize the importance of sharing information with its members. Access to information is facilitated through the internet in general. Dairies have well established sites and are active in the digital social networks. The information is also accessible for the competitors.
- The world dairy demand is growing. For the U.S. processors, this is joined by a growth in domestic demand. Future earnings are larger than present ones and it is feasible for the industry to join forces nationwide to

influence policy changes and stimulate the presence of the nation's dairy sector on the world market and abroad.

- The effect of the internationalization of dairies will enlarge their multi-market contact out of the control of farmers in the home market.

The dairy market has also characteristics that do not facilitate tacit collusion:

- Demand is quite inelastic for dairy products. However as seen during the financial crisis, the world demand reacted strongly when the economy slowed down.
- Product innovation is highly present as the processing sector and especially the large cooperatives are focusing on value added products next to traditionally producing commodities.

Exogenous factors present in the dairy market facilitate collusion and thus the possibility to exert oligopsony power by processors. To understand that, the concept of spatial markets is discussed in the next subchapter 5.2 Spatial Markets.

5.2 Spatial Markets

A key concept in describing competition to procure raw milk on the market is the effect of transportation cost. As milk is characterized to be bulky and perishable, the procurement of raw milk goes together with high transportation costs.

The spatial factor can be regarded to increase over time as the concentration in the processing sector also increases. The number of milk processing facilities decreased by approx. 21% in Germany during 1997-2006 (Graubner et al., 2011),

in the U.S. accordingly the amount of milk processing plants decreased in the same period with 27% (Gould, 2010). Plant size, however, increased combined with more efficient transportation possibilities for raw milk. This contributed to the decrease of the number of plants. Thus, fewer plants do not necessarily involve a reduction in competition as the action radius of the plants increased. There is a trade off between the number of plants and the action radius regarding the overlapping of markets. However, the regional character of processors, combined with increasing concentration and a reduction in plants, all indicate an increasing possibility for oligopsonistic market power even when the market radius around a plant increases.

In a paper by Sexton (1990), the effect of spatial competition on the price spread between farmers and processors is elaborated.

To simplify the analysis, it is assumed that two processors are homogenous and are price takers, farmers are also homogenous and distributed uniformly in a linear space with density D and production function $q = q(w)$ with $q' > 0$. The processors are located on the ends of the market. It is also defined that the producers bear the transportation cost. This pricing method is called free on board pricing (FOB). Next it is assumed that there are economics of scale in processing (i.e. rising marginal costs (m) with $m' > 0$ and $m'' >> 0$ for the processing firm). The assumption of economics of scale is necessary to generate a spatial distribution of processors. Also, the conversion factor is assumed to be one, which involves a complete conversion of raw material into product. No substitution

between the raw product and other processing inputs is possible. Taking these assumptions into account, Sexton finds the following relation for the price spread:

(1) $$\frac{p-w}{w} = \varepsilon_{w,R} + \varepsilon_{w,L} \times \eta_{L,R}$$

With:

(2) $$\varepsilon_{w,R} = \frac{\partial w}{\partial R} \times \frac{R}{w}$$

(3) $$\varepsilon_{w,L} = \frac{\partial w}{\partial L} \times \frac{L}{w}$$

(4) $$\eta_{L,R} = \frac{dL}{dR} \times \frac{R}{L}$$

p is the processed product price net of marginal non-raw product processing costs, *w* stands for the price the processor pays for the raw milk minus the transportation costs, *R* stands for the total amount procured by the processor which is equal to the equivalent amount of product as the conversion factor is equal to one, *L* is the market radius of the processor.

Equation (1) shows the components of the price spread. Component (2) is positive and entails that the volume of procurement increases when the price increases taking into account a constant market radius. This involves that if the price increases, farmers within the market radius of the processor will increase their

production. Component (3) is negative and entails that, when the market radius increases, the price for producers will drop as the market power of the processor increases with increasing market radius. Component (4) measures the processor's perception of competitive conditions in the market.

The competition depends on the behavior of the competing processors:

- Löschian competition (LO) holds that each competitor behaves as if his market area is fixed. LO behavior represents collusive behavior.
- Hotelling-Smithies (H-S) competition holds that each competitor believes that his action will not affect rival's prices. H-S competition represents competitive behavior.
- Cournot-Nash competition (C-N) holds that a given competitor's quantity changes will go unheeded by rivals.

The effect of these behavioral conjectures is shown within the assumption of equilibrium behavior, which is that the net prices of rivals are equal at their common borders. This assumption results in:

(5) $$\frac{dL}{dR} = \left[\frac{dw}{dR} - \frac{d\bar{w}}{dR}\right]\frac{1}{2t}$$

$d\bar{w}$ is the rival's procurement price and t is the transportation cost. In the case of the Löschian conjecture, (5) is equal to zero as the market radius is fixed and does not change with a change in procurement volume. This has as a result that $d\bar{w}/dw$

= 1, which means that any price change by a processor will exactly be matched by its rival. This leads to the joint monopsony solution when all firms entertain this conjecture. For Hotelling-Smithies conjecture $d\bar{w}/dw = d\bar{w}/dR = 0$. This leads to the competitive solution as all actions of the rivals are independent from each other, which is known to generate the competitive solution, where price equals marginal cost. An increase in market radius is joined by an increase in price to attract additional supply. The higher the transportation cost the lower the market radius increase. For the Cournot-Nash conjecture $d\bar{R}/dR = 0$, which involves competition on quantities.

This results into three formulas for the price spread under these behavioral conjectures:

(6) $$\left(\frac{p-w}{w}\right)^{LO} = \varepsilon_{w,R}$$

(7) $$\left(\frac{p-w}{w}\right)^{H-S} = \varepsilon_{w,R}\left[\frac{1}{1-(1/2t)(\partial w/\partial L)}\right]$$

(8) $$\left(\frac{p-w}{w}\right)^{C-N} = \varepsilon_{w,R}\left[\frac{2t-(\partial w/\partial L)}{2t-2(\partial w/\partial L)}\right]$$

It follows that (6)>(8)>(7). Assuming a given price for processors, p, Löschian behavior results in the lowest price for farmers, whereas Hotelling-Smithies

behavior results in the highest. Collusive behavior of the form price matching, results in a lower producer surplus and higher processor profits.

In an article by Alvarez et al. (2000), oligopsony power with uniform spatial pricing on the procurement market in Spain is investigated. This is in contrast of the previous free on board pricing (FOB) assumption where the cost of transport is borne by the producer. Under uniform spatial pricing or uniform delivered pricing (UD) the processor bears the transportation cost. This can be regarded as discriminatory pricing because the seller does not bear the actual cost of shipping its product (Alvarez et al, 2000). Producers close to the plant are negatively discriminated as they get a lower price for their milk due to transportation cost sharing with producers located further from the plant. UD pricing is common in practice on the milk procurement market (Greenhut, 1981; Durham, Sexton and Song, 1996; Table 4). The popularity of UD pricing is due to its administrative simplicity and it enables firms to compete effectively over a larger geographical area (Alvarez et al, 2000; Greenhut, Norman and Hung, 1987). Another reason for UD pricing is that it fits coop ideology of equal membership. As seen in the previous section FOB pricing results in non-overlapping market areas for each competing firm, UD pricing permits overlapping markets. In reality we see overlapping procurement markets as shown in Figure A6-1 and Figure A6-2 in Appendix 6.

Under Hotelling-Smithies competition firms set their prices regardless of the prices of their competitors. It is now easy to understand that if a firm offers a

higher price than its competitors under UD pricing, this firm will capture the whole supply. However considering the ratio:

(9) $s/p = td/p$

with *d* the distance between two rival processors located on a line, *t* the freight rate per unit of distance and *s* the measure of absolute importance of space on the market involved. When this ratio is sufficiently great, each firm can behave as a spatial monopsonist. A high value for ratio (9) implies that the absolute importance of space in the market outweighs the net value of the product for the processor.

Considering Löschian competition under UD pricing, the assumption of fixed market areas is not feasible as given UD pricing, market areas are overlapping and are constantly changing with the price the firm or its rivals pay for raw milk. For Löschian competition under UD pricing Alvarez et al. (2000) are considering price-matching conjecture (PM), which is implied through fixed market areas under FOB pricing as discussed above. This price matching conjecture implies that firms pay the same price and have as consequence the same market radius. The degree to which markets overlap between duopsonists depends on the ratio described in equation (9). For $s/p \geq 4/3$ both firms can behave as spatial monopsonists. The spatial effect dominates. For $4/7 < s/p < 4/3$ the market areas overlap in the area between the firms. For $s/p \leq 4/7$ the market areas of both firms overlap beyond the distance between the firms. In the latter case, space is less

important relative to the net value of the finished product. The implications for price transmission for the PM conjecture under UD pricing is given by the following equations:

(10) $\partial u^* \Big/ \partial p = \frac{2}{3}\left[1 - \frac{p}{\sqrt{\left(4p^2 - 6s^2\right)}}\right] > 0$ for $0 < s/p < 4/7$

(11) $\partial u^* \Big/ \partial p = \frac{1}{2}$ for $4/7 < s/p < 4/3$

(12) $\partial u^* / \partial s = \frac{s}{\sqrt{\left(4p^2 - 6s^2\right)}} > 0$ for $0 < s/p < 4/7$

(13) $\partial u^* / \partial s = -\frac{1}{8}$ for $4/7 < s/p < 4/3$

with u^* the optimal UD price. Equations (10) and (11) show that under PM-behavior with UD pricing, the price paid to farmers is increasing with an increasing net average product value. However, when space is less important and market areas overlap beyond the rival's plant position (also called competition in the backyard) the price transmission is smaller then when space is more important. It can be concluded that larger overlapping market areas have as effect a lower price transmission to farmers under PM behavior and UD pricing. If the value of the net product has much more importance than the space factor, the market is not spatial anymore. The price transmission is then equal to the case of a single monopsonist in a non spatial market. Out of equation (12) and (13) we can

conclude that with the increase of s, the space component, the farmer's price increases when space is relatively less important and the farmer's price decreases when space is relatively more important. This can be explained by the following; when transportation cost rises, a firm increases its price and so do its rivals under PM strategy. By doing this the firm will reduce its market area and so will its competitors and will reap more benefits due to an increase of milk procured from producers that are located closer to the plant. Processors end up pricing above the monopsony level when markets are overlapping beyond the location of the rival's plant as they have an incentive to reduce their rival's and their own market area. This effect is smaller for plants that are located close to each other (small *d* decreases the impact on *s* when transportation cost rise).

In a paper of Graubner et al. (2011) competition on the German milk procurement market was investigated with a model based on UD pricing under PM behavior. An additional aspect in this paper is the implementation of bargaining cooperatives and a more flexible supply function of the form $q = u^y$. Bargaining cooperatives have as effect that processors may not be able to choose its optimal market radius and in this model they serve the whole market (the whole market in this model is described as the area between the two rivals, i.e. $4/7 < s/p < 4/3$). The more flexible supply function makes it possible to investigate the impact of the supply elasticity on price transmission. The following relationships are obtained:

(14) $\partial u \Big/ \partial s = -\frac{y}{2(y+1)}$

(15) $\partial u \Big/ \partial y = \frac{2p-s}{2(y+1)^2}$

(16) $\partial u \Big/ \partial p = \frac{y}{y+1}$

Equation (16) shows us the effect of the elasticity on the price transmission. In the model according to Alvarez et al. (2000) the elasticity is assumed to be one which results in a value for equation (16) equal to equation (11). With a price elasticity of one the percentage price change equals the percentage quantity change. The milk supply elasticity on the long run under the quota system has a value of 0.054 (Requillart et al., 2008). This results in a value for equation (16) equal to 0.05, which involves a low price transmission. The effect of the abolishment of the quota system on price transmission can be positive as the supply elasticity is expected to increase (see section Quota, Chapter 2), this however, assuming a market that has UD pricing and PM behavior.

The average transportation cost in Germany was 0.01EUR/kg raw milk in 2007(Friedrich, 2010). If we regard this as the absolute importance of space, i.e. *s* and we assume a net value for dairy products of 0.40 EUR/kg[16] we get a value for *s/p* equal to 0.025 which involves overlapping markets, with a market overlap greater than the inter-firm distance. In reality we can expect a smaller net product

[16] This value is taken as approximate to the wholesale price for dairy products in Germany between 1998-2007 (Graubner et al, 2011). This can be considered as the maximum value for p possible taking marginal processing costs are zero.

value, which would increase the importance of space. However, the space factor is not that straightforward in reality. If we look at Figure A6-1 in Appendix 6, we see that the processing plants of the largest German dairies are regional located. This would result in a higher distance between competing firms and increase the importance of space. Also with increasing fuel prices, increasing labor costs and decreasing amount of processing facilities the space factor gains importance which involves reduced competition on the market. Another aspect is regional geographic differences. The transportation cost per kg milk is larger in South Germany than in the East Germany (Friedrich, 2010). Graubner et al. (2011) find for the price transmission on the German market a value smaller than 0.5, which confirms the presence of spatial market power and PM behavior and a low supply elasticity. However it must be noted that market power is not always the source of imperfect price transmission, it can also be caused by adjustment costs, inflation, and perishability of products or inventories (Peltzman, 2000).

In the U.S., the FMMO policy provides dairies with a minimum uniform price they have to pay to farmers. FMMO can also interfere with price transmission. The minimum uniform price is calculated based on market prices and processors marginal cost to process raw milk. This can have a fixing effect on the price transmission as it relates market prices and processors costs with the minimum uniform price. A similar analysis as the one done by Graubner et al. (2011) could provide evidence for PM behavior on the U.S. market. However, the fact that wholesale prices for dairy products are closely related to the price achieved on the

CME market, can be interpreted that dairy traders use the CME prices as reference prices for their products.

Comparing the plant density in both countries, we find for the U.S. 1.5 plants/10,000km² and for Germany 8 plants/10,000km². This would involve that the U.S. is more prone to oligopsony markets than Germany, however production in the U.S. is much more clustered in states like California, Wisconsin, etc., where the number of plants is higher too. In states where milk production is not "big", outside options for farmers can be very limited, especially when they deal with national milk procurers (e.g. DFA), who have more bargaining power due to the relative unimportance of a single market area.

5.3 The Effect of Cooperatives on Competition

The difference between the cooperative and IOF are twofold. First, the pricing of a cooperative is done by distributing all its profits over its members. Secondly, by joining supply, bargaining cooperatives make it harder for processors to set their optimal market radius.

The goals of the two types of businesses are different. The cooperative breaks even, while the IOF makes profit. To illustrate this we follow Sexton (1990). Again the assumptions are the same as for the example of spatial markets under FOB pricing (no market overlap).

We define NARP = Net Average Revenue Product

(17) $NARP = \left[PR^c - m\left(R^c\right) - f\right] / R^c = P - AC\left(R^c\right)$

and NMRP = Net Marginal Revenue Product

(18) $NMRP = d\left[PR^c - m\left(R^c\right) - f\right] / dR^c = P - m'$

The coop maximizes its profit when it sets w where NMRP intersects member supply. However, for the coop to break even, member supply must intersect NARP. This is the second-best solution as the coop does maximize its profit subject to the break even constraint.

If w^c (price of the cooperative for raw milk) is set where NMRP intersects with NARP, the coop's profit is maximized and the break even constraint is fulfilled. However, this solution has only one outcome and can thus only be maintained through fixed supply.

When a coop competes with an IOF we find

(19) $\frac{dL}{dR} = \left[\frac{dw}{dR} - \frac{dw^c}{dR}\right] \Big/ 2t$

After some conversions we get for the price spread for an open membership cooperative:

(20) $$\left(\frac{p-w}{w}\right)^{OM} = \varepsilon_{w,R}\left[\frac{1}{1-(\gamma/2t)\partial w/\partial L}\right]$$

With:

$\gamma > 1$ when NARP is increasing (NARP < NMRP)

$\gamma = 1$ when NARP is a maximum (NARP = NMRP)

$0 < \gamma < 1$ when NARP is decreasing (NARP > NMRP)

Under an increasing NARP (6) > (8) > (7) > (20)

When NARP is at its maximum (7) = (20)

Under a decreasing NARP (6) > (8) > (20) > (7)

When a coop is in the situation where NARP is smaller than NMRP it can increase its profits by attracting supply thus having an open membership policy. This results in competitive behavior on the market with a reducing effect on the price spread of competing IOF. However, the first best solution is reached when NARP equals NMRP; this is when the coop can maximize its profits like an IOF under the break even constraint. The coop can be tempted to close its membership as additional supply will result in a lower NARP. However if the coop fixes its procurement by closing membership the IOF can entertain Löschian competition, that is behave like the market areas are fixed. This would result in an increase of

the price spread; the IOF can behave like a monopsonist in its market area. If the coop, however, does not close down its membership, the NARP decreases but competition on the market is benefited as the producer price spread stays lower than if the firms on the market behave under the Cournot-Nash conjecture. So it can be concluded that an open membership cooperative, that sets prices equal to its net average revenue product, induces pro-competitive behavior in a spatial market. Farmers have thus an incentive to organize coops. This is also called the incentive to induce a yard-stick effect.

In a paper of Tribl (2009) the effect of a coop in a duopsony market facing an IOF is discussed. Tribl follows the model as described in the example of Alvarez et al. (2000), which is a duopsony market with overlapping market areas due to UD pricing. The model by Tribl (2009) is adapted by locating the procurers at the endpoints of the linear market and assuming that the whole market is shared by the processors as is the case in the paper by Graubner et al. (2011) by assuming the presence of bargaining coops. The coop prices at NARP. Tribl compares three market types, a pure IOF market, a pure coop market and a mixed market. The pure coop market results in the highest price for farmers, whereas the mixed market results in higher prices compared to the pure IOF market. These findings confirm the yardstick effect coops have on the market.

The pure coop market is discussed by Huck, Salhofer, and Tribl (2006). It is an extension of the model by Alvarez et al (2000) by replacing the IOFs by coops.

Comparing the results with the ones of Alvarez et al., Huck finds a double price transmission for a pure coop market. Again the lowest price transmission is found for competition in the back yard as the coops have an incentive to increase the procurement from farmers closer to the plant and decrease competition. By applying their model to the case of milk procurement in Schleswig-Holstein (a state in Northern Germany where 95% of the milk is procured by coops (Huck, Salhofer, and Tribl, 2006)), they conclude that the coops are competing in the back yard. Further, they advise consolidation of the procurers as that would induce a higher price for farmers.

We discussed in chapter 5.2 Spatial Markets the effect of bargaining cooperatives under UD pricing with PM strategy. Graubner et al. (2011) also show that there is an equilibrium under Hotelling-Smithies competition when bargaining cooperatives are present and when farmers choose a processor with equal probability. Bargaining cooperatives prevent the processor to choose its optimal market radius. Under Hotelling-Smithies competition, a processor raises its price in order to dominate the whole market. However by doing so, the processor attracts suppliers from around the whole market as suppliers choose a processor with equal probability. This result in additional negative profits due to high transportation costs. The processor finds an equilibrium price that is the price for which its total profits are zero.

Taking this into account, Graubner et al. designed a payoff matrix under PM and HS competition with UD pricing. This payoff matrix is presented in Figure 5-1.

		Processor B	
		HS	PM
Processor A	HS	0;0	PHS;0
	PM	0;PHS	1/2PPM;1/2PPM

Figure 5-1: Payoff matrix for Hotelling-Smithies and Price Matching competition under Uniform Pricing.

Source: Graubner et al., 2011.

It is obvious that the dominant strategy for both processors is HS behavior. However, this results for both in zero profits. The Pareto optimal solution is to adopt PM behavior and so to cooperate with each other. In a market with UD pricing and when processors can not choose their market radius, processors optimal strategy is to collude.

5.4 Pricing Methods and Competition

Dairies have different pricing methods. Three can be distinguished; the cooperative pricing method, the reference pricing method, and the negotiating method (Schlecht and Spiller, 2009). With regard to what is described above the cooperative pricing is the equivalent to the coop setting prices according to the NARP. A coop, pricing according to this method and applying an open membership policy, has a pro competitive effect on the market. However one can ask if the pricing by the entrepreneurial coops is done that way. The coop is run

by managers that maximize the profit, to reinvest or to return to members in the form of dividend on shares. The cooperative does not price at NARP but at NMRP. There is no yard stick effect present. If the reference pricing is, like in the case of FrieslandCampina's pricing method and according to Huck, Salhofer, and Tribl (2006) the common pricing procedure of dairy processors in Germany, based on the average of the surrounding competitors prices, the change of prices between competitors are closely related which is a characteristic of the Löschian conjecture. The effect of this pricing method is thus non-competitive. The negotiating method to set prices should bring forward competitive behavior if the bargaining power of both negotiators is equal. Looking at the assumptions as set before, the farmer does not have any bargaining power, for he is a price taker. The farmer is assumed to deliver to the dairy where he can maximize its profit. This depends on how firms on the market compete and set procurement prices. The Bundeskartellamt expressed its concern about the pricing methods of dairies in Germany as one of the factors that reduce price competition (Germany, Bundeskartellamt, 2010).

Regarding FOB pricing or UD pricing, Zhang and Sexton (2001) found for the case of an IOF duopsony market that when *s* is small, a firm's optimal choice is to choose FOB pricing. As seen before the firms only compete at the market borders with each other and are able to behave like a monopsonist in the area closer to the plant. When the space becomes more important UD is the preferred pricing method by processors, however this is for quite large values of *s*. UD pricing,

even though it result in inefficient transportation, results in higher welfare for low *s* values due to a higher competition level in overlapping markets.

Fousekis (2010) investigated the effect of coops on the choice of the pricing method, i.e. FOB or UD. In a mixed duopsony, firms choose UD pricing when *s* is relative small. When space becomes more important FOB pricing is applied by the coop, the IOF first sticks with UD pricing but turns indifferent for larger values of *s*. Regarding the earlier suggested value of 0.01 for the absolute value of space for milk in Germany, UD pricing for both coops and IOFs represents the equilibrium.

6 Contracting

The structural transformation of the dairy market, as discussed in previous sections, results in increasing risk. Risks involve the price but also involve quantities, as these are becoming more concentrated. The emergence of contracts in the dairy sector is observable. Contracts can have many forms, they can be unwritten agreements between two parties, or they can be written, legally binding contracts. When talking about contracts in dairy markets several attributes are necessary in an agreement between processor and producer, i.e. price, quantity, duration and quality standards of the product. While private firms usually specify these attributes, cooperatives tend to have more open, uniform contracts. This involves no limit on quantity, price determined by the market price and the cooperative performance, duration unlimited (usually around a year notice of contract termination), and quality according to government regulations. In the changing market environment this type of contracting is under pressure. Individualized contracts tend to respond more to the market environment of the future. Increasing member heterogeneity and consumer oriented production reflects the necessity to individualize contracts and market volatility reflects the necessity to incorporate risk reduction in contracting. Price risk management is highly discussed on the U.S. dairy market. A system is set up to reduce price risk for farmers and the industry. This involves forward contracting combined with a futures market.

6.1 Price Risk Management on the U.S. Dairy Market

Price volatility is increasing in the German as well as the U.S. dairy market. In the U.S. this phenomena is already recognized and a governmental program to reduce price risk for farmers is set up called the Dairy Forward Pricing Pilot Program. The program was established to promote forward contracting between farmers and dairies. A forward contract is an agreement between a buyer and a seller to sell an agreed quantity of a product at an agreed price for an agreed period in the future. The program was installed to promote forward contracting as it exempted milk handlers from paying the minimum blend price as provided by the FMMO. The program was effective from July 2000 until December 2004 and was reinstated by the Farm Bill of 2008. The handlers could only forward contract the milk used for non-fluid purposes, i.e. Class II, III, IV milk. Also, any first time contract could only be made for a time period less or equal to 12 months. The effects of the program were analyzed in a report of the USDA's Agricultural Marketing Service covering the first two years of the program (U.S. Department of Agriculture, 2002). In another report provided on the e-platform Understanding Dairy Markets by the University of Wisconsin, the 4 year period was analyzed (Gould, 2005). The prices realized in the forward contracts were substantially lower than the non-contract prices for milk over the first two year period of the program. However the researchers believed that due to the limited time span of the study, the observation of a period where the prices were higher was not made. They refer to a quote by the USDA:

"Over time, we should expect to see forward prices to producers below the blend price in some months and above the blend price in other months… On balance, the pluses and minuses should cancel each other out since, one could argue, the desired objective of forward contracting is to remove the uncertainty and variability in prices…" (U.S. Department of Agriculture, 2002). The report covering the whole length of the program showed that the price achieved through forward contracting was lower than the market price but that the volatility of the price was reduced.

Unbalanced bargaining power could also contribute to a lower contract price. There can be several reasons for an unequal bargaining power: significant difference between the size and turnover, economic dependency arising out of a long term business relationship, significant sunk costs already incurred by the farmer, and changing supply and demand conditions (European Commission, 2010d). A report of the Ling and Liebrand (1996) stated, by looking at other commodity markets where forward contracting is done, that producers pay a price for shifting market risk to other parties.

The reasons for farmers to forward contract were mainly to assure a stable cash flow (75% of the producers), 45% contracted because the offered price was attractive to them. Nearly 60% of the contracting producers thought that the trade off between the lower contract price and the reduced risk was not worth it (U.S. Department of Agriculture, 2002).

A future or a futures contract is an agreement between two parties to trade a certain quantity[17] of a product at a certain price at a certain time. The price agreed is the estimation of the seller and the buyer what the product will be worth (the spot price) at the time of trade with a difference of the so called "normal backwardation". This is the risk premium paid by the seller to the buyer due to the uncertainty of the spot price at the moment of trade. Futures market involves trade of futures and options. An option can be regarded is an insurance on the future. It is the possibility to "call" or "put" the future. The buyer of a call option has the right to buy (call) the future, for an agreed price, called the strike price, over the period the option is valid. The buyer pays a premium for the option and hopes the value of the futures contract will be higher than the strike price plus the premium. The buyer of a put option has the right to sell (put) the future, at the strike price over the period the option is valid. The buyer pays a premium for the option and hopes the value of its future minus the premium will not be lower than the present market value, if so the option can be used to sell the future for the strike price. In reality only small shares of the futures contracts actually result in delivery of the product (Ling and Liebrand, 1996). Futures are used as a financial instrument to reduce the price risk. On the futures market there are hedgers and speculators. The hedgers sell futures contracts, which they cover when the future is about to mature. When a future matures, actual delivery of product is acquired. By buying futures

[17] At the CME the quantity traded in one monthly future is 200,000 pounds. The CME offers futures and options on Class III and Class IV milk, butter (two different types), nonfat dry milk (two different types) and on dry whey (Chicago Mercantile Exchange, 2011). It also provides spot markets for butter, cheese and nonfat dry milk (U.S. Department of Agriculture, 2002).

when they are about to mature, no delivery is required as the quantity sold is equal to the quantity bought. Speculators buy and sell futures to make a profit. Speculators provide the market with liquidity. They buy the futures offered by the hedger and sell them back before they mature. The hedger tries to reduce its price risk, while the speculator tries to make a profit. In U.S. two markets trade dairy futures. The CME started trading dairy futures in 1996. The New York Coffee, Sugar and Cocoa Exchange (CSCE) started trading cheddar cheese and NFD-milk futures and options in 1992. Historically, dairy product cash markets have been referred to as "thin" markets. The market is closely observed by a number of commercial traders in various segments of the dairy industry who stand ready to buy or sell large amounts of milk to influence the market price when thought necessary (U.S. Department of Agriculture, 2002). The price of dairy products as observed by the NASS is highly correlated with the CME price for dairy products which shows the price making role of the CME.

Farmers have two options to reduce price risk due to volatility and uncertainty[18]; forward contract their milk or futures contract their milk. The USDA encouraged farmers to enter the futures market with the Dairy Option Pilot Program. This was an educational program to make farmers able to hedge. Maynard et al. (2005) evaluated the risk management potential of private milk hedging. They found that the farmers that joined the Dairy Option Pilot Program reduced their price risk by 50-60% and on average had a hedging ratio of around 60%. In this study Maynard

[18] Next to differntiation strategy and value-adding strategy which reduce price risk by accessing other markets then the raw milk market.

et al. also refer to the price risk reduction the FMMO provides to farmers. They found that the PPD acts as a buffer when Class III prices change. This provides a risk reduction in the producer price under the FMMO. Maynard et al. suggested five reasons why hedging may not be favored by a producer to reduce price risk:

- No information was available about the effect of hedging on reducing risk.
- The size of futures contracts, i.e. 200,000 pounds favored large producers and formed a barrier for small producers.
- Transaction costs are rather high as hedging requires time to follow futures market, establishing a hedging strategy and evaluating its performance on a regular monthly basis.
- Hedging is psychologically demanding as the farmer takes all responsibility of achieving a good price on him.
- Some producers think hedging is unnecessary as milk is a flow product and the average price they get is the market price, suggesting they perceive risk over a long term.

Additionally Ling and Liebrand (1996) mention a risk that farmers can face and that is due to illiquid futures markets. When the future matures and farmers are not able to lift the hedge, they could be faced with high cost to deliver the milk as they usually do not have the equipment to transport milk and it could be against the agreement made with the regular dairy (especially dairy cooperatives due to the obligation to deliver all milk).

Maynard, Wolf, and Gearhardt (2005) conclude to suggest that for some farmers forward contracting is a better alternative. The benefits of forward contracting are less time spent on managing the marketing of milk, no volume restrictions are present to step in a forward contract, price determination can be for a longer period providing financial security to small producers and to their banks, and cash flow concerns can be reduced as forward contract markets are highly liquid.

Due to the illiquid futures market, hedging through futures markets seems inadequate to reduce price risk, for that the need of government programs to reduce the risk appears necessary. However these government programs result in a low use of the futures market, which in turn makes it not mature. The importance of government is to reduce its risk reducing programs and to stimulate the use of cash markets to hedge price risk, making them liquid.

In an article of Boussard (2003) futures contracts are compared with production quotas. Boussard argues that these two systems to reduce price risk volatility are closely related. They are an agreement stating a fixed price for a fixed quantity. Only the party the producer is dealing with is different; government versus a private operator. Government bears the risk of low world prices and the benefit of high world prices. The private operator however is not willing to take as much risk as government and charges higher fees, called "normal backwardation[19]". This results in a gain of efficiency due to government intervention comparable

[19] Normal backwardation is defined by Boussard (2003) as *"the difference at the time of the contract setting, between the price of the contract and the expected spot price at delivery time".*

with when government builds roads. Boussard refers here to an article of Arrow and Lind (1970), which argues that the role of government is to bear risk whenever risk markets do not exist or do not work efficiently. Boussard argues further that commodity prices fluctuate according to a chaotic dynamic system. In such a system variables are sensitive to initial conditions, that is, a slight change in value at time t can result in a huge change of value at time t + n. This explains that prices in commodity markets are autocorrelated, yet still unpredictable. The chaotic cobweb based on the work of Ezekiel (1938) is with modern dynamic theory joined by return strings. In a cobweb model with inelastic demand and elastic supply return strings prevent extreme or negative values for prices and quantities. These return strings in commodity markets reflect risk averse behavior of producers and the decay of capital. These return strings reduce the volatility of commodity markets. Boussard argues that when taking away or reducing these return strings by providing for example a fixed price (no price risk aversion anymore) the system goes to bankruptcy or a political deadlock. For that, the implementation of quotas is a good alternative as it increases efficiency by reducing volatility and prevents a crash of the system by preventing an infinite supply.

In short, Boussard argues that futures markets are a less efficient system than production quotas due to its lower capability to absorb large amounts of risk than government is, but when it is possible to have liquid futures markets that result in a zero “normal backwardation”, than it is doomed to bankruptcy due to an infinite increase in supply.

A comment to make on this is that futures contracts are a negotiation between two parties that results in a fixed price. Out of research seems that it reduces price volatility in the U.S. milk market with 50%-60% (Maynard, Wolf, and Gearhardt, 2005). However futures contracts do not completely abolish price volatility, resulting in the presence of price risk aversion by producers, one of the return strings in the chaotic cobweb model. Futures contracts shift the risk from the producers to the processors but price volatility will never be completely abolished as the contracts are negotiated on a regular base and each time prices have to be negotiated resulting in a low price for the farmer for one contract and a high price for the other according to expected market prices[20]. A second comment is that the supply of milk is not quite as elastic as the supply of wheat for example, due to the large specific investment cost in cattle and equipment.

6.2 Dairies on the Futures Market

Dairies also have their position on the futures market. In order to hedge their price risk, dairies forward contract with farmers. By selling futures contracts they can lock in a profit. Hedging dairy products reduces the volatility of dairy product prices, which in turn reduces the volatility of the blend price for producers under the FMMOs. Cropp (1996) discussed the hedging activities of Alto Dairy cooperatives. Alto Dairy presented its members price bids for which they could step in a forward contract with the coop. These bids were based on the Class III price of the previous day. A member could contract a maximum of 50% of its

[20] Futures contracts do not reduce price volatility on the market, it only reduces it for the user when managed appropriately.

production. Alto would pool the volume of forward contracted milk and sell cheddar cheese futures on the CSCE equivalent to the forward contracted milk plus a basis[21]. When the contracted milk is delivered, Alto Dairy would buy cheddar cheese futures contracts. According to the price of the bought futures compared to the earlier sold futures, Alto dairy would make a profit or a loss. If the price had risen, they would lose, however they pay out the farmers a price lower than the present market price, if the price had fallen, they would win, however they have to use that profit to pay out a price higher than the present market price. By locking in the prices, Alto hopes that the profits or losses made on the futures market will be offset by profits and losses in the cash market, resulting in a zero cost for price certainty, the transaction cost not considered. This is made possible due to the close correlation between cash prices and the dairy futures prices. Alto's experience with the project was positive, it showed that it is possible to use cheddar cheese futures markets to forward contract and reduce members' price risk. The coop encountered however two problems, an illiquid CSCE market, making it more difficult to set and lift hedges on cheese and a change in the basis. Alto would solve the latter problem by achieving a tighter basis as to provide a higher forward milk price (Cropp, 1996).

In a paper by Ling (1996) and a report of the USDA by Ling and Liebrand (1996) carefulness for hedging practices by cooperatives is advised. Carefulness

[21] A basis is the difference between the futures contract price achieved and the actual cheddar cheese price at the moment of the hedge. It can be negative or positive dependent on the contracted price for the futures.

regarding the amount of futures sold is required. Some of its member farmers are maybe not able to deliver the quantity agreed in the forward contract between the dairy and the farmer. A part of the futures sold could have the danger of being speculative, resulting in the risk of uncovered losses on the futures market. For that reason the amount hedged by the cooperative should best be limited to a certain share of member's production. If the price in the market increases, the coop can be out-paid by competitors, resulting in a friction with members. Another possibility is that the futures market is not liquid enough for the coop to liquidate its futures position by the settlement date. Providing forward contracts on a voluntary basis can be disliked by the members who do not want to forward contract. Issuing forward contracts result in a price risk transfer from the members who contract to the coop. However, a coop is jointly owned by all members, resulting in all members bearing the risk of the forward contracts. A solution suggested by Ling is to separate the milk pool obtained through forward contracts and price independently. Ling formulates the key to successful hedging as follows:

- Treat risk management as an integral part of the cooperative's overall corporate strategy. That is combined with the strategies as discussed in Chapter 4.
- Adopt an explicit policy for the use of the hedging mechanisms and communicate this with the members.
- Set up a process to monitor the cooperative's uses of the hedging mechanisms.

- Have safeguards to ensure that controls are in place to protect against misuse and fraud.
- Require that risk exposures by using the hedging mechanisms be properly accounted for in the financial statements to inform members, creditors and other interested parties.

(Source: Ling, 1996)

A contract between a cooperative and a member is based on the obligation to procure all members' produced milk and the exclusivity of the coop to procure member's milk. Contracts can have all kinds of forms. An example is given for the case of Alto Dairy cooperatives. The more entrepreneurial organization and behavior of cooperatives makes it necessary to keep a close eye on the contracts between the coops and its members as they become more differentiated and harder to control. With the emergence of futures for dairy products on the EUREX[22] stock exchange in Frankfurt, the possibility for German and European dairies to reduce price risk through futures is present. However by looking at the U.S. market, carefulness is required. Nordmilch and FrieslandCampina announced to procure all members' milk when the quota system is abolished. It seems that duration and price are more important aspects of contract formation (Schlecht and Spiller, 2009). However, demand is expanding and to announce full procurement regardless of production of members can strengthen the coop-member

[22] EUREX launched the first European futures on butter and skimmed milk powder in 2010 with help of the dairy industry associations German Dairy Association and Eucolait and important market participants in the European and US dairy industry (EUREX, 2010).

relationship. When the market will be confronted with a reduced demand, quantity fixation can still be a relevant issue.

6.3 Contracts in a Concentrated Supply and Purchase Market

A new era in the dairy market structure seems inevitable, contract farming, as seen in other commodity markets and already spreading in the U.S., will gradually increase due to the increase of price volatility. Dairies contract milk with farmers and, to lock in a profit, contract milk and dairy products on the futures market. Dairy farmers can forward contract or sell futures, however to lock in a profit, contracting input supplies is advisable. Input markets also know an increasing volatility, and to have certainty of their financial situation, farmers can combine contracting inputs and output, i.e. raw milk.

The importance of a well established competition law and control institution is already shown in Chapter 5. However farmers also face an increasing concentration on the input side, resulting in an unfavorable bargaining position to form contracts from both sides. With the entrepreneurial cooperatives tending to behave more like IOF, the possibility and necessity of new bargaining coops or producer organizations on the market is prevalent. Producer organizations could provide farmers with hedging skills, contract information and market information and pool their milk to create a better bargaining position. However, farmers, unlike laborers, tend to be keen on their independence and the formation of such producer groups could go difficult.

In a survey by Schlecht and Spiller (2009), the willingness of German farmers to contract was investigated by means of a survey with 161 farmers in North-

Western Germany, a region were almost all farmers milk is procured by cooperatives. The researchers found that farmers have a preference for entrepreneurial freedom and independence. The most important contract attribute for farmers is the price; the second most important attribute is the volume. Farmers strongly reject the cooperative price setting due to a perceived lack of control; instead, they favor frequent price negotiations or the application of a reference price. As price reflects the farmers' profitability and income, the volume reflects the farmers' possibility to grow. Farmers prefer no volume restrictions in the contract. And if they do estimate production, they do not want a fine in case of over- or underproduction. Also, the cooperative type exclusive selling and intake obligations are preferred to stay in place by the farmers. The preferred duration of a contract is maximum two years, with a cancelation period as short as possible. Schlecht and Spiller conclude that processors need to consider the suppliers' attitude and preferences for contract attributes, as this increases the acceptance of contracts by the farmers.

7 Recommendations for the Players on the Dairy Market

The changing market conditions provide opportunities for the relevant players on the market. With opening borders, increasing demand and consolidation on every level of the dairy supply chain, a higher level of business orientation is required to grasp these constantly changing opportunities and to deal effectively with weaknesses and avoid future threats. In the scope of a global dairy market, governments play an important role to stimulate the home businesses towards a competitive global industry.

7.1 Farmers

Farmers can apply following strategies in the future to reduce market risk and increase profitability:

- Grow and specialize to reduce cost and be competitive on the world market
- Produce for niche markets where a higher value can be obtained, that is create added value to milk
- Differentiate business activities to reduce risk; for example rural tourism, green energy production.
- Reduce price risk by forward contract or by hedging on the futures market.

A combination of these strategies is also possible. We can expect a change in the structure of dairy farms. The evolution to larger more specialize farms will

continue due to the necessity to produce at lower cost. Contracting will find its way in the dairy market to serve as a strategy to reduce price risk.

A strategy to ameliorate the bargaining position is the formation of producer groups. These producer groups will have as purpose to pool milk in order to have more weight in contract negotiations. In the case farmers are members of cooperatives, producer organizations can provide independent contract and market information.

7.2 Industry

The dairy industry faces an increasing competition as dairies continue to merge and become international players. Competition is not regional or national anymore, it became international. With huge amounts of capital, large dairies are able to buy smaller dairies and so increase their market share at the procurement side and the consumer side. Important strategies for dairies are:

- Grow and increase efficiency to lower cost of production.
- Explore niche markets.
- Add value and differentiate market products to be able to get a higher profit margin.
- Explore international markets to reduce risk by differentiating and enlarging procurement markets and consumer markets and take a global competitive position.
- Advertise products to increase demand and obtain a better bargaining position towards the retail sector.

- Invest in member communication and respecting entrepreneurship and demands of dairy farmers. Create a higher involvement of members in the company as they are an important source of capital.
- Utilize the futures market and forward contract with farmers to reduce risk and stabilize quantity.
- Cooperatives can further solve for the traditional cooperative problems by utilizing professional managers, design investment tools with an individualized character so the members can create their portfolio according to their risk preferences.

7.3 Interbranch Organizations

The importance of interbranch organizations during these changing market conditions can be high. International demand is growing and important producing countries like Germany and the U.S. can take an important position to supply the growing international demand. It is important that as well as the industry, also the producers are efficient and demand oriented. A close cooperation between producers and industry could result in a strong national or in the case of Europe, union dairy industry. In Germany focus on the producers seems of the highest priority. Processors seem aware of the market opportunities and invest highly in value added products and increase their market scope by merging, forming joint ventures and internationalizing. German dairy farms are still small scaled and have a low yield per cow resulting in high production costs. In the U.S. the opposite seems true, the main production is done by highly specialized producers, the industry though, needs to invest more in international markets. As farmers

provide the raw material to dairies, this has to be offered at a world competitive price. Especially cooperatives can be faced with the difficult situation of paying low market prices to inefficient members. For that reason, cooperation between farmers and the industry could result in a joint amelioration of the competitiveness of the whole dairy chain. Interbranch organizations can play a useful role in research, improvement of quality, promotion and spreading of best practice in production and processing methods (European Commission, 2010c).

7.4 Policy

In order to adapt to changing market environment, governments in the U.S. and Europe present new policy measures. In Europe the policy reform was announced as the "Milk Package" and a proposal was released by the European Commission at the end of 2010 (European Commission, 2010b). In the U.S., the USDA presented a report with recommendations for public policy to improve dairy farm profitability and reduce milk price volatility early 2010 (U.S. Department of Agriculture, 2010h).

The milk package was formulated taking into account the recommendations of the High Level Group on Milk (HLG). The HLG presented a report on 15 June with 7 recommendations for the EC. The EC responded in its proposal on the first three recommendations (contractual relations, bargaining power of producers and interbranch organizations) and rapidly responded to the recommendation on transparency.

Concerning the contractual relations, the EC regulates several aspects; other aspects are left to member states in order to satisfy national contract laws (European Commission, 2010b). The contract shall:

- Be concluded in advance of the delivery
- Be made in writing
- Include:
    - The price payable for delivery, which shall:
        - Be static and be set out in the contract, and/or
        - Vary only on factors which are set out in the contract, in particular the development of the market situation based on market indicators, the volume delivered and the quality or composition of the raw milk delivered,
    - The volume which may and/or shall be delivered and the timing of deliveries, and
    - The duration of the contract, which may include an indefinite duration with termination clauses

(European Commission, 2010b)

Standardized contracts are not favored by the EU National Competition Agencies. Contracts should be voluntary; however a code of good conduct and practice by operators in the dairy value chain would be favorable (European Commission,

2010c). If a country decides to make contracts compulsory, the above mentioned rules apply.

Concerning producer organizations the EC proposes to limit the volume pooled by these organizations to ensure competition[23]:

- A maximum of 3.5% of EU milk production can be pooled in a producer organization to bargain for contracts with the dairy processors.
- A limit of the national production is proposed to ensure competition in the supply of raw milk at the national level. A limit of 33% of the national production would be applied.

The formation of interbranch organizations is highly recommended by the EC for the reasons discussed in the previous subsection 7.3 Interbranch Organization. These organizations however should not play a role in any price regulation or agreement within the dairy chain.

Concerning transparency the EC expressed some concerns. Transparency is not beneficial to farmers, as soon as the minimum price for milk is reported it becomes immediately the reference price for processors, this is definitely the case in an oligopsonistic market (European Commission, 2010c). With the existence of the EUREX a reference price becomes available for the dairies. As seen in the U.S., this can result in price matching behavior among dairies, and so result in lower non-competitive prices for farmers. However, transparency can be beneficial when farmers are organized in producer organizations. An equal bargaining volume and equal access to information provide a strong bargaining

[23] Too strong producer organizations could result in double marginalization and a higher cost for the consumer.

position for producer organizations. Interbranch organizations can play a role in providing market transparency on contract formation and prices.

The other recommendations by the HLG still to be evaluated by the EC are:

- Market measures that are green-box compatible and the role of future markets to reduce income volatility.
- Innovation and research; i.e. ameliorate the communication between research centers and governmental institutions.
- Quality and labeling; i.e. origin of production labeling and handling imitation dairy products.

(High Level Group on Milk, 2010)

In the report of the USDA's Dairy Industry Advisory Committee, compiled out of several parties from the dairy industry and dairy experts (U.S. Department of Agriculture, 2010h), the focus was on 4 different topics:

- Existing programs and authorities
- Price protection, stabilization and regulation
- Income protection and stabilization
- Profitability and market improvement

In the first topic, the review of the FMMO was advised due to the possible impact on end-product pricing and so on milk price volatility and the impact of classified pricing and pooling on processing investment, competition and dairy innovation.

The use of Farm Loan Programs[24], emergency interventions, and a system that provides transparency of dairy farm profitability were recommended to be further used and expanded.

Under the second topic it was recommended to eliminate the DPPSP and the DEIP and use these budget savings to further enhance the safety net for farmers, provide transparency in dairy prices, explore alternative measures to the current end product pricing system as under the FMMOs and adopt a growth management plan[25].

Concerning income protection and stabilization the establishment of a credit system for coops or proprietary firms that procure milk to cover the margin deposits required to ensure the performance of the terms of a futures contract is suggested. This should facilitate the access for dairy firms on the futures market and enhance contract formation on the dairy market. The MILC-program should be revised on two aspects; provide an insurance program for production exceeding the cap so to provide protection of income for larger producers and use an all-milk income/feed cost margin trigger. Also farmers should be able to have a savings account for which deferred tax rules apply.

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[24] Farm Loan Programs provides farmers with credit who cannot obtain commercial credit from a bank, Farm Credit System institution or other lender. It also issues emergency loans in situations where farmers have been adversely impacted by severe weather conditions (U.S. Department of Agriculture, 2010h).

[25] An investigation of the potential of a Growth Management Program (GMP) to reduce price volatility is provided by Nicholson and Stephenson (2009). They conclude that a GMP, based on a market access fee and limiting farmers to grow with a certain percentage; if they grow more they have to pay a fine which is divided among the other farmers, reduces price fluctuations effectively when they are induced by normal cyclical variations, however with price shocks the program does not effectively reduce price fluctuations.

The last topic concerns profitability and market improvement and advises the support for competitive market structures, support for export market development, support for value-added dairy, provide incentives for environmental practices, phase out ethanol subsidies, improve dairy herd health, provide the access to immigrant labor sources, support milk quality and restrict the use of dairy descriptors on product labels (that involves restricting the possibility to free ride by non-dairy copy products on the image of dairy products).

In both countries the policy makers are further stimulating free markets, though there is a high concern about the own industry. The income of farmers is tried to be safeguarded by providing them with possibilities to reduce price risk and design market programs that are green box compatible.

7.5 SWOT Analysis of the Dairy Market

By interpreting the discussion in previous chapters, the strengths and weaknesses and opportunities and threats can be listed below for the players, i.e. farmers and procurers/processors, in the market as also for the market as a whole. There are many similarities between the German and the U.S. dairy market. This can be explained due to the fact that both are industrialized markets with a tendency to open up the market.

Table 7-1: SWOT analysis German dairy industry.

Strengths	Weaknesses
Orientation to foreign markets	High cost structure dairy farms
Increasing consumer oriented	Oligopsony/Collusion danger due to high market concentration
Competitive dairy processors	Extra cost compared to world competition to incorporate externalities
Subsidies to incorporate animal welfare and environmental externalities for dairy farmers	Cooperative-member relationship increasingly under pressure
High importance for the domestic economy resulting in policy makers interest	Weak bargaining position to form contracts for dairy farmers
Opportunities	**Threats**
Producer organizations to increase bargaining power stimulated by the EC	Shift of milk production due to regional differences can disrupt rural societies
Increasing world demand and increasing access to foreign markets	Increasing production in foreign markets
Market transformation from protectionism to open markets	Uncertainty about future policies

Establishment of a futures market	Increase of price volatility
Interbranch organizations to stimulate competitiveness of the whole dairy chain	Decreasing domestic demand
Lower cost for farmers and the opportunity to grow for farmers and processors with the abolishment of the quota system	
High value added markets	
Niche markets	
Differentiation possibilities to reduce risk	

Table 7-2: SWOT analysis U.S. dairy industry.

Strengths	Weaknesses
Increasingly consumer oriented	Oligopsony/Collusion danger due to high market concentration
Competitive dairy processors	Lower focus of the dairy industry on international markets
Competitive dairy farms	Low internalization of externalities
Use of futures market to reduce price risk	Weak bargaining position for farmers to form contracts
Producer organizations (CWT see Appendix 2)	Cooperative-member relationship increasingly under pressure
High importance for the domestic economy resulting in policy makers interest	
Opportunities	**Threats**
Increasing world and domestic demand.	Increasing production in foreign markets
Market transformation from protectionism to open markets	Uncertainty about future policies (e.g.: policies to internalize externalities; FMMO)
Interbranch organizations to stimulate competitiveness of the whole dairy chain	Increase of price volatility

High value added markets Niche markets Differentiation to reduce risk	Shift of milk production due to regional differences can disrupt rural societies

This market organization seems to be prospering in the short term. However it must be noticed that this can come under pressure in the long term. Berry (2001) wrote:

"The developed nations had given to the free market the status of a god, and were sacrificing to it their farmers, farmlands, and communities, their forests, wetlands, and prairies, their ecosystems and watersheds. They had accepted universal pollution and global warming as normal costs of doing business."

It must be noticed that not every individual on the market follows this tendency; new ideologies on sustainability[26] create a market next to the industrialized one, though within the framework of policies and law. These markets (farmers market, local food restaurants …) form an alternative route for farmers and processors to market their products to an increasing share of the western population that get aware of the limited capability of the industrialized market to internalize externalities.

[26] Inquieries into the Nature of Slow Money by Woody Tasch (2008) presents the concept of Slow Money as a new way to invest locally, to invest in soil.

8 Conclusion

The dairy market is highly regulated in Germany and the United States. Dairy policies were implemented to provide farmers a stable price. In Germany the quota system is the dominant policy. By fixing supply overproduction is eliminated. In the United States the market is highly regulated by the Federal Milk Marketing Orders. This policy provides farmers with a minimum, uniform price and also provides consumers with access to milk. Other policies in both markets are intervention by purchase and export subsidies. These policies protect the domestic market for low world market prices and make a higher stable price possible. Direct payments to support farmers' income are also present in both markets. In Germany these are mostly decoupled, while in the U.S. countercyclical direct payments are put in place.

However, due to the World Trade agreements the EU and the U.S. are obliged to open up their markets for world trade. The European Commission decided to abolish the quota system by 2015 through the means of a soft landing. The gradual increase of the quota has an effect that quota rents drop and the national quota was not filled the recent years. Intervention was abolished but was reinstated due to low market prices in 2009. Decoupled direct payments play an important role in supporting the income of German dairy farmers. In the U.S. some changes in the dairy policy were made to fulfill the WTO agreements, i.e. the change from supporting raw milk price to supporting dairy products with the Dairy Product Price Support Program, and the implementation of Tariff Rate

Import Quotas instead of an import tax. Protectionism of these markets is reduced which has an effect on the market.

The German and the U.S. markets are characterized by an expanding demand for dairy products. Producers have responded by increasing supply. The German market is less responsive than the U.S. production market. This is due to different producer characteristics. Production in the U.S. is more specialized as seen by a higher yield per cow. Dairy farms in the U.S. have a larger average herd size. German producers were less flexible to expand production due to the quota system. The study showed that consolidation on the supplier as well as on the buyer side is present in both markets. It must be noted that both countries have different regional characteristics of production, making generalizations less concrete.

The changing market environment had also an effect on cooperative organization. Cooperative organizational forms have been transformed in order to adapt new strategies. This study shows how leading cooperatives in both markets adopt more and more to an individualized structure. Several forms of financial tools are established like bonds, delivery rights, and shares. Capital is gained through these financial tools and through retained earnings. Member participation in the decision making process is reduced and not according to the principle “one man-one vote” anymore. The day to day decisions are taken by CEOs. The cooperative pricing policy is of less importance. The cooperatives are shareholders of profit

oriented firms, which price like private firms. UD pricing is the main pricing method providing competition on the market. Profits are paid out to farmers in different ways or are retained. By raising capital and reducing member involvement in the decision making process, cooperatives are more flexible to react to market changes by adapting strategies. The main strategies applied by the large cooperatives are value adding, merging and internationalizing. The effect on cooperative-member relationship is important. The more individualized approach and entrepreneurial form could result in a lack of trust towards the cooperative in defending the cooperative values. The transformation to an entrepreneurial cooperative, which is profit-maximizing, results in two identities for the member-farmers; the identity of investor-shareholder and the identity of supplier. This identity can be split, especially when cooperatives start to invest in markets outside the members' market. The shareholder can benefit the presence of unequal bargaining power between farmer and processor, the farmer however does not. Cooperatives should understand the importance of informing their member-farmers about strategic decisions and investments to strengthen the relationship.

The reduction of protection on the domestic markets made competition between dairies more prominent. A wave of mergers was seen in the U.S. and the EU market. This raises questions of oligopsony power. The characteristics of milk as raw product contribute to the possibility of oligopsony power. The study showed how the pricing methods of the dairies are of importance, and that, under price matching behavior, competition is reduced. The importance of bargaining

cooperatives and open membership cooperatives, that price to maximize average revenue instead of marginal revenue, to increase the price transmission is also shown. With changing coop structure to more profit oriented businesses, it is important to consider execution of oligopsony power by entrepreneurial coops towards their members. This argument is especially relevant in the evaluation by competition authorities of mergers by cooperatives.

The study also elaborated on the use of futures markets and contract formation as a means to reduce price risk. Volatility of dairy prices increases as markets get less protected. In the U.S., the use of futures markets and forward contracts to hedge price risk is present. It has been proven a useful tool to reduce price risk however there are some objections towards the system. The main objection is that the market is to illiquid. Government plays an important role in this issue. By providing market policies that reduce the volatility of the price no incentives to use the futures market is given, making the market illiquid. This argument is then used to ask government to keep on providing protectionist market policies. Government could reduce protectionist policies and at the same time promote the use of the futures markets; in this manner a gradual change from government as price risk buffer to the futures market as price risk buffer could be facilitated. Another objection is the unbalanced bargaining position between farmers and dairies. Producer organizations combined with transparency could be a solution for this problem. Further, it is important for the dairies to take into account the

preferences of the dairy farmers towards contracting in order to facilitate contracting.

By looking at the evolution of policies, market conditions, farm structure, processing structure, cooperative organization and strategies like the use of futures markets and contracts, trends in the dairy market at both sides of the Atlantic could be discovered and compared. Taking these trends into account, future opportunities and threats can be identified. As the dairy market is an important segment of the economy in both countries, policy makers keep a close eye on the changes in the market environment. Policy reforms are announced in both markets, entailing reduced protectionism and increased conformation towards the WTO agreements. However policy makers also provide the industry with means to deal with the increased price volatility. In U.S. the implementation of a Growth Management Plan could reduce price volatility. In Europe a futures market is established and the formation of interbranch organizations and producer organizations are stimulated.

The future prospects for the market for dairy products seems prosper. However, competition is necessary for an efficient market, the importance of a skilled competition institution seems now more important then ever. If both the national dairy companies and farmers work towards a competitive position, the supply of the domestic market can be guaranteed and the benefits in foreign markets can be reached.

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Appendix 1: Top 20 Processors Germany and U.S.

Table A1-1: Top 20 of German dairy operators 2009 according to milk quantity processed.

Rank	Company	Milk quantities (Mil. kg)	Turnover (Mil. Euro)	Euro/kg Milk	Organizational Form*
1	Nordmilch Group	4,100	2,500	0.61	Cooperative
2	Humana Group	3,000	2,301	0.77	Cooperative
3	Müller Group	2,150	1,768	0.82	Kapitalgesellschaft
4	Hochwald	1,900	1,170	0.62	Cooperative
5	Milch-Union Hocheifel	1,078	620	0.58	Cooperative
6	FrieslandCampina	983	1,482	1.51	Cooperative
7	Uelzena Group	962	344	0.36	Cooperative
8	Molkerei Ammerland	957	387	0.40	Cooperative
9	BMI Group	892	492	0.55	Cooperative
10	Rücker	850	344	0.40	Kapitalgesellschaft
11	Omira/Neuburger	792	622	0.79	Kapitalgesellschaft
12	Hansa-Milch	740	369	0.50	Kapitalgesellschaft
13	Goldsteig	713	371	0.52	Kapitalgesellschaft
14	Bayernland	700	1,000	1.43	Cooperative
15	Frischli	700	365	0.52	Kapitalgesellschaft
16	Zott	670	790	1.18	Kapitalgesellschaft
17	Allgäuland-Käsereien	589	403	0.68	Kapitalgesellschaft
18	Meierei	545	129	0.24	Cooperative

19	Barmstedt Hochland	496	1,100	2.22	Kapitalgesellschaft
20	Ehrmann Group	441	664	1.51	Kapitalgesellschaft

*The organizational form is according to German law. Kapitalgesellschaft is an organization regarded as a legal private person by law. It is comparable with the structure of a limited company. The German forms are GmbH, AG, KGaA. The cooperative structure is according to the German law an eG.

Data: German Dairy Association (2011) + sites of the respective dairies.

Table A1-2: Top 20 Dairy companies U.S. according to sales in 2009.

Rank	Company	Sales * 2009 (Mil. $)	Type
1	Dean Foods Co.	11,158	Publically-Traded Company
2	Kraft Foods North America Inc.	4,000	Publically-Traded Company/Subsidiary
3	Schreiber Foods Inc.	3,600	Private
4	Kroger Co. Dairy Operations	2,375	Subsidiary
5	Prairie Farms Dairy Inc.	2,302	Cooperative
6	Land O'Lakes Inc.	3,208	Cooperative
7	HP Food LLC	2,200	Private/Subsidiary
8	Lala USA	2,200	Private
9	Leprino Foods Co.	2,150	Private
10	Dairy Farmers of America	2,090	Cooperative
11	Dairygold Inc.	2,000	Cooperative/Subsidiary
12	Dreyer's Grand Ice Cream	2,000	Subsidiary
13	Unilever Ice Cream	1,925	Subsidiary
14	Great Lakes Cheese Co.	1,800	Private

15	California Dairies Inc.	1,410	Cooperative
16	Associated Milk Producers Inc.	1,400	Cooperative
17	Fonterra North America	1,300	Subsidiary
18	Yoplait USA	1,299	Subsidiary
19	Grassland Dairy Products Inc.	1,199	Private
20	Foremost Farms USA	1,141	Cooperative

*Only sales of finished dairy products are accounted for.

Source: Dairy Foods (2010).

Appendix 2: Herd Retirement Program by CWT

The Cooperatives Working Together program is a dairy industry sponsored program initiated in 2003 by the National Milk Producers Federation. Its aim is to support dairy prices by controlling supply through herd retirements and stimulating demand by providing export assistance. In 2009 the export assistance was eliminated as CWT believes that the herd retirement program is the most effective one. The herd retirement program provides farmers, who are member of CWT or an indirect member through a cooperative who is a member, with financial compensation if they decide to take dairy cows out of production. The farmers can offer a maximum bid of $5.25 per hundredweight raw milk to CWT. In 2009 there were 3 opportunities for farmers to offer a bid to CWT. The organization chooses the lower bids first to decline the herd. The payment CWT offers is the bid price multiplied by the herd's milk production over the 12-months period starting on September 1 2008 through August 31 2009 for the 2009-3 Herd Retirement Program. The effect of the Herd Retirement Program by achieving a reduction in the national herd to balance out supply and demand is a higher price for milk producers with the benefit of receiving compensation for declining their herd. The effects on the herd size and on the milk price are shown in Figures A2-1 and A2-2. As can be seen in Figure A2-1, the Herd Retirement Program in 2009 was the largest one in the history of CWT.

The participation payment for farmers is $0.10 per hundredweight since 2007, before it was only $0.05. These are the funds CWT uses to compensate for the loss in cows for farmers who reduce their herd. The farmers can be joined through

a cooperative that makes the transaction of the $0.10 easier by deducting it every month from the farmer's account. The National Milk Producer Federation estimated a net increase of the milk price by $1.30 per hundredweight if the milk supply was reduced by 4.6 billion pounds. However, after adapting this amount for a loss in MILC-program benefits due to the price increase, this would mean an increase of $0.86 per hundredweight. However with a reduction of 1.2 million pounds the adjusted price increase would only be $0.23. Of course this is a benefit for every dairy farmer and not only for the ones who participate in the program and pay the $0.10 (Gould, 2009). But with the synergy of several herd retirements the overall effect on the price was estimated on $ 1.54 per hundredweight from January until November 2009 by Dr. Scott Brown of the University of Missouri (Cooperatives Working Together, 2010).

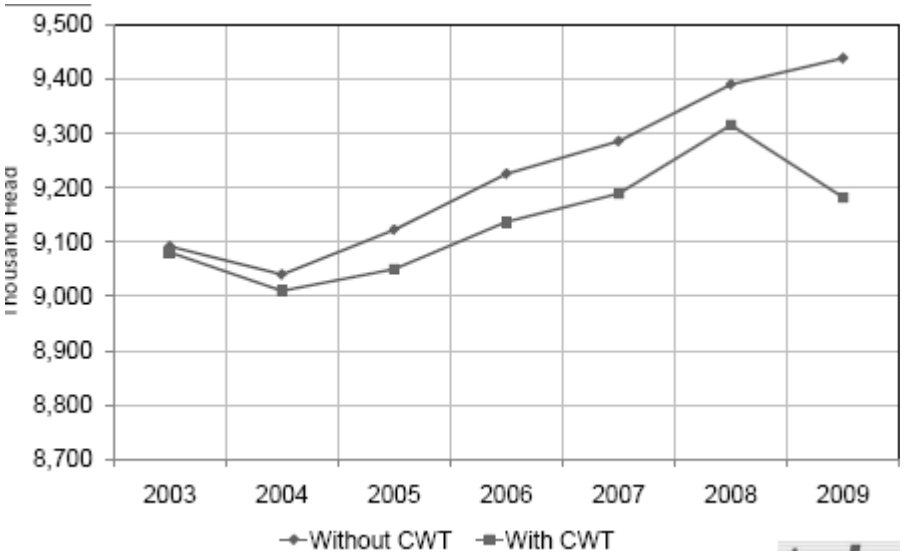

Figure A2-1: Effect of CWT on herd size.

Source: Brown (2009).

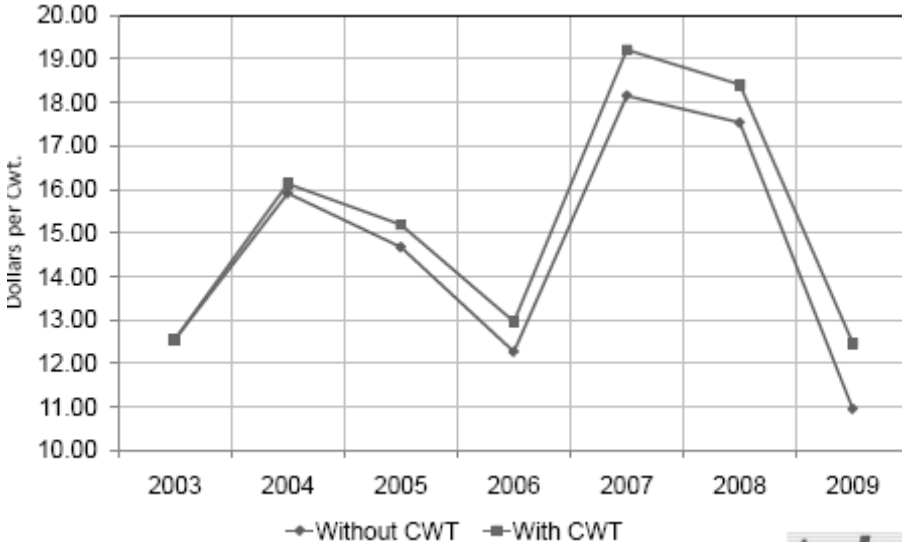

Figure A2-2: Effect of CWT on milk price.

Source: Brown (2009).

As mentioned before the funds for the CWT program are provided by membership payments of $0.10 per hundredweight marketed milk. The total contributions for the period January 2009 until August 2009 accounted $71 million. With a total carryover of $76 million from 2008 and interests this resulted in revenue of $148 million. The expenses for the Herd Retirement Program 2009-1 and 2009-2 were $140 million, administration accounted for $2.5 million and interests and fees accounted for $0.6 million. The total expenses for the period January 2009 until August 2009 were $143 million. This left CWT in a positive balance at the end of August 2009.

Appendix 3: Constraints of Classical Cooperatives

The five classical constraints of ill-defined property rights in a cooperation are briefly explained. Their relevance in this topic is highly. Because of the changing market situation the ill-defined property rights turn into several not negligible disadvantages, also called cooperative baggage. Property rights are defined as a socially and legally enforced right to select uses of an economic good (Cook and Iliopoulos, 1999). Ill-defined property rights undermine efficiency because the decision maker does not bear the full impact of his decision. The ill-defined property rights create the opportunity of a conflict between investor and user. The conflicts are about decision control and residual claim. They appear when IOF ameliorate to the market failures or when there is an economic depression in which it is necessary to act flexible. This cooperative baggage is referred to as internal pressure to reform the co-operative.

Free-rider Problem

The free rider problem occurs when property rights are untradeable, insecure or unassigned (Cook, 1995). This involves the sharing of benefits the cooperation induces with members or non-members of the cooperation that did not attributed entirely to receive those benefits. This is a mayor problem in open membership cooperatives. The insider free rider problem is a more complex type of this problem of ill-defined property rights. It refers to the problem occurring when new members of the cooperative are entitled to the same amount of patronage and

residual claimant as existing members and are entitled to the same payment per unit of patronage.

The free rider problem induces a lack of incentive to invest in the cooperative because the full benefits of the investment are not returned to the members who invest. This can result into a chronically shortage of capital in the cooperative or a more reliance on debt.

Portfolio Problem

The lack of transferability, liquidity and appreciation mechanism for exchange of residual claims is an obstruction for members to match their cooperative asset portfolio with their risk preferences (Cook, 1995). This has as consequence that members who are taking more risk than willing are pressing the cooperative management to adapt the portfolios to a lower risk suiting their own risk-return trade-off. Since equity is divided in patronage and retained earnings used for investment, a lower risk involves most of the time lower investment, which can result in a suboptimal financial structure and lower expected returns.

Horizon Problem

The horizon problem occurs when a member's residual claim on the net income generated by an asset is shorter than the productive life of that asset (Porter et al., 1987). Members of a co-operative are not sure they will be a member of the cooperative until the asset they helped to invest in is worthless. If a member steps out before the end of the production life of the asset he helped to invest in, he

would have a loss. In an IOF this does not occur since the transferability of shares on the stock market allows the value of the shares to contain the expected future earnings of the long-term investment. The result is that there is a disincentive to invest in long-term assets.

Control Problem

The control problem occurs when the board of directors has incomplete information about the interests of their members and the other way around. This agency cost increases with an increasing number of members and organizational complexity. Unlike an IOF, the co-operative does not get the incentive by publically traded stock so operational inefficiencies can go unobserved. In a large cooperative, members also have a lower incentive to monitor the performance of the management and board of directors due to their lower individual impact to make a change.

Influence Problem

The influence problem occurs when the possibility within a cooperative exist for its members to have different objectives, this can occur in a cooperative with a widely variety of activities. The influence of a part of members with a different interest than another can result in unbalanced distribution of wealth within the cooperative. This is a result of the dual role of the members as user and investor. As an investor and provider of capital, they have the power to steer the

cooperative in the direction that will benefit them as user the most. This makes management of the cooperative more difficult.

Appendix 4: Merger Friesland Foods/ Campina: Investigation of the European Commission

In 2009 two main Dutch dairies, Friesland Foods and Campina, merged. According to European Commission Merger Regulation the two dairies asked approval of the European Commission. The EC concluded that a reduction of competition would take place on the market for cheese and fresh dairy and long life dairy drinks. Also the reduction of competition on the procurement market could lead to negative consequences for consumers. The new formed dairy FrieslandCampina would be able to raise it prices on the downstream market. However due to higher performance of the cooperative the member farmers could enjoy a higher revenue per liter milk delivered which could involve reduced competition on the procurement market and intensify the position of FrieslandCampina. Because of these arguments, the EC allowed the merger if FrieslandCampina would reduce its market share, sell certain processing firms and reduce its amount milk processed.

On 12 June 2008 the European Commission received a notification of the proposed merger pursuant according to Article 4 of the EC Merger Regulation. The Commission initiated proceedings on 17 July 2008 on the basis that the concentration raised serious doubts as to its compatibility with the common market and the functioning of the European Economic Area Agreement. The merger case is referred to as Case No COMP/M.5046-Friesland Foods/Campina. This discussion is based on an article of de La Mano et al. (2009).

The parties

Friesland Foods and Campina were before the merger the two largest dairy cooperatives in the Netherlands. Friesland foods counted in 2007 9,417 members while Campina counted 6,885. The total amount of dairy farmers in the Netherlands in 2007 was 22,000. Campina was active in Europe, North and South America and Asia while Friesland Foods was active in Europe, the Middle-East, Asia and Africa as well as sales worldwide of dairy ingredients for professional and industrial customers.

As the two companies are cooperatives, this merger involves more than a combined procurement of raw milk from farmers; the member-famers have a relationship stronger than mere an economic one with the merged entity. The member-farmers are also the owners of the coop and for that involved in the governance of the coop. Further, member farmers are obliged to sell all their produced milk to the coop as the coop is obliged to accept that milk. FrieslandCampina declared in their Half Annual Report 2010 that it will keep procuring all the produced milk from their member-farmers even after the abolishment of the quotas (FrieslandCampina, 2010a). Another special relationship is the performance payments to member farmers additional on the guaranteed price. It is obvious that there is a strong link between the coop and its members due to the profit-milk price relation and profit-investor relation. Farmers have a disincentive to leave the coop first due to the promise to procure. Milk is a highly perishable product and the promise to procure reduces the uncertainty and

risk of not finding an outlet. Secondly if farmers sell their bonds they cannot benefit from the future profits of recent investments.

With this merger Friesland Foods and Campina expected to be able to anticipate better and the act more powerful on the each time faster changing market conditions like:

- the liberalization of the market and its deregulation
- the increasing competition on the regional and global markets
- the high fluctuation on the market for dairy
- the increasing global consumption of dairy products

(Source: FrieslandCampina, 2009)

The investigation

Procurement of raw milk:

Friesland Foods and Campina argued that the procurement of raw milk is sub-national in scope. The EC stated that it was national in scope for several reasons[27]. They argued that the costs of procurement are depended on other factors than only distance, as there are the size of the plants and the size of the farms that source the plants. Economies of scale can reduce the procurement cost. Also the competitors

[27] In a recent available report from the Bundeskartellamt on the merger of Humana's and Nordmilch's sales department into Nord Contor, the procurement markets were defined as the area within 150km around the plant. Even though Humana and Nordmilch have a share in several of the investigated markets equal or more then 40%, the Bundeskartellamt decided that there were still enough outside options for farmers (Germany, Bundeskartellamt, 2009).

of Friesland Foods and Campina collect raw milk in areas that extend beyond the working areas of the parties and cover a substantial part of the Netherlands. Another reason why the Commission decided that the procurement market is national in scope is that the competitors of the parties do not take the price Campina or Friesland Foods pays to their farmers as a benchmark price, while other dairies do, irrespective of the region where these farmers are located.

The total market share of the merged entity is on national level 70% to 80% (de La Mano et al., 2009). The average yearly Dutch national production during 2006-2009 was 11 billion kilogram (Netherlands, The Statistics Netherlands, 2010). Together with the fact that dairy farmers are badly organized, there is a strong indication of a dominant position for the merged entity on the procurement market for raw milk.

The Commission however, found that the dominant position of FrieslandCampina on the procurement market would not lead to lower prices for farmers as the structure of the merged entity is a cooperative one. The promise to procure the milk from its members and the fact that farmers own the company will lead to not lowering the purchase of milk thus raising the price on the downstream market. The Commission did find out that FrieslandCampina's dominant position could be a threat to downstream competitors as they would have difficulties to source raw milk. Also, as FrieslandCampina would have a dominant position on the markets for some dairy products (cheese and fresh dairy products), they would be able to higher the price for consumers and thus earn higher profits. This would entitle them to give farmers a higher price for their milk delivered as the payout price is

directly linked to higher profits, thus reducing the possibilities for other downstream competitors to procure raw milk. While offering the same benefits to farmers like the other cooperatives on the Dutch dairy market, like stability of income, assurance of procuring all farmers' milk produced and long standing relationships, the position of the merged entity would only gain dominance by reducing the possibility for other downstream competitors to compete. For these reasons the Commission decided to implement the merger conditions as mentioned above.

Fresh dairy products:

The market of fresh dairy products includes fresh basic dairy products (i.e. fresh milk, fresh butter milk and plain yoghurt), value added yoghurt and quark, fresh flavored dairy drinks, fresh custard and porridge. In these markets several sub-markets are defined that we will not discuss here as it is not relevant to investigate the attitude of the EC towards mergers. What is important to mention is that for every product the market definition is important in order to assess the dominant position of the merged entity. The characteristics of the product are important (brand or private label, organic or non-organic, health drinks or non-health drinks) as also the distribution channel (retail or Out of Home) for the products. Based in these parameters the Commission found a dominant position of FrieslandCampina for several fresh dairy products due to the parties' high combined share on the market, the fact that they were regarded as each other's closest competitors

(resulting in the difficulty for costumers to switch to alternative suppliers) and the difficulty for competitors to expand production whenever a price increase occurs.

Cheese:

The market investigation showed that the cheese supply chain in the Netherlands has many specific features. There are two Dutch-type cheeses based on the production level: naturally matured cheese or rindless cheese (i.e. cheese that is wrapped in a plastic foil when it is young and does not mature any further). Dutch-type cheese is sold in the Netherlands to specialized cheese wholesalers, who are active at the intermediate level between production and downstream distribution channels, or to retailers. The cheese wholesalers often buy cheese at the age of 15 days to stock it and let it further ripen, after which they sell it to downstream distribution channels in the Netherlands. The division of the markets is done by looking in which downstream channel the cheese is marketed. The investigation found out that the market for matured cheese is national of scope while the market for rindless cheese is international of scope with important markets in the Netherlands and Germany.

The investigation by the Commission found out that due to the merger, the competition on the markets for the sale of Dutch-type cheese to specialized cheese wholesalers and to retailers would be impeded in the Netherlands. This result is based on the high market shares of the parties, the closeness of competition between the parties so that specialized cheese wholesalers and retailers have limited outside options, the limited prospects of future entry and expansion and

the fact that all countervailing factors put forward by the parties were found to be insufficient to prevent the merged entity to increase prices.

The conditions to merger

On 17 December 2008 the commission gave permission for the merger under several conditions. To meet those conditions FrieslandCampina had to sell a Dutch-type cheese plant in The Netherlands, finish a part of their activities on the Dutch market for daily fresh dairy products and quit some brands of the long life dairy drinks production in Belgium and The Netherlands. The merged company was also obliged to decrease its share on the Dutch procurement market for raw milk to free a quantity of 1.2 billion kilogram milk to be available to procure by (new) other processors of fresh dairy and nature-ripened cheese. This condition is binding until 2017 or when the commission decides not to.

To meet these conditions Friesland Foods Fresh at Nijkerk was sold to Arla Foods from Denmark. Friesland Foods Fresh covers the products fresh milk, fresh buttermilk, plain yoghurt, value added yoghurt and quark, fresh custard, porridge, fresh flavored dairy drinks, fresh cream and organic fresh basic dairy products. For the use of the brand Friesche Vlag a licensed agreement was made for a period of 5 years followed by a black-out. Milcobel took over the sale of two brands of the long life dairy drinks. The cooperative milk delivery union DeltaMilk took over the cheese activities of FrieslandCampina in one plant in Bleskensgraaf. The Dutch Milk Foundation was founded to implement the conditions on raw milk. The foundation managed the transmission of milk

delivery to other dairies (Arla Foods and Deltamilk) and manages also the step-out of member-farmers from FrieslandCampina. The member-farmers who decide to leave FrieslandCampina and deliver their milk to another dairy, get a premium of 5 euro per 100 kilogram milk. This step-out contributes also to the reduction of the procurement of milk on the market.

Appendix 5: Description of 4 Dairy Cooperatives

FrieslandCampina

FrieslandCampina was formed out of the merger between Zuivelcoöperatie Friesland Foods U.A. (Friesland Foods) and Zuivelcoöperatie Campina U.A. (Campina). The dairy is active on several markets including the procurement market for milk and the production and sale of various dairy products for consumers and professional and industrial consumers. FrieslandCampina is the biggest dairy cooperative of the world and the third biggest dairy company after Nestlé and Danone. The headquarters are in the Netherlands but the countries of activity are scattered over Europe and the world. The main countries where FrieslandCampina is active are Belgium, The Netherlands and Germany.

Structure

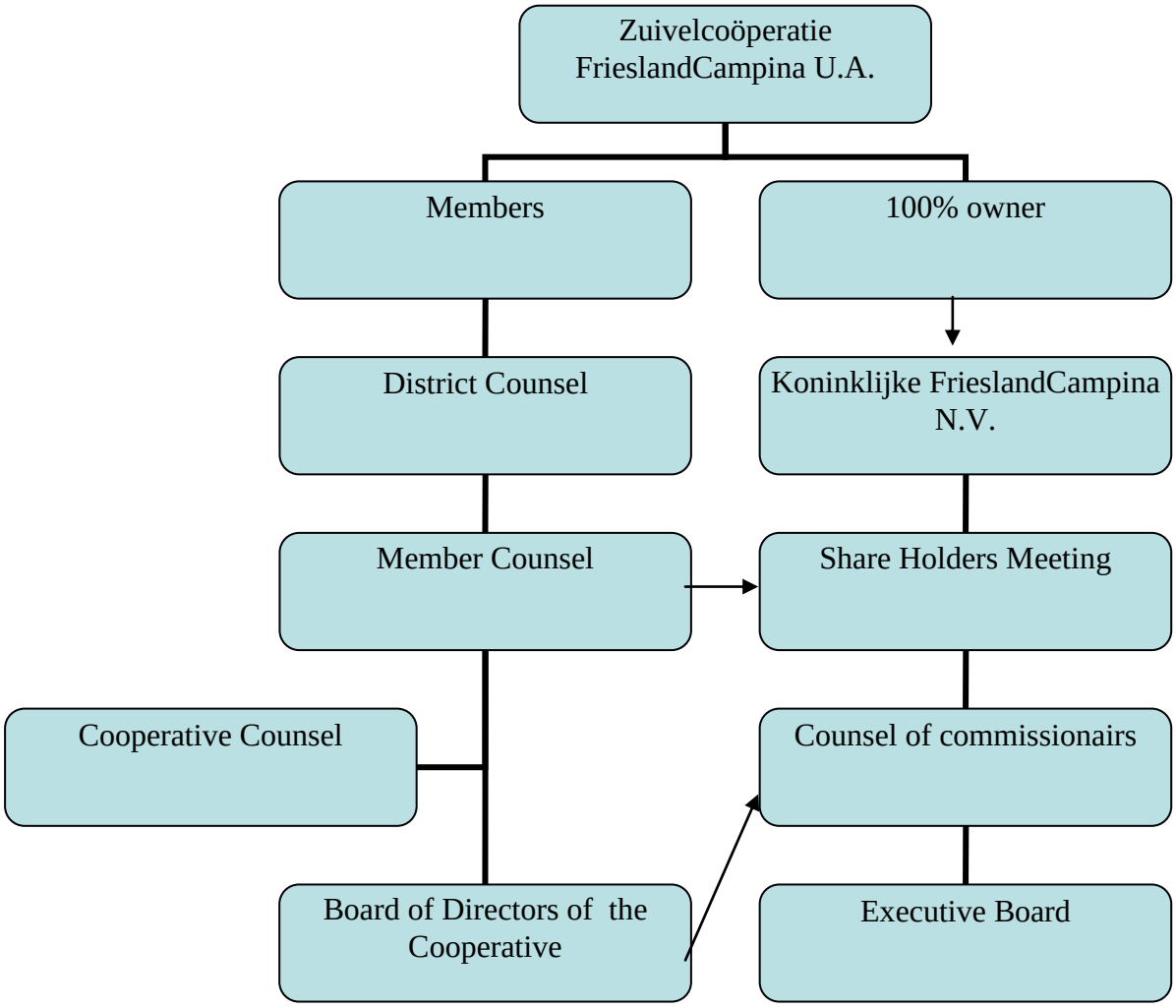

Figure A5-1: Organizational structure FrieslandCampina.

Source: FrieslandCampina, 2010b.

The Zuivelcoöperatie FrieslandCampina is a cooperative with approx. 16,000 member-farmers in The Netherlands, the west of Germany and the Belgian province Antwerp. The cooperative owns the firm Koninklijke FrieslandCampina

N.V.[28], which is processing and selling the members' milk. The member-farmers are thus through the cooperative owner of the firm FrieslandCampina.

The member-farmers are divided geographically in 21 districts. Each district has an elected board of 10 people which forms the connection between the member-farmers and the cooperative. The district board members have a vote in the Member Counsel according to the volume of milk produced in their district. The Member Counsel consists of the district board members and 9 member-farmers who are elected to govern the cooperative, the Board of Directors of the Cooperative. The Cooperative Counsel exist of 21 district board members who advice the Board of Directors of the Cooperative about investments and mergers. This is the description of the cooperative structure, on the other hand there is the structure of a firm called N.V. According to Dutch law an N.V. must have a meeting of the shareholders at least once a year. This meeting of shareholders represents the highest organ of the N.V. In the structure of FrieslandCampina N.V. the shareholders are represented by the Member Counsel. The daily running of business is in the hands of the executive board existing of CEOs. A Counsel of Commissionaires is requested in a firm of that extent. The task of this counsel is to keep an eye on the Executive Board. In FrieslandCampina N.V. this counsel is represented by the Board of Directors of the Cooperative plus 4 external members.

Activities

[28] N.V. stands for Naamloze Venootschap which is a business structure comparable with the joint stock company.

FrieslandCampina has several activities. The main activities are procuring milk, processing milk, marketing and selling dairy products.

FrieslandCampina is obliged to procure the milk from its members as the members are obliged to deliver the milk to their cooperative. This results in a constant flow of raw milk to the cooperative. The delivery rights (quotas) are owned by farmers but administrated by FrieslandCampina.

FrieslandCampina has more then 30 known brands in dairy products (Campina, Cécémel, Fristi, Joyvalle, Landliebe, Optimel, Yazoo, …), fruit juices (Appelsientje, DubbelFriss, …) and sport drinks (Extran) for consumers, cream and butter products, desserts, ice-cream, milk shakes (Debic, Hollandia and Polderland) for professional consumers and ingredients for industrial retailers (Creamy Creation, Kievit, Domo, …).

The firm is present in 24 countries in which it sells or processes dairy. The focus on Asia and the expanding market share are main goals. Yearly the firm processes 10.8 billion kilogram milk from which 8.7 billion is delivered from the member-farmers (FrieslandCampina, 2010b).

The main goal of the firm is to expand, become more profitable and valorize milk. FrieslandCampina wants to be strong on the market by providing high value dairy products like dairy drinks, cheese, ingredients for baby and child food, products for the hotel and catering industry, bakeries and professional kitchens and providing the food industry with specific ingredients. The aim is to shift

production of bulk commodities like milk powder, casein and basic cheese to specialized products with a higher value for which the profit margin is bigger.

Performance

This is based on the year report 2009 of the Royal FrieslandCampina N.V. (FrieslandCampina, 2009).

FrieslandCampina N.V. had a yearly net revenue of 8.2 billion euro in 2009. This has shrunk compared with 2008 with 14% due to a low price-level for products as milk powder, caseins and basic cheese. The profit of the company however raises with 35% compared with 2008 to 182 million euros. This resulted in a performance payment of 0.59 euro per 100 kilogram milk to farmers who received a price 26% lower than 2008 i.e. 26.99 euro per 100 kilogram milk inclusive the bonus. The pricing for raw milk by FrieslandCampina is based on the average market price. The guaranteed price is calculated by taking the average milk price for Germany, the milk price of Arla Foods in Denmark, of Bel Leerdammer, Cono Kaasmaker and DOC Kaas in the Netherlands and of Milcobel in Belgium. Each month the guaranteed price is formed from the expected guaranteed price for that month and any settlement of differences in the expectations from preceding months. Additionally a performance payment of 25% of the companies result is divided to the member farmers at the end of the year.

75% of the profit goes to the reserves with which the company wants to make autonomic investments, either directly (60%) or through the issue of bonds to members (15%) (de la Mano, 2009). As demand in the whole world decreased

due to the financial and economic crisis of 2009, FrieslandCampina was still able to raise its profits. The company felt the pressure due to lower exports of milk powder, caseins and basic cheese as the euro held its strong position in the financial market in comparison with the dollar. One reason for higher profits is its growing market share in South-East Asia and Africa for which the demand still increased but less than the predicted trend. The EU restored the intervention by buying butter and milk powder as also the export subsidies for milk powder, butter and cheese. These measures helped to keep the domestic price at level.

The company processed in 2009 10.8 billion kilogram milk, 6% less than in 2008. 81% of that milk is produced by its member farmers. Its most important markets are located in Europe, Asia and Africa. Figure A5-2 shows the geographical market shares based on their contribution to the revenue in 2009.

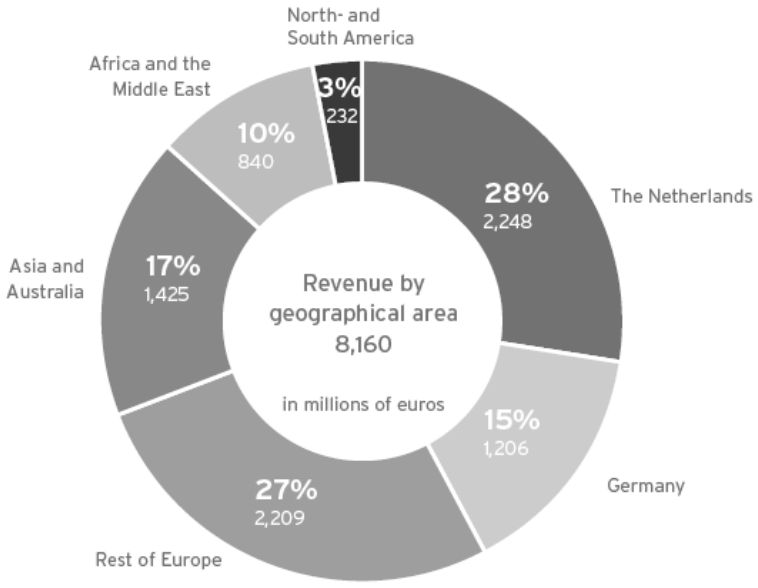

Figure A5-2: Geographical market share FrieslandCampina.

Source: FrieslandCampina, 2009.

Nordmilch

The following description is mainly based on the Annual Report 2009 of Nordmilch (Nordmilch, 2010). Nordmilch is Germany's largest dairy company. The cooperative has around 7,000 members, markets around 4 billion kg milk and has a turnover of 2.5 billion euro in 2008. In 2008 66% of the milk marketed was delivered by members while in 2009 80% was delivered by members. An increase of milk from members (due to a merger with the East German coop Dargun eG Pommernmilch) and a reduction of all milk marketed contributed to this difference. The industry business and cheese are among Nordmilch's key income-generating pillars.

Nordmilch strategies to be a competitive market player can be summed as follows:

- Focus on markets with a rising demand. Nordmilch had a strong growth in the production of cheese.
- Create countervailing power towards the retail sector. Nordmilch merged its sales department with Humana, the second largest German cooperative. The new entity is called NordContor.
- Nordmilch invested in advertisement by showing product specific spots on television.

- Next to merging the sales department, Nordmilch bought an East German cooperative, enlarging its processing capacity and its market presence.
- Nordmilch also invested in value added products and branded products. This was made possible due to a restructuring scheme during 2003-2008 with an investment of 400 million euro.
- Focus on export markets in Asia and Africa.
- To strengthen it position on the market Nordmilch and Humana will merge their processing companies in the beginning of April. The new company will be called Deutsches Milchkontor GmbH. The cooperative mother companies will stay unchanged and become equal shareholders in the new entity

(Source: Nordmilch, 2011a).

Unfortunately information on the organizational structure of the company is limited. The coop applies the one man-one vote principle. 20 members elect one delegate in one district (Nordmilch, 2011b). The cooperative exists of a Supervisory Board (compiled out of employee elected members and others) which has as a task to monitor the Management Team (compiled out of CEOs) that runs the company Nordmilch GmbH. The Board of Nordmilch eG (compiled out of farmers) act as an interface between the Management Team and the farmers. No information was available on who elects who, which makes it hard to evaluate to

voice of the farmers in the cooperative. However following citation shows the profit oriented approach of the Management Team:

"Responsibility for the cooperative's business operations lies with the wholly owned subsidiary NORDMILCH GmbH, while the cooperative NORDMILCH eG (eG standing for "eingetragene Genossenschaft") (the eG) focuses entirely on milk production and cooperative holding company duties. Two irrevocable contracts form a strong communal bond between the two organisations. The emphasis on business know-how on the one hand and production know-how on the other maximises competence in both fields – in the interest of high market returns and competitive milk prices." (Nordmilch, 2011a)

The members of Nordmilch have to own delivery rights in order to deliver. In 2009, this was 4 EUR/100kg. On the patronage the member gets interest, which was 4% in 2009 (Nordmilch, 2011b).

The earnings of Nordmilch are distributed among farmers according to the quantity they delivered, after deducting costs for marketing or milk collecting (Nordmilch, 2011b).

Fonterra

Fonterra Cooperative Group Ltd has more than 10,463 shareholders (Fonterra, 2011) and markets around 90% of the New Zealand milk production, i.e. around 15 billion kilograms. The coop exports 90% of its shareholders production with

main export products milk powder, butter, casein and anhydrous milk fat (Nilsson and Ohlsson, 2007). The coop is responsible for more than one third of the international trade in dairy products (Fonterra, 2011).

Fonterra's focus strategies are (as stated on their website):

> - *Ensure Fonterra remains one of the lowest cost, sustainable dairy co-operatives in the world.*
> - *Build trusting partnerships with customers by being a multi-origin supplier, allowing us to build more valuable relationships through supply chain integration and innovation.*
> - *In high growth markets, where it is not practical to use New Zealand milk, we will leverage our cow to consumer expertise to take leadership positions using locally produced milk.*
> - *Make Fonterra products the first choice of customers and consumers wherever we do business*
>
> (Fonterra, 2011)

Fonterra's main strategy is to be the lowest cost supplier of commodity dairy products. The comparative advantage of Fonterra lays in it size, from which it through economies of scale can reduce it's per unit cost and in it's members' possibility to produce at low cost compared to other dairy exporting countries like the EU member states. It is then also obvious that its main products are commodities.

Another strategy is to increase the level of internationalization by making foreign direct investments in local foreign production.

The strategy to build out partnerships and joint ventures is also pursued, such as an alliance with Nestlé, a joint venture with Arla Foods in Great Britain and a joint venture with Dairy Farmers of America (Nilsson and Ohlsson, 2007).

The organizational structure of Fonterra is shown in Figure A5-3.

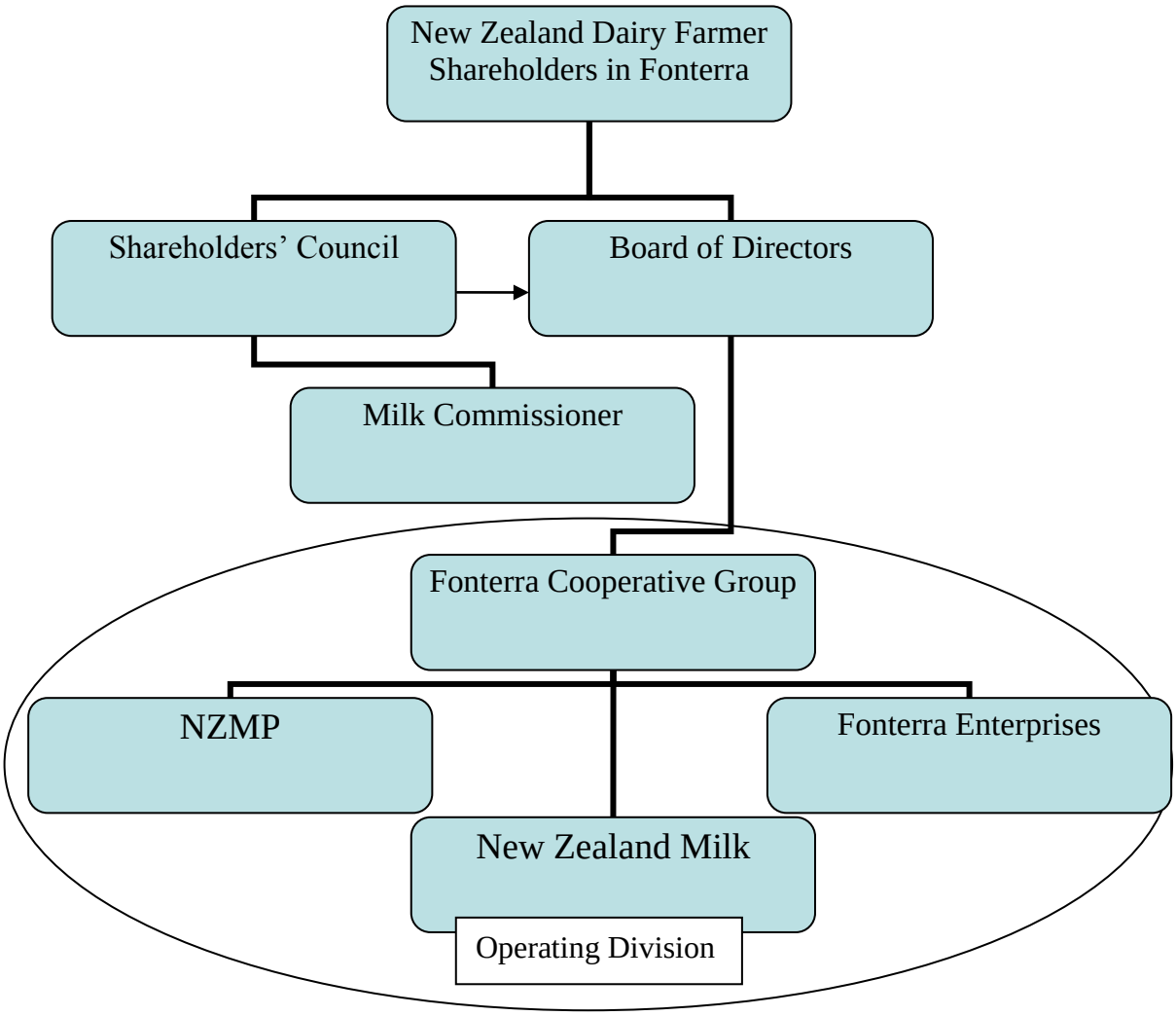

Figure A5-3: Organizational Structure Fonterra.

Source: Nilsson and Ohlsson, 2007; Fonterra, 2011.

The Board of Directors exist of nine directors chosen by the shareholders, additionally three directors are chosen by the nine directors for there specialist skills resulting in a board of nine directors. The Shareholders' Council exists of 46 Councilors representing the shareholders. The council keeps an eye on the board to ensure that shareholders' interests are taken into account. The council also appoints a Milk Commissioner who arbitrates in disputes between shareholders and the coop.

The voting is based on a quantity approach, which entails one vote per 1,000kg of milk solids delivered by the shareholder with an exception for the election of the Councilors for the Shareholders' Council where each shareholder has two votes.

Fonterra Cooperative Group exists of different business branches. NZMP takes the ingredient business for its account. This involves the collection of milk, manufacturing and packaging items and the operation of a supply chain linking production plants in New Zealand and overseas. The New Zealand Milk business branch takes the consumer section for its account by selling branded products internationally as also standing in for the operation of plants abroad. Fonterra Enterprises supports Fonterra's core business e.g., a biotechnology company, technology development, a rural retailer and an agricultural website.

The payout to shareholders exists out of two components: the Actual Milk Return and a value-added component. The Actual Milk Return is calculated based on Fonterra's revenues and costs. The value-added component is calculated using the coop's net profits from capital investments, after an amount for reinvestments has been deducted. As Fonterra has a market share of around 90% it can not compare its performance with other processors in New Zealand. A benchmark price is calculated by an independent valuer, Standard & Poor. This price, also called the Commodity Milk Price is a theoretical estimate of the price an invented efficient processor could pay out and still make an adequate return on capital. This price is based on international commodity prices and foreign exchange rates less an assessment of efficient manufacturing costs.

The investment made by shareholders is done through the purchase of Fair Value Shares. The shareholders are required to hold one share for each kilogram of milk solids supplied. Fonterra used to pay out farmers when they would leave the coop, nowadays they put up a market Trading Among Farmers where farmers can buy and sell their shares. This ensures Fonterra with a permanent share capital. Also by issuing the Fair Value Shares, Fonterra made it possible by creating individually owned investment instruments to raise capital and to invest in a differentiation strategy next to the cost leadership strategy.

As Fonterra collects 94% of the milk production in New Zealand in 2007/08 government implemented several policies in order to limit the risk of abusive

practices by using market power. The Dairy Industry Restructuring Act allows farmers open entry and exit to and from Fonterra. This is done by compelling the dairy to issue and redeem cooperative shares at the same price. The Act also allows member farmers to deliver 20% of their weekly production to an independent dairy processor without having to redeem shares. Also the act makes sure that one third of the supply contracts expires or can be terminated at the end of each season, limiting the possibility for Fonterra to lock in producers. The Raw Milk Regulations of 2001 give the Minister of Agriculture the possibility to compel Fonterra to supply up to 5% of its milk to independent processors at a regulated price so ensuring entry possibilities and protecting consumers.

Dairy Farmers of America

Dairy Farmers of America (DFA) has 9,572 members with an annual milk production of 17 billion kilograms. In total the cooperative markets 28.5 billion kilograms of milk (Dairy Farmers of America, 2011a). The primary activity of DFA is to market milk. DFA delivers fluid milk to other processors as Dean Foods, Lala USA, Kroger Co. Dairy Operations, Kraft Foods.

Its core business DFA defines as follows:

"DFA is a milk marketing cooperative and dairy foods processor dedicated to delivering value to members through secure markets, competitive pricing and

increasing value throughout the entire dairy chain." (Dairy Farmers of America, 2011a)

Marketing[29] raw milk is the core business of DFA with a contribution of 76% to net sales in 2010 (Dairy Farmers of America, 2011c).

In addition to marketing milk, DFA is a dairy foods processor with investments in brands and plants that bring added value to members. Some of these investments include:

- 20 DFA-owned manufacturing plants that produce a wide range of products
- Fluid milk joint ventures and shared ownership in milk bottling plants
- Joint-venture partnerships with America's best private-label food marketing companies
- Innovative partnerships resulting in specially formulated ingredients, products and packaging

(Dairy Farmers of America, 2011a)

Additionally DFA entered the Hispanic market in 2010 by the acquisition of La Vaquita brand cheese, which is their first step in foreign markets by direct investments. The internationalization strategy is recognized by the cooperative.

[29] The term "bargaining" instead of "marketing" was used in this document to describe the action involving selling members' raw milk without processing it.

DFA started to produce Gouda cheese as it is a type of cheese highly demanded in export markets (Dairy Farmers of America, 2011c).

The organizational structure of DFA as shown in Figure A5-4.

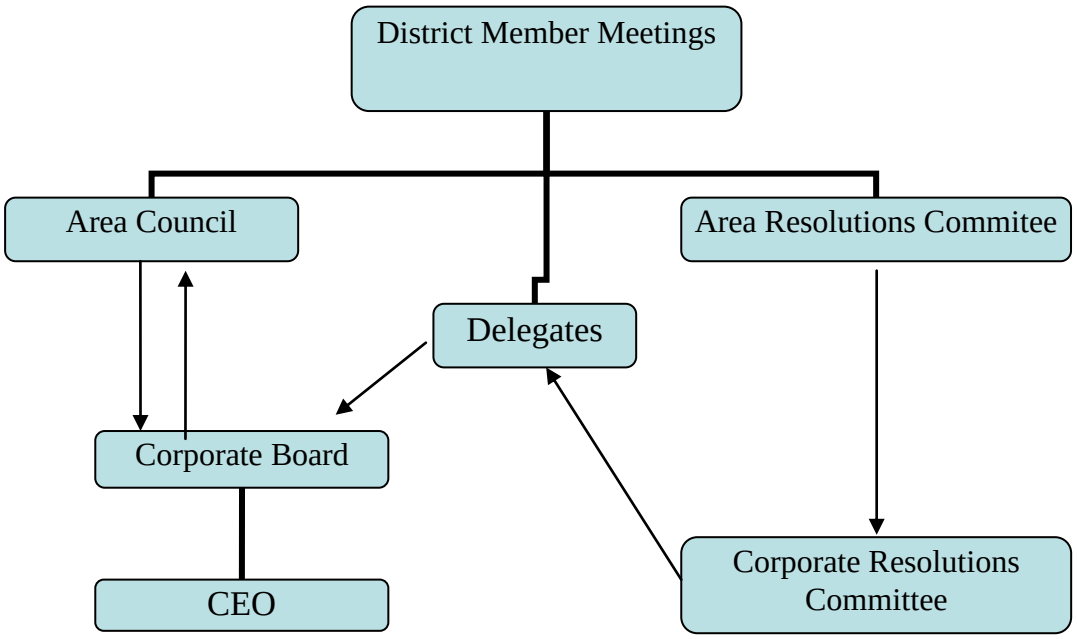

Figure A5-4: Organizational structure of Dairy Farmers of America.

Source: Dairy Farmers of America, 2011b.

Although DFA is a national raw milk marketing cooperative, it is divided into seven areas, ensuring grassroots representation of its members.

Areas are organized into districts, in which members elect representatives to serve on their Area Council. The Area Council controls and advises the Corporate

Board, as also monitors the marketing of milk and performs any duties as established by the Corporate Board. Out of the Area Council representatives are elected by the delegates to serve the Board of Directors that guides the cooperative and establishes policies and business directions, also the board of directors elect a CEO. The Delegates represent one farmer on fifty, next to electing the members of the board of directors it also approves or rejects resolutions that passed the process of resolution approval through the Area Resolution Committee and the Corporate Resolution Committee (Dairy Farmers of America, 2011b).

Dairy producers are not just members of DFA, they are owners. In order to join DFA and deliver milk a base capital of 1.75$/cwt is required (Dairy Farmers of America, 2011b). Profits are redistributed to members based on their patronage in DFA (Dairy Farmers of America, 2011a).

Appendix 6: Processor Facilities Locations in U.S. and Germany.

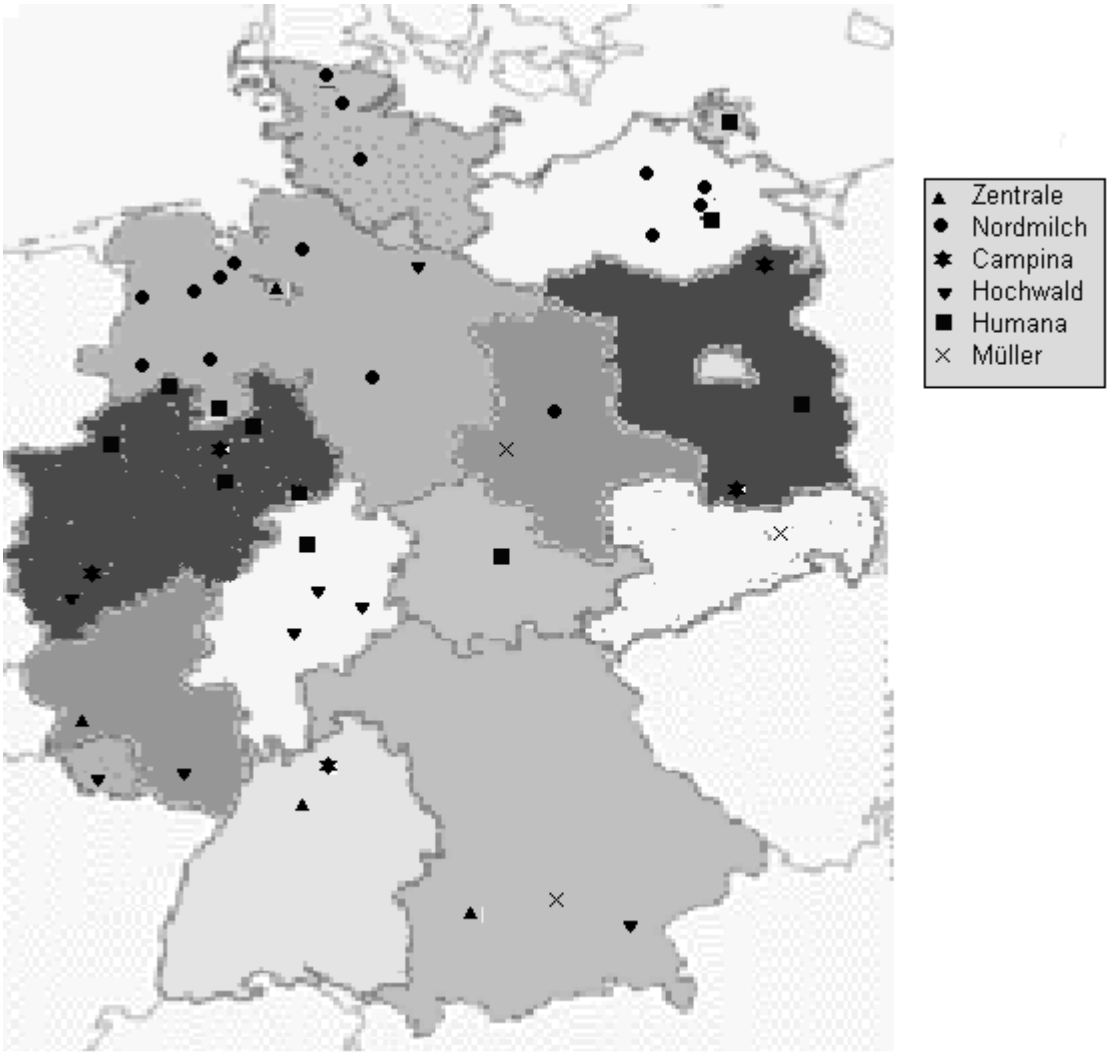

Figure A6-1: Processing facilities of the 6 largest dairies in Germany.

Source: Friedrich (2010)

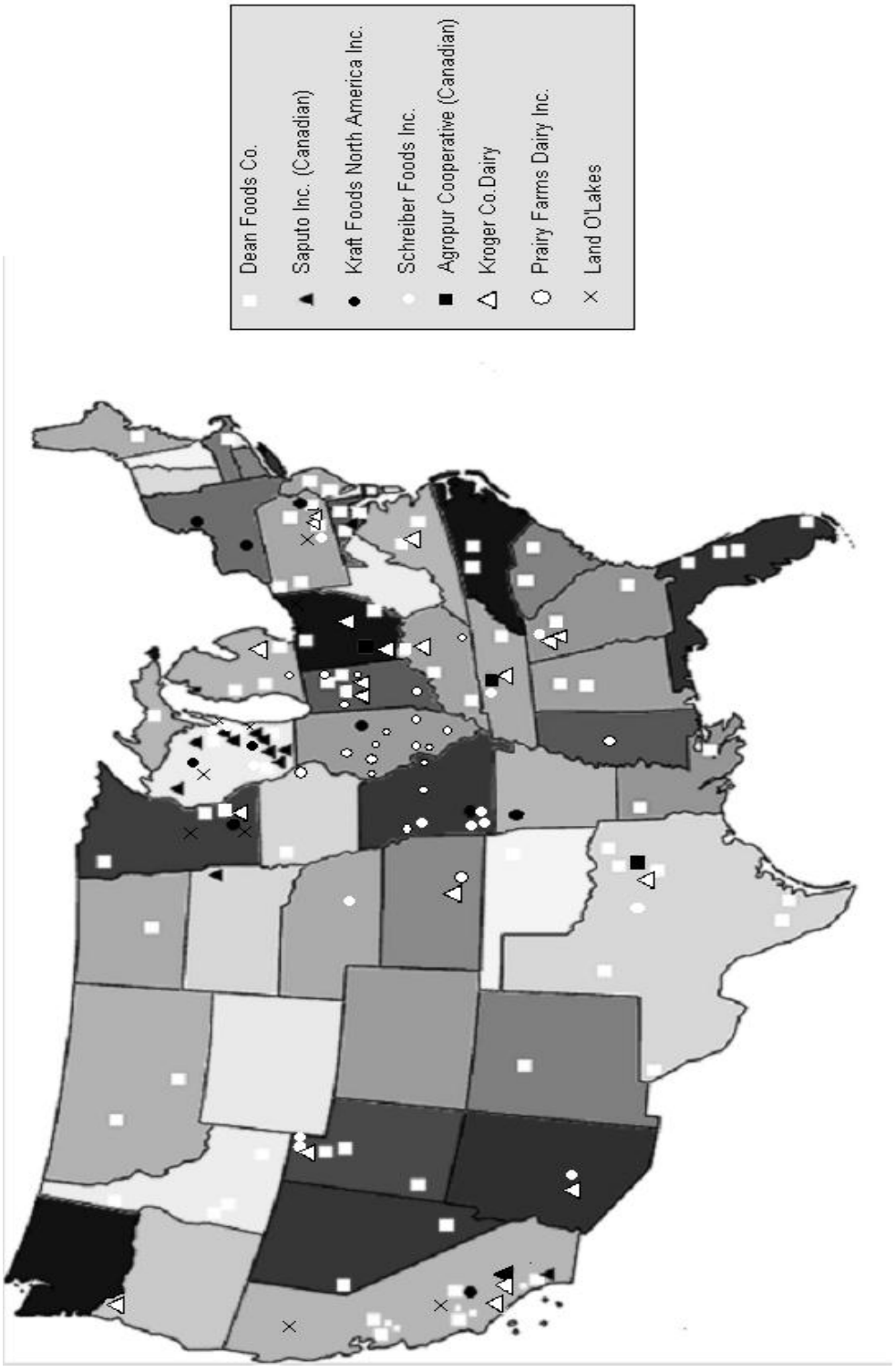
Dean Foods Co.
Saputo Inc. (Canadian)
Kraft Foods North America Inc.
Schreiber Foods Inc.
Agropur Cooperative (Canadian)
Kroger Co.Dairy
Prairy Farms Dairy Inc.
Land O'Lakes

Figure A6-2: Processing facilities of the 8 largest dairies of North America in U.S.

Source: Dairy Foods, 2010.