Competitiveness of Northern European dairy chains

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1 INTRODUCTION

1.1 The concept of competitiveness

Competitiveness is one of the most popular terms in the economic and business literature, and it has several different definitions depending on the context of analysis and the subjects of competition.

Competitiveness can be investigated for companies or other levels of economic units such as sectors or national economies. Krugman (1994) points out, that while corporate competitiveness has a clear meaning, the competitiveness of national economies can be a wrong and dangerous obsession when the word is related to carelessly used economic figures and the related political and economic suggestions.

The business competitiveness is the ability to grow and strengthen the position of the particular company – this is always done on the expense of the other competitors. The case of national economies is not a zero-sum game, the competitiveness of a nation can, in fact contribute to the growth and wealth accumulation of others.

A major difference between the competitiveness of business units and national economies is in the ultimate objective. In the first meaning it is the success or in severe cases the very survival of a company, while in the second meaning the objective is to raise living standards. This latter concept was manifested in OECD's definition according to which competitiveness is "... the ability of companies, industries, regions, nations or supranational regions to generate, while being and remaining exposed to international competition, relatively high factor income and factor employment levels on a sustainable basis" (Hatzichronoglou, 1996, p. 20).

The determining factors of competitiveness of nations have identified and investigated since 1977 by the world economic forum. The Global competitiveness report has been published on a regular basis. Their definition of competitiveness is "... the set of institutions, policies, and factors that determine the level of productivity of a country. The level of productivity, in turn, sets the level of prosperity that can be reached by an economy." (Schwab 2013, p. 4). The twelve pillars for national competitiveness include among others the infrastructure, education, macroeconomic and financial factors, market size, technological readiness and innovation. Countries in the world are scored and ranked based on their strength of pillars supporting past and future competitiveness.

Although the prosperity of nations may be attributed to a wide and complex set of determinants, the economic aspects, such as determinants and drivers of competitive advantages experienced on the markets has been the subject of economic literature.

Competitiveness has also been investigated for particular sectors of national economies. Porter (1990) realised that "with striking regularity, firms from one or two nations achieved disproportionate worldwide success in particular industries."

Despite the popularity of the term of competitiveness in the literature, there is not a consensus on the ways it should be measured. Latruffe (2010) provides a thorough overview of the methodology and measurement techniques usually associated with competitiveness. She also discusses the methods and findings of over a hundred empirical studies which have addressed the issue of competitiveness in the agrifood sector. Those techniques usually apply either the trade or strategic management measures of competitiveness, with the latter set of measures being primarily used to analyse the development and comparison of farms in various countries. Investigating the performance of food industries is more seldom the subject of competitiveness studies. In a way, analyses that develop trade measures of competitiveness capture the performance of both farming and the food industry, provided the product group includes both agricultural and processed food products.

Analysing the performance of entire food supply chains, however, remains rare in the competitiveness literature. One reason is that there is not a commonly approved methodology to approach this complex issue. Yet, it is the organisational and structural features of the chain that ultimately determine the success of its products both on the domestic and foreign markets. Some of these characteristics can be expressed in the form of exact indicators like raw material procurement or industry structures.

The effects of many other factors, though, such as the operational and business environment, transactions costs, the patterns of commodity and information flows, vertical integration or power relations among the segments of the chain are either harder to quantify or would require the use of confidential corporate data. Furthermore, business culture, traditions, attitudes of consumers, policy makers and other parts of society imply a great deal of intangible (e.g., psychological) factors which affect the final performance of the particular chain.

In addition, comparing the competitiveness of several countries' supply chains remains a challenging subject due to cross-country differences in data availability and the difficulties to collect and compare qualitative but important factors. One of the rare exceptions is the comparison of the competitiveness of the dairy supply chains in 12 new member states and eight candidate or potential candidate countries (van Berkum, 2009)[1]. Another difficulty is to form a commonly applicable framework for the comparison, since the range of available information differs from country to country.

Competitiveness of the European agrifood sectors has received growing attention in the recent years from policy makers and the business itself. It is essential to have a clearer understanding of our own status and competitive positions in the common EU and the world's food markets particularly now under the pressure of liberalising trade patterns, stricter international trade agreements, volatile prices and global recession.

In the mid 2000s the European Commission ordered a broad analysis on

[1] The study of van Berkum is the synthesis report of a large EU- financed project, in which national research teams were responsible for the collection of data/information and contributed their insight views and understanding on their countries' dairy chains. Similar international projects were organised earlier to compare the meat and cereal sectors of the new and candidate countries, for more information see www.agripolicy.net

the European food industry. The report (Poppe et. al, 2007) revealed a rather modest overall competitiveness for most European countries and food industry branches relative to the main competitor countries, namely the USA, Canada, Brazil and New-Zealand. Following the release of those disturbing results, the federation of European Food and Drink Industry initiated regular and systematic monitoring of competitiveness indicators (CIAA, 2008, 2010 and FDE 2011, 2012).

1.2 The European dairy sector

The global demand for dairy products has grown faster than global supply (IFCN, 2013). Middle and long term projections around the world count on the rapidly expanding demand of China and other developing countries. The OECD-FAO agricultural outlook (2013, p. 206) forecasts a growth rate of 2 % per annum for developing countries in the next decade. Milk production is anticipated to expand in the world by 168 million tons by 2022 from the present level of 740 million tons. Although three-quarter of the increase is expected to originate from the developing countries – and 29 % alone in India – even this growth will satisfy part of the increase in demand.

The rest of the rising demand will be met by the traditional dairy exporting countries, which will continue to play a major role in global dairy trade. It is important to note that most of the milk is consumed in the countries where it is produced, so global trade in dairy products in milk equivalent accounts for only 12-14 % of the world's milk production. Consequently, global dairy product prices have also been affected largely by the changes in supply and demand of traded volumes, in fact a fraction of world production.

The OECDA-FAO outlook reckons that quota abolition in Europe will not induce a shock on the supply side, partly because the national quotas have recently been expanded by one percent every year. Production volumes are expected to rise by 0.8 % in the first two years after the quota abolition and will flat out afterwards to around 0.3 % per annum.

Despite the modest outlook a distinct growth for EU exports is forecast for dairy products, in particular for cheese and skim milk powder, in which the EU is the largest exporter in the world. The EU is anticipated to have a dominant share of 44 % in the global cheese export by 2022 slightly growing from the current 43 %. Similarly, the global SMP export is estimated to reach 35 % from the current 34 %. Although these growth rates appear very modest, the overall volume of global cheese exports is expected to expand by 21 % and SMP exports by 27 % over the next decade. In butter and WMP New Zealand is expected to preserve its leading positions (OECD-FAO, 2013, p. 214).

Europe has recently been more competitive on the global markets and it will have an opportunity to expand by satisfying some of the growing demand in emerging markets such as China, Russia and Arabic countries in the next decade. The room for growth in New Zealand is getting more and more limited by public opinion, as illustrated by the environmental considerations bearing on

extensive dairying. In New Zealand there is a low production cost of milk, mainly due to very low feeding and building costs, which means that milk farmers can survive with a price of 27¢/kg of milk. Farmers do not milk cows in the winter, a period during which most cows are dry, so that there is a large seasonality in milk production. The US has potential for growth, but they have at the same time a huge internal market to satisfy as well.

The weight of Northern Europe or – as we call the group of countries in this study – the Baltic Sea region in EU's dairy sector is remarkable, it accounted for 37.4 % in the volume of milk deliveries to dairies in 2012 and 31.5 % in dairy industry sales revenues in 2011.

Within the food industry around the Baltic Sea region, dairy manufacturing is one of the most significant industries. It is the biggest in the Baltic countries and Finland and the second biggest after meat processing in Germany, Poland, Denmark and Sweden. In the combined figures of the eight countries, the dairy industry sales revenues amounted to 45 billion € or 15.7 % of the total food and beverages industry, which as a whole ranked dairy manufacturing second after meat processing (24 %).

1.3 The chain approach

Food supply chains consist of four major segments: agricultural input supply, agricultural production, food manufacturing and, finally, the food wholesale and retail sector, which ensure the distribution of final products to consumers. Economic power is hardly ever allocated evenly in the chain, which raises a number of questions on the division of roles. Economic and financial strength may grant some actors the ability to develop the chain, while at the same time giving them the possibility of control or influencing other participants.

Although interests may conflict in many aspects, it is ultimately a common concern of all segments to make the chain operate as efficiently as possible. The organisational setting of the supply chain usually varies from country to country, but the major questions concerning the division of roles are the same everywhere:

1. Who owns the chain?

Ownership structure is a fundamental characteristic, which has a strong impact on the operation of food supply chains. Farms are usually owned by the farmers themselves (i.e., families and private persons in Europe), except for an increasing number of agricultural companies in which ownership is more complex and potentially divided among managers, other private investors, and/or companies. Food manufacturers can be owned by farmers – usually in a cooperative form – or by any other investors such as private capital, banks, pension or insurance funds etc. The type of ownership determines the long term development strategy of the particular company, because the interests of owners largely differ between domestic and foreign investors, or professional and financial investors. Based on the interests of owners, the strategy of food manufacturers can vary from modernisation and technology development to market consolidation, geographical expansion, profit maximisation and high or rapid returns on the invested capital.

2. Who coordinates/integrates the chain?

The performance of the chain can be improved by vertically coordinating its operation and transactions among segments. It is essential that there are strong

players in the chain, who initiate supply chain development. Such coordination may address organisational issues, information flows, traceability, quality standards and hygienic requirements. Vertical integration is a deeper form in which the goals of efficient operation of the chain stem from common ownership.

3. Who controls the chain?

Economic power can allow companies to force their will on others - the stronger the company, the more negotiating power it has in the chain. In this aspect industry structures are of utmost importance. The various segments such as farms, processing and retail have different levels of concentration, and large players of concentrated industries would be able to keep the other segments under control. Power relations also imply the issue of income distribution among the segments.

4. Who bears risk in the chain?

Risk management has received increasing emphasis due to the highly volatile commodity markets over the recent years. It has been seen that price fluctuations can seriously damage the viability of agricultural producers and processors. Risk management techniques are still not utilised widely within the European food supply chains. It is important how sudden price changes in inputs, agricultural commodities or in major cost items can flow through the chain, which raises the issue of price transmission. Other risks associated specifically with the food supply chains are e.g. weather risk in agriculture and the risk of unsold food products in retail units.

In each country the concrete framework concerning the above division of roles predetermines the prospects and capability of the dairy supply chain to improve its competitiveness.

1.4 The dairy supply chain

The segments of the dairy supply chain can be easily identified. As captured in the popular definition of “farm to fork”, the dairy supply chain would include dairy farms, dairy processing companies, wholesalers, retailers and final consumers. This basic chain concept could be extended with the segment of agricultural input producers in the beginning phase.

In the dairy supply chain market actors interact with each others across the segments. They make contracts and organise the flow of commodities and goods from inputs to raw materials and processed products until it gets to consumers. While commodities and goods flow usually forward, payments backward, the flow of information is in both directions.

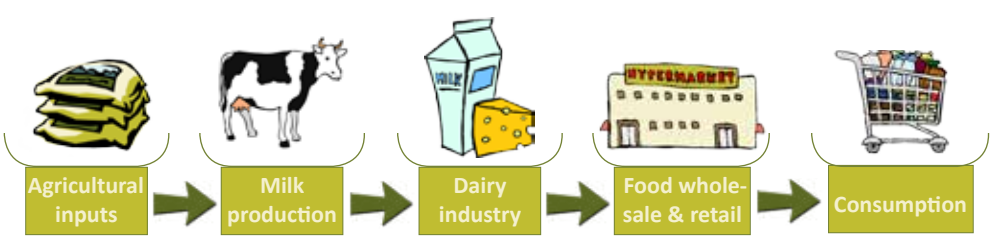


Figure 1. Segments of the basic dairy supply chain.

In reality the dairy supply chain is much more complex than depicted in Figure 1. Various services are provided by specialised companies in order to make the functioning of the chain smoother (e.g., milk collection, transportation or trading companies). There has been a tendency for food processing companies in general and dairy manufacturers in particular to outsource a great number of activities such as logistics, accounting etc. to external companies.

In addition to grocery purchases, end users consume milk and dairy products in the myriad of Horeca (hotel, restaurant and catering) units, which can be defined as eating-out or eating away from home. The Horeca sector is a major segment of the detailed dairy supply chain, as it represents the second major channel for consumption.

There are numerous forms of secondary processing of milk and dairy products both within and outside the food industry. The ice cream, bakery, confectionery and ready-meal manufacturing industries are the most obvious secondary processors. Dairy manufacturers have developed a range of food ingredients such as whey and casein derivatives, protein, milk minerals etc. which can be used to produce various functional and special nutrient products.

The ways to amend the flowchart of goods and business relations with deeper and more detailed inter-connections are endless. However, the understanding and monitoring of such a complex set of relations, and its economic analysis, would become far too complicated and face challenges of data availability. A prominent example of poor data availability relates to the operation of the Horeca sector. Therefore, the assessment of the general set-up and efficient functioning of the each country's dairy supply chain will be based on the more straightforward basic dairy supply chain scheme (Figure 1).

Although an increasing volume of goods and even services originates from or is sold abroad, the dairy supply chain essentially functions within the national borders of a specific country. The market actors of the national dairy supply chain can be distinguished by the place of operation even if ownership relations would stretch over the borders. The majority of the milk, which is produced within the national boundaries, is processed and sold in the same country. Similarly, consumption of the dairy products usually relies on the output of the national dairy supply chains.

There are certainly differences, however, in imported volumes of raw milk and import dependency of dairy products just as there are significant differences in export intensity and specialisation for exporting milk or dairy products.

Competitiveness will also be compared among the national dairy supply chains by using the basic scheme. The range of analysis concerning the economic performance is largely determined by the availability of statistical data. Market structure will be compared for milk farms, dairy processing and retail sector across countries. Levels of concentration relate to the power relations in a national dairy chain. Highly concentrated industries would also have large companies and their size and the exploitation of economies of scales also matter in international competition.

Ownership structure is also an important factor indirectly influencing competitiveness of the dairy supply chain. Cooperative ownership by farmers has a long tradition in the countries of this study and it is the most common form of vertical integration in dairy supply chains. Other important structural characteristics are the dairy industries' production mix and the consumption structure of countries.

In addition to structural indicators, the basic financial performance trends are presented in aggregate forms for milk farms and the dairy industry. Milk procurement and milk prices are compared as well as contracting practices among processors and retailers. Furthermore, a long list of

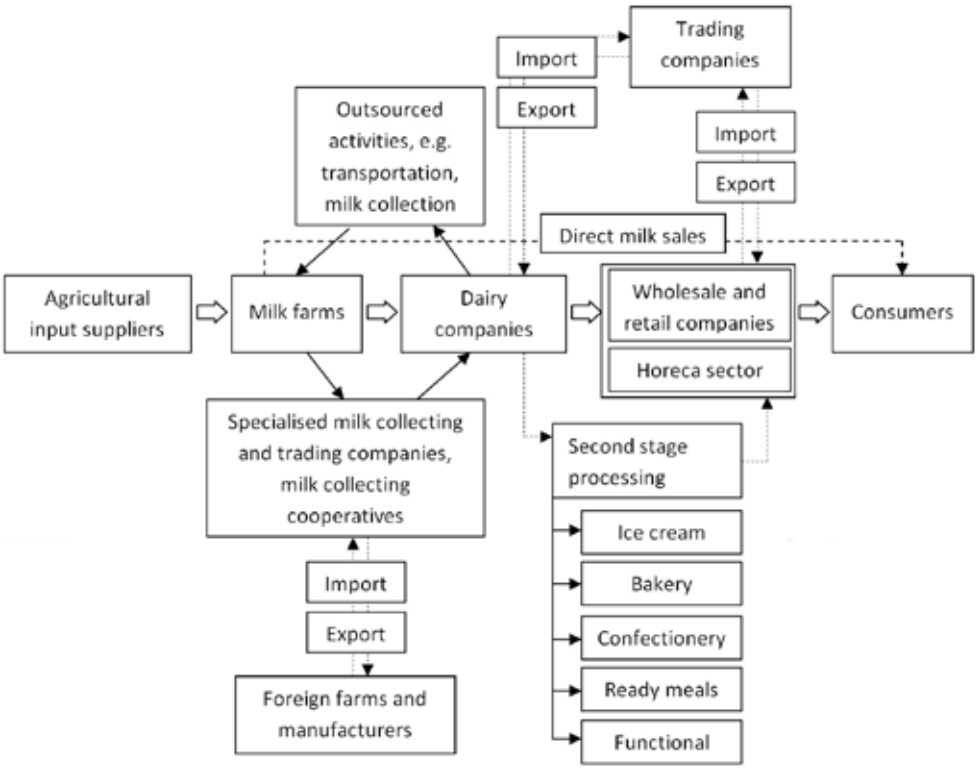


Figure 2. Extended relations of dairy supply chain.

factors, which indirectly influence the economic performance of market actors and eventually the competitiveness of the chain, is also discussed in this section.

In further sections, productivity is monitored for the two major production segments in the chain, milk farms and dairy industry. Foreign trade performance indicators encompass the activities of companies across the chain, primarily dairy manufacturers and traders, but even farmers and their cooperatives. Traded goods are usually the production chain's final output, to which input suppliers, farmers and manufacturers make contributions. In this respect, foreign trade performance indicators point to the competitiveness of the entire chain. Growth is analysed again for the two major producing segments; the dynamics of their output, milk production for milk farms and sales revenues for dairy industry is compared across the countries. Finally, innovation is detected at the stage of processing, where it has the highest impact on value added and future competitiveness.[2]

[2] Innovation here is defined as own innovation generated by the actors of the chain. Innovation of external companies such as farm or food industry equipment suppliers is not considered, despite the fact that it results in technology or process improvements for the actors of the chain.

1.5 Background and structure of the report

This report is the final output of a project "Comparison of the competitiveness of dairy supply chains in the Baltic Sea region" that was implemented in 2011-2013. The report consists of a qualitative comparison of the dairy chains and a comparison of a set of indicators, all which are related to competitiveness.

The statistical data were collected from public sources such as the dataset of Eurostat. Custom-tailored data were ordered from national statistics institutes particularly for the productivity calculations. Data needs and data sources are explained in more detail in sections 3.2.

In addition to statistics, first-hand information was collected via over one hundred interviews at the stakeholders in the dairy chains of the eight countries. They were based on a semi-structured questionnaire which consisted of a large set of open ended questions.

The interviews were carried out among over 30 dairy farms, plus dairy manufacturers, farmers' and dairy industry associations, research institutes, universities and ministries. The authors would hereby like to express their gratitude to all the actors and experts of the dairy chains who kindly contributed with their views and expertise to this broad comparison.

The set comprising fifteen indicators were identified for monitoring, these are either the driving forces, determinants or manifestation of competitiveness. The indicators were classified into five major groups as the contributing factors to a dairy chain's competitiveness:

(1) economic performance,
(2) productivity,
(3) foreign trade performance,
(4) growth and
(5) innovation.

Table 1. The set of indicators used in the report.

Factor of competitiveness	Indicators
Economic performance, market and ownership structures	Profitability ratio (net profit to sales revenues) Concentration in the dairy industry (CR4) Dairy farm structure, average milk farm size Milk use structure: Ratio of milk deliveried to processing Milk prices Share of foreign vs. domestic ownership capital Share of cooperative based ownership
Productivity	Labour productivity Total factor productivity (TFP) Milk production per cow
Foreign trade performance	Balassa indices (RCA) Export share in sales revenues
Growth	Growth of dairy industry sales revenues Growth of milk production value Growth of dairy exports
Innovation	R&D expenses/sales revenues

The above set of indicators is reviewed in the study for the applicable segments of the dairy supply chain. The focus has been put on the farm and industry segments, i.e. milk production and dairy manufacturing. Figure 3 enlightens the structure of the report and the utilisation of indicators in the segments.

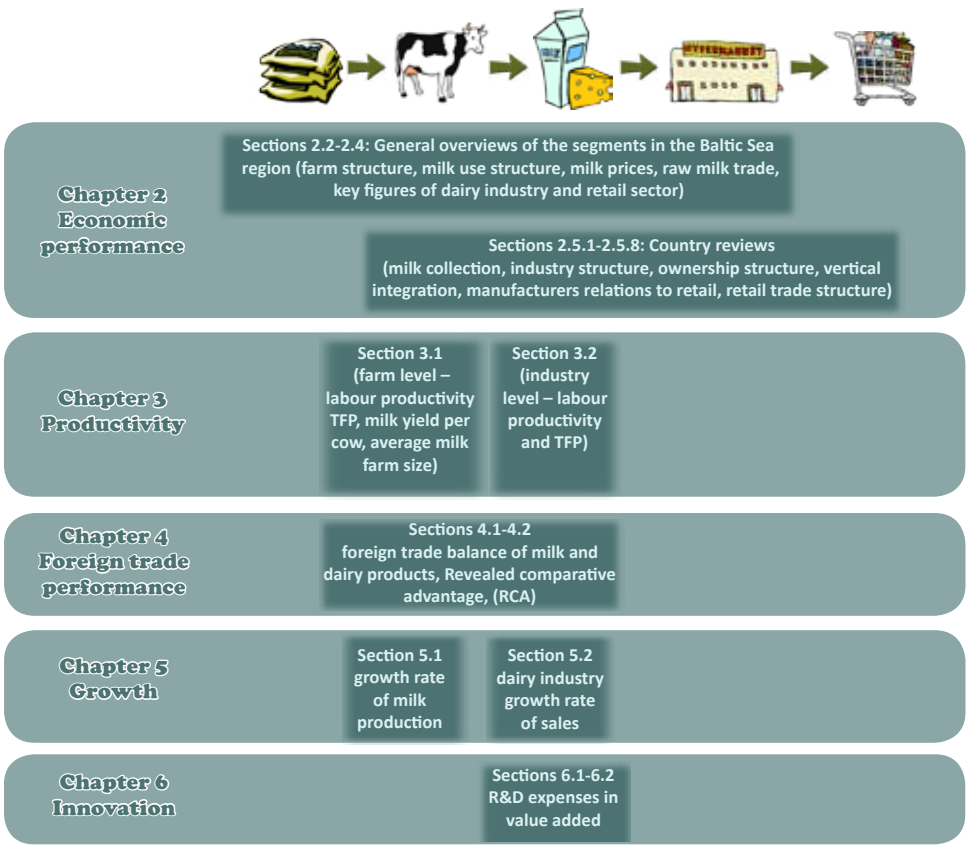


Figure 3. The structure of the report.

2 ECONOMIC PERFORMANCE

The economic and financial performance of players in the chain is a substantial indicator of competitiveness. In order to sustain the competitive position on domestic and export markets, the chain has to be organised well and work smoothly. Economic actors in each segment have to be viable and profitable, while income has to be allocated in a balanced way throughout the chain.

2.1 Agricultural input supply

The most important inputs for milk farms are their fixed assets and equipment, land, labour, dairy cows and the services and materials – such as veterinary and feed – associated with the herd and inputs needed for own feed production.

The level of input costs differs greatly in the eight countries of the comparison. One of these major inputs is labour force. Cheap labour is a cost advantage in favour of the new member states, but the share of external labour force in the cost structure of milk farms – except for the case of Estonia – has been rather low. Milk farms in Latvia, Lithuania and Poland rely predominantly on the family's own labour.

Other inputs such as energy and fuels for heating and working machines do not follow the polarised patterns of land and wages between the new and old EU members since both energy and fuel prices are heavily influenced by the local policy through taxation and subsidies.

Feed prices have followed the fluctuations in grain and oilseed prices on the world market in all countries. Dairy farms, however, have been less exposed to the radical price changes compared to meat farms, because they use silage or hay and typically produce grain themselves. Feed related costs – both purchased feed and own production – constituted between 55-75 % of variable costs in the eight countries in 2011.[3]

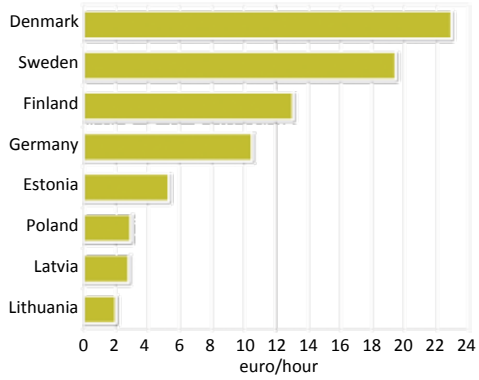


Figure 4. Labour costs at dairy farms around the Baltic Sea.

Source: European Commission, FADN database.

[3] Figures are based on the results of the Standard Output (SO) database of FADN for specialised milk farms.

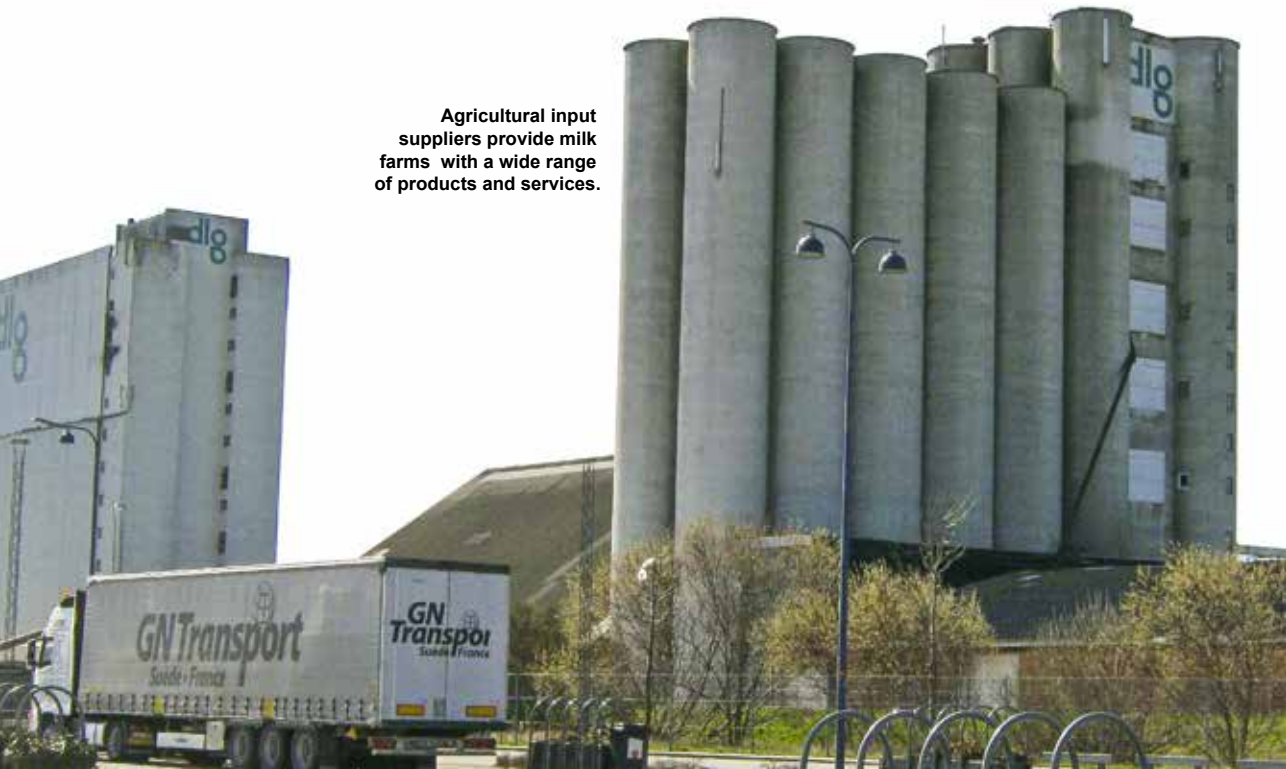
Feeds, seeds and chemicals make up most of the variable costs for milk farms.

The agricultural input supply companies tend to provide farmers with a full spectrum of inputs including mineral fertilisers, pesticides, machinery, seeds and feed. In the old member states several companies operate in cooperative ownership form, while in the Baltic countries and Poland they are privately owned businesses.

The price of agricultural land, which is needed badly for farm expansion, varies within an extremely broad interval among the countries starting at around 35-40 000 €/ha in Germany to about 2 000 €/ha in Poland and Lithuania. Rent fees also range across the countries, although the scope of deviance is smaller.

Land is valued at two distinctly different levels in the old and the new member states. Cheap land gives cost advantage and provides farmers in the new member states with opportunity to expand their farms. Due to the large difference between old and new member states, upon the EU enlargement in 2004 nearly all acceding countries set a moratorium on land purchase by foreigners. The transition period lasted until 2011 but several countries applied for an extension e.g. the moratorium will end in 2014 in Lithuania and 2016 in Poland. Land prices and land rent fees may vary significantly within the same country and even within the same micro-region due to the different level of competition for land including crop and other livestock farms and industry.

Agricultural input suppliers provide milk farms with a wide range of products and services.



2.2 Milk production

2.2.1 Milk farm structure

Milk farm structure is a key factor that determines the effective management of the dairy supply chain. It is obvious by the number of contracts, the management of commodity and information flows, that a fragmented farm structure inevitably increases the transaction costs in the chain, while a concentrated one decreases them. Dairy companies attempt to minimize their transaction costs by shifting their group of suppliers to larger units wherever it is feasible. Although it is hard to estimate the exact sum of these transaction costs, the Lithuanian dairies' case gives a rough estimate: the transaction costs have to be higher for a truckload of milk to collect from the scattered small farms in Lithuania than to get it 500 kilometres away from one big farm in Estonia.

The evolution of the milk farm structure, the pace of concentration and the share of large-scale farms in production are factors that contribute notably to the performance of the chain. In other words they form a bottleneck or a serious impediment to growth for the rest of the chain, however productive and efficient the other segments may be.

Milk sectors around the Baltic Sea show a diverse picture. The eight countries can be classified into three typical groups based on their dairy farm structure in 2012:

1. dominance of large-scale farms (Denmark and Estonia),
2. dominance of mid-scale farms (Germany, Sweden and Finland),
3. dominance of small-scale farms (Latvia, Lithuania and Poland).

Despite similar farm structures in Denmark and Estonia, milk farms in the two countries have followed distinctly different evolutionary routes to arrive to the current structure. The starting point for the Danish milk sector was a family farm oriented structure: 57 % of the cows were held in middle-sized farms with 10-50 cows in 1990. Since then an extraordinary process of farm concentration has taken place, with which no other European milk sector has kept pace. By 2010, the share of aforementioned middle-sized farms shrank to just below 3 %, whereas 85 % of the cows were in units of over 100 cows.

The Danish restructuring story is a unique one. The most spectacular phase of growth for the large farms dates back to the years between 2000 and 2007, a time of economic boom. Farm structure had also concentrated in the other agricultural sectors by that time, which created an acute demand for land and capital, as both production factors are needed for expansion. Land prices rocketed, but the banking sector did not impede the process. In the contrary, banks offered ever bigger loans to expanding dairy farmers. With the 2009 recession, the land price bubble eventually burst bringing hundreds of dairy farms to the verge of bankruptcy. Banks, once so keen to offer big loans to farmers, have now put credits on ice. Some small regional banks went bankrupt.

Currently it is extremely hard for dairy farmers to get access to any kinds of loans. The Danish milk production dominated by large-scale farms roars and production has increased every year. However, the balance is very delicate, built upon the low interest rates and favourable milk prices. A slightly stronger shock in either of these factors would instantly trigger a wave of bankruptcies.

Estonia's milk sector has a far different history, as under the soviet regime Estonian farms used to be collectivised into giant production units. Once the country regained its independence in 1991, Estonia first followed

an unusually liberal agricultural policy. The country did not opt for politically popular decentralising restitutions, instead keeping many of the collective farms intact and privatising them as large units.

Despite the fact that the pace of concentration in Estonia has been the extreme opposite to the Danish one, the outcome in terms of farm structure is very similar in Denmark and Estonia. In the latter country, over 75 % of the dairy cows were on large farms (i.e., those with over 100 cows) in 2010, although Estonian big farms are much bigger than their Danish counterparts in the same size class. In Estonia numerous dairy farms have over 600 cows and the average size of large farms in 2010 was 345 cows as opposed to 163 cows in Denmark. Another difference is the corporate form of the farm, which tends to be an agricultural company with a few joint owners and managers in Estonia. In Denmark most farms are still managed or directed by a family or a single person, even though the farm might operate in a corporate form and employ several workers.

Milk production structure is dominated by mid-scale farms in Germany, Sweden and Finland as a result of several decades of historic development. A gradual shift occurred from the dominance of small-scale farms to a more mid-scale farm dominated structure as family farms started to expand in the 1960s and 1970s. The concentration process has accelerated since the 1990s. It has been reinforced by the EU membership for Finland and Sweden since 1995.

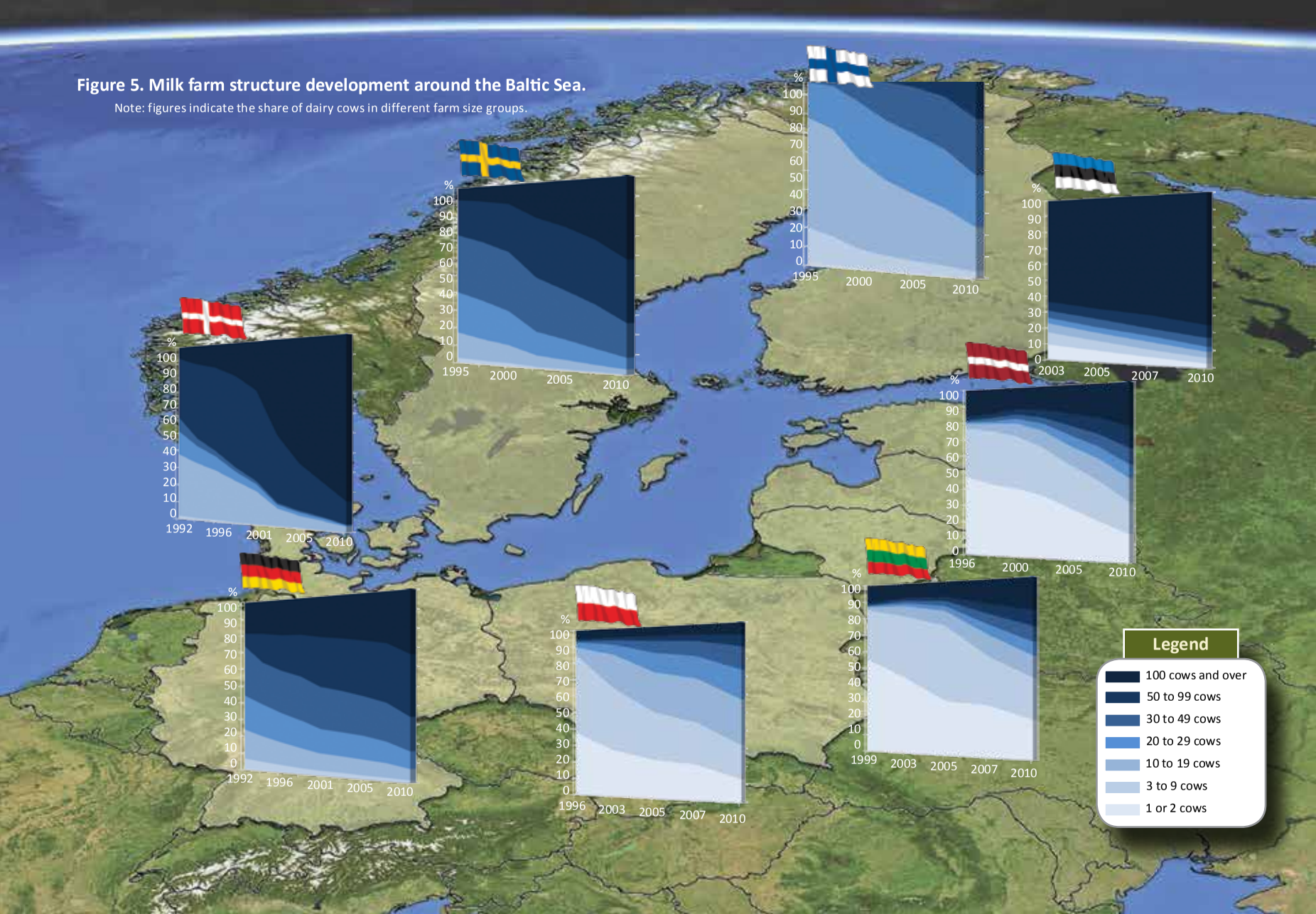
Despite a similar dominance of mid-scale family farms, the three countries have followed paths of structural development at different paces, and have achieved, as a result, different levels of concentration. Although average farm size has grown rapidly due to the expansion of farms in recent years, the dairy farm structure in Finland was still dominated by farms with 10 to 50 cows in 2010: those farms accounted for 70 % of all dairy cows. Sweden joined the EU in 1995 with a milk farm structure similar to that of Finland in 2010, so the Swedish concentration process has been about fifteen years ahead and has reached a higher stage. By 2010 already 73 % of cows were held in farms with over 50 cows in Sweden.

Germany is a special case of regional discrepancies concerning milk farm structure. First, milk production has been regionally concentrated into two distinct areas in the North-West and South of Germany. This regional specialisation is illustrated by the special allocation of cows among the federal republics. North-West Germany, including Niedersachsen, Nordrhein-Westfalen and Schleswig-Holstein, accounts for 36.7 % of the dairy cows, while Bayern and Baden-Württemberg in the South account for 38.4 %. Altogether three-quarters of all

Danish milk farms have invested a lot into farm expansion in the 2000s. The average farm size reached 163 dairy cows in 2013.

Figure 5. Milk farm structure development around the Baltic Sea.

Note: figures indicate the share of dairy cows in different farm size groups.



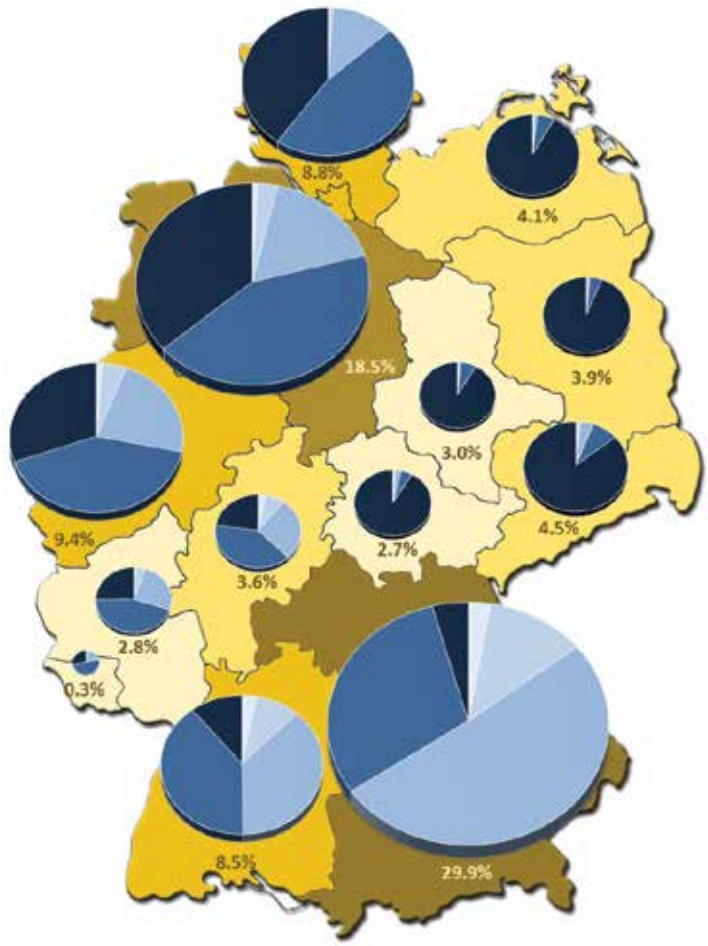


Figure 6. Milk farm structure in Germany by federal states, 2010.

Source of data: Statistisches Bundesamt, Fachserie 3, Reihe 2.1.3

dairy cows in Germany are kept in only five republics.

As far as the milk structure is concerned there is a remarkable difference in Southern and North-West Germany. Milk farms are middle-sized family operations in the South. The structure has changed rather slowly, so that the concentration level is close to that of Finland. As an example 63 % of the cows were in farms with 10 to 50 cows in Bayern, the largest milk producing republic in 2010. North-West German republics have concentrated at a much higher pace. The region belongs to the quickly developing milk belt. The proximity of the Netherlands and Denmark, where a striving entrepreneurship attitude in milk farming has driven expansion for the past fifteen years, has definitely had a high impact on the willingness to invest in the North-West republics of Germany. This area – the Netherlands, North-West Germany and Denmark – also has powerful dairy companies with large economies of scales, which is another driving factor for rapid concentration in milk farming.

The middle republics of Western-Germany have a much smaller share of the country's milk production and their farm structure represent a transition between the North-Western and Southern German milk farm structures.

The milk farm structure in Eastern-German is an interesting case of its own. Altogether the five republics had less than a fifth of all dairy cows in Germany in 2010, but the farm structure is extremely concentrated: over 90 % of the cows are kept in farms with over 100 cows and over 40 % of the cows are in huge farms with over 500 cows. The structure was inherited from the previous regime. Prior to the unification, East-German dairy farming units were not split into pieces but preserved intact just like in Estonia, the Czech Republic and Slovakia. The farms continued primarily in a corporate form on their inherited premises with the existing assets, but they were bought by private investors who have brought sub-

stantial capital to modernise some of the facilities.

The milk farm structure in Poland, Lithuania and Latvia are still dominated by small-scale farms. The Baltic countries inherited a large-scale farm structure from the previous regime: at the turn of 1980s and 1990s over two-thirds of the milk in that region originated from large state- or cooperative farms. While in Estonia, the majority of large farms were directly transferred into private ownership, and only some of the farms were divided into smaller pieces, in Latvia and Lithuania the land restitution reforms put a priority on small-scale family farms, which resulted in a fragmented farm structure: by the mid 1990s the majority of dairy farms had 1-2 cows. Less than 50 % of these subsistence farms delivered some milk to dairy processing companies.

Milk farms have concentrated into larger units over the recent years. The growth of farms has been fast primarily in Latvia and Lithuania, where the farm structure used to be rather fragmented. As late as in 1998 farms with over 10 cows accounted for only 14 % of the dairy cows in Lithuania and 25 % in Latvia. By 2010, these middle and large-scale farms accounted for 43 % of all dairy cows in Lithuania and 55 % in Latvia. Expanding and strengthening mid- and large-scale farms take over the market shares of thousands of exiting 1-2 cow farms every year. Yet, the concentration process lags far behind that in other countries in Northern Europe, and any catching up will take a long time due to the initial fragmented structure.

Polish farms have never been subject to forced collectivisation as they remained family based even under the previous regime. A deeply fragmented farm structure characterised much of Poland with the exception of some regions in the north and west where plenty of large farms also emerged. In the 1990s the milk farm structure was very similar to that of Lithuania and Latvia, but the development paths were different. While in Poland fragmentation was a heritage of the earlier decades, in the two Baltic countries it was achieved through a quick disaggregation of the former large collective farms.

Thousand of milk farms still have less than 10 cows in the Baltic countries. Milk production has contributed to home supply and income generation in the rural areas, where employment prospects remained scarce.

Text box:
Renewable energy production on German milk farms

Milk farms in several countries have resource buffers, or additional resources which are attached to the farms but not directly associated with milk production. Some of these resources are potentially available when the financial or economic conditions of the farms necessitate it. Hence, in Poland, milk farms occasionally use those extra resources to extend their activities to include meat production. In the new EU member states, the farm can often draw on the workforce provided by additional family members or relatives. For Swedish and Finnish milk farms, an economic buffer has been provided by the forests located on the farms.

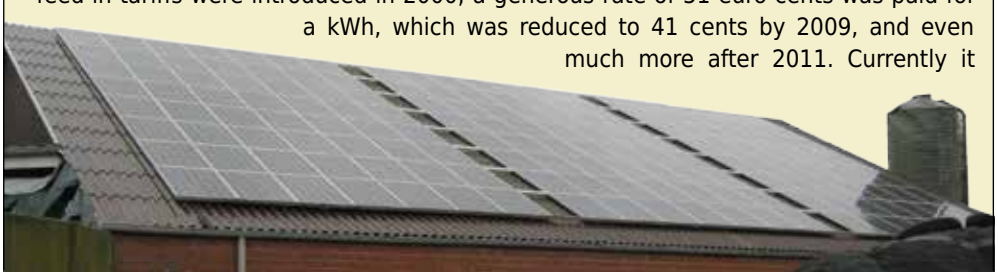
The buffer opportunity mobilised by German milk farms, however, is probably the most unique and attractive in this comparison as it is a source of secure, stable and long term additional income. Germany's strategic objectives to increase the share of renewable resources in energy production and eliminate the use of nuclear power by year 2022 (Breidthardt 2011) have drawn milk farmers to energy production since the early 2000s. The economic terms of energy production have been very favourable and, as a result, farmers have invested into electricity production units. Electricity is usually produced on farms by separate legal entities (i.e., firms), so the resulting income and related investments do not appear in the bookkeeping of the farm.

Biogas production is convenient to attach to a dairy farm, because it utilises manure and biomass, both of which are readily available on farms. In the biogas production units, manure is mixed with green maize or alternatively sugar beet, and the mixture is heated to generate methane gas. Electric power, the final product, is derived by burning the gas in an engine attached to a generator. The heat can be used again in the process or for heating buildings or drying grain.

The most usual biogas stations produce 100-500 kw/hour and include one to four tanks. There are some bigger stations with the capacity of 2000 kw/hour. These can be found e.g. in large farms in Eastern Germany because they require a bigger investment and need much more manure and biomass.

Another type of investment into renewable energy has been solar panels. This investment does not need much space and is scalable by varying the number of panels. The roofs of milk sheds have provided a natural place for the solar modules, and in some cases of farm expansion, considerations linked to solar panels have been determinant in the choice of the spatial organisation (e.g., direction) of the new buildings.

An investment of about 150-200 solar panels can produce a daily amount of electricity ranging from 10 kW on a rainy day to as much as 150 kW on a sunny day. Farmers have taken advantage of the discounts that they get as a business for the bulk use of electricity and the feed-in tariffs paid for the produced energy. In the beginning, when feed-in tariffs were introduced in 2000, a generous rate of 51 euro cents was paid for a kWh, which was reduced to 41 cents by 2009, and even much more after 2011. Currently it



ranges between 10 and 15 cents depending on the size of the establishment. Feed-in tariffs are fixed for 20 years and depend on the investment year. The first ones to invest into solar energy achieved the highest profits, but investment costs were also the highest for them. Solar panel manufacturers enjoyed extremely high prices in the early 2000s, but they faced financial problems later on as feed-in tariffs substantially decreased and competition for new investments intensified. Some of the solar panel manufacturers have even gone bankrupt or are on the verge of bankruptcy.

Feed-in tariffs were also reduced for biogas plants, albeit not as radically. Biogas investments suffer from the high prices of green maize silage, due to an increase in demand from milk farms and biogas establishments, especially in North-Western Germany. This, in turn, has induced competition for land. In specific areas rent fees for land went up in 10 years from 350 €/ha to 1000 €/ha and the purchase price of good quality land doubled from 20 000 €/ha to 40 000 €/ha over the past four years. Due to the activities of biogas plants, maize silage has also become a cash crop. The price in 2013 was about 45-50 €/ton harvested or 33-35 €/tons on field.

The third most popular type of renewable energy investment is wind turbines. Windmills still represent a profitable investment. They have to be located to a certain distance from populated area for safety reasons and because of the noise pollution that they generate. Nowadays it is more and more difficult to get permission for installing new windmills, because of stringent regulations and the lack of suitable locations. Windmills are located mainly in the Northern and Central parts of Germany, where there are wide unpopulated areas and the wind conditions are suitable. This, however, also creates a challenge for the grid due to the distance to the largest end users, i.e. the industrial regions. As of June 2013, there were over 23.2 thousand wind turbines in Germany providing about 8 % of national electricity consumption. Some farmers have invested into their own turbines, but most typically they lease their land to large wind power farms.

Energy policy and development of renewable energy are important factors determining the economic well being of German farms. Farmers have set up wind, solar energy or biogas production units. About 20-30 % of the farms are estimated to have installed at least one form of renewable energy production recently. The electricity producing units are regarded as secure investments for farmers. The government guarantees the price for the electricity paid to farmers for 20 years. Eventually end users, i.e. consumers, pay the subsidies in the form of high electricity prices. Even though feed-in tariffs have recently declined, renewable energy investments will support German farmers financially for years ahead.

Milk farms in Poland are predominantly in family ownership. Milk production is geographically concentrated in the central and north-western provinces.

In Poland large-scale farms with over 100 cows have long accounted for only 5 % of the dairy cows, which was due to the coexistence of previously state-owned large farms and small family farms. The concentration process started around the turn of the millennium with the expansion of thousands of tiny farms from a few cows to 10 to 20 cows. Many of these farms started a second expansion by the end of the 2000s, when the share of cows in the farm size of 20 to 50 cows was already 30 %. Fifteen years ago this farm size category was practically non-existent in Poland.

The countries in the comparison feature different history of milk farm structure development prior to the 1990s. History largely determined developments for the past two decades. Farm structure is mostly the outcome of a long and gradual development, although some radical and rapid changes have been seen in some countries such as Denmark or the decentralisation in Latvia and Lithuania. One feature is the same throughout the entire region: milk farm structure has concentrated and average milk farm size has increased everywhere. Productivity development and the preferences of dairy companies have constantly driven the expansion of viable milk farms and the elimination of smaller ones.

2.2.2 Milk supply

No matter how competitive the dairy industry is, a shortage of milk supply creates a serious bottleneck for even the best dairy companies. Therefore, the access to sufficient high quality raw material is a key issue and a fundamental indicator with regards to the competitiveness of the entire dairy supply chain. Milk production volumes manifest the effects of numerous factors, both quantitative and qualitative. These factors explain

the downward or upward trends of national milk production, which will be analysed in more detail in Section 5.1. These same factors explain the farmers' motivation to continue, expand or quit their activity.

(1) Economic viability of dairy farms

Profitability results suggest stronger viability for dairy farms in the new member states than in the old ones. The profitability ratio in Figure 7 also takes into account the farmers own labour cost and the interest rate demand on the farmers own invested capital. A particular farm reaches the breakeven point when the ratio is 1, in other words the farmer gets a salary which equals the wage rate paid to the external labour force and gets the return on invested capital based on the average interest rate on the market. All costs are covered by farm income when the ratio is 1. Real profitability starts above the value of one.

Milk farms on average achieved good or reasonable profitability in the new member states Estonian and Lithuanian farms performing the best, whereas the ratios remained between 0 and 1 for milk farms in the old member states. This is not surprising considering the fact that especially Lithuanian, Latvian and Polish farms use much less external labour force and purchased feed than their counterparts in the old member states. Even when their own labour and capital input is taken into consideration the level of those costs are much lower. Therefore this comparison does not facilitate far reaching conclusions in terms of economic viability.

Nevertheless, Figure 7 verifies two interesting facts concerning the financial performance of milk farms. One is the detrimental effect of the low milk prices throughout Europe in 2009. It hit all farms around the Baltic Sea equally. Second, the severely indebted Danish milk farms are very vulnerable to changes in the world market, milk price or interest rates, a fact very visible in the Danish curve between 2008 and 2010. (See also Text box on Denmark on page 110).

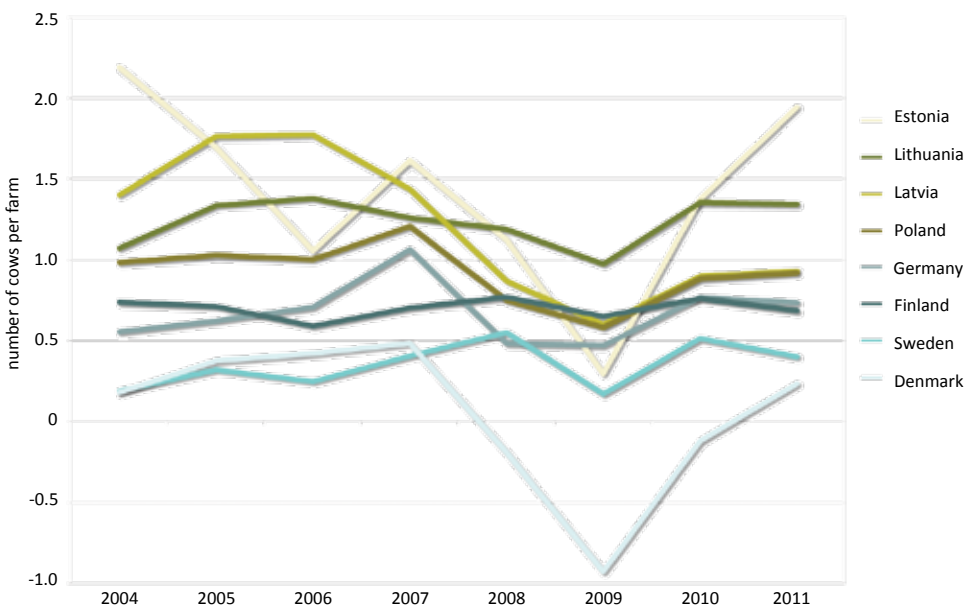


Figure 7. Profitability ratio of milk farms around the Baltic Sea.

Source: European Commission, FADN database.

(2) Milk farm concentration and farm expansion

A growing proportion of milk production tends to be in the hands of expanding farms as farm structure has concentrated in all countries. Conditions for the continuity and growth of milk production such as generational take-over programs, the threshold for new entries into dairying, access to loans for investment or various subsidies are of utmost importance in motivating farmers to continue production in ever growing units.

(3) Openness for new technologies

Farmers' adaption rate of new technology is first of all a function of their financial abilities and their attitude. Financial abilities encompass their income levels both from the market and subsidies and an access to external financing. Modernisation implies investments to largely different equipment for farmers in various stages of technical status and development. For small Baltic and Polish farmers investments into proper milking and cooling equipment was a great technology heap in the late 1990s and early 2000s, whereas at the same time in Denmark and elsewhere in the old member states the installation of milking robots were considered one of the next steps of technology modernisation.

(4) Well-being and perseverance at work

Dairy farming, a work which ties up farmers for seven days a week and 365 days a year demands a lot of persistence (stamina). This special "life-style" keeps the farmer on continued alert due to animal health issues, calving and overall responsibility etc. It involves early morning and evening shifts all year round, wearing out a person both mentally and physically. This burden is heaviest for farmers with herds of under 60 dairy cows. They still cannot afford to hire external workers, the workload is heavy and continuous with no or very short breaks. In most of the countries farmers even have to finance replacing caretakers on their own, should they wish to take holidays. Even if several family members are engaged in the farm, it does not help to have a family vacation. The farm interviews revealed that most farmers in the small and middle-scale category suffer from this permanent workload stress regardless of the country.

Well-being and perseverance at work is not paid as much attention as it would deserve due to its crucial influence on milk farm structural changes and the continuity of milk production. Particularly in those countries where small and medium-scale farms account for a dominant part of the production, there is a constant risk that the share of aging, quitting and exhausted farmers is not entirely compensated by the expanding production of the young ambitious investing farmers. If in a certain country the production volume of quitting farms is not exceeding or at least taken over by expanding ones, the domestic milk production inevitably turns to a decline.

The size of the farm is crucial in determining farmers' persistence. Once the farm has jumped over 80-100 cows – depending on the country – it starts employing external labour force. Thus the workload of the farmer levels off and a division of labour alleviates the constant physical demands of the farm.

(5) Management skills

Farm expansion over the critical limit may ease the alert on farm and improve well-being and the quality of life in terms of free-time, but it sheds a great deal of increased responsibility on the farmer. A large farm calls for the high competence of complex management skills including business, marketing, technology and agronomy. As one of the Danish farmers expressed it

Whiteboard showing the work allocation in a large Danish farm. Work is organised and allocated among the employees for a week in advance in a meeting. Assignments can be checked later on any time in the meeting room. Organising human resources is one of the crucial management responsibilities of owners in the enlarged farms.

"the growth of requirements from driving a tractor to be a general manager of a big thriving business is tremendous".

It may be puzzling that the economic performance of farms in the same region with the same size and same conditions for production can differ a lot. One example is the restructured state farms in the Baltic States, of which some survived and succeeded in the market but many went bankrupt. Since their fixed assets, land, herd size and genetic material did not show notable differences, management is the single most important explanatory factor for their different destiny. Competence was identified as one of the success factors for dairy farms in several countries (de Lauwere 2014).

Within specific local areas positive examples of successful farm expansions and well functioning networks of dairy farms can motivate young farmers to invest ambitiously into dairy farming. A positive and inspiring business environment for dairying is the outcome of numerous factors among which the attitude of municipality authorities, local advisors, new development projects and own initiatives of the farmers play important role. As a result, business activity and farming enthusiasm may be of substantially different level even across neighbouring micro-regions, a fact illustrated among others by the examples of Jönköping in Sweden (Olsson 2010) or the Savo region in Finland (Ovaska et. al, 2004).

In all countries the financial indicators of the worst and best 25 % of the large farm size category show large differences. A part of this divergence can be attributed to recent investments and indebtedness, but management skills again explain much of the differences.

The management requirements at a 20-cow farm in the 1990s also differ considerably from the requirements of a 140-cow farm today and in the future. The infrastructure of education and advisory services plays a key role in providing farmers and the managing directors of the ever growing companies with all the necessary competence for the successful operation of a milk farm business. The supporting infrastructure is an important element contributing to the competitiveness of milk farms, albeit one that is hard to quantify. It is not the number of business schools or staff of advisory services that counts, but the quality of education and support, which itself has to be constantly upgraded and renewed according to changing needs. It is also hard to quantify what part an educational and advisory support system plays in the survival of individual milk farms, but it is clear that a well-designed and high quality network of support improves the chances of successful businesses.

2.2.3 Raw milk trade and milk prices

Since the early 1990s Polish, Lithuanian and Latvian processors have coped with the additional costs attributed to the small amounts and heterogeneous quality of milk collected from small farms. In the late 1990s over 78 % of dairy cows were kept in farms of under 10 cows in Latvia, while the corresponding figure was 85 % for Poland and Lithuania. Dairy companies overcame the challenge of sourcing milk from tens of thousands of minor farms by establishing a two-stage procurement system. Milk collection stations were set up in the villages and municipal centres with cooling and storage equipment. Small farms used to take their milk to these collection points, from which dairy companies collected the milk in larger quantity.

Processors were reluctant to bear the additional costs of the fragmented structure of suppliers and they passed on these expenses to the small milk farms in the form of lower milk prices. This pricing policy of processors explains the low milk price level in Poland, Lithuania and Latvia. What the price curves do not reveal, though, is the discrepant price range paid to small and large suppliers. Over the years, the price paid to small producers could be as much as 20-30 % lower than average, while the price paid to large-scale producers could be notably higher than average.

Processors are eager to buy milk particularly from large farms in order to ensure large shipments and homogenous high quality. Given the fragmented milk farm structure in the three countries and the fierce competition for milk produced in large-scale farms, cross border trade of milk exploded a few years after the countries joined the common EU market in 2004.

Three drivers have emerged for cross border trade of milk: (1) seasonal balance of supply (2) price differences (3) milk flowing from big farms to dairies in other countries, where local milk farm structure is more fragmented. Examples for the latter two reasons are exports from the Czech Republic to Germany, from Estonia to Lithuania or from a number of Central European countries (Hungary, Germany, Austria, Slovenia) to Italy.

Cross border trade has always existed among the old member states prior to the EU enlargement. Companies located close to the border occasionally sourced some of their raw material from the neighbour countries in order to balance seasonal shortage in their supply. Germany has long had a spot market of about one to 1.5 million tons which is freely traded on the domestic market and part of it finally exported.

A special case of cross border trade is Denmark, where Arla – having subsidiaries and cooperative farm members in Germany and Sweden – exports and imports milk within the company to respond promptly to the needs of its production plants.

It was however the EU's eastern enlargement that made the trade of milk rocket both between the new and old member states and among the new members. Differences in milk prices have been the main driving force. The price level in the Baltic States and Poland was hardly half of that in the Nordic countries and Germany in 2003, before the EU accession of the first group of countries.

Prices in the new members raised rapidly upon accession, and have followed the fluctuations of the EU average ever since. Yet, there remained a 15-30 % gap between the Polish and Baltic prices and the EU average up until now. Over the past two years Estonian milk price level has approached the EU average, pointing to the fact that the main reason for lower prices in Latvia, Lithuania and Poland can still be explained with their fragmented farm structure.

Figure 8. Raw milk trade of countries around the Baltic Sea, 2012.

Note: Calculations are based on EUROSTAT foreign trade data base. Figures include only the unpackaged milk of under 6 % fat content for further processing within the CN 0401 group. Milk churns indicate the size of exports from the specific country.

Raw milk can be transported hundreds of kilometers over the borders in Europe.

On average milk prices in the EU-10 new member states have been 10-15 % lower than prices in the EU-15. Price differences also apply to those countries, where most of the milk is produced in large-scale farms such as Czech Republic, Slovakia or Hungary. The constant price difference suggests the long term prevalence of cost advantages in the milk production of the new member states. Labour, land and own feed are some of the main inputs of production giving cost advantage compared to the old member states.

Throughout the ten years of price development, Germany's milk prices went hand in hand with the EU average. It is not surprising, since the country is a price maker with its substantial weight in production, it accounted for over 21 % of collected cows' milk in the EU in 2012. The German dairy sector is also sensitive to changes in the world market price since it contributes more than 15 % of the EU dairy export to third countries.

The higher milk price levels in Denmark, Sweden and Finland are attributable to the cooperative ownership of the largest dairy companies in these countries. Arla, the largest dairy in Denmark and Sweden had to adjust its procurement prices to the prices prevailing in Germany, the UK and the Netherlands, since the company has thousands of farm members in those countries and it follows the cooperative principle of offering the same price to all members. Valio has members only in Finland, which allows the company to set procurement prices in line with the interests of its owners.

Wijnands et. al (2007) found that the price of raw material is an essential element to determine the competitiveness of the food industries. Milk can form 30 to 60 % of a dairy industry's expenses, so even small deviation in price will have a great effect on the companies' costs and, eventually, profitability.

2.3 Dairy industry

Dairy industry is a key segment in the chain, since the ultimate international competition is fought with processed dairy products. The competitiveness of a country's dairy industry is determined by the industry structure, the number, size and distribution of the companies, the ownership structure and the cost level of production resources.

Additionally, competitiveness is determined by a number of other factors, which

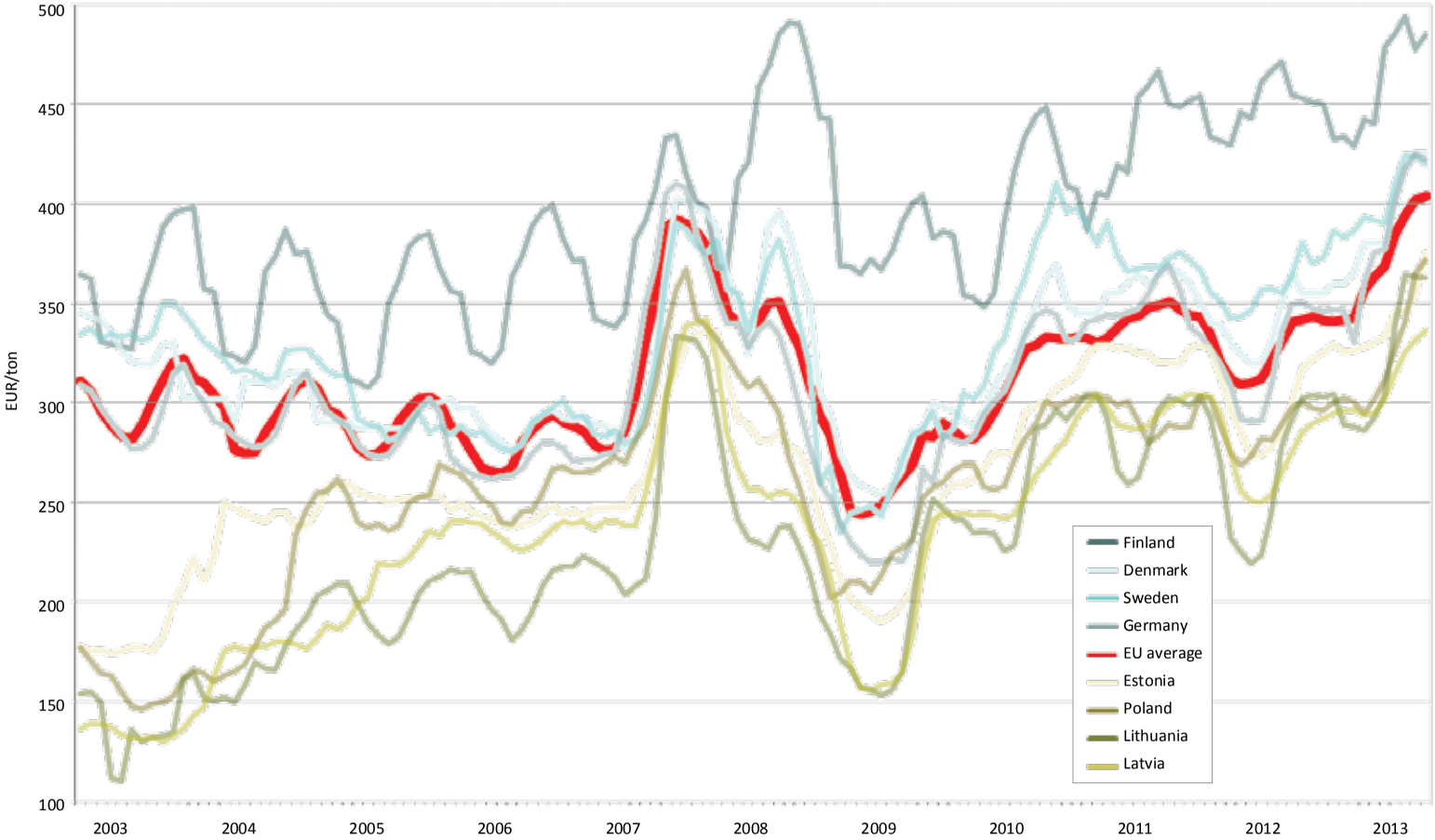


Figure 9. EU average milk price and milk procurment prices in the Baltic Sea region.

Source: European Commission.

are more difficult to quantify. These are the general business culture, the management of the dairy companies, consumption patterns and consumers' attitude to domestically produced dairy products. The society's attitude to the dairy chain is decisive- for instance, a broad consensus prevails in several countries that the dairy sector is the most important or at least a very significant part of the food chain due to its export earnings and multiplier effects in the economy. Such a consensus may involve politics, the media and public opinion in general, which forms a basis for psychological and – if need be – financial support to the dairy chain.

The competitiveness of dairy industry can be detected in its market performance on two major "battle fields", the domestic and export markets. Maintaining market positions on the domestic market may be regarded as a sign of successful competition against imports concerning prices and product assortment. Usually the bigger the domestic market the better preconditions it grants to companies to achieve adequate size and financial strength for the international arena. For dairy manufacturers operating in smaller countries a constant strive for growth and critical mass of production will result in forceful industry concentration or expansion over the national borders.

Countries around the Baltic Sea have rather stagnant dairy markets. They are especially mature in the old member states and in the new ones consumption growth was cut by the 2009 global crisis. Therefore, dairy manufacturers have had to seek growth in export markets. The eight countries' dairy industries represented 29 % in the combined sales revenues of the EU dairy industry in the first years of 2000s.[4] This share had risen to over 32 % by 2011, which gives a strong indication of the growing significance of the sector from a European perspective.

Dairy chains in the eight countries differ from each other in many respects. Market structure tends to be more concentrated in the smaller countries' dairy industries. Economic performance in individual countries is a function of costs related to raw material purchases (milk prices, milk farm structure, logistics) and other costs of operation (labour, energy etc.). Costs of the major production resources differ substantially in the eight countries.

Ownership and vertical integration are also factors that influence the functioning of the chain. Despite several differences among these countries' dairy industries, one characteristic is apparently common in Northern Europe: the noticeable share of cooperative-based processing capacity in the dairy industry. It is based on a century long tradition in Germany and in the Nordic countries. The milk farmers' cooperative movement has strengthened considerably in the Baltic States in recent years, which leads to strong endeavours to build own processing capacity in all three countries (see more details in the country sections of Estonia, Latvia and Lithuania).

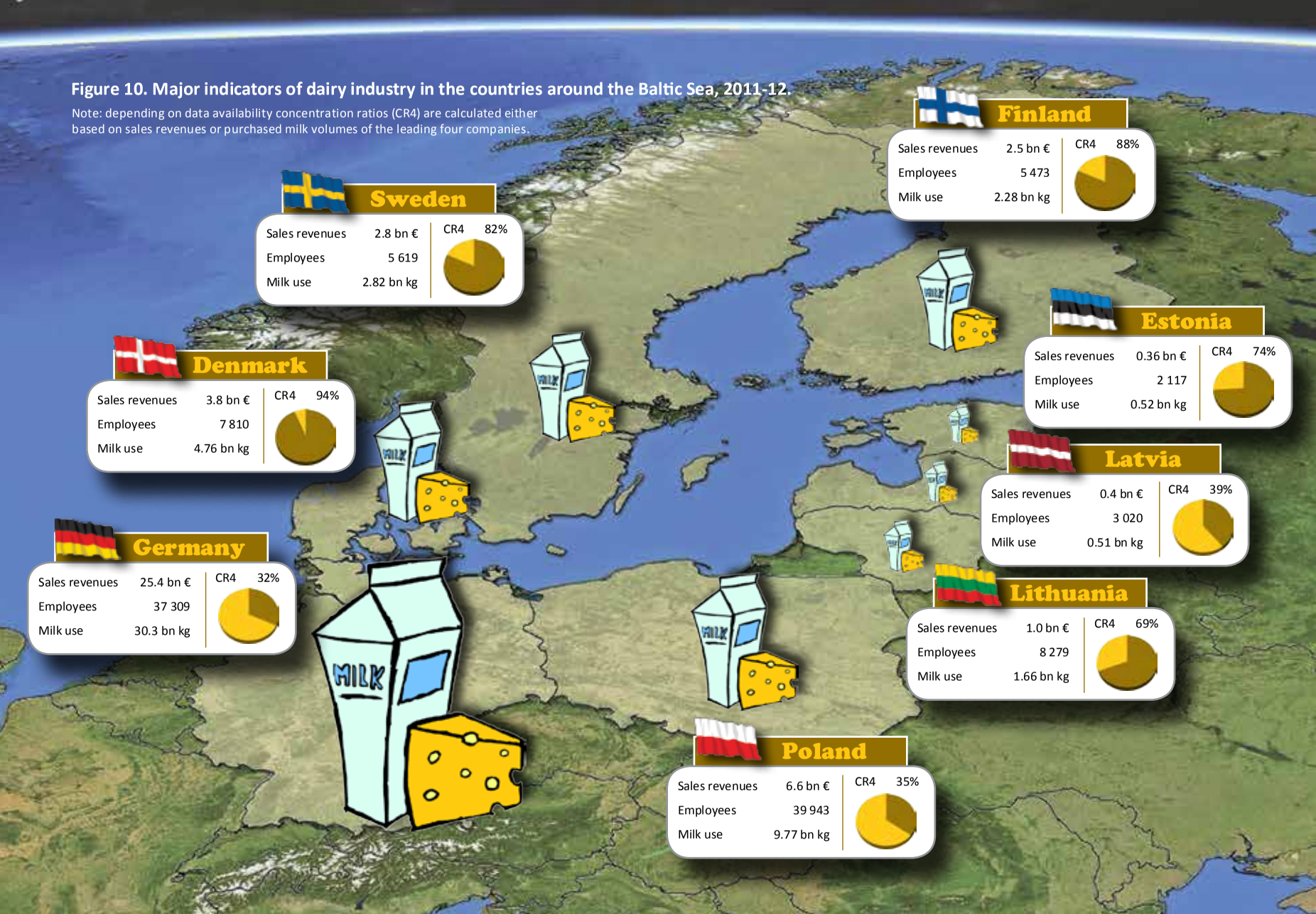
Apart from industry structures, ownership and costs, economic success is determined by the sales performance of the dairy industry including marketing and management, business relations, both domestically and abroad, and the goodwill of manufacturing companies.

Dairy products are basic foodstuffs forming an important part of everyday consumption. Dairy manufacturers can have two distinctly different lines of production, one is the group of conventional products, such as regular liquid milk, butter, basic cheese types and fermented products, while the other extreme is highly processed, high

[4] Shares were calculated by using nominal dairy industry sales revenues of 27 EU members, Romania and Bulgaria were included retrospectively to the EU aggregate prior to 2007.

Figure 10. Major indicators of dairy industry in the countries around the Baltic Sea, 2011-12.

Note: depending on data availability concentration ratios (CR4) are calculated either based on sales revenues or purchased milk volumes of the leading four companies.



value added products such as drinking milk and fermented products with functional characteristics, spreads, various processed cheese, quark and desserts. The latter group involves constantly new flavours, added nutrients, vitamins, minerals, fibre or protein, lactose free production etc. As reflected in their product mix, dairy manufacturers may follow different strategies, either a cost-effective production or a value-adding strategy.

2.4 Food wholesale and retail

Wholesale and retail companies have internationalised and concentrated rapidly over the past two decades. The significance of specialised wholesaling has declined as the leading retail companies tend to integrate wholesale and distribution activities into their chains all around Europe. At the same time the regular clientele of traditional specialised wholesalers, the individual shops or small local chains have quickly lost their share. Therefore, wholesale companies have shifted their emphasis to the Horeca sector, which still feature a suitably fragmented structure of individual actors.

Retailers have gained more market power in nearly all European countries as the sector has more concentrated. Foreign chains established their network in the neighbouring countries as early as in the 1970s. The volumes of foreign direct investments have multiplied in the retail sector since the beginning of 1990s. The main reason was a rush of Western-European chains to conquer the Central and Eastern European retail markets. At the same time, investments among Western-European countries also intensified. Cross border investments lead to the emergence of pan-European corporations, which operate retail chains in numerous countries.

The other evidence of increased power of retailers is the strategic purchase alliances. These have been formed by various retail chains from different countries to facilitate higher volumes of the same product and lower prices from the suppliers.

The recent economic recession has lowered the income of consumers since 2008. This megatrend has favoured and accelerated two trends, both of which in fact started decades ago: the progress of discount store chains and retailers' private labels. Both have gained increasing popularity by offering the price sensitive consumers cheaper product alternatives. The recent march of the discount chains can be observed in many countries and is well reflected in the boosting sales figures. The discount store concept originates from Germany, and as the leading concerns have spread across Europe competitors responded with setting up their own corresponding discount chains.

Private label has also existed long before but the consumers' lower income in the recession years apparently gave it a strong impetus. The growth is particularly well observed in the dairy product group in several countries in this comparison. Many dairy manufacturers consider private labels a threat, because they directly compete with industrial brands. Other suppliers see private labels as an opportunity. It is a fact that contract conditions of private label products are more strictly dictated and controlled by the retailers. It also involves a constant risk of discontinuation for the supplier. Private label production can be an appropriate strategy for dairy manufacturers with a cost effective strategy and/or high economies of scales and conventional bulk products. Most recently, though, retailers have expanded the range of private label to higher processed or special dairy products, such as organic, lactose-free or functional goods.

Figure 11. Major indicators of retail trade in the countries around the Baltic Sea, 2011-12.

2.5 Country reviews

In the previous sections of Chapter 2 we have reviewed the general characteristics of the milk supply chain segments around the Baltic Sea. Milk production including milk farm structure development, prices and the foreign trade of raw milk were presented by using plenty of country specific examples. In the following country reviews the special characteristics of the dairy industry and retail sector, their market structure with the leading actors, their relations to the other segments in the chain are discussed in more detail.

2.5.1 Germany

The German dairy industry is the biggest in Europe with sales revenues exceeding 25 billion EUR. Geographically it is concentrated into two distinct areas following the regional distribution of milk production. The North-Western cooperative-based dairies usually feature high processing volumes but deliver low-price, standard products e.g. UHT milk, cheap standard cheese. The Bavarian dairies are often owned by private persons or families. They more often manufacture and export branded products of higher price, a wide range of cheeses such as ripened moulded or other special cheeses. Their suppliers, the Bavarian milk farms, have higher costs (Jürgens et. al. 2013), smaller farm size and the average dairy processing factory size is also smaller in Southern Germany than in the North of the country.

The structure of the industry is rather fragmented which is due to historic reasons and the vast domestic markets. Although the number of dairy manufacturers decreased sharply over the past decades, the concentration in the industry did not change significantly in the 2000s as the largest four companies accounted for about one fourth of the sales revenues in the market.

Perceptible consolidation started as late as 2010 with a merger between Nordmilch and Humana Milchunion resulting in the cooperative Deutsches Milchkontor (DMK). Around 10 000 member farms from the seven

Table 2. Main indicators of the German dairy industry, 2003-2012.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of companies	360	295	453	379	416	401	420	498	495	..
Sales (billion EUR)	23.6	24.0	23.0	22.4	27.8	27.8	22.0	23.2	25.6	25.4[a]
Gross operating surplus (million EUR)	1 054	1 216	1 046	1 059	884	825	887	777	..	..
Number of employees (thousand)	44.9	41.8	39.3	37.2	39.8	38.9	36.2	36.5	37.1[a]	37.3[a]
Processed milk[b] (billion kg)	27.5	26.8	27.3	26.9	27.4	27.9	28.0	29.5	30.3	30.3

Source: Eurostat; [a] Statistisches Bundesamt; [b] Processed milk is corrected for cross-border milk trade.

Table 3. The leading dairy companies in Germany, 2011.

No	Company	Sales (million EUR)	Milk (million kg)
1	DMK Deutsches Milchkontor	4 600	6 800
2	Arla Foods (MUH, Hansa Milch, Allgäuland)	1 303	2 489
3	Hochwald	1 194	2 047
4	Bayernland	1 146	700
5	Hochland	1 110	483
6	Theo Müller	1 000	2 000
7	Meggle	900	750
8	Zott	815	852
9	Ehrmann	685	465
10	FrieslandCampina Germany	600	700
11	Danone	589	325
12	Fude+Serrahn Milchprodukte	508	300
13	Omira Oberland Milchverwertung	503	952
14	Molkerei Ammerland	491	1 077
15	Bayerische Milchindustrie	481	807
16	Käserei Champignon Hofmeister	480	400
17	Uelzena	442	439
18	Rücker	435	800
19	Frischli Milchwerke	379	735
20	Goldsteig Käsereien Bayerwald	357	735

Source: Milchindustrie-Verband, Molkerei Industrie Spezial, IFE.

federal regions in North-Germany supply over 6 billion kilos of milk to DMK.

The second case of consolidation is the market expansion of Arla through a series of acquisitions. Since 2011 the Danish-Swedish dairy has acquired Hansa Milch, Allgäuland-Käsereien and Milchunion Hocheifel making it at once the second largest dairy group on the German market. Arla has approved about two-thirds of the German suppliers as full cooperative members. The rest of the farmers are regular suppliers mostly located in the south.

There are four companies offering the full spectrum of consumer dairy products: DMK, Müller, Arla and Bayerische Milchindustrie (BMI), the rest of the companies usually have some sort of specialisation such as cheese or fermented products. Liquid milk is the product group excluded from the specialised companies' assortment.

Consolidation in the German dairy industry has proceeded slowly compared to what has happened in many other European countries (Weindlmaier 2012b). Foreign direct investment, a factor which has driven dairy industry consolidation in several countries, have had – at least until recently – limited influence in Germany. In such a huge market only the global leaders of the dairy industry would be financially strong enough to accelerate concentration. Yet, competition gets extremely fierce in the German dairy industry. Processors often find themselves in a cost-price squeeze of milk prices and depressed output prices. There is

DMK's plant in Edewecht, North-Western Germany is one of the biggest cheese factories in Europe. With a production capacity of over 100 thousand tons of cheese, the plant processes 1.3 billion kg of milk annually.

a heavy price pressure within the chain from the side of retailers and consumers (Sossna, 2012), so profitability remains modest. This factor has probably kept the global dairy companies from proceeding with rapid megamergers in Germany.

Consolidation is also challenging for the domestic leaders. It is difficult for cooperatives to merge, because it should eventually result in streamlining and rationalisation, i.e reduction in labour force, closure of some factories and concentration of the processing capacity in fewer locations.

Despite the recent mergers and acquisitions of the leading companies, the emergence of DMK, and the mergers and acquisitions of Arla, the market structure is still fragmented. The concentration ratio CR4, calculated as the largest four companies' share of the industry' sales revenues, reached 32 % in 2011 from 27 % in 2006. Currently even the 30 largest companies account for only about 60 % of the dairy industry's output. Concentration is notably higher if measured by shares in milk collection: the first four companies accounted for 45 % of milk intake in 2011 (38 % in 2006). This is because the largest companies are cooperatives that buy all milk from their members, and the redundant volumes can always be sold further.

Milk purchase

Dairies tend to ensure the appropriate supply of raw materials with supplier contracts. Milk is usually collected within a 100-150 km radius, but cooperative-based companies and privately-owned manufacturers have different supply contracting practices. The cooperatives usually guarantee the purchase of all milk from full member farms, and the terms of the supply contract are fixed for a period of two years. The private dairies enter supply contracts whose length can vary from one to five years or even 10 years. Most often the contract requires exclusivity, i.e. the farmer cannot sell his milk to anyone else, and contract violations are very rare.

Farmers are quite loyal and abide to the agreement, but switches from one dairy to another also occur, especially in regions where farmers have several options to sell their milk. During the 2008 crisis, some farmers left their cooperatives (for instance, DMK did not pay a competitive price) and redirected their production towards private dairy companies. This proved to be risky, because some of the small private dairy companies went bankrupt and farmers eventually had to seek a return to the cooperative. Often, those farmers were accepted but not as

full members, hence playing the role of second-class members.

Price is revised monthly in the contracts. In terms of pricing, cooperative and private dairies again employ slightly different routines. Cooperative-based manufacturers first sell dairy products and, at the end of the period, calculate a related milk price applicable in the following month. Hence, milk purchase prices are changed based on the dairies' retrospective cash-flow. About one third of the cooperatives (among others Molkerei Ammerland, FrieslandCampina and Arla) also apply a retrospective bonus payment on milk. Private companies monitor the price levels of cooperatives and use them as reference for their own pricing, but they freely negotiate their prices with suppliers.

The cooperatives pay the same price to all members but private companies usually set prices differently for small and large milk farms. DMK, although it is a cooperative, also pays a so-called logistic bonus or milk collection premium to large farms. In Bayern, milk prices have traditionally been relatively higher, and privately owned dairies pay more to fragmented farms, which usually also have higher costs. In North-Western Germany milk prices have been 1-2 euro cents lower, in line with the lower costs of milk production in larger farm units.

There are regional differences in the frequency of milk collection. In Southern Germany milk is collected every day, about 500-700 kg/day from an average farm, while in northern Germany milk is collected every second day 1500-2000 kg at a time. Southern German farms usually do not have extra storage capacity for milk. Regional differences prevail also in the milk use structure: the percentage of production delivered to dairies is bigger in the north, where farms use milk powder for feeding calves (i.e., in the south, farms use more milk for feeding).

Dairy companies take care of the milk collection by themselves with their own fleet of trucks. In response to relatively high logistics costs and labour costs (including salaries and social security payments), several dairies have recently outsourced milk collection. Their trucks have been sold to private entrepreneurs or former drivers. As an employer, a truck driver used to work eight hours a day, as an entrepreneur the working days have often stretched up to 14 hours. The optimisation and logistics planning of milk collection routes is still carried out by the dairy company.[5] Drivers take a milk sample, which is then sent to laboratories.

Laboratory analysis has also been outsourced, partly for cost reasons but also to avoid conflicts of interest and ensure the objectivity of the analysis. Farmers like having the analysis of fat and protein contents carried out by a third party with no stakes in the results. Laboratory activities are centrally organised in the federal regions, but the dairies also accomplish their own analytical tests.

Germany is the biggest milk producer in the EU and a peculiarity of the German milk chain is a fairly big spot market, which is estimated to be between 1 and 1.5 million tons annually. The foreign trade of milk constitutes part of this spot market (Table 4).

There are also trading companies specialised in the purchase and resale of milk. The biggest is B.M.G. (Berliner Milcheinfuhr-Gesellschaft mbH) which collects annually about one billion kg of milk and sells it to German and foreign dairy companies for processing. B.M.G. used to purchase milk from Eastern Germany for the consumption of West Berlin when Germany was divided, and it still entertains good relations with big Eastern German milk farms. Meanwhile

[5] Nonetheless, both independent entrepreneurs and dairy companies have to take into account German labour and social security legislation which limits the outsourcing of activities to outside entrepreneurs who only pretend to work independently.

Table 4. Germany's foreign trade of milk, 2003-2012, thousand tons.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Exports	1 115	1 312	1 178	1 196	1 134	1 192	1 122	1 126	1 112	941
Imports	1 303	974	1 096	1 262	1 260	1 618	1 631	1 509	1 648	1 549

Source: EUROSTAT, foreign trade database.

B.M.G. has also expanded its activities to Western Germany. It also maintains good relations with the other segments of the chain, both upstream and downstream.

Ownership and vertical integration

The majority of dairies are owned by German capital, with farmers and other private investors forming the two biggest groups of owners. Cooperatives buy about 62 % of the milk produced in Germany (Friedrich 2010). The rest is purchased by dairies having other corporate forms, (ltd, co or private entrepreneurs). Cooperative-based dairies tend to be located in Northern and Central Germany, while privately owned manufacturers are typically situated in Southern Germany. The cooperative dairies have recently become more professional in their management and corporate strategy. They have also increased their export revenues notably.

The farm cooperative membership fee is usually determined as a function of yearly milk production. It costs 4¢/kg, so for 100 000 kg it is 4 000€. An average farm has about 20 000€ capital tied up in the cooperative as a membership fee. New members or expanding members can pay their membership fee in the form of price deductions gradually over the years. The upper ceiling for capital contribution is one million kg or 40 000€.

Foreign ownership has been rather low. Two of the global dairy giants Nestle and Unilever invested into Germany at the end of the 1990s, but left the country after a few years having realised the challenges on both cost and sales sides. Nestle sold its three factories to Hochwald and Unilever to Edelweiss.

Currently there are three big foreign investors in Germany: Arla (DK/SE), Friesland (NL), and Danone (FR). Firesland's and Arla's investments can be considered only partly foreign due to the involvement of German farmers into the ownership structure of the companies. Altogether foreign companies account for about 12 % of milk purchases in Germany.

FDI is important because foreign companies challenge the German dairy manufacturers. It is both the size of a factory and the combined market shares of the company that contributes to competitiveness of the industry. The industry is very fragmented as a whole, but in certain sub-segments of the market, shares are already considerable, e.g. 30 % of the fresh cream market is held by one company. This type of concentration strengthens the negotiating power of dairy companies against large retail chains.

Relations to the retail sector

The German dairy industry operates with a low profit margin when compared to dairy processors in other countries.[6] The low profitability of the German dairy industry can be explained by the power relations within the chain and the structure of the German retail sector. Hard discount chains such as Lidl, Aldi, Edeka (Plus chain now changed

[6] A proxi for profitability is gross operating surplus shown in the summary tables of national dairy industries. Germany has the lowest figures among the eight countries.

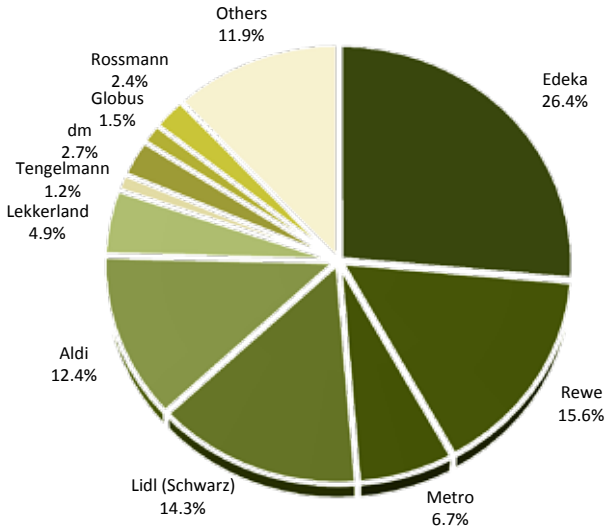


Figure 12. Market structure in the German food retail sector, 2012.

Source: Handelsverband Deutschland.

to Netto) and Rewe (Penny Market) are especially strong in the German food retail. Discount chains account for 39 % of German food retail, traditional retail chains such as hypermarkets account for 24 %, traditional supermarkets account for 28 %, and independent retailers cover the rest. Aldi and Lidl are more or less evenly spread over the country and are present in every large and medium-sized municipality. Edeka and Rewe are present in urban areas but also cover the countryside with their units.

The strongest industry brands of manufacturers can be found in Southern Germany, mostly in the Bayern region. On the other hand cooperatives are the biggest manufacturers by volume and produce the majority of private label products in Germany. PL products account for approximately 40-45 % of the German dairy sector. The contract for PL products can be defined for the German market or directly for Germany plus export markets. If only a small amount of cheese (e.g. one small container) is involved, the retailer organises the logistics of export, otherwise (e.g., for a full truckload of UHT milk), the manufacturer takes care of transport to the final destination (e.g. France).

The white line of private label products is negotiated twice a year and the supply contract is in force for six months at a time. The yellow line (cheese) is contracted for one year. Butter-related contracts form an exception as they can be renegotiated every month. The butter business is influenced by international trade. There are specialised trading companies, which have experience

Discount store chains are operated by all the leading retail concerns. Competition keeps the price level of foodstuffs at a lower level than in countries in Northern Europe.

in buying cream in the international markets and tendering for butter (in the times of butter mountains). Traders take the cream to dairies, which make butter that is then sold under private labels – about one-third of all butter sold in Germany is done this way.

German consumers are very price sensitive, and tend to prefer cheap dairy products. At the same time there is an increasing range of lactose-free products on the market. A big share of high-priced dairy products, such as premium yoghurts or cheese, is in the hands of foreign companies (Swiss, French) either through imports or through subsidiary companies.

Consumption patterns

Corporate social responsibility issues in the dairy sector have not been the subject of much public debate for quite a long time. This has started to change very recently, influenced by more vivid public debates, for instance on animal welfare, and CSR strategies of major foreign competitors, mainly Arla and FrieslandCampina. All in all, about 10-20 % of consumers are interested in fair trade and other responsibility issues. Nevertheless, the dairy industry is giving consideration to those issues, because animal welfare is becoming important, although still more in relation to the meat chain than the dairy industry.

Water footprints are not discussed at all, whereas carbon footprint and greenhouse gas emissions of the sector have been subject of some public scrutiny.

GM-free production methods have been endorsed by a retail chain, Rewe, which probably sees it as a means of differentiating itself from its competitors. Rewe initiated a program called pro planet in which they commit to checking the production methods of the foodstuffs they sell. Dairy products form a pilot group in the segment of food products of animal origin, and the use of GM feeds is banned from the production process of products sold in the low-price, private label segment. The idea is to provide some added value to the consumer without raising the final price of the product. So far, the GMO-free project is still a pilot project and has not been rolled out to the whole supply chain.

Organic milk consumption accounts for about 4 % of total milk consumption in Germany in value terms. Sales of organic dairy products amount to 659 million EUR, divided into 408 million EUR for white products and 259 million EUR for yellow products. About 3.8 % of the market volume is organic, so these macro-level figures suggest that there is only a slight price premium for those organic products.

Geographic indication of the origin of dairy products (e.g., regional or local) has not been identified as an important factor in the dynamics of the sector, although there are certain initiatives to reintroduce the concept. Even strong loyalty for domesti-

Cheese disk in a German supermarket.

cally produced dairy products cannot be observed.

Foreign trade

Germany is the biggest milk producer in the EU and an influential player on the markets of processed dairy products. Dairy exports have expanded dynamically primarily due to the increased sales of cost efficient companies. They have achieved high production scales and offer basic processed products at competitive prices. Exports have been accelerated by the headway of giant German discount store chains throughout Europe. German suppliers often win the tenders of their private label dairy products, which is hardly a result of a conscious national aim, rather the outcome of long term traditional business relations and the ability of German processors to meet the tough price targets of discount stores.

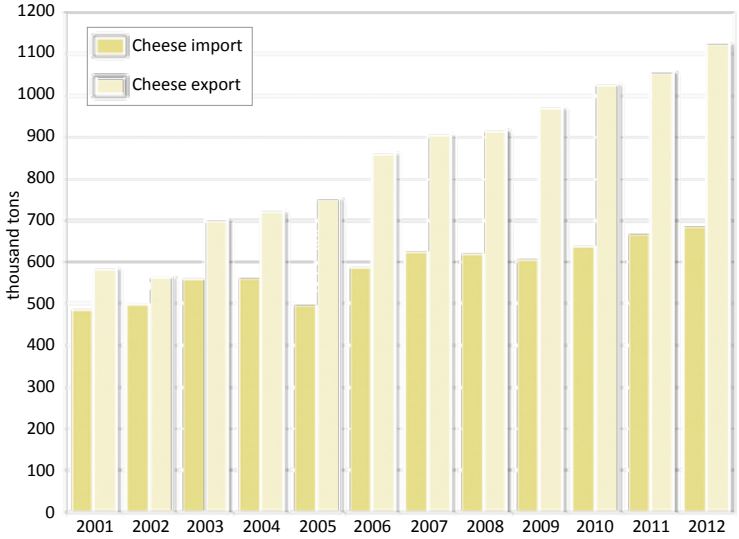


Figure 13. Germany's cheese export and import volumes.

Source: Eurostat, foreign trade database.

Germany's export structure is, therefore, dominated by processed bulk products, a strategy that best suits dairies with the largest economies of scales in Europe. The German cheese trade illustrates this peculiar structure. Cheese exports have doubled in volume terms between 2002 and 2012, whereas imports increased only 38 %. However, Germany exports cheap ordinary cheese, and imports special high value cheese, so the unit value of imported cheese has exceeded that of the exported cheese over the past ten years.

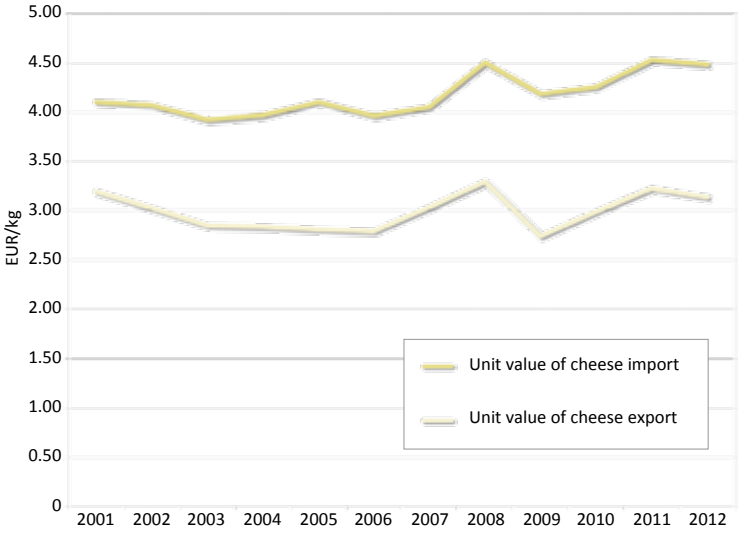


Figure 14. Unit value of Germany's cheese export and import.

Source: own calculations based on Eurostat foreign trade database.

2.5.2 Denmark

The current Danish dairy industry structure finds its roots in the thriving cooperative movement that started over a hundred years ago in the country. By the 1960s there were still well over a thousand cooperative dairies, so the starting point of the development of the sector was an extremely fragmented structure. The establishment of Mejeriselskabet Danmarks (MD) in 1964 was a milestone in the history of the Danish dairy industry, as it launched a steady path of consolidation for the subsequent decades (Hansen, 2005).

The manifested objective of MD from the beginning was to consolidate the fragmented Danish dairy industry and this goal was completed through a series of acquisitions within less than four decades. The expansion strategy and sometimes the means to prepare and accomplish the acquisitions were rather aggressive, generating a great deal of criticism by competitors. The final merger was preceded by a long and bitter price war with the last big competitor Kløver that had been established to offset the increasing power of MD Foods. After the merger of the two cooperative dairies in 1999 over 90 % of the milk deliveries were concentrated in the hands of just one company (Nilsson and Ollila, 2006).

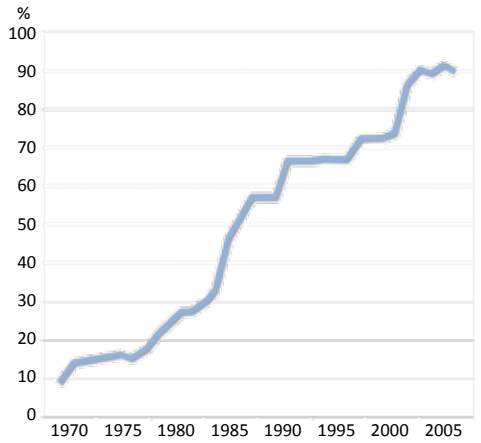


Figure 15. The share of Mejeriselskabet Danmarks (MD) and Arla Foods since 2000 in Denmark's milk deliveries.

Source: Hansen 2005, p. 83.

MD foods merged already the following year with the largest Swedish dairy which resulted in the largest cooperative dairy in Europe, whose size was also very significant by global standards (only Dairy Farmers of America, (US) was a bigger cooperative at that time). By 2005 Arla became the fifth largest dairy in the world. Positions have changed slightly in recent years and in 2012 the company was the seventh largest dairy company and fourth largest dairy cooperative in the world (see Attachment 1).

Arla has unquestionably become the most significant dairy of the Baltic Sea regions over the past decade. Its creation was the first cross-border merger of dairy cooperatives, since it involved Danish and Swedish farmers as owners. The company pursued this unique strategy of cooperative expansion by spreading into Germany, the UK, Belgium and Luxembourg. Member farms of the acquired cooperative dairies were offered a membership in Arla, but in several countries the company also has contract suppliers. Growth and capital expansion remain a critical issue to resolve in a cooperative dairy, so shifting into a shareholding model has been considered. The membership, however, decided in 2010 to increase the equity capital significantly in order to facilitate the ambitious growth strategy of the company by 2015 (Hansen, 2013 p. 297).

Arla has practically maintained its over 90 % share of milk deliveries in Denmark (the share has only slightly risen by the ac-

Table 5. Main indicators of the Danish dairy industry, 2003-2012.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of companies	61	66	71	78	74	76	69	69	70	70
Sales (billion EUR)	3.2	3.3	3.4	3.5	3.6	3.9	3.4	3.7	4.1	3.8
Number of employees (thousand)	9.8	9.2	9.2	8.8	8.7	8.2	7.5	7.4	7.8	..
Processed milk[a] (billion kg)	4.5	4.4	4.5	4.5	4.4	4.4	4.4	4.6	4.6	4.8

Source: Eurostat and Statistics Denmark; [a] Processed milk is corrected for cross-border milk trade.

quisition of some additional small dairies in the 2000s). The concentration indicator CR4 measured by milk deliveries did not substantially change over the past years: it was 94.1 % in 2005 and nearly the same, 94.3 %, in 2012. Currently, an unusual "status-quo" characterises the dairy industry structure including about 70 small-scale dairies and one giant. As one Danish dairy industry expert stated "the bigger the company, the bigger shade it gives". Small dairies complement the assortment, fill niches in the market with their specialties and, in some product categories such as organic milk, they even challenge the hegemony of the leading company.

Mammen mejeri is a privately owned dairy, which produces 14 thousand tons of cheese annually for both the domestic and export markets. Thise and Naturmilk both specialise in organic products. The organic drinking milk share in Denmark is very high, nearly 30 %, and Arla accounts for approximately 50 % of this segment, while these two companies account for much of the remaining share. Organic dairy products are fully manufactured by the domestic dairies, as the import of organic products is negli-

The headquarters of Arla Foods in Aarhus.

Organic milk farms are also big in Denmark.

gible. The cooperative dairies of Them and Bornholm produce a wide variety of cheeses (about 5 000 tons annually).

Organic milk production started to grow significantly when cooperatives started their promotion. Nowadays there is strong loyalty for Danish organic milk and dairy products, but less loyalty for domestically produced conventional milk and other dairy products. Recent market development shows that there is room for more consolidation even in the extremely concentrated Danish dairy industry. In January 2014 Naturmælk took over the small organic cheese maker Osterie Hinge (Birk, 2014).

Milk and whey protein powder are significant products of the chain. Additionally, there are two dry cheese powder manufacturers with considerable export sales: Lactosan and Cremo cheese, which is a subsidiary of Carry group (Ireland). The cheese is bought from cheese factories (not usable for consumer packaging) and the powder is used as food ingredients by food companies in various countries.

Vertical integration and ownership structure

The vast majority, over 97 % of the Danish dairy industry is cooperative-based, so the processing capacity is owned almost fully by farmers. Arla has over 3 300 members in Denmark, and nearly 9 000 in five other countries, so the challenge for the company is to maintain the collective ownership interest by various channels of communication. The brief Owners' magazine is published regularly in English, Danish, German, and Swedish. Meetings are organised between the board of representatives and local councils of dairy farmers to discuss the results of the previous annual report, future strategy, milk prices and investment plans. The attendance rate in these meetings has been about 40 %.

Should a member want to leave, it has to be announced by August in order to come into effect from the beginning of the following year. Arla decided to let members go and

Table 6. The leading companies in the Danish dairy industry

Company	ownership	Milk purchase (million kg)		Farmers	Plants	Staff
		2005	2012			
Arla	cooperative	4 053	4 320	3 354	20	7 000[a]
Mammen mejeri	private	52	150	60	3	90
Thise mejeri	cooperative	23	91	87	2	120
Them andelsmejeri	cooperative	36	54	34	1	60
Bornholms andelsmejeri	cooperative	39	50	45	1	60
Naturmælk	cooperative	12	32	33	2	70
Nørup mejeri	private	13	17	12	1	20

Source: Nilsson & Ollila, 2006; Mælkeri tidende 19.4.2013, p.6.; companies' homepages. [a] Arla Denmark staff, headquarter is included.

Small dairies specialise in niche products, such as special cheeses or organic products. Despite their size, several of them have achieved success on export markets.

return according to their free choice. The owner's capital is paid back to a quitting farmer within three years. In the case he rejoins the cooperative, a farmer has to pay 15 000 DKK (2 000 EUR) in administration costs.

Out of the 12.1 billion kg of mik processed in 2012 over 10 billion kg originated from member and approximately 2 billion kg came from contracting suppliers. Arla has been the textbook example of a cooperative continuously expanding to new countries by absorbing cooperatives and accepting their members (Hansen 2013, p. 291). Due to the special nature of cross-border cooperative expansion, Arla has developed the rule of double stipulation for would-be members. Farmers of an acceding cooperative have to bring in milk deliveries and contribute with capital.[7] This mode of participation in the company gives members the real possibility of influencing decisions as well as a sharing of the risk.

If the company needs additional capital for expansion, a regular loan is taken from banks. Danish banks have been used exclusively until last year, but this year international financial markets –mainly large European banks – are also considered.

Arla has followed the cooperative pricing policy i.e. the same price is offered to all its members regardless of their size and country. Contracted suppliers are paid based on the prevailing market price of their country, a fact that irritates members in the same country if Arla's unified price falls under, which was the case in the UK in the spring of 2013. From January 2014 over 80 % of the current contract suppliers in UK have become members of Arla Foods Amba.

The year-end payments are similar to dividends calculated on the basis of the company's performance in the previous years. In Germany, the extra payment is made to the subsidiary cooperative in one sum, based on the supplied volume, and the subsidiary then distributes the money further.

Relations to the retail sector

The value of Danish grocery sales was approximately 15 billion EUR in 2011. The Danish

[7] In the joining cooperative of UK there were numerous members with capital share only and no milk production. The active members were required to buy plain capital owners out, before they were accepted to be members of Arla.
[8] While the first two chains own all their units, many retail shops associated with Dagrofa are run by individual entrepreneurs, who cooperate in terms of purchases of goods and marketing.

retail sector is one of the most concentrated in Europe. The three leading chains are the consumer cooperative chain COOP, Dansk Supermarked and the wholesale company Dagrofa/SuperGros,[8] which also runs a number of chains with different concepts in the retail business. Altogether, those three companies accounted for about 89 % of the retail food market in 2010.

There are also three foreign chains and, quite interestingly, all three in the discount store category. Aldi from Germany opened its first outlets as early as in the late 1970s, Norwegian-owned Reitan with its Rema1000 chain arrived in 1994, and German Lidl started its Danish operation in 2005. Their combined market share was over 9 % in 2010. Grocery sales have increasingly concentrated into these leading chains, since other smaller chains and independent shops accounted for 15 % of the market in 2001 but only 2 % ten years later.

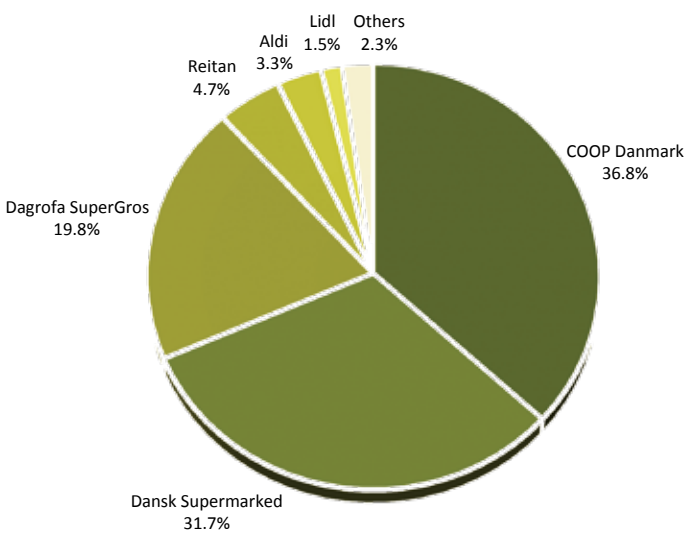


Figure 16. Market structure in the Danish food retail sector, 2010.

Source: Konkurrence- og Forbrugerstyrelsen, (2011), p. 14

The Danish retail sector is characterised by a high store density and a much smaller average shop size compared to other countries. The category of hypermarkets with a considerable food share in their sales is completely missing from the Danish market. Small retail units cannot achieve the same economies of scales as large stores. The fragmented store structure explains the lower labour productivity figures compared to those in the other Nordic countries, where hypermarkets account for a sharply growing proportion of food sales (Konkurrence- og Forbrugerstyrelsen, 2011).

The report reveals that the largest manufacturers did not consider producing private label products due to the disadvantages and direct competition that it would create for their own branded products. Recently this attitude has changed. Private label products have gained an increasing market share. It has been realised by the largest suppliers that it is better to participate in the production of private label products not to lose too much of their overall market share. The small suppliers have even noticed that in some cases their private label production facilitated the access of their branded products to the retail chains (Konkurrence- og Forbrugerstyrelsen, 2011).

In the case of dairy products there also used to be reluctance towards private label products in the beginning when in the mid 2000s Aldi initiated their sales. The products originated partly from small Danish suppliers and partly from Germany. The price level deepened competition and the other retail chains have reassessed their private label strategy. Presently, both small dairies and Arla Foods supply private label products to the retail sector.

2.5.3 Sweden

The Swedish dairy industry has been geared to serve primarily the domestic market. Exports of dairy products have been low as domestic sales have accounted for 90-95 % of the turnover of the industry.

The focus on the domestic market is inherited from the pre-EU era when Swedish food markets were protected from foreign competition by high import duties. Before 1990 the generous agricultural policy used to support the income of farmers with heavy subsidies. Dairy cooperatives divided the market in geographic terms and a special income redistribution system prevailed both across dairy farmers and the cooperatives (Nilsson and Ollila, 2006).

The costly agricultural policy was abolished in 1990 by a parliamentary decision, which phased out the subsidies. Unlike Austria and Finland, which also joined the EU in 1995, Sweden decided not to apply for any transitional arrangements or economic support for its agriculture (Nilsson end Ollila, 2006). Thus, farmers and processors in the Swedish dairy supply chain encountered the challenges thrown by the EU common market, fierce competition of imports and a sharp decline in milk prices.

A dairy farm in the Jönköping region.

Table 7. The leading companies in the Swedish dairy industry.

	Milk deliveries (in %)			Sales (in million EUR)		Employees
	2004[a]	2010[b]	2012	2011[c,d]	2012[c,d]	2012[c,d]
Arla Sverige	66.3	64.2	72.0	1 643	1 756	3 483
Skånemejerier	11.7	12.3	14.4	399e	414[e]	590
Milko	11.6	10.0	-	-	-	-
Norrmejerier	6.0	6.8	7.3	199	211	470
Falköpings Mejeri	2.2	3.3	3.5	65	71	80
Gefleorten mejeriförening	1.3	1.2	1.1	36	41	109
Gäsene mejeriförening	0.6	0.6	0.7	..	..	25
Others	0.4	1.7	1.0	..	..	..
Total	100.0	100.0	100.0			..

Sources: [a]Nilsson and Ollila, 2006, p. 85, [b] Lukkarinen J. & Öberg Å. (2012), p. 7, [c] Veckans Affärer 500 tabell, [d] annual reports of the companies, [e] Ingvarsson 2013.

The structure of the dairy industry did not change significantly in the first few years of EU membership. Arla had become the dominant company of the industry already in the 1980s and in 2000 it merged with Danish MD Foods resulting in the Danish-Swedish dairy cooperative Arla Foods. The company's main geographical focus was southern and central Sweden. Out of the three middle-sized cooperatives Skånemejerier covered Skåne in Southern Sweden, while Milko and Norrmejerier operated north of Stockholm (Sigbjörn 2012). The status quo of the spatially divided market fell apart gradually in the mid-2000s, when cooperatives also started to compete within each others' traditional geographic areas in the fresh dairy product groups (Nilsson & Ollila, 2006).

Apart from a few small acquisitions the industry structure remained the same throughout the 2000s, and the shares of milk deliveries accounted by the main players did not change notably between 2004 and 2010 (see Table 7). Subsequently, a series of significant changes began. First, Arla Foods took over Milko in November 2011, then French dairy giant Lactalis emerged on the market to acquire Skånemejerier. One of the conditions of the latter deal was a guaranteed milk price set to that of Arla's for several years. The first year result under foreign ownership appears to have improved the financial performance

Table 8. Main indicators of the Swedish dairy industry, 2003-2012.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of companies	109	115	117	118	127	127	125	136	140	156[a]
Sales (billion EUR)	3.1	2.8	2.6	2.6	2.6	2.8	2.4	2.6	2.8	2.9[b]
Gross operating surplus (million EUR)	62	130	107	169	143	97	114	70	..	..
Number of employees (thousand)[a]	8.2	8.2	8.1	6.5	6.5	6.1	6.1	6.4	5.9	5.6
Processed milk[c] (billion kg)	3.2	3.2	3.1	3.1	3.0	3.0	3.0	2.	2.9	2.8

Source: Eurostat; [a] SCB, Statistics Sweden; [b] Estimate. [c] Processed milk is corrected for cross-border milk trade.

Farms are scattered in Northern Sweden, where milk is collected over relatively long distances.

of Skånemejerier as loss making turned to clear profit (Ingvarsson, 2013).

Norrmejerier follows as the third largest dairy company in Sweden. It has a diversified product mix, and its suppliers and primary consumption markets are concentrated in the northern regions of Sweden, although specific products are sold throughout the country. The company is owned by 570 farmers and has three processing plants.

Three dairies Falköping, Gefleortens and Gäsene are smaller in size, but the first one has managed particularly well to expand its market share in a shrinking industry. Their strategy is to specialise into niche markets such as organic dairy products or special cheese.

Arla has continuously streamlined production and reduced the number of processing plants since its merger with MD Foods. A lot of factories have been closed and production has been concentrated into fewer locations to improve efficiency, economies of scale and competitiveness. A new investment of a milk powder facility was completed in Vimmerby in 2004.

Economies of scale is also an important issue in cheese production. The objective of concentrating manufacturing capacity is to reduce production costs, so that cost competitiveness would get closer to that of German competitors. Falkenberg dairy with a capacity of about 25 000 tons of cheese was already closed in 2013 mainly due to the lack of milk supply. The production moved to Taulov in central Denmark where the annual capacity is 75 000 tons.

Arlas's structural package for 2014-15 published lately (in October 2013) shows how quickly and radically rationalisation plans can change. Falkenberg will actually reopen and the dairies in Göteborg and Skövde will close completely (Berglund 2013). Göteborg dairy's diversified production will be moved to Jönköping while Falkenberg will continue to manufacture Skövde's cottage cheese. According to the plans the production in Falkenberg will

The dairy plant in Falkenberg, Southern Sweden.

increase so much that the plant will become the largest cottage cheese manufacturing unit in Europe. By the end of the structural package in 2015 Arla will have only 11 processing plants in Sweden.

The ultimate objective with rationalisation processes is always to deliver improvements in terms of capacity utilisation and labour input. Large dairies which have several locations have practiced such a streamlining strategy in nearly all European countries. It has always caused pain to the affected local regions, but is usually acceptable on the national level as it improves the effectiveness and international competitiveness of the particular companies and the domestic industry. The issue is much more delicate when a company has production facilities in several countries and rationalises on all its markets at the same time.[9] The process is even more delicate when owners of the company are scattered over in the same involved countries as is the case of Arla. Moving production capacity across the border becomes a sensitive matter of balancing owners' interest and capacity across countries. The latest example of such a decision is Arla's plan to invest about 40 million EUR into a brand new research and development facility in the vicinity of the headquarters and concurrently reduce R&D staff in Sweden.

Cooperative ownership and vertical integration

The Swedish dairy industry has long been dominated by cooperatives in which member farmers own the processing facilities. Lactalis' acquisition of Skånemejerier changed at once the hegemony of cooperatives as the second largest actor became a privately owned company. The member farmers of Skånemejerier became contracting suppliers.

[9] Even if the dairy is multinational having production facilities in many countries, but it is owned by private capital, the decision making is straightforward. The decisions of the investor-owners always have to be accepted.

The other transaction that reduced the dominance of farmers-owned cooperatives in the chain was the cooperative retailer COOP's purchase of Grådö mejeri, although this was less significant in terms of the size of the market affected. The Swedish competition authorities excluded Grådö mejeri from the Arla-Milko merger in 2011. COOP acquired the dairy to ensure own production of a range of private label dairy products. The retail company expects that dairy products from Grådö will cover 20 % of their liquid milk sales. This transaction in fact did not reduce cooperative ownership in the chain, but the case is unique. There are very few precedents of a retail company investing downstream into its own food manufacturing.

Relations to the retail sector

The Swedish retail sector is rather concentrated, as the four leading companies have a combined market share of 93 %. ICA accounts for almost half of the retail sales in Sweden and also has retail chains in Norway and the Baltic countries.

ICA was originally owned by the participating retailers, (entrepreneurs of the individual units). In 1999 Dutch Ahold bought 50 % of the company and later another 10 %. However, it sold its entire share back to the original Swedish owners in May 2013. The company runs four chains of different retail concepts, Nära (convenient stores), Supermarkets, Kvantum and Stormarknad (hyper-markets).

COOP is the consumers' cooperative retail chain, while Axfood and Bergendahls are owned by private capital. The two foreign chain established their store network in the 2000s in Sweden. Lidl arrived in 2003, while Danish Netto in 2002 (Lindow 2012).

A few years back, private label category only accounted for a small share, under 10 % of total sales of dairy products for most retailers. ICA's PL cheese sales accounted for 12 % and dairy products in general for 7 % in 2011 (Berge & Larsson, 2013). In the 2010s a real race began amongst the Swedish retailers to increase this share. The reasons for the more ambitious growth can be related to global trends and to the success of the business model adopted by discount retailers.

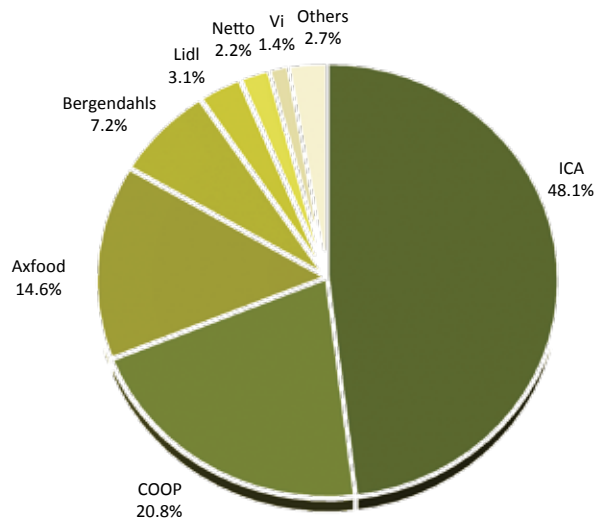


Figure 17. Market structure in the Swedish food retail sector, 2011.

Source: Lindow 2012, p. 22.

Private labels have usually been perceived as a threat to the dairy industry due to the lower margins that they generate for the manufacturer. Thus, for a long time Arla was rather reluctant to be involved in the production of private label products. However, last year an agreement was made with ICA to deliver fresh milk under the name of the largest retailer. Coop's purchase of Grådö

Retailers are keen to increase their direct impact on food production. Rapid spread of private label foodstuffs and on-site baking units can be observed throughout Europe. COOP's acquisition of Gråddö dairy, however, is a unique example of vertical integration in the dairy supply chain initiated by a retailer.

dairy indicates that retailers are ready to take the initiative themselves to boost their PL supply. Axfood and Bergendahls have also made contracts with various Swedish dairy companies (Skånemejerier and Falköping) to manufacture their private label products. Lidl has contracts with Arla and Falköping for its PL fresh milk, however long shelf-life milk is imported from Germany.

Most retail chains strive to enter private label contracts with more than one dairy company. One reason is to maintain the constant competition between suppliers. When ICA increased its scope of private label products, the country origin of the products has become more diverse e.g. drinking yoghurts as well as cream originate from Austria while cheese is imported from various countries. Nowadays, the share retail sales of fresh milk products sold under private labels varies between 10 and 20 % in Sweden. It is expected that this proportion will stabilise around 25 % in the future (Karlsson, 2013).

A large poster by a supermarket entrance draws the customers' attention to nearby suppliers. Retailers in Sweden sometimes promote regional food production in a more pronounced manner than they promote products of domestic origin.

Profitability has remained rather low in the entire industry due to the inner competition and the challenge of cheaper imported and private label products.

Consumers' loyalty towards domestic products is high only in the case of liquid milk. For other products, such as yoghurt, cream and cheese, consumers consider price to be the most important factor and purchase imported goods to a large extent. Institutional kitchens have not either shown any particular inclination to choose domestic dairy products over foreign equivalents.

Although preferences towards domestically produced food does not appear very strong, Swedish consumers seem increasingly interested in other characteristics of food products, such as an organic mode of production or whether the food is produced by local manufacturers. Both characteristics have gained popularity in general, but for dairy products the greater emphasis on local production has favoured primarily small-scale dairies and the processing activities of milk farms.

2.5.4 Finland

Finland's dairy industry is predominantly cooperative based just like in its Nordic neighbours, Sweden and Denmark. Its history is interwoven with that of Valio, the leading dairy company, which was established well over 100 years ago, in 1905. Valio was originally an umbrella organisation for milk farmers' cooperatives with the objective of exporting butter, but it soon developed to be the main supplier of dairy goods on the domestic market. As more and more regional cooperatives joined the company, Valio's dominant position in the market rose steadily. Its share of milk deliveries has varied between 80 and 90 % since the 1960s (Perko, 2005).

Finnish agriculture operated in a heavily subsidised and protected market environment before it was liberalised in preparation for EU membership in the early 1990s. Structural change in the dairy industry, involving some corporate restructuring and rationalisation of Valio's processing plants, also occurred before Finland's EU entry, and the network of processing plants did not change significantly afterwards. Currently the company has 15 plants throughout Finland and is owned by 18 regional cooperatives of milk producers.

The second largest processor Ingman Foods used to be a family-owned dairy delivering products all over Finland and having dairies in different parts of Finland. Arla Foods bought 30 % of the company in 2007 and the rest in 2008. Arla Ingman provides the full assortment of dairy products in the Finnish market. The largest part of their assortment originates from Finland from their own processing plants and the cooperative and private dairies with which they cooperate. A part of their production - primarily cheese - is imported from Denmark.

The rest of the market actors are much smaller in size. Some of the independent cooperatives, such as Satamaito or

The majority of milk farms can be found in Central, Northern and Eastern Finland.

The headquarters of Valio in Helsinki.

Maitokolmio, focus on regional markets or manufacture private label products for the retail sector.

Hämeenlinnan osuusmeijeri packages fresh milk procured by its own members and imported from Sweden. Marketing of their products is organised in collaboration with Arla Ingman.

Kaslink Foods is a privately owned manufacturer of ESL (Extended Shelf Life)- or UHT- (Ultra High Temperature) milk and cream and other foodstuffs. The company specialises in the production of private label products for retail chains.

Additionally several small-scale dairies specialise in niche markets such as delica-

Table 9. The leading companies in the Finnish dairy industry.

	2005		2012			
	Revenues (million €)	Employees	Revenues (million €)	Employees	Milk intake (million kg)	Cooperative members/ suppliers
Valio	1 578.7	4 199	1 749[a]	4 600	1 865	8 000
Ingman Foods/ Arla Ingman	270	902	343	284	280	510[b]
Hämeenlinnan Osuusmeijeri	46.3	71	64[c]	..	110c	170
Maitomaa	31.8	54	38	50	75	120
Kaslink Foods	..	..	37	70	..	..
Satamaito	29.3	54	30	..	45	240
Maitokolmio	21.7	51	33	71	34	120

Source: annual reports and websites of the companies. [a] Revenues from Finnish activities, total revenues of Valio totalled 2000 million EUR in 2012. [b] The number of suppliers. In 2012 the total number of suppliers including the members of cooperating dairies amounted to 800 (Kilpailuvirasto 2012, p.9) [c] Figures for 2011.

Table 10. Main indicators of the Finnish dairy industry, 2003-2012.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of companies	53	56	55	48	56	52	53	53	57	57
Sales (billion EUR)	2.0	2.0	2.1	2.0	2.2	2.5	2.3	2.2	2.4	2.5[a]
Gross operating surplus (million EUR)	90.2	95.6	110.4	95.5	91.1	85.3a	117.3	132.9	121.8[a]	..
Number of employees (thousand)	5.4	5.3	5.2	4.6	5.1	5.8	5.4	5.4	5.5	..
Milk processed[b] (billion kg)	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3

Source: Eurostat; [a] Tilastokeskus; [b] Processed milk is corrected for cross-border milk trade.

tessen, functional or regional dairy products. The biggest of these are Juustoportti, Riitan Herkku, Jokilaakson juusto, Kuusamon juusto and Ålands mejeriet.

The concentration ratio (CR4) of the industry calculated from sales revenues decreased slightly from 92 % to 88 % between 2005 and 2012. Market shares differ from the industry shares of the companies due to the high volumes of exports and imports.

Ownership and vertical integration

Cooperative ownership of milk farmers is the dominant form of ownership in the Finnish dairy supply chain. Approximately 98 % of Finnish milk farmers are owners in Valio, regional cooperative dairies or milk purchase cooperatives. Valio is a joint stock company, which is owned by the cooperatives of milk farmers.

Due to the two stage organisation of milk supply and processing, ownership structure in the Finnish dairy industry is slightly more fragmented. Farmers' cooperative ownership is also the major ownership form in the industry, albeit smaller than at the milk collection stage.

Foreign ownership in the dairy industry has increased over the past few years. Besides Arla Foods' subsidiary the two largest ice cream factories have also been purchased by foreign companies. Nestle bought Valio ice cream already 2003 and Unilever bought Ingman Ice Cream 2012. The share of domestic private ownership is a few percent in the industry's total equity. Some of the small scale dairy companies are family businesses or run and owned by private entrepreneurs.

Relations to the retail sector

The Finnish retail sector measured by the combined market share of the largest four

companies is as concentrated as the Danish and Swedish ones. However, CR2 – the combined market share of the leading two chains – is the highest in Europe.

S-Group, the consumers' co-operative, is the equivalent of the COOP chains elsewhere in the Nordic countries. Kesko is owned by private investors and listed on the stock exchange. The joint market share of these two retail companies surpassed 80 % in 2012.

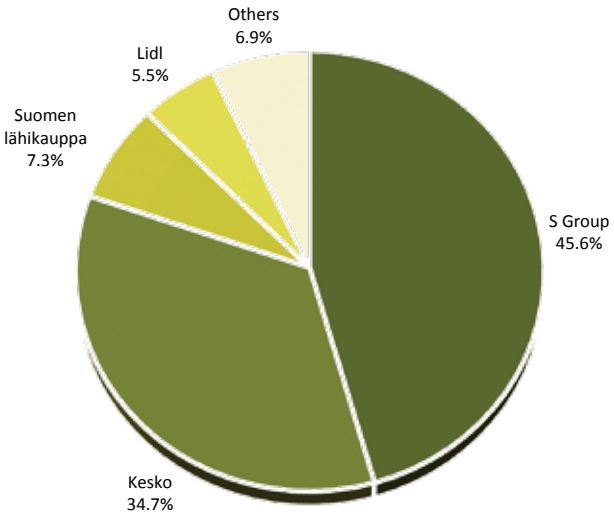


Figure 18. Market structure in the Finnish food retail sector, 2012.

Source: AC-Nielsen.

The Finnish retail sector has undergone a turbulent time since the start of the millennium; market shares have changed rapidly and concentration has increased. S-Group increased its share from 29 % in 2000 to over 45 % in 2012, first with the buy-out of some competing chains, then with organic growth. It took over the leading position from Kesko in 2005. Suomen lähikauppa (formerly Tradeka) shrank from 12 % to 7 % in twelve years.

Lidl arrived to Finland in 2003 and managed to increase its market share to 5.5 %, although this success was required the Finnish subsidiary chain to soften notably the original hard discount store concept of the company.

Valio has taken care of logistics by itself, and, due to its market position, had relative strength in negotiating contracts with retailers. There has been tough competition on the fresh milk market. Market positions have changed during the past years due to more competition in all dairy product categories.

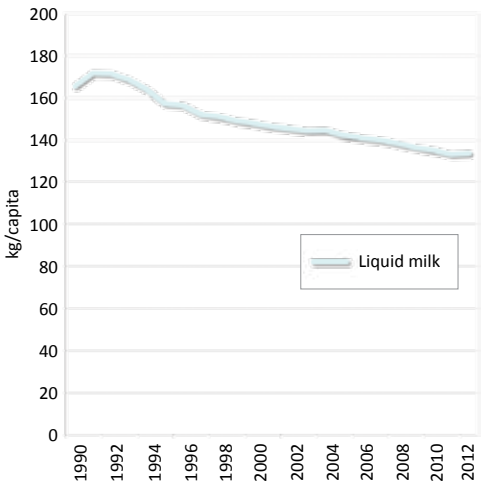
Consumption patterns

The main trends of consumption are similar to the changes perceived in the other countries. The consumption of liquid milk has gradually decreased on the long run, with a concurrent increase in the consumption of cheese and other fermented dairy products. Like in other Nordic countries a milk fat consumption turned into growth in the second half of the 2000s after decades of continuous decline. This tendency can be observed in the consumption statistics of whole fat milk and butter. Traditional sorts of cheese have also gained in popularity at the expense of lighter low fat alternatives.

A megatrend on consumers' market has been the fast progress of private label products of the retailers. It appeared for several dairy product categories already in the middle of 2000s. While the Finnish origin of fresh milk is regarded as very important by consumers, loyalty to domestic origin is much weaker in the case of other processed products. Private label cheese has been originated from Estonia, Denmark, Germany and the Netherlands whereas yoghurts are

imported from Estonia, Austria etc. The country of origin is labelled appropriately for most of the PL dairy products in Finland.

Imported dairy products in general gained a stronger foothold in the second half of the 2000s. Finnish dairy manufacturers have lost a considerable share of the fast increasing cheese market. In fact, the consumption of domestic cheese has not changed much over the past decade, in volume terms it stagnated around 60 thousand tons. Therefore, importers have fully taken advantage of the increased cheese demand. The quantity of imports has over tripled between 2002 and 2012 from 19 to 61 thousand tons. Private label cheese accounts for only part of the increase. Cheese assortment has broadened with high value



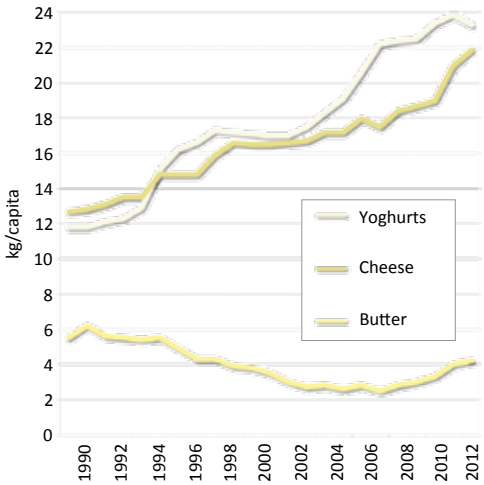


Figure 19. Consumption of dairy products in Finland, 1990-2012.

Source: Tike, Ravintotase.

special ripened cheese types, which are often supplied under the manufacturers' brands.

The quantity of imported yoghurts has remained moderate compared to the progress of cheese, although a steady increase was also recorded for yoghurts. Volumes of foreign yoghurts increased sixfold between 2002 and 2010 from 6 to 36 thousand tons, but have stabilised for the past three years. The share of imports was the highest (29 %) in 2010. Preliminary results for 2013 suggest that their share has stayed at 28 % (TNS Gallup, 2014). Two big groups make up the imports, the retailers' private label products and the yoghurts of a strong private manufacturer, Danone.

Fresh milk was the last bastion of manufacturers' branded products to be penetrated by the retail sector. Private label milk has become one of the most inexpensive options in most of the retail chains. Its share has increased remarkably from its 10 % level in 2011 (Kilpailuvirasto, 2012, p. 9). Lidl sells exclusively private label milk and, due to its low price, has acquired a higher share of the fluid milk market than their general approximated 6-7 % market share of the retail sector. S-Group and Kesko have also reported dynamic growth of their PL milk, and have stated that they expect to obtain a 20 % market share with their own brands in the near future. Arla – reluctant to be involved with private label products in their home markets in Denmark and Sweden for a long time – has been an active private label milk manufacturer in Finland. Other suppliers are the smaller cooperatives (Pöntinen 2013), e.g. Maitomaa has been an active private label supplier.

Imports of fresh milk have stayed at a much more modest level compared to cheese and yoghurts. Until 2008 milk import was almost negligible. Milk has been imported in increased volumes from Sweden to be packaged and processed in Finland since 2009. According to the records of Finnish Custom Board the volume of

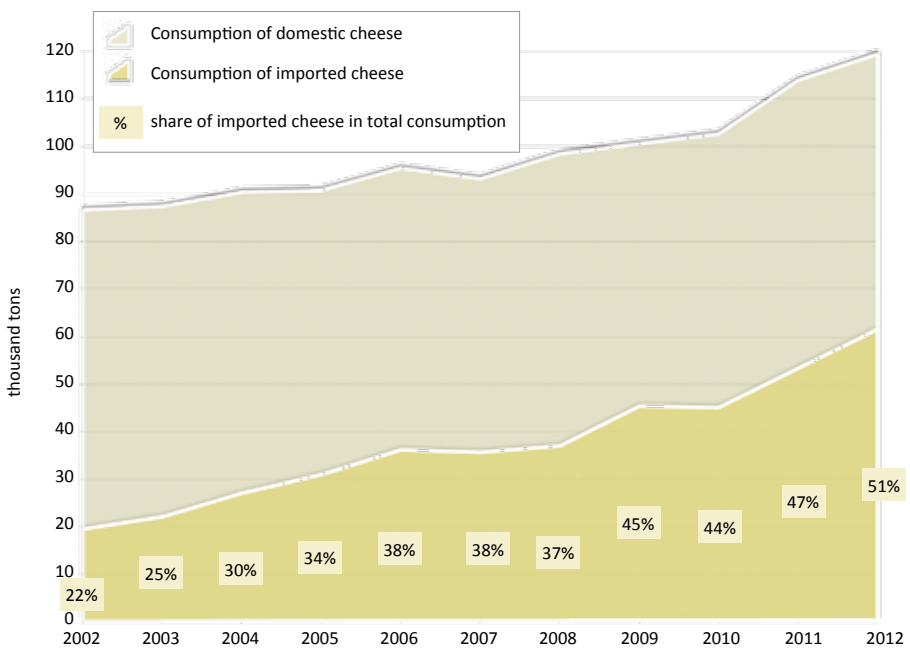


Figure 20. Domestic and imported cheese consumption in Finland, 2002-2012.

Source: own calculations based on database of Tike and Tullihallitus.

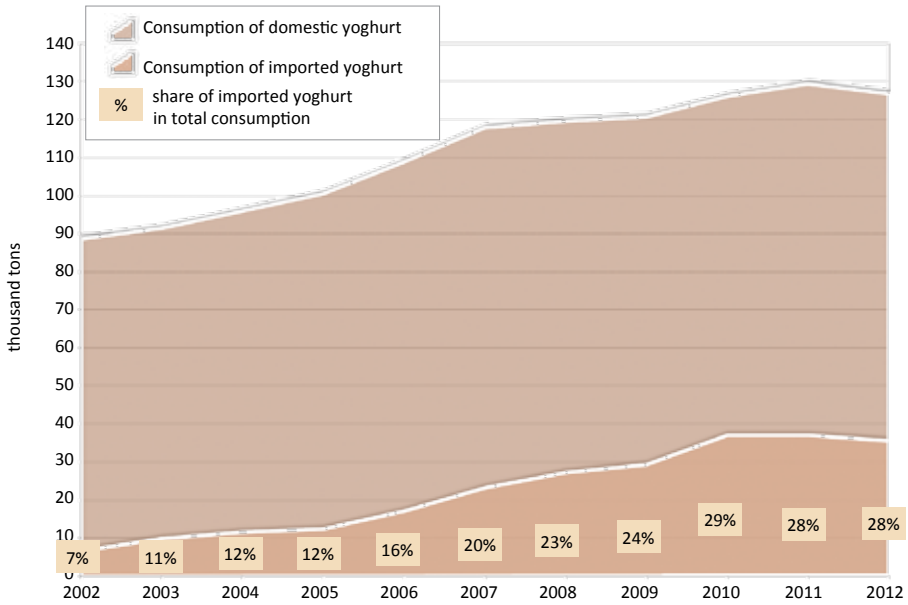


Figure 21. Domestic and imported yoghurt consumption in Finland, 2002-2012.

Source: own calculations based on database of Tike and Tullihallitus.

Swedish milk import has varied between 47 and 52 thousand tons in 2010-2012. This represents about 2 % of the milk produced in Finland. Approximately half of the imported milk is packaged as drinking milk for consumers. The total fresh milk market amounts to approximately 700 million litres (Kilpailuvirasto, 2012, p. 35 and TNS Gallup, 2014) so the share of imported milk packaged for consumption has had around 4 % market share. Some smaller amount of UHT milk has also been imported to Finland, but the total consumption of UHT milk is insignificant in Finland compared to fresh milk.

2.5.5 Estonia

The Estonian dairy industry has been rather fragmented ever since the decentralisation process that took place at the beginning of the 1990s. Foreign companies showed high interest in Estonian dairies and purchased several companies during the privatisation process, so that over 60 % of the aggregate equity was owned by foreign investors by the end of the 1990s (Jansik 2001). In the 2000s foreign investors divested or left the industry one after another and by now the only considerable professional foreign-ownership is that of Valio.

The dairy processing industry has traditionally been export oriented as output has always surpassed domestic consumption. Therefore, the changes in the export markets usually have repercussions on the domestic market. Even after the bankruptcies caused by the Russian rouble devaluation crises in 1998 the structure of the dairy industry was rather fragmented. In 2002 about 90 % of the raw milk was procured by the eight large processors of roughly similar sizes, so that the concentration ratio CR4 measured in terms of raw milk procurement was as low as 42 %. Even ten years later, in 2012 the four leading companies still accounted for only 58 % of milk purchases.

The pace of consolidation appears higher when it is analysed in terms of the turnover of the leading companies. In 2001 the sales revenues of the four largest companies together accounted for 42 % of the industry's total sales, whereas in 2012 that share was already 74 %. The notable difference between the two concentration figures in 2012 is attributable to the special characteristics of the Estonian dairy supply chain, i.e. the fact that recently over a fifth of Estonian milk is collected and taken out of the country as raw milk.

Valio Eesti is the subsidiary of Finnish Valio concern and is currently the biggest of Estonian manufacturers by turnover. The company has its own trademark that includes a wide array of dairy products, e.g. milk, sour milk, cream, sour cream, yoghurts, cream cheese and cottage cheese. Valio also acquired the majority stake of the biggest Estonian cheese manufacturer, Võru Juust at the end of 2003. The two subsidiaries were formally merged to one company as of the beginning of 2014.

Tere is nowadays the second largest accompany, it has a diverse assortment of consumer products. The company closed its plant in Tallinn in 2013, and production is continued in the two remaining plants in

Table 11. Main indicators of the Estonian dairy industry, 2003-2012.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of companies	28	31	30	31	36	31	28	27	24	22[a]
Sales (million EUR)	238	309	306	326	376	383	307	339	377	364[a]
Profit (million EUR)a	9.3	0.2	1.1	10.6	21.6	15.3	15.0	11.2	5.9	17.2
Number of employees (thousand)	2.6	2.7	2.6	2.6	2.5	2.4	2.2	2.2	2.3	2.1[a]
Milk processed [b] (million kg)	487	539	559	548	559	551	606	553	564	520

Source: Eurostat; [a] Statistikaamet; [b] Processed milk is corrected for cross-border milk trade, Estonian companies used 77 % of the milk produced in Estonia in 2012.

Table 12. The leading companies in the Estonian dairy industry.

	ownership	Sales revenues (million €)		Milk collection (million kg)	
		2008	2012	2008	2012
Valio Eesti	foreign	90.7	99.2	65.6	79.2
Tere	bank	94.4	80.3	57.2	65.4
Piimandusühistu E-Piim	cooperative	n.a.	49.3	96.7	86.9
Maag Piimatööstus	private	25.8	40.5	32.0	38.0
Estover Piimatööstus	private	14.0	24.2	7.3	8.2
Saaremaa Piimatööstus	cooperative	26.5	23.2	32.2	35.5

Source: Toiduainetööstuse TOP, Äripäev, Tööstus 2009 and 2013; Põllumajanduse Registrite ja Informatsiooni Amet (PRIA).

Viljandi and Põlva. The company has very recently started to produce some lactose-free products. Tere is owned by the Finnish subsidiary of Nordea Bank. Maag Piimatööstus is the successor of former Rakvere Piim and Jõhvi Piim. The company provides a range of consumer products including milk, fermented products, cheese and butter under the Farmi brand name. The parent company, Maag Grupp als has a considerable share in the meat market.

Dairy farms make up the largest group of owners via their cooperative ownership. E-Piim is the biggest cooperative in the country that owns three dairy processing plants, one producing milk powder and butter and the other producing cheese. The current production of cheese totals 8400 tons. In 2013 E-Piim installed a modern powder producing equipment in Järva-Jaani including the demineralization technology for whey. This processing line is unique in Baltic States.

Saaremaa Liha- ja Piimatööstus is another example of a farmer-owned processor, which has two major orientations: dairy and meat processing. The company covers the area of Saaremaa island and collects milk from local farmers, who are the main owners. The primary line among dairy products is cheese.

Estover is a specialised cheese manufacturer and distributor with its main plant located in Rannu, Kaarlijärve. Recently they also acquired the Vigala cheese plant. The company is owned by private domestic capital.

Efficiency is a challenge for processors due to the wide assortment of consumer products, such as yoghurts, on a relatively

Cheese manufacturing in a cooperative owned dairy.

small market. The series are small, and there are frequent shifts to new flavours, which raises costs. The competitive advantage of the Estonian dairy industry can be maintained to the extent that raw milk remains cheaper than in Sweden or Finland.

There is not a very sophisticated set of equipment in the Estonian dairy industry compared to Finland. The Estonian industry is capable of manufacturing basic dairy products, such as cheese, yoghurts, butter, SMP, but for a long time there was no production line for lactose-free products. The production of lactose-free cheese has started recently opening new market opportunities. Technology utilised by the Estonian dairy industries is of different age, powder production equipment is the oldest while packaging lines represent the most recent technology. Cheese manufacturing equipment has also been replaced mostly over the past decade (Värnik et. al. 2011).

The cost share of labour is bigger in Estonia than in the old member states around the Baltic Sea. The cost advantages have prompted several Estonian dairies to participate in the private label bids of the Nordic retailers. Among others, Tere and E-Piim have manufactured private label products for Finland, Denmark, Latvia and Lithuania.

Cooperative ownership and vertical integration

The majority of milk is purchased from large farms, which makes procurement more straightforward than in the other two Baltic countries. Milk is directly transported from the farms to dairy processing companies. Contracts with the milk suppliers are formulated for a period of one year and define supplying practices, supplying schedules and quality requirements. Prices are revised every month.

The 2009 economic crisis gave a further impetus to the cooperative movement in the Estonian dairy farm sector. Milk production decreased due to declining demand for dairy products on the domestic and foreign markets. However the results were not as dramatic as, for instance, in Latvia and no

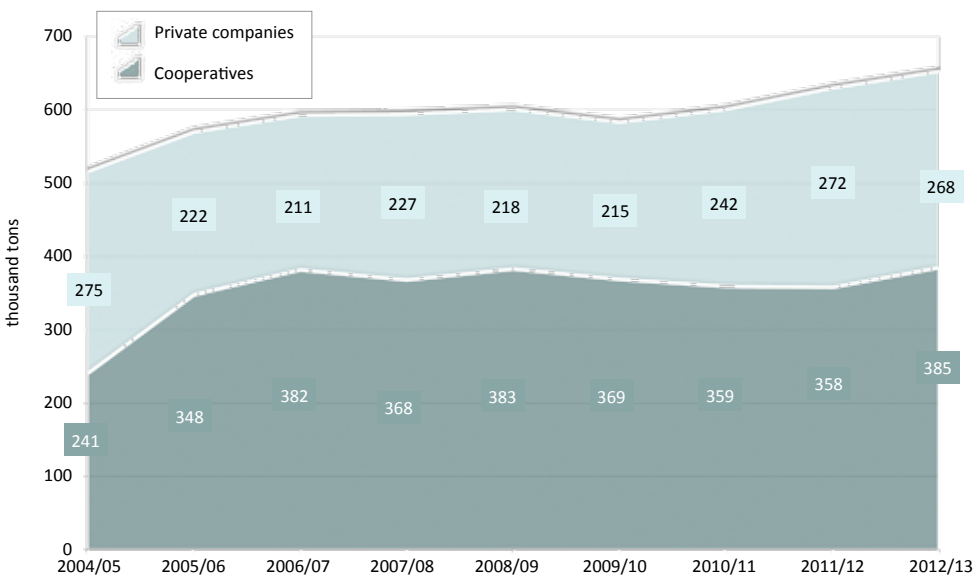


Figure 22. Milk collection by farmers' cooperatives and private companies in Estonia.

Source: Põllumajanduse Registrite ja Informatsiooni Amet (PRIA) data.

More than one third of Estonian dairy cows belong to herds of over 600 cows.

big bankruptcies happened among the Estonian milk farms. During the time of lower milk demand, dairy processors did not need more than 60 % of the milk produced and the farms coped with that situation by marketing the rest of their production directly. Finally, farms ended up buying milk powder manufacturing services from the processors and exported the powder themselves. Later, they responded by forming cooperatives to market milk themselves. Later on cooperatives were the sales channels which have allowed them to decide whether to sell the raw milk to domestic or foreign processors.

The private dairies' milk collection amounted to roughly the same volume upon accession to the EU and during the recent quota year. During the second half of 2000s dairies collected slightly less and the rise over the past two-three years can be attributed mostly to the growing purchases of ELPA I.E. (an intermediary company which had gained 8 % of the milk market by 2012).

Some of the cooperatives, such as E-Piim or Saaremaa, process the milk themselves while other farmers' cooperatives are purchase and sales organisations. Milk is sold to the processors both in Estonia and abroad. Before EU accession, Estonian dairies utilised all milk produced in the country. In 2005-07 already 10 % of the raw milk was exported and the export share increased to 23 % by 2012. There is a notable structural difference between the milk exports of the mid-2000s and the recent ones. Earlier dairy processing companies exported raw milk, while now raw milk export is organized by primary producers, so the processors have lost control over the raw milk by now. The largest exporters of milk are cooperatives such as EPIKO or intermediaries like ELPA I.E.

The biggest cooperatives E-Piim, Saaremaa and EPIKO have investigated the opportunity to set up joint cooperatives in the future and convince their members to invest into modern processing equipment. Most recently E-Piim and Saaremaa have continued with a joint proposal, while Epiko announced cooperation with Maag at the end of 2013 (Stadnik 2013). A new processing facility would allow the export of raw milk to be reduced and the Estonian dairy industry to increase its presence on the processed dairy products' markets (Lättemäe, 2012). The plan faces challenges since farmers and agricultural cooperatives may be reluctant to tie a lot of capital into new processing capacity as opposed to prompt

The cooperative movement has gained strength among Estonian dairy farmers.

high milk prices. Furthermore it is unsure how the competition authorities would react to such consolidation in the industry. The possible support for such a new processing capacity has been included to the new Rural Development Program of Estonia.

The national dairy strategy of Estonia declares that farms should have the potential to produce one million tons of milk annually, as opposed to the current level of 721 000 tons, but it would require an increase in the number of dairy cows. However, the current milk farm structure of the country makes this objective realistic. The strategy also adds that this should be followed by the development of dairy processing in order to ensure higher value added in the chain (Värnik et. al. 2011).

Fresh cheese made on an organic farm.

Relations to the retail sector

Contracts between the dairy processors and retailers are usually made for one year at a time, but prices are negotiated more frequently. The leading three dairy companies provide the retailers with a wide range of consumer products. Small dairies also have access to the large retail chains if they offer niche or culinary products. For instance, Vigala piimatööstus sells special Italian cheese to the retail chains, Nantecom is also present in the chain with their specialised quark dessert and Saidafarm supplies most of the retailers with organic curd.

Dairy companies have relatively few possibilities to increase their margins through high value added products. For example about 80 % of all liquid milk is the regular 2.5 % fat milk, nearly 20 % is full fat (3.5 %) milk and only 0.5 % is sold as special milk (e.g., low fat, fat free, lactose free). Recently even unpacked non-pasteurised organic farm milk has been sold from large containers in the shops. Farmers intend to raise consumption by setting up vending machines

in some shops of ETK with proper product and traceability information/ labelling.

The structure of the retail sector is moderately concentrated. The five leading chains accounted for 80 % of the turnover of the retail sector in 2012.

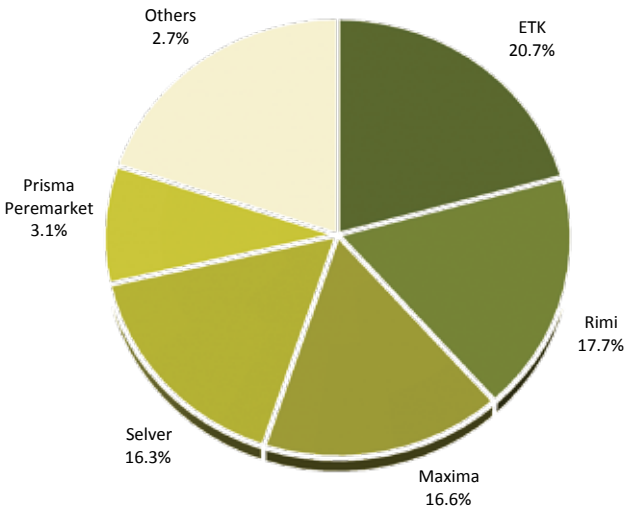


Figure 23. Market structure in the Estonian food retail sector, 2012.

Source: own calculations based on Kaubanduse TOP, 10.10.2013.

ETK (Eesti Tarbijateühistute Keskühistu) is the central organisation of 19 regional consumer cooperatives. Its history dates back to 1902 and ETK is the only viable consumer cooperative retail chain in the Baltic countries that has survived up to the present time. The company runs 264 units in three different chain concepts: Maksimarket, Konsum and A & O.

Rimi – owned by the Swedich ICA – is the second largest retail chain in Estonia with 84 retail units, of which 13 are hypermarkets, 18 super-markets and 53 discount stores called Säästumarket.

Maxima, the Lithuanian retail chain, operated 70 units in three different size categories in 2012. Selver is a domestic retailer which opened its first outlet in Tallinn in 1995. Currently Selver has 41 retail units, of which 13 are operated in the capital city.

Prisma Peremarket is the subsidiary of the Finnish S-Group. It runs 9 hypermarkets in Estonia.

Consumer loyalty towards domestically produced food is supposed to rise with an annual campaign in which shelves of Estonian-made foodstuffs are marked with a flag in the retail units. The yearly campaign has run for the fourth time in a raw and most of the foreign-owned retail chains participate in it (Kaukvere 2013). Consumers appear to show loyalty towards domestic foodstuffs especially in three product groups: dairy, meat and bakery products.

Dairy products together with other foodstuffs received attention in Berlin, where Estonia was the special guest of Grühne Woche 2013.

2.5.6 Latvia

The Latvian dairy industry was split among several equally strong enterprises in the 1990s. Although some consolidation happened in the 2000s, such as Limbažu Piens' take over by Rīgas PK, the basic fragmented structure has prevailed up to now. In fact, the size of the market leaders has shrunk in the industry in recent years. The declining market shares of the leading companies highlight some of the problems experienced in the Latvian dairy industry. The companies are small by international standards, which makes it difficult for them to exploit economies of scales and compete with efficiently run and much larger rivals. The high share of conventional products such as butter, over-diversification into various consumer products, frequent shifts among production series and low capacity utilisation are a few of the challenges that several dairy companies face.

Market difficulties have translated into financial difficulties in recent years. The gross operating surplus has been quite low for many years and corporate profitability has been rather poor for the individual companies. In 2003, three of the five leading companies achieved profitability to sales revenues ratio of only minus 2.5-4 %.

The problems have also been reflected in the frequent change of owners at the companies. In the 1990s, ownership of several dairies was allocated to farmers as a result of privatisation, e.g. Valmieras Piens, Rīgas Piensaimnieks and Tukuma Piens were primarily owned by dairy farmers for a long time. As farmers sold their shares, the ownership structure of the companies changed rather frequently to include financial investors, private investors, and even politicians. An illustrative example is that of Rīgas Piensaimnieks, whose majority shareholding changed in only the recent years from Estonian investors to a US investment companies and later an offshore company. No matter how competent the management of a company, a repeated change in owners and interests may well distract the achievement of long term strategic aims.

After a boom in domestic income the Latvian dairy industry was severely hit by a reduction in domestic demand in 2008 and the years afterwards. The structural production problems of dairy manufacturers coinciding with declining income resulted in a loss of market shares domestically. Processors generated more income from

Table 13. Main indicators of the Latvian dairy industry, 2003-2012.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of companies	51	42	48	53	49	42	44	47	48	48
Sales (million EUR)	237	309	306	326	376	383	307	339	377	398
Gross operating surplus (million EUR	23.1	22.9	32	27.2	29.5	23.1	17.1	24.5	21.6	..
Number of employees (thousand)	4.2	4.2	4.1	4.2	4.0	3.7	3.2	3.0	3.0	..
Milk processed [b] (million kg)	434	468	478	531	538	502	437	494	465	506

Source: Eurostat; [a] Latvijas statistika; [b] Processed milk is corrected for cross-border milk trade.

Table 14. The major Latvian dairy companies.

	Sales revenues (million €)			Employees 2011	Milk intake (million kg)
	2002	2007	2011		
Rīgas Piena Kombināts	51.4	84.2	81.1	555	132
Valmieras Piens	25.9	46.8	36.2	305	83
Rīgas Piensaimnieks	24.2	36.8	27.2	247	25
Tukuma piens	13.5	25.9	34.7	225	45
Preiļu siers	10.1	43.6	36.8	281	80
Limbažu piens	7.8	-	-	-	-

Source: Dienas bizness, Top 500 Latvijas lielakie uznemumi 2003, 2008 and 2012, company websites, Chevalier et. al.

the export markets. Some of the dairies complained that the increasing margins of food retailers forced them to concentrate on exports as opposed to the domestic market (BNN, 2011).

In recent transactions, two of the leading companies Rīgas piena kombināts (RPK) and Valmieras piens were purchased by Russian investors, who then merged the two companies in the summer of 2012. RPK used to direct its exports towards the Russian markets. Valmieras piens is a dairy with a fully diversified production portfolio, which includes all kinds of consumer products from liquid milk to fermented products and cheese. After the merger the company was renamed Food Unions. In 2013 it announced that it was stopping cheese production in order to concentrate its activities around other products such as ice cream (BNN, 2013).

Tukuma piens produces more than 180 different dairy products including yogurts, cottage cheese and conventional products such as butter and cream. The company collects about 50 000 tons of milk from about 215 milk suppliers located mainly in the Kurzeme and Zemgale regions. Rigas piensamnieks produces high value-added consumer products such as curd cheese desserts. It exports about one-third of its production.

The new processing facility of farmers, Latvijas piens (Latvian milk) started manufacturing in the end of 2012. During the first eight months of 2013, it has already achieved a turnover of 24 million EUR, which makes the company one of major players among dairies at once.

The concentration ratio CR4 was 56 % in 2007 and even declined to about 50 % in 2011. Despite the very recent consolidation observed in the industry, concentration can still be considered moderate by international comparison. One reason for that is the emergence of the new cooperative owned dairy in the industry in 2012.

Milk collection

Many Latvian milk farms have invested substantial amounts into farm expansion. An investment boom took place in the middle

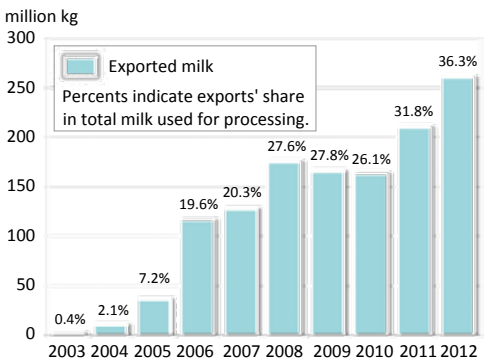


Figure 24. Milk exports of Latvia.

Source: own calculations based on Eurostat data. Note: milk exports in the chart include only the bulk unpackaged milk of under 6 % fat content within the CN 0401 group.

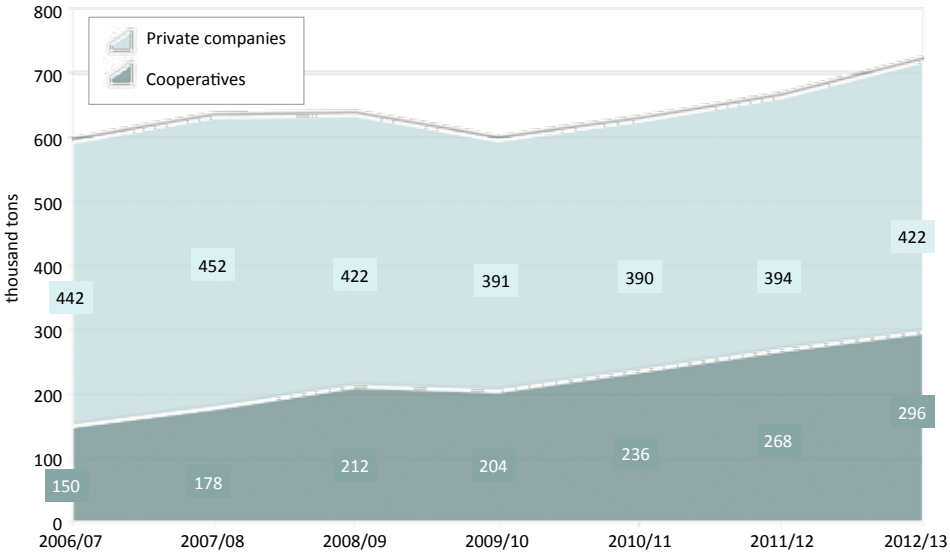


Figure 25. Milk collection by farmers' cooperatives and private companies in Latvia.

Source: Lauksaimniecības datu centrs.

of the 2000s and the economic crisis of 2008-09 hit the Latvian economy particularly hard through foreign-owned banks. Many of the expanded dairy farms had just taken tremendous loans, which could not be repaid before the recession hit.

During the hardest times of 2008-2009, dairy manufacturers encountered serious difficulties in selling both domestically and on export markets. The resulting cash-flow problems delayed payments to milk farms by up to 60 days, and some of the most indebted farms went bankrupt simply because they could not serve their debt. Prices for milk dived in 2009 and, due to the sluggish demand from domestic processors, farmers were forced to seek direct sales channels.

One of the solutions was to restart direct sales of milk in urban areas. Although a receipt printing machine was compulsory for farmers practicing direct sales, non-compliance was also tempting since it offered a

The current large and middle-sized family farms grew gradually from small farms over the past two decades.

possibility of generating revenue without paying the proper VAT. For many farmers, this quick source of revenue improved the acute cash-flow problem at the hardest of times.

Another alternative sales channel was the export of milk to Lithuanian processors. Exports already started to expand in 2006 and the processors' reluctance to purchase milk triggered further growth in 2008. By that time, farmers became stronger so that they also actively sought export opportunities either directly or through cooperatives. In 2011-12, export demand for raw milk grew again, as Lithuanian processors offered better prices than domestic ones, so that in 2012 over 36 % of the collected milk was sold to the southern neighbour country.

In eastern Latvia, where milk farms are still extremely scattered, Preilu siers has to collect milk from thousands of farms. However, to counterbalance this relative handicap, the company is also able to purchase the raw material at a particularly low price. In these regions, milk collection points were set up to facilitate procurement. Looking forward, it seems very unlikely that small farms in this area will have any opportunities to modernise and expand production in the future.

Cooperative ownership, vertical integration

As farms expanded, they started forming purchase and sales cooperatives in the 2000s. In the registry of the Latvian Agricultural Data Centre, out of 67 milk purchasing enterprises, 36 were already cooperatives in 2013. The share of cooperatives in domestic milk collection has risen steadily and exceeded 41 % in 2013.

Farmers have united into cooperatives in order to reach better prices for a higher volume of milk. Some cooperatives have mostly large farms while others welcome all farms regardless of their size. However, usually business minded milk farmers are the ones who tend to join cooperatives.

Milk pretreatment room in the Jelgava plant of Latvijas piens.

Sales and purchase cooperatives sell their milk to both domestic and Lithuanian dairy manufacturers. They also negotiate price discounts with input suppliers through joint purchases. There have even been some cases when a member farm on the verge of bankruptcy was saved by its co-members via temporary financial arrangements to cope with a crisis.

Farmers' cooperatives already acquired some processing capacity by the middle of the 2000s. Some of those cooperative dairies, such as PKS Straupe, offered various products, while others were rather specialised, such as Trikāta KS which mainly produces cheese.

The difficult market situation and problems in supply chain management in 2008 and 2009 led milk farmers to take the initiative to establish a more significant processing capacity. Hence, the construction of a green-field investment project, worth over 10 million €, started in Jelgava in September 2011 and the factory was completed by

Vacuum packaging of cheese.

Cheese is packaged for delivery to the retail units.

the end of 2012. Some of the Latvian dairy processors fiercely criticised the project because of the political support farmers received from the government. Dairy manufacturers were unhappy about the development of new capacity in an industry where the capacity utilisation rate of the existing processors was already rather poor (BNN 2011a). Farmers contributed 1.2 million € of their own capital and the rest of the project was financed through loans from the EU and private banks.

The new company Latvijas piens is owned by three cooperatives: PKS Dzēse, Trikāta KS and Piena partneri KS. Altogether about 600 dairy farms constitute the membership of the owner cooperatives and provide the milk supply. They produce over 90 thousand tons of milk annually, or 18 % of all the milk processed in Latvia in 2012. Production at Latvijas piens has been expanded gradually in 2013, the plant's pasteurisation capacity is 100 000 tons and it is also capable of manufacturing 27 000 thousand tons of milk powder and 10 000 tons of cheese annually.

Farmers and agricultural policy makers have always regarded the cooperative-owned dairy industries in other Nordic countries as a desirable model of vertical integration that should be replicated. This was reflected in the regulative framework of dairy industry privatisation in the 1990s, in which farmers enjoyed preferential treatment. At the time, most farms were not strong financially to hold on to their ownership of the privatised dairy manufacturers. By 2010, however, the economic situation of farmers had strengthened so much that they were able to set up their own processing facilities, which has brought them one important step closer to the Nordic model of cooperative-based dairy supply chains.

Relations to the retailers

Distribution of dairy products is conducted through contracts with the trading companies. The Latvian wholesale and retail sectors are still formed of several chains of various size and geographical coverage, which gives medium and small size dairy processors opportunities to access the market. On the other hand, the large dairies may have contracts with several chains and many operate logistic or distribution points across the country to better supply the regional retailers.

Despite the fragmented market structure, retailers enjoy a dominant position in the dairy chain in both Latvia and Lithuania. They negotiate only on price, while all the other terms of the contracts are imposed on the supplier without much discussion. It is extremely hard to get into the chains with conventional cheese types (tilsiter or edam), because there are so many processors providing those. Therefore, niche products or speciality products represent the best options for small companies. A fancy packaging or speciality product can be a

door-opener e.g. into foreign retail chains. In bulk cheese production, the economies of scale or cost-efficient solutions of the large processors would definitely make competition very difficult for small dairies.

The structure of retail trade is moderately concentrated in Latvia, as indicated by a CR4 concentration ratio of about 61 % in 2011. The two leading companies (Swedish-owned Rimi Latvia and the Lithuanian Maxima chain) both control about 27 % of the market. The third company, Palink, is also the subsidiary of a Lithuanian retail chain.

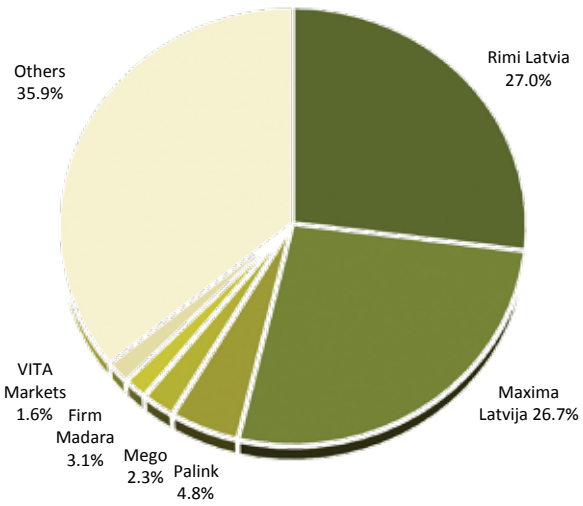


Figure 26. Market structure in the Latvian food retail sector, 2012.

Source: own calculations based Dienas bizness, Top 500, 2013.

Altogether foreigners account for about 60 % of the Latvian retail market. Some Latvian experts have identified a threat of the Lithuanian dairy supply chain taking ever greater control of the Latvian chain. Lithuanian dairy processors purchase Latvian milk and the processed products flow back to Latvia through the sales channels of the Lithuanian-owned retail companies, either as branded or private label products.

The retail sector includes plenty of middle-scale chains apart from the two leading ones. There is a dozen of retail chains, with each one holding one to two percent of the retail market. Even independent village shops account for a considerable share in the rural areas of Latvia.

2.5.7 Lithuania

The dairy sector has always been the flagship of the Lithuanian agrifood sector and an important export-earning segment of the economy. Due to its role, the dairy sector has always received a lot of attention from the country's politicians and, consequently, held a strong position in the process of agricultural development.

The major figures indicate that the Lithuanian dairy industry has developed impressively over the past decade. Sales have been export driven and have grown two and a half times in ten years in nominal terms. Profitability in the Lithuanian dairy sector has also been high. Gross operating profit as a ratio of sales revenues has been among the highest – along with Poland – in the comparison of the eight countries. The trend has been in line with the performance of the four leading companies, which have achieved profit to sales ratio of 3-5 % between 2009 and 2012. The most spectacular growth was achieved in terms of the volume of milk processed, an increasing part of which was sourced from the neighbouring countries.

The structure of the Lithuanian dairy industry has changed radically for the past two decades. At the beginning of the 1990s the decentralised privatisation in the Lithuanian dairy industry created about 50 dairy processors, none of which had a dominant position, so market power used to be relatively evenly distributed among the companies. After an intensive wave of mergers and acquisitions – and bankruptcies – three companies emerged from the consolidation by the turn of the millennium. Together they dominated the industry, accounting for about 88 % of total milk deliveries.[10] Rokiškio sūris, known primarily for its cheese production, acquired dairy companies mainly in Eastern Lithuania. Pieno žvaigždės emerged in 1998 after the merger of three dairy companies. The third group, Žemaitijos pienas, comprised dairy companies in Western Lithuania. At that

Table 15. Main indicators of the Lithuanian dairy industry, 2003-2012.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of companies	39	33	36	33	69	69	44	40	44[a]	42[a]
Sales revenues (million EUR)	394	487	518	589	804	856	726	808	984[a]	1020[a]
Gross operating surplus (million EUR)	33.1	10.1	45.2	74.7	101.7	24.0	71.1	62.7	79.1a	..
Number of employees (thousand)	10.5	10.9	9.6	9.1	9.3	8.7	8.1	7.6	7.6a	8.3[a]
Milk processed [b] (million kg)	1 025	1 140	1 241	1 409	1 485	1 561	1 429	1 457	1 539	1 658

Source: Eurostat; [a] Statistics Lithuania; [b] Processed milk is corrected for cross-border milk trade. Note: some national sources report lower figures for the number of enterprises and the number of employees, see e.g. Stalgiene 2013, p. 39.

[10] Industry concentration (CR4) in the beginning of the 2000s based on turnover figures was slightly smaller than on the basis of milk purchase shares, because there were also four ice cream manufacturers operating in the dairy industry.

Table 16. Financial figures of the major Lithuanian dairy companies.

Company	Sales revenues (million €)					Profit (million €)	Profit to sales (%)
	2002	2009	2010	2011	2012	2012	
Rokiškio sūris	107.2	162.3	160.4	199.3	230.7	10.0	4.3
Pieno žvaigždės	75.7	180.3	179.6	203.0	222.7	9.9	4.4
Žemaitijos pienas	72.7	108.0	125.6	143.2	145.0	7.9	5.4
Marijampolė pieno k.	3.4	70.4	87.7	94.0	104.8	..	..
Vilkyškių pieninė	13.3	46.1	70.7	84.0	85.7	2.0	2.3
MGL Baltij[a]	..	16.9	26.4	27.0	20.3	0.1	0.5
Pienas LT[a]	..	3.5	34.8	43.9	40.0	1.1	2.7
Pieno puta[a]	..	4.5	6.6	8.7	8.3	0.02	0.2
Litamilk	..	9.1	19.5	14.5	16.8	..	..
Varenos pienelis	..	14.3	9.8	7.4	9.5	..	..

Source: Verslo žinios, Liepos 7 d., 2003, Verslo žinios, TOP 1000, 2010-2012. Note: [a] purchasing and sales cooperatives of milk farms.

time only a few medium-sized dairy companies preserved their independence, but two examples of those are Vilkyškių pieninė and the former milk conserve manufacturer Marijampolė pieno kombinat.

Later the dominance of the three major companies weakened as other dairy manufacturers reinforced their shares in the industry. Vilkyškių pieninė, an old dairy specialising in cheese production, generated good profit and used the earnings primarily for expansion. In a few years they have acquired other smaller processing plants in their area. Marijampolė pieno kombinat, after having shrunk to a small size, has recovered from its financial and market difficulties to challenge the leading companies with the help of growing export sales. Due

Packaging in the cheese factory of Rokiškio sūris.

Dairy companies collect their milk from thousands of small farms. This hundred-year-old log-structured barn gives shelter to a few cows and calves.

to the strengthening of middle-sized manufacturers, the turnover-based concentration (CR4) dropped from 83 % in 2005 to 69 % in 2012.

Currently all the five big companies have several processing plants: Rokiškio sūris has three, Pieno žvaigždės four, Žemaitijos pienas three and Vilkyškių pieninė also three. Marijampolė pieno kombinat has five plants. It produces canned milk in Marijampolė and skim milk powder in Kalvarija, while the other three plants are smaller.

Despite impressive growth in the past decade, the capacity utilisation of the processing facilities has occasionally been rather low around 60 %. Consequently, the Lithuanian dairy industry could, in principle, produce nearly twice its current volume output. The target level of raw material to be processed was declared upon EU accession to be 2.5 billion kg. It is still 1.5 times larger than the actual volume processed in year 2012. Capacity utilisation also has a seasonal nature. Especially processors using relatively more milk from small farms tend to have more excess capacity in the winter.

Four big companies are listed in the stock exchange and are all in majority domestic ownership. Rokiškio sūris is mainly owned by its management while Pieno žvaigždės and Žemaitijos pienas are owned by various Lithuanian private individuals and companies. Foreign ownership is rather modest in the industry. Ingman ledai used to be owned by Finnish Ingman foods but it was moved to

Inside the log barn.

Small farms use portable milking equipment.

Unilever ownership when Unilever acquired the Finnish parent company in 2011. MGL Baltija, a milk powder manufacturing company, used to be in German ownership, but currently the company has Swiss owners.

Lithuanian experts of the dairy sector consider that there are many factors that contribute to the overall impressive performance of the Lithuanian dairy supply chain, including:

1. Cheap production factors. Lithuania has one of the lowest average milk prices in the EU. Additionally, cheap labour force is available for farms and manufacturers.

2. Feeding is based on cheap grass and there is a favourable climate, precipitation is sufficient, and there is no need for irrigation. The soil quality is reasonable and fertility is maintained with natural manure.

3. The Lithuanian dairy industry has specialised in cheese and companies also concentrated some of their recent investments into cheese manufacturing.

4. Export marketing and establishment of various export sales channels. (1) Lithuanian dairy products hold an important place or play a growing role in the markets of Russia, the Asian countries such as Kazakhstan and the Caucasian countries. In the Russian market prices are good and there is a traditional reputation of Lithuanian cheese. (2) On the EU common market the main competitive factor for cheese is its price. It is the basis for private label products but in some cases industrial cheese is exported to EU countries like Italy and France, where it is repacked and sold with a good margin as branded products.

Milk churns drying in a dairy farm of fifteen cows.

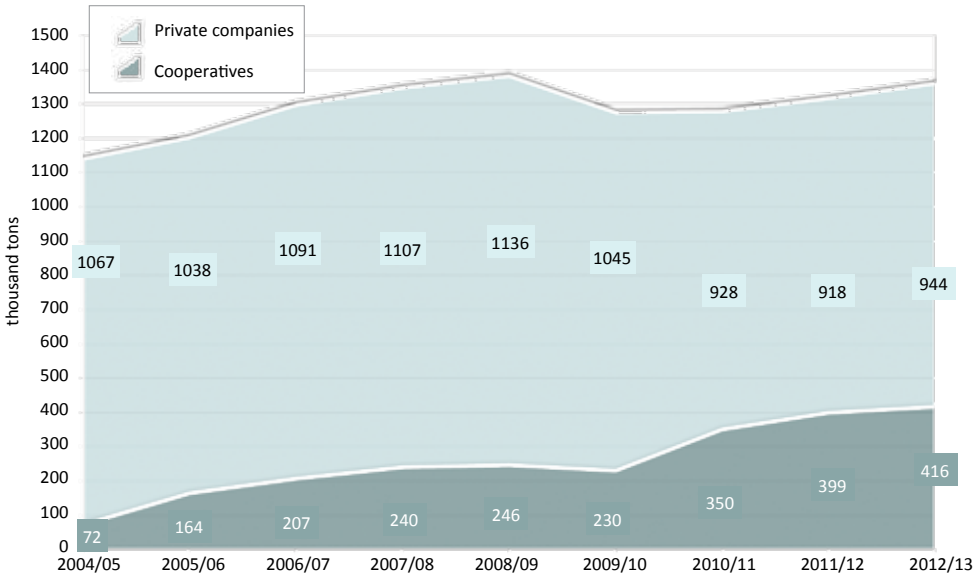


Figure 27. Milk collection by farmers' cooperatives and private companies in Lithuania.

Source: Lithuanian Ministry of Agriculture.

(3) Lithuanian manufacturers are also exploring the possibilities to regain their foothold in the US market.

Lithuanian companies have accumulated valuable export sales experience during the past two decades, but the geographical concentration of their cheese exports to Russia makes them vulnerable. Russia is a volatile market where from one day to another unexpected changes can occur, causing substantial damage to sales revenues. The underlying factor can be an economic shock, as happened in 1998, which affects all exporters. Russia has also applied import barriers related to hygienic conditions of livestock products originating from various countries. The Lithuanian dairy companies were adversely hit by a temporary ban on Russian imports already in September 2009, but the second ban prompted lately by political motives in October 2013 has presumably had even more severe effects, since it was released only in December. These events highlight the economic and political risk of concentrating an industry's exports towards Russia.

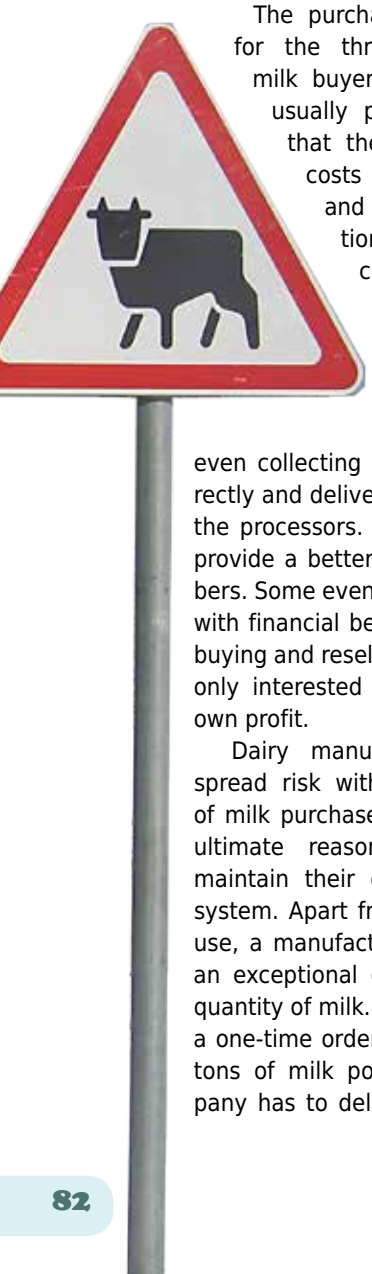
Milk purchases

A few years ago dairy manufacturers took care of milk collection themselves. Before the accession the milk collection system received subsidies from the Lithuanian government. Recently milk collection has been shared among three groups of companies: (1) dairy processors, which still collect their own milk, (2) milk cooperatives and associated member farms, and (3) milk trading companies. Previously processers organised most of the milk collection but they have partially outsourced it to the new milk collecting and trading companies.

In 2012 there were 44 dairies, but the number of milk purchasers was as high as 75. The situation has created competition in milk purchase but, in some cases, also increased costs such as those related to quality assurance. Samples are taken at the point of milk collection, as in previous years, by the first-stage milk purchasing companies, but processing companies also take additional samples to monitor quality (double checking). Milk collection has also

been scattered in geographic terms, since nowadays companies buy milk all over Lithuania and there is no territorial division among milk purchasers. Due to this fact even the most remote farms have a choice to sell their output to several milk purchasers.

Milk prices in Lithuania do not include collection and transportation costs. The number of collection stations is estimated to be approximately one thousand. For big farms the purchase price paid for milk may be 5-6 euro cents above the average, i.e. about 34 cents instead of 28.



The purchase strategy differs for the three main types of milk buyers. Dairy companies usually pay a low price so that they can recover the costs of transportation and the collection stations they run. Milk cooperatives do the same organisational work, maintaining some collections points, operating a fleet of trucks, even collecting from small farms directly and delivering the bulk milk to the processors. Still, often they can provide a better price to their members. Some even provide the farmers with financial benefits. Milk trading – buying and reselling – companies are only interested in maximising their own profit.

Dairy manufacturers strive to spread risk with multiple channels of milk purchase. This is one of the ultimate reasons why they still maintain their own milk collection system. Apart from the regular milk use, a manufacturer may also have an exceptional demand for a large quantity of milk. Such a case may be a one-time order of several hundred tons of milk powder that the company has to deliver in a given time e.g. half a year. In such a case the company may make milk supply contracts with big cooperatives and traders for this period of time, but depending on market conditions or prices the supplier can easily terminate the contract after one month.

Cooperative ownership, vertical integration

Cooperation among milk farmers has strengthened in Lithuania. The primary motivation for establishing the cooperatives was the endeavour to achieve better prices. The cooperative movement is also granted some financial incentives. After EU accession, support for milk collection was removed, but cooperatives still enjoy some support in the form tax exemptions and direct subsidies. This support complies with EU rules and can amount to up to 5 % of annual sales revenues. The support is phased out in five years after the establishment of the cooperative, and the maximum amount of overall support cannot exceed 1.4 million Litas.

In 2012 the two major cooperatives were Pienas LT and Pieno puta (Table 16). The first one unites large milk farms while the latter is formed primarily of small ones. The overall influence of cooperatives has been growing as they have become stronger especially since 2010. Similarly to what happened in the other Baltic countries, dairy processors' milk purchase volumes and prices dropped drastically due to market difficulties in 2009, which resulted in more activity from cooperatives.

The investment of Pienas LT shares many similarities with that of Latvijas piens in the northern neighbour: it is a green-field investment in the dairy industry by the strongest milk farmers' cooperative. Pienas LT's dairy processing plant is currently under construction in the Kaunas Free Economic Zone. It has enjoyed political support and part of the financing originates from EU funds, as it has happened with its Latvian counterpart.

A truck collecting milk from a cooperative member. Several dairy cooperatives have been established recently in Lithuania, and Pienas LT has primarily big farms in its membership.

Pienas LT has so far sold its milk to Lithuanian processors or exported it to Poland. Sales revenues of the cooperative totalled 40 million EUR in 2012. The production potential of Pienas LT members suggests a strong viability of the new investment. The value of the new processing plant is about 29 million EUR and it is scheduled to be ready by the end of 2014. The initial annual processing capacity will be 240 million kg of milk which can later be extended to 440 million kg. Obviously, processing companies do not like new entrants in the industry. The green-field capacity has received much criticism from the existing dairy manufacturers, many of which have excess capacity at the moment. The owners of the new plant comprise 211 members of Pienas LT, individual farmers, companies and smaller cooperatives. The factory is planned to produce and export milk protein used in the food and pharmaceutical industries (Januškevičiūtė 2013).

Although milk production is still dominated in Lithuania by micro-farms, the construction of the new processing plant directs attention to the strengthening of large milk farms in the country. There are two distinct groups of big milk farms in Lithuania:

(1) Family farms, which increased their size from a few cows to over 50 or even 100 heads. These have constantly grown, bought new animals, started employing outside workforce and invested into buildings and new technology. They also had an access to EU money.

(2) Agricultural companies, the successors of the old kolhoses/sovhoses have always been big. They mostly use the technology and buildings inherited from the previous regime, although some have modernised. The attitude towards innovation and modernisation may not be as self-evident as in business-minded family farms, which achieved their dynamic growth steadily over 15-20 years. In general, it is much more difficult to renovate an old farm (e.g. arrange a new milking system, set up a manure removal system etc.) than to build a completely new shed. Still, the milk yield is very high in some agricultural

Big family farms in Lithuania have reached their current size as a result of gradual development since the beginning of the 1990s

companies. Agricultural companies hold about 45 thousand dairy cows. In 2012 their average milk productivity was 7160 kg/cow compared to the average of the family farms, 4940 kg/cow. In fact, the agricultural companies which have survived so far are very likely to stay in business in the future. There is even some partial foreign ownership in three or four of the farms.

There are also other examples of vertical integration in the Lithuanian dairy supply chain. The owners of Pieno žvaigždės and Vilkyškių pieninė also own a few big dairy farms. In these cases, however, the level of vertical integration remains rather low. Another example is Norfa, the fourth biggest retailer chain that has a dairy called Rivona in Alytus. Rivona supplies a wide range of fresh dairy products exclusively to Norfa.

Relations to the retail sector

The Lithuanian retail sector has very strong domestic chains. Both VP Market and Palink started their business in the 1990s with the same concept of introducing western style retail chains to Lithuanian consumers. Since Western-European chains did not immediately show particular interest in the Lithuanian grocery market – as it happened in Poland, Czech Republic, Slovakia or Hungary – the Lithuanian owned retail chains had room and time to get a solid foothold on the market.

Both VP Market and Palink have expanded their network of retail units rapidly. VP Market's Maxima group runs five different retail chain concepts in Lithuania: convenient stores, supermarket, hypermarkets and a cash & carry chain called Bazė. Altogether the group had 499 retail units in 2012. Palink runs 228 stores under three retail chains: IKI, IKIUKAS and CENTO.

Both retail companies have expanded abroad. The Maxima group has gained a large market share in Estonia and Latvia and acquired some smaller chains in Poland and Bulgaria. Palink has a subsidiary in Latvia.

The third largest chain, Norfos mažmena, was established in 1997 and by 2012 had 132 stores. The company runs its outlets in five size categories (S, L, XL, XXL and Hyper) under the name Norfa. Rimi Lietuva is the fourth biggest chain and the only one under foreign ownership since it is the subsidiary of Swedish ICA. Rimi Lietuva consists of 17

hypermarkets and 22 supermarkets.

Retailers have contracts with all companies. Supply contracts are long term (sometimes even for 4-5 years) but the price is renegotiated twice a year. Retailers may demand participation in sales campaigns (e.g., three for the price of two) and costs are passed on to suppliers. Due to the large market power of the retailers, relatively smaller profit can be realised in the domestic market, as opposed to a notably larger profit rate in the export markets.

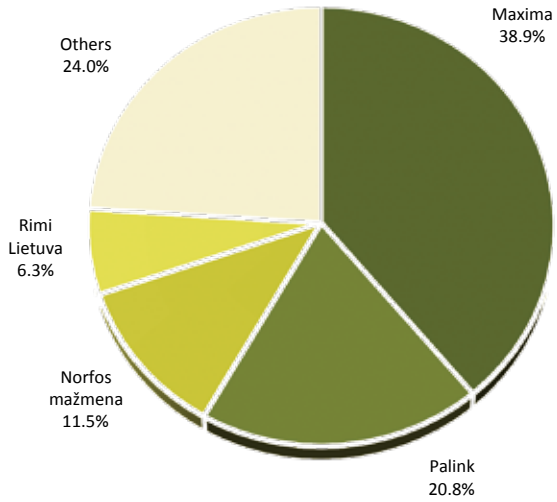


Figure 28. Structure of the Lithuanian food retail sector, 2012.

Source: own calculations based on VŽ Verslo Klasė, TOP 1000, 2013.

The small dairies cannot sell to large retailer chains because output volumes are not enough to ensure product availability in all retail units. Therefore, small companies sell to smaller chains such as Aibe or small independent village shops.

Retailers' payments have always been a problem. They have often been late and long delays e.g., three months occurred often. At present, however, a government decree requires all agricultural and food products to be paid within 30 days. The retailers now abide by this rule, but they interpret the beginning of the 30 days in their own way: it is not the day of delivery to them, but the date they sell the product. In the case of some long shelf-life products like cheese, the difference can be significant and up to 30-40 days.

The Lithuanian retail concern Maxima is the largest company in the Baltic retail business.

2.5.8 Poland

Preparation for joining the EU's common agricultural market started already in the 1990s with a massive wave of investment seeking modernisation and compliance with EU requirements. Modernisation of the dairy farms has been accomplished with the help of EU and national support. Until 2003 the SAPARD program played an important role in supporting investment. In the 2000s it coincided with the modernisation program of the Polish government that provided cheap loans. As a result of the modernisation investments, the capacity and scale of production also increased in the dairy industry.

The Polish dairy industry has apparently taken great advantage of the country's EU accession in 2004. Compared to the pre-EU period, sales revenues have doubled and even real term sales have risen by 58 %. The gross operating surplus has remained at eight percent of sales, which is among the best and most stable performances of the countries in the peer group.

The volumes of milk processed have also swelled steadily, hence indicating a strengthening of the market position. The growth analysis of real term sales revenues (in Table 29 on page 137) unveils that the Polish dairy industry has enjoyed constant and significant growth on the large domestic market. Domestic sales increased by 2.75 % annually between 2000 and 2011, so the domestic market has contributed 60 % of the dairy industry's total growth.

The dairy industry is rather fragmented in Poland. Although the leading companies are strong, none of them controls more than 11 % of the aggregate sales revenues of the industry. In 2009 the concentration CR4 was 32 % and CR8 was also as low as 45 %. Two years later, the concentration ratios had not changed. Both the aggregate output of the industry and the sales revenues of the market leaders have increased at similar pace. Domestic experts anticipate slow consolidation and consider the mergers of the domestic leaders rather unlikely in the near future.

Table 17. Main indicators of the Polish dairy industry[a], 2003-2012.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Number of companies	779	774	723	736	682	724	656	663	604	..
Sales revenues (billion EUR)	3.4	3.9	4.7	5.0	5.9	6.1	5.0	6.1	6.6[b]	7.2[c]
Gross operating surplus (million EUR)	281.3	312.9	342.5	352.7	526.8	420.4	468.6	498.2	..	..
Number of employees (thousand)	48.1	46.2	45.2	44.3	42.8	41.7	41.8	41.3[b]	39.9[b]	..
Milk processed [d] (billion kg)	7.5	8.1	8.7	8.7	8.7	8.8	9.0	8.9	9.2	9.8

Source: Eurostat; [a] Note: Figures include both dairy manufacturing (NACE 1051) and ice cream manufacturing (NACE 1052). In Poland, ice cream manufacturing is dominated by microenterprises, while bigger enterprises make up the dairy manufacturing industry. [b] Central Statistical Office of Poland (GUS); [c] Rzeczpospolita [d] Processed milk is corrected for cross-border milk trade.

Table 18. The leading companies in the Polish dairy industry.

	Sales (million €)	Sales (million €)	Milk intake (million kg)	Number of milk suppliers	Average delivery per supplier (kg/day)	Sales (million €)
	2009	2010				2011
Mlekpol	439	638	980	14 000	192	715
Mlekovita	508	626	740	10 000	203	707
Polmlek	324	426	550	20 000	75	437
Danone	361	438	100	700	391	410
Lacpol	185	576	900	25 000	99	316
Lowicz	196	263	480	7 000	188	303
Zott Polska	191	160	120	800	411	232
Piatnica	113	136	130	2 500	142	170
Hochland Polska	153	188	120	2 500	132	159
Bakoma	95	114	65	2 000	89	125
Spomlek	66	125	160	8 000	55	108
Gostyn	73	120	175	1 500	320	93

Sources: Rzeczpostpolita TOP 2000, Forum Mleczarskie, IERIGZ and company websites

Milk purchases

Milk purchases by dairy companies shrank drastically through the years of economic reform in the early 1990s. Restructuring and privatisation of the formerly state owned companies and a severe decline in consumers' income pressed down milk deliveries to dairies. The income drop, difficulties in the market and pronounced economic uncertainty even affected the output of cooperative-based dairies, which however continued to be owned by farmers. In 1995 as little as 52 % of total milk pro-

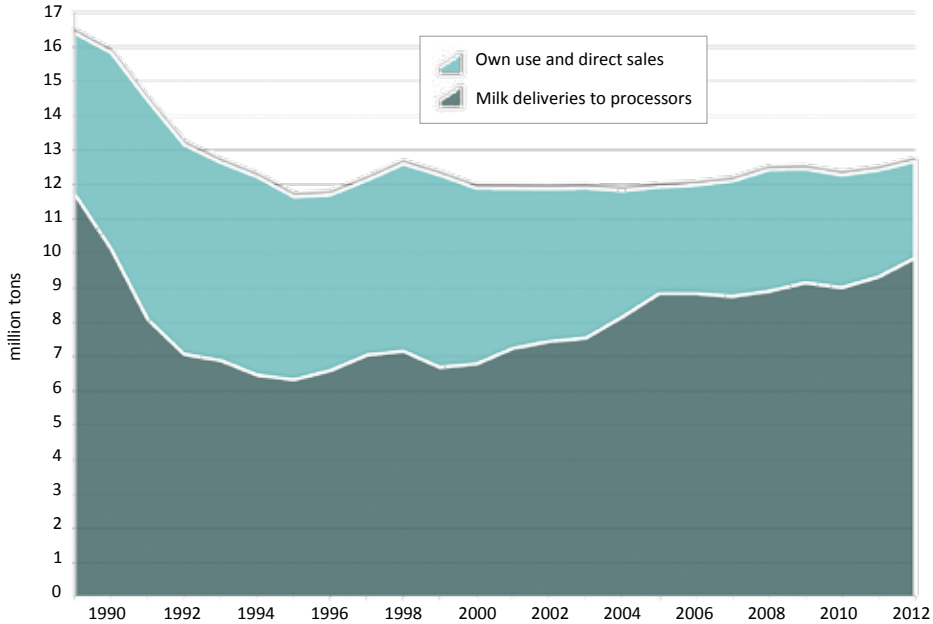


Figure 29. Milk use structure in Poland, 1989-2012.

Source: Eurostat data.

duction was processed by dairy companies, while almost half of the milk was consumed on the millions of producing farms or sold directly, either on local markets or through various other channels.

During the past two decades the significance of home supply and direct sales has declined gradually and by 2012 the share of milk delivered to dairies had increased to nearly 78 %. In 2010 the share of self-supply of Polish households amounted on average to 13 % for milk, 6 % for cheese and 8 % for cream and sour cream, while the shame shares for farming families were 74 %, 37 % and 47 % respectively (Seremak-Bulge et. al, 2012). Some farms manufacture fresh cheese and there is still a local market for milk and other dairy products.

A milk collection network already operated before 1990 and thousands of milk collection points were still functioning in the countryside in the 1990s and early 2000s. The multiplicity of collection points was a necessity due to the small size of milk farms and the lack of cooling capacity on farms. In the 2000s the number of milk collection points shrank as expanding farms invested into their own cooling equipment. Dairy factories first outsourced the collection points to logistic enterprises before gradually phasing out the whole activity. At present, dairies manufacturers either procure the

milk directly on their own, or purchase the milk collection services from entrepreneurs or specialised firms. Milk collection stations, however, still operate in regions where milk is purchased from very small farms.

The geographic scatter of milk farms is one of the main weaknesses of the Polish dairy supply chain. Several dairy manufacturers procure milk from thousands of small and medium-scale farms. The foreign-owned companies tend to get their milk from large farms, e.g. Danone and Zott suppliers deliver on average 400 kg milk a day, which is two to three times larger than the corresponding average for many domestic competitors (see Table 18).

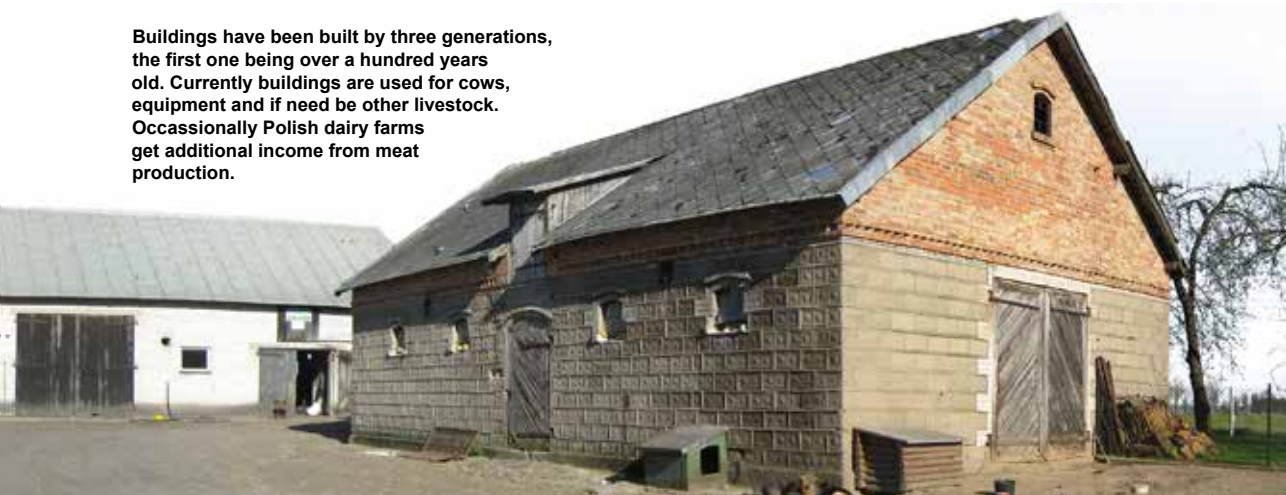
Cooperative ownership and vertical integration

Cooperative movement started in the Polish dairy sector already a hundred years ago and the number of cooperative-owned dairies increased fast. The period covering the 1950s to the 1980s brought a gradual consolidation, but at the end of the previous regime in 1989 almost a 100 % of the milk was purchased by cooperative dairies.

During the restructuring and privatisation process, private owners acquired about 20-30 % of the assets of the industry. Foreign investors arrived early in the 1990s and have increased their presence ever since. The biggest investments have been made by Danone, Hochland, Zott, Bongrain and Lactalis. All these foreign-owned companies have also contributed to the dynamism of dairy exports. Additionally, Milkiland, the international dairy concern of Russian-Ukrainian origin acquired some production capacity. Arla divested from Poland by selling its cheese plant to Polmlek in 2011.

Feed mixing equipment.

Apart from the foreign-owned companies, the largest dairy manufacturers in private domestic ownership are Polmlek, Lacpol and Bakoma. The first two are concerns which consist of several processing plants across the country. Polmlek has eight factories, while Lacpol has eleven. Both companies belong to the market leaders of the Polish dairy industry.



Buildings have been built by three generations, the first one being over a hundred years old. Currently buildings are used for cows, equipment and if need be other livestock. Occassionally Polish dairy farms get additional income from meat production.

Mlekovita is one of the leading Polish dairy cooperatives.

Due to the progress made by privately-owned manufacturers, the share of cooperatives in milk procurement declined to about 80 % by 2005, while their share in the sales of the industry was estimated to be 70 % in the same year (Seremak-Bulge et. al, 2005, p. 116). Dairy cooperatives are still very strong and the leading ones, such as Mlekovita and Mlekpol, have invested heavily in a continuous process of modernisation. They have also initiated actively some consolidation in the industry.

The ownership of Polish dairy cooperatives is rather bitty, the biggest cooperatives having several thousands of members whose ownership, however, feels very distant. These companies are directed by a group of managers with individual farm owners having little word on strategic decisions. The smaller the cooperative, the more influence farmers feel they have on the dairy's activities.

Nowadays there is also a new type of horizontal integration of producers, especially among the suppliers of the private dairies. In these groups, farmers who have big herds and proper cooling facilities negotiate jointly the price of milk with a processor, but the milk is taken by the dairy manufacturers directly from the farms.

Foreign owned dairies have had important spill-over effects of spreading new management and marketing techniques since the mid 1990s in Poland.

Relations to retailers

As elsewhere in the region, retailers in Poland tend to transfer risks to suppliers by making them repurchase unsold goods, imposing marketing and logistic fees, or charging the cost of promotion campaigns. Consumers prefer small retail outlets in Poland and the units of discount store chains because of convenience and price level.

As a rule, when negotiating with retail chains, dairies have little bargaining power. There are some exceptions, usually when the dairy holds a relatively high market share for a particular narrow product segment (e.g. cottage cheese of OSM Piatnicza).

In addition to the quality standards that are widely in use, retailers tend to have their own quality requirements, although those are also regarded by suppliers as just another way for retailers' to extract excess profit from them. The requirements involve regular checks of production processes and the quality control argument facilitates an insight to the manufacturers' cost structure.

Although the market share of private label products has recently grown in Poland, PL sales are still much lower than in the other Central and Eastern European countries. Private label products accounted for 18 % of sales in 2012 compared to 28 % in Slovakia, 25 % in Hungary, or 20 % in the Czech Republic (GFK 2013). The small market share of private label products rate in Poland can be attributed to the fragmented structure of the retail sector.

The share of private label products in Poland varies considerably by retail concept. In 2012, discount stores already offered 56 % of their goods under their own private labels, while the proportion was only 10 % for hypermarkets and 18 % for supermarkets. Manufacturer brands are expected to lose market shares as private labels are forecast to increase their shares to 62 % in discount stores, 12 % in hypermarkets and 22 % in supermarkets by 2015 (GFK 2013).

Some dairy manufacturers with strong brands and good market positions are not willing to manufacture private label products at all (Wieczorkiewicz, 2013). Private label, however, is a relevant option for those cooperative dairies, which struggle with excess capacity. For private label products, the retailer sets the appearance (images, text, font). The producer is fully responsible for the packaging and getting all the necessary permissions from the national and EU authorities. Retailers usually do not want to take this responsibility themselves.

The role of wholesalers within the chain has decreased, as wholesalers source products from small dairies and serve primarily individual small retailers. The largest retailers are chained and take care of their own supply through direct contracts with the largest dairies.

Retailers have strong negotiating power despite the rather fragmented market structure. The retail sector of Poland has changed substantially over the past two decades. It was restructured in the economic reforms of the early 1990s like elsewhere in the former socialist countries. The retail chains of the soviet era disappeared and foreign retail companies settled in the country one after another already in the 1990s.

The period between 1995 and 2007 witnessed a boom of hypermarket constructions, as the concept proved to be a cost effective way of delivering rapid growth in market shares. Increasingly affluent consumers also favoured the big units with wide assortments. Several foreign chains such as Tesco, Metro, Auchan and Carrefour created and expanded their network of hypermarkets.

The recession brought changes in shopping and consumption patterns very similar to those experienced in the other countries. Discount stores have gained in popularity since 2008. Their sales have increased 10-20 % annually, which represents a much faster growth rate than that of the other retail formats. The two leading chains of the

Table 19. The major companies of the Polish retail sector.

No	Company	Names of the chains	Retail concept	Sales (million EUR)				Country of ownership
				2008	2009	2010	2011	
1	Jeronimo Martins	Biedronka	discount stores	3638	3883	5061	6138	Portugal
2	Tesco	Tesco Tesco Extra	hypermarket, supermarket	2591	2341	2682	2610	Great-Britain
3	Carrefour	Carrefour, Carrefour Market	hypermarket, supermarket	2434	1894	2278	2171	France
4	Lidl Polska	Lidl	discount stores	1025	1179	1527	1820	Germany
5	PSH Lewiatan	Market, Minimarket, Supermarket, Lewiatan Partner	franchise	..	..	1707	1772	Poland
6	Makro Cash & Carry	Makro	cahs & carry	2200	1998	2164	1754	Germany
7	Auchan	Auchan, Simply Market	hypermarket, supermarket	1564	1375	1565	1584	France
8	Kaufland Polska Markety	Kaufland	supermarket	1009	1046	1266	1373	Germany
9	Real sp i spólka	Real	hypermarket	1500	1464	1415	1273	Germany
10	Grupa Muszkieterów	Intermarche	supermarket	816	756	904	1019	France
11	Selgros Sp.	Selgros Cash & Carry	cash & carry	824	700	791	824	Germany
12	POLOmarket Sp	POLOmarket	supermarket	626	601	744	801	Poland
13	Zabka Polska	Zabka	convenience stores	521	490	586	686	Poland
14	E.Leclerc Polska	E.Leclerc	hypermarket	602	527	630	643	France

Source: Rzeczpospolita, Polskie przedsiębiorstwa lista 2000; Figurska J. & Rybarski M.

discount store concept, Lidl and Jeronimo Martins, have strengthened their market positions considerably. This new trend is largely attributable to the reduced income level of Polish consumers as a result of the economic recession.

On the other hand discount stores themselves have also improved their services and assortment. Due to the dense network of relatively small outlets, discount store chains have managed to offer the benefits of convenient stores in the suburbs of large cities and the centres of small provincial towns or sometimes even in the bigger villages of rural areas. The biggest rivals have recognised the business potential of the concept and responded promptly by setting up their own discount store chains. At present, already nine of the 20 biggest retail companies in

Poland operate a discount or convenience store chain.

The structure of the Polish retail sector is extremely fragmented: there are still over 350 000 retail units throughout the country, of which 90 % are smaller than 100m^2. The geographic distribution of the population is rather scattered, with 40 % of the 38 million inhabitants living in rural areas. Small grocery stores have also survived in the towns.

Foreign chains ran 11 700 outlets at the beginning of 2011. Those chains operate most of the hyper- and supermarkets, which represent the largest retail units in the country. In 2012 there were 434 hypermarkets and 1998 supermarkets, which compares to 30 and 1 300 in 1996, respectively. The number of discount stores reached 2 920 in 2012, of which Biedronka stores totalled 2083, Lidl 450, Netto 276 and Aldi 64 (GFK 2013).

Although foreign chains have acquired significant positions in Polish retail, the sector still has several big and equally powerful competitors. Many companies have been attracted by the large market, but it has been a challenge for them to gain large market shares. Therefore, concentration stays below the level observed in other European countries: CR4 was only 26 % and even CR8 was as low as 38 % in 2011.

The list of leading companies illustrates the dominance of foreign-owned chains and confirms the relatively even distribution of market power. However, the recent sales figures show the growth of discount stores. Biedronka (Jeronimo Martins) and Lidl have managed to almost double their sales in four years while other chains dominated by hypermarkets and supermarkets grew more moderately over the same period.

The sector concentrates constantly as the large chains increase their market shares at the expense of small individual shops. The market leaders also expand via mergers and acquisitions, e.g. Metro Group sold its hypermarket chain to Auchan at the end of 2012, which moved in the ranking list to second place with this transaction. At the same time, additional foreign chains become interested in the Polish market: in 2012, VP Market acquired a small chain of 21 outlets in Eastern Poland, a transaction which is considered to be only the first step for the Lithuanian company of a growth strategy in Poland. However, concentration in the Polish retail sector has been and remains very slow.

Biedronka is the leading discount store chain in Poland.

3 PRODUCTIVITY

The competitiveness of an industry such as the dairy sector is achieved when individual companies within that industry are able to sell goods or services at a price and quality that compare favourably to those of competitors. Competitiveness therefore relates closely to the concept of productivity, defined as the efficiency of the process by which firms (or sectors) transform inputs into outputs. Indeed, for entire countries or large sectors of an economy, some prominent economists consider that competitiveness is just "a funny way of saying 'productivity'" (Krugman, 1994, p. 32). In a similar vein, the UK Department for Environment, Food and Rural Affairs concluded its review of competitiveness indicators for the food chain industries by stating that "at root, competitiveness should be viewed as being about economic efficiency or productivity" (DEFRA, 2002). Against this background, the objective of this section is to assess productivity levels and productivity growth in the dairy chains of the eight countries of the Baltic Sea region.

3.1 General approach and methodology

3.1.1 Productivity growth versus productivity level

The productivity of a firm or sector is simply defined as the ratio of outputs (e.g., yoghurt, butter) to inputs (e.g., labour, milk) (Coelli et al., 1998, p. 2). While the value of the index is uninformative by itself, its rate of change measures the growth in output that is not explained by the growth in inputs and therefore directly captures how the efficiency of the production process changes over time. This is why the results of a productivity analysis are often presented in the form of growth accounting that decomposes output growth into its component parts, including productivity growth. In turn, productivity growth can be broken down into various sources:

- Technological change, defined as the process by which new technologies are adopted by firms.
- Changes in technical efficiency, defined as the ability of a firm to produce maximum output with a fixed quantity of inputs, given the state of the technology. In effect, that a firm is technically efficient means that it

does not 'waste' any of its production factors.

- Changes in allocative efficiency, defined as the selection of input mixes that produce a given quantity of output at minimum cost (given the input prices that prevail) and, if multiple outputs are produced, the choice of an output mix that maximises revenue from a given quantity of inputs (given the output prices that prevail).
- Changes in scale efficiency. For instance, in an industry characterized by relatively large fixed costs and increasing returns to scale, restructuring towards larger firms would deliver productivity growth.

Each of those four sources relate closely to the operational and strategic decisions that businesses have to make, such as the choice of outputs to produce, level of investments in tangible assets (e.g., machinery), or choice of size of operation. Hence, productivity growth represents a first competitiveness indicator. However, just as the productivity of a sector can be analysed at different points in time, it can be compared at one point in time across different countries, and here as well differences in productivity levels can have multiple causes, including differences in technologies, scale, output mix, input mix and technical efficiency. Our analysis therefore compares both productivity growth and productivity levels of the dairy sectors in eight countries of the Baltic Sea area.

3.1.2 Partial versus Total Factor Productivity (TFP)

If the production process involved a single input and a single output, calculating productivity levels would be straightforward, but this is unfortunately never the case in reality, where firms combine multiple production factors in order to manufacture a whole range of products. Hence, the problem of measuring productivity becomes one of aggregating inputs and outputs into appropriate indices. This can be achieved by application of various methods that differ in terms of accuracy, ease of implementation and data requirements, but two types of measures can be usefully distinguished:

- Partial productivity measures, which simplify the problem of aggregating inputs and/or output by focusing on only one of each (e.g., milk for outputs, labour, dairy cows or land for inputs). The main advantage is the ease of calculation and interpretation, but it comes at the cost of accuracy. For instance, a high level of labour productivity can reflect high efficiency resulting from the use of a superior technology, but it can also be due to the inefficient substitution of capital for labour. In a similar vein, at the level of a farm, high milk yields can be sub-optimal if they are achieved through an inefficient use of costly feeds. It is therefore clear that partial productivity measures can provide a misleading indication of overall productivity when considered in isolation.
- Total Factor Productivity (TFP) measures, which integrate all inputs and all outputs in the calculation.

3.1.3 Measuring productivity

The analysis is based on a combination of partial productivity and TFP indices. Partial productivity measures are often self-explanatory but, at the farm level, the selection of specific indicators is guided by the literature on technical change and

development in agriculture of Hayami & Ruttan (1991). Specifically, labour productivity (Y/L) is partitioned into output per dairy cow (Y/C) and the number of dairy cows per worker (C/L) according to the relationship: Y/L=Y/C*C/L. The advantage of this decomposition lies in the sources of growth in each of the partial productivity indicators: an increase in output per dairy cow (i.e., milk yield) reflects mainly biological innovations, such as genetic improvements or the amelioration of feed composition. On the other hand, the number of dairy cows per worker changes mainly with mechanical innovations, such as the labour requirement of milking machines or automation of other production processes such as feeding, cleaning, maintenance etc.

A variety of methods are available for the measurement of TFP growth. When prices of all outputs and all inputs are available, that information can be combined with quantity data in order to produce traditional indices, such as Laspeyres, Paasche, Fisher, and Tornqvist indices. Coelli et al. (1998) demonstrate that the Tornqvist index has superior economic properties and it is therefore used in this analysis. Formally, it is constructed from an output index and an input index:

$$\ln\left(\frac{Input_t}{Input_{t-1}}\right) = \sum_{i=1}^{n} 1/2(\alpha_{i,t} + \alpha_{i,t-1}) \ln\left(\frac{x_{i,t}}{x_{i,t-1}}\right)$$
$$\alpha_{i,t} = \frac{w_{i,t} x_{i,t}}{\sum_{j=1}^{n} w_{j,t} x_{j,t}} \qquad (1)$$

$$\ln\left(\frac{Output_t}{Output_{t-1}}\right) = \sum_{k=1}^{m} 1/2(\beta_{k,t} + \beta_{k,t-1}) \ln\left(\frac{y_{k,t}}{y_{k,t-1}}\right)$$
$$\beta_{k,t} = \frac{p_{k,t} y_{k,t}}{\sum_{l=1}^{m} p_{l,t} y_{l,t}} \qquad (2)$$

where $x_{i,t}$ denotes the quantity of input i used in period t; $w_{i,t}$ is the price of that input; $y_{k,t}$ denotes the quantity of output k produced in period t and sold at a price $p_{k,t}$.

In spite of the cumbersome notations, these expressions have a simple interpretation once it is recognized that, for any variable v, $\ln(v_t/v_{t-1})$ is the growth rate of v between t-1 and t.

The total growth rate of inputs $\ln(Input_t / Input_{t-1})$ is therefore a weighted average of growth rates of individual inputs $\ln(x_{i,t}/x_{i,t-1})$, with the weights equal to the average cost shares of the inputs i.

Similarly, the total growth rate of outputs $\ln(Output_t/Output_{t-1})$ is a weighted average of growth rates of individual outputs $\ln(y_{k,t} / y_{k,t-1})$, with the weights equal to the average revenue shares of each output j.

TFP growth, defined as the growth in ouput not explained by growth in inputs, is therefore calculated as the difference between the two previous expressions:

$$\ln\left(\frac{TFP_t}{TFP_{t-1}}\right) = \ln\left(\frac{Output_t}{Output_{t-1}}\right) - \ln\left(\frac{Input_t}{Input_{t-1}}\right) \qquad (3)$$

3.2 Data and construction of variables

3.2.1 Dairy farming

The analysis of productivity of dairy farms relies on the aggregate data provided by the European Commission's Public Database of the Farm Accountancy Data Network (FADN)[11]. For the eight countries of the Baltic Sea region included in the study, the information extracted from the database pertains to the TF14 grouping entitled "Specialist milk farm" (i.e., group 41 for the old classification based on gross margins before year 2004, and group 45 for the new classification based on standard output thereafter). The study covers the period from 1995 to 2010, from the time Finland joined the European Union to the latest year for which the FADN data is available. The database being run by EU institutions, it only contains information from member states and this means that for the relatively new entrants, the data is only available from the year of EU accession (2004 for the three Baltic States and Poland).

Detailed information is available on the main aspects of the production process. Output values at current prices are recorded for milk, crop productions and beef/veal, which makes it possible to calculate the revenue shares β in equation (2). The corresponding quantity indices entering the definition of the output index (2) for crop productions and beef/veal are then calculated by deflating the current value figures, using the deflators in the EUROSTAT database.[12] For milk, information is available on the number of dairy cows as well as milk yield, and it is therefore possible to infer a physical quantity of milk produced.

Input values are recorded for the main variable production factors, namely fertilisers, commercial feeds, pesticides, energy and seeds. The issue of family labour, which represents typically an important factor of production that is not directly paid, is addressed as follows. An average wage rate is calculated as the ratio of the wage bill to the quantity of paid labour, which is then applied to the input of family labour in order to infer the total cost of labour (family as well as hired). Capital inputs are more difficult to take into account because what should enter the productivity calculations are the flow variables, i.e., the productive services and associated costs provided by all the capital goods, although the database only records capital stocks for four classes of assets: land, buildings, machinery and livestock. Hence, for each asset class, we build the cost of capital as the sum of depreciation costs and opportunity cost of the investments. The first component is calculated assuming linear depreciation over 20 years for buildings, seven years for machinery, and five years for livestock, while land is assumed not to depreciate. The opportunity cost of capital is calculated as the interests that would have been earned by a near risk-free investment of the same value. The corresponding interest rate is approximated by the yield on long-run government bonds, as given by the European Central Bank database.[13] By adding the depreciation and opportunity costs of the four classes of capital goods, one obtains the total cost of capital which is then used to calculate the cost share in the total input index (1). The growth in the quantity of capital in (1) is then calculated by using deflated values of buildings, machinery and livestock, while

[11] Available online at: http://ec.europa.eu/agriculture/rica/index.cfm.

[12] http://epp.eurostat.ec.europa.eu/portal/page/portal/agriculture/data/database, categories Agricultural prices and prices indices – Price indices of agricultural products (2005=100).

[13] http://sdw.ecb.europa.eu/browse.do?node=bbn3146

the physical quantity of land (i.e., surface area) is used for that asset.

The examination of cross-country productivity levels using DEA only requires data on input and output quantities. Those are calculated in the same way as for the construction of the Tornqvist-Theil indices. However, the frontier used as a reference for benchmarking is built from FADN data of Finnish dairy farms, as explained when presenting the results.

3.2.2 Processing sector

The data collection for the analysis of the dairy processing sector proved more challenging than for the farm sector because Eurostat does not provide all the necessary information to calculate TFP indices. However, in order to establish a comparison across the entire Baltic region, labour productivity was calculated for all eight countries as follows.

EUROSTAT's Structural Business Statistics, subsection DA155 (manufacture of dairy products) provided data on gross output, value added at factor cost and the total number of employees in the sector, allowing calculation of labour productivity using current prices. The short-term business statistics then provided indices of producer prices (PPIs) to convert current price values into constant price equivalents. In doing so, we used the PPI for dairy manufacturing whenever possible, and otherwise chose an alternative as close to that sector as possible (e.g., food manufacturing).

In order to calculate a TFP index for some countries, substantial effort had to be devoted to retrieving the data directly from National Statistical Institutes, with variable levels of success. Throughout this entire report dairy industry is presented and analysed by using NACE group 155 (Rev. 1.1) or 105 (Rev. 2.). The figures include both "operations of dairies and cheese making" (1551 or 1051) and manufacture of ice cream (1552 or 1052). Since in most countries the latter is quantitatively very small, the decision was made to keep the analysis at the level of the entire dairy manufacturing sector. It also ensured comparability because the 3-digit NACE classification was available for all countries. Eurostat data were used primarily for the calculation and the dataset was updated with the most recent business structure statistics of the national statistical institutes.

Output for all countries is only reported annually in nominal terms as total production value and value-added (i.e., revenue minus intermediate consumptions). In order to calculate real output, a deflator is therefore required but, unfortunately, statistical institutes seldom release statistics on producer prices or wholesale prices in dairy manufacturing.

Alternatively, it is possible to use the component of the Consumer Price Index (CPI) corresponding to the category 'cheese, dairy and eggs' or the Producer Price Index (PPI) for the whole food manufacturing sector (DA15). Neither option is entirely satisfactory, as the transmission of prices from manufacturers to retailers of dairy products is most likely imperfect, while sectoral specificities imply that producer prices in dairy manufacturing may change differently from producer prices in other food sectors. Eventually, PPI for food manufacturing was used for all those countries where PPI for dairy industry was not available.

On the input side, labour is measured as the total number of hours worked by paid employees, and the corresponding cost is calculated by summing wages/salaries and the social costs borne by the employer. The nominal value of intermediate inputs is constructed as the difference between total production value and value added, which is then deflated. Given that milk is the main

intermediate factor used in dairy processing, the farm price index of milk was used for that purpose.

Capital stock series are not available but can be built from statistics on investment in tangible assets using the perpetual inventory method:

where K_t denotes capital stock in year t, I_t

$$K_t = (1-\delta)K_{t-1} + I_t \qquad (4)$$

is investment in year t, and δ is the rate of depreciation. National statistical offices only report the nominal value of investments in any given year, which needs to be deflated. For most countries nominal and real term investment data of the food industry was ordered from the statistical institutes. The deflator was constructed by using these two series. The annual depreciation rate is set at a conventional value of 10 %, as used for instance by Berghäl (2006, p. 27) in his analysis of productivity growth in Finnish ICT manufacturing. Because the initial capital stock in 1995 is unknown, for the old member states the perpetual inventory method is applied from 1970s onwards so as to minimise the approximation. For the new member states the inventory method was applied starting in the 1990s.

3.3 Results for dairy farming

3.3.1 Partial productivity measures

The analysis of partial productivity measures is summarized in Table 20 and Figure 31-Figure 33. The performance of dairy farms in terms of labour productivity varies tremendously across countries. For instance, focusing on the latest year available (2010), one hour of labour on a dairy farm produced on average 255kg of milk in Denmark but only 58kg in Finland and 15kg in Latvia – a variation of a factor 17. Hence, on the basis of that indicator, Finnish dairy farms are not very competitive, lagging behind those in Denmark, Sweden and Germany. The new entrants have much lower levels of labour productivity than Finland, although Estonian farms outperform Latvian, Lithuanian, and Polish farms by a large margin.

The positive trends visible in Figure 31 and the growth rates reported in Table 20 indicate that labour productivity has been increasing rapidly in all countries. The speed of growth over the 1995-2010 period in the four old EU member states varies from 3.7 % for Germany to 7.9 % for Finland. However, those differences in growth rates for this group of countries are not enough to significantly change competitive positions: Denmark is the clear leader throughout the period, Sweden and Germany have rather similar levels of productivity, while Finland lags behind. Turning to the situation of the new entrants, Estonia stands out from its large growth rate of labour productivity (+13 % annually), which is significantly larger than the Finnish rate over the 2004-2010 period, and the labour productivity gap between Finnish and Estonian farms has therefore decreased. By contrast, there is no evidence of the other three new entrants catching up in terms of labour productivity, with Polish farms displaying particularly low rates of growth of that indicator.

Text box:
The case of Estonia - Milk farms as the most powerful segment in the supply chain

Milk farms have invested heavily in Estonia over the past ten years. The investments started with SAPARD and continued with the rural development funds. As a result, over 50 % of dairy cows are kept in farms, which have invested into modern milk production technology and buildings. Usually new buildings were built and new milking, cooling and feeding equipment was installed in those farms. Many of the smaller farms could not meet the hygienic requirements of the EU and quitted milk production. The investing farms increased their size and took over the market share left by the exiting small farms. This accelerated the concentration process of milk farms.

The investments were initiated by the government due to the hygienic requirements of the EU, so many of the investments had to be completed before EU accession or during a certain transition period. Commercial banks got interested in issuing agricultural loans at the same time, in the early 2000s, when public money started to flow into the sector. This facilitated the financing of investments.

The primary aim of the investments – besides hygienic considerations – was to raise the average milk yield of cows. Over the past decades the breeding composition of dairy cows in Estonia has changed considerably from brown to Holstein. While Estonian red and Holstein had almost equal shares of the entire herd in 1995, by 2010 the share of Holstein had grown to 77 %. Additionally, a standard share of 0.5 % of Estonian native breed has been kept as genetic reserve since the 1960s.

Nowadays, animals are kept and fed all year round indoors. Before year 2000 about 90 % of the farms used grazing and 10 % used total mixed ratio (TMR), but for large modernized farms the shares have now been reversed. While most of the farms do grazing to some extent, it's physically difficult have several hundreds of milking cows grazing because there's not enough grasslands in the vicinity. Therefore, usually small farms or those not so interested in high milk yields, keep their herd in the fields grazing for a longer time. The aim of milk farm investment was to reduce costs and improve efficiency. The average yield in Estonia has been growing rapidly, indeed, but it should also be acknowledged that costs have increased as well.

Estonian milk farms, particularly the large prospering ones, have clear plans for further growth. An ambitious objective was announced in the National Dairy Strategy to increase Estonian milk production to one million tons by 2020 from the current 721 thousand tons.

Banks consider dairy farming to be a secure sector to which to lend money. The value of the main collateral, i.e. land, has been growing and the good conditions and future prospects of milk production apparently convince the financial sector that further investment in milk farming makes economic sense.

Foreign investors have also set their eyes on Estonian dairying. Two main groups of foreign owners have emerged so far: (1) farmers, who settle down in Estonia to manage milk farms, and (2) financial and professional investors. The first group includes several nationalities but mostly farmers from Finland, while the second involves Scandinavian or even Austrian capital, as the latest investments associated with Trigon and Vaklak Group illustrate. The total share of foreign-owned farms in milk production is estimated to be as high as 20-25 % by some local experts.

Estonian milk farms continue concentrating, and the largest share of production originates from large holdings or agricultural companies with over a thousand dairy cows. They have formed strong cooperatives over the recent years to control milk procurement and sales. Eventually those farms decide whether they sell their milk domestically or to foreign processors. Their proposed new processing capacity would further increase their dominance. Markets in Estonia are developing in a unique manner from the point of view of milk farms and as compared the situation in other new member states in the EU: milk farmers have become in Estonia the most powerful segment of the national dairy supply chain.

3.3.2 The parallel between farm structure and labour productivity

The positions and slopes of the labour productivity curves suggest a relation to the initial farm structure and the speed of concentration over time. Denmark's initial position was 44 cows per farm in 1995 while Sweden, Germany and Finland had 27, 25 and 12 respectively. The average farm size increased in Denmark at a fairly moderate

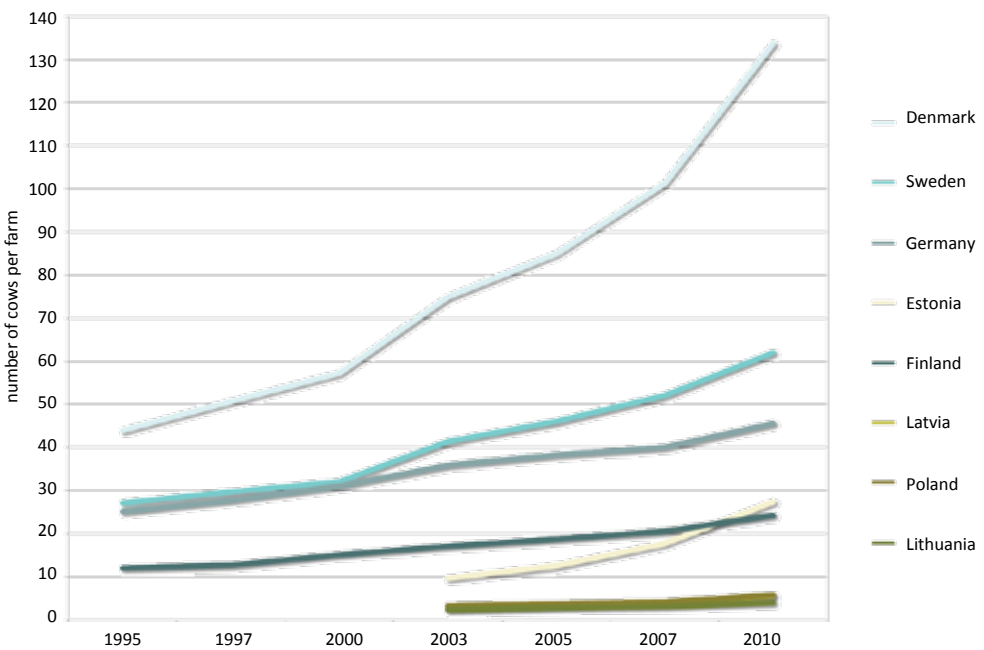


Figure 30. Average farm size development.

Source: Eurostat.

pace until 2000, when the pace of milk farm structure development accelerated, following precisely the same pattern as observed in the labour productivity curve.

Average farm size development of Sweden and Germany also resemble the development of labour productivity of the two countries. Sweden set off with a slightly higher average farm size in 1995. The two countries' farm structure developed at a relatively similar rate in the first half of the 2000s the process finally accelerated in Sweden in the last five years leaving Germany slightly behind, again precisely the same pattern as observed in the case of labour productivity development.

Finland started with a much lower level average farm size and the farm structure has changed at a steady albeit rather modest rate throughout the entire period. It reached the 1995 level of Sweden by 2010 – almost exactly the same way it did in the case of labour productivity development.

The similar evolution of milk farm structure and labour productivity is due to the close relation of farm size and the technical organisation of work in various typical dairy farm size categories.

In the case of new EU member states the initial positions in average farm size and the speed of farm structure changes also explain the different pace of labour productivity development. A similar parallel can be identified concerning the rankings of two indicators within the group of the new member states and in relation to the positions of the old member states.

Prior to their accession to the EU in 2003 Estonia had over three times higher starting level of average farm size compared to Latvia, Poland and Lithuania. The pace of concentration has also been much sharper than in the other three countries, again an identical development to that of labour productivity. Apparently, the rapid farm concentration has been behind the fast catching up of Estonia's labour productivity towards the old member states, while a much slower concentration process seems to be responsible for the slower catching up of other countries.

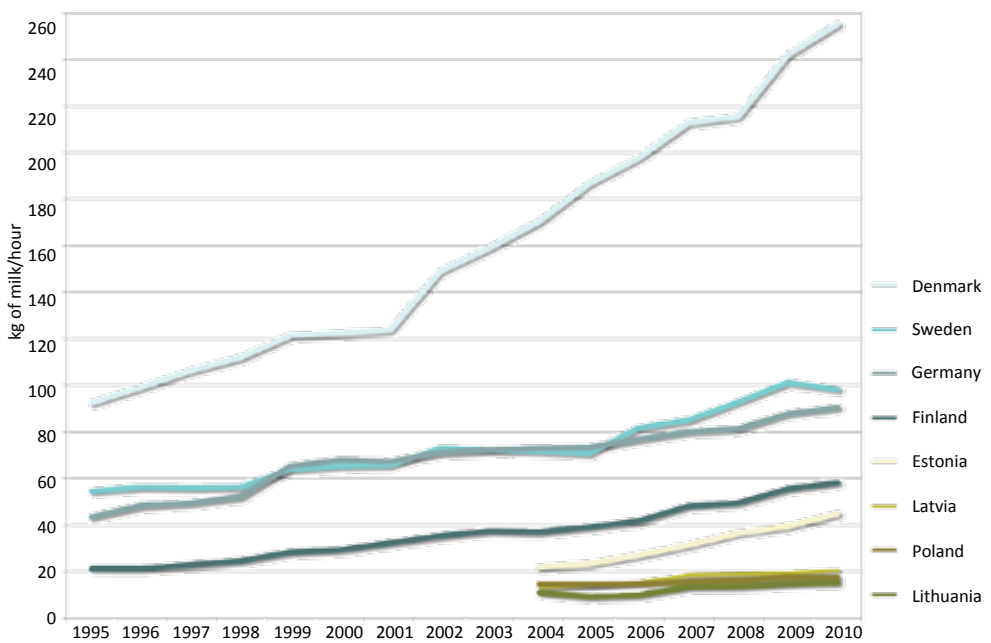


Figure 31. Evolution of labour productivity in dairy farms.

Source: Eurostat.

There is, however, one exception to the numerous similarities between farm structure and labour productivity evolution. Estonia's 27 cows per farm already exceeded the average farm size of Finland of 24 cows in 2010. In terms of labour productivity Estonia's catching up is obvious but as of yet there has not been a flip in the ranking positions. This can be explained by the substantially different wage levels between the old and new member states. Salary differences between the two groups of countries may be three to fivefold. The inexpensive labour costs do not force large Estonian dairy farms to reduce their labour inputs radically. As the other side of the coin lower salaries impose a severe challenge on the Estonian dairy farms to find professional skilled labour force. Low wages often cause lack of motivation and non-efficient work.

3.3.3 The two components of labour productivity

As discussed in the methodology section, labour productivity has two components, milk yields and labour requirements per dairy cow, which we now investigate. Figure 32 shows that there are important differences in yields across countries, but that three groups of countries can be defined at the end of the period:

- The yield leaders include Finland, Denmark and Sweden. For those countries, a dairy cow produces on average roughly 8500 kg of milk.
- Germany and Estonia form an intermediate group of countries, with yields around 7500 kg per dairy cow.
- The "laggard" countries - Latvia, Lithuania and Poland - display yields around 5 000 kg per dairy cow.

Milk yields are clearly increasing over time (Figure 32 and Table 20) but the speed of the growth is limited, usually under 2 % annually. The exception is Estonia, which managed to close its yield gap with Germany after joining the EU. From 1995 to 2010, the Finnish, Danish, and Swedish yields converged and the calculations suggest that growth in yields beyond 8 000 kg is becoming increasingly difficult. In particular, one notes that yields have not increased much among the yield leaders over the last four years of the study, and Table 20 also shows that for all four old EU member states but Sweden, growth in yields over the period 2004-2010 was significantly less than over the period 1995-2010.

Hence, one can postulate that the biological innovations supporting yield growth, such as better genetics and improved feeding, are reaching a phase of marginal decreasing returns. This means in particular that improving performance on Finnish dairy farms through yield increases is becoming more and more difficult. On the other hand, as exemplified by the Estonian experience, Latvia, Lithuania and Poland probably have the potential to raise their productivity considerably through the achievement of higher yields.

Text box:
The trade off between milk yield and fertility

Milk yield is the natural productivity indicator that has received much attention both by breeders and economists. It is indisputable that high milk yields contribute to the economic well being of farms via high milk production volumes and income. The indicator is easy to calculate, interpret and its growth is a matter of proud for individual farms and national dairy sectors. The undesirable side effect to high milk yields is, however, low fertility of cows.

The trade off between yield and fertility was realised a long time ago. Pryce et. al. 2004 reviews a great number of scientific articles that verify the negative correlation. The fact that the same genetic features are responsible for a higher yield and lower daughter fertility affects all dairy breeds. Nevertheless, breeding programs of the past decades have too intensely focused on increasing milk yields. Fertility or resistance to diseases did not receive so much emphasis in the selection criteria. This especially applies to the breeding programs of Holstein, which breed has been taking up dominant positions in Northern European stocks of dairy cows.

The negative correlation between milk yield and fertility also came up in the farm interviews of this project regardless of the country. An endeavour for high yields tends to press down the average age of cows, and the average lactation periods remain well below three. Several farms mentioned that cows have to be replaced after their first or second lactation due to fertility problems.

Although often overseen, fertility is an important contributor to the economic performance of dairy farms. It costs a lot to replace a young cow either by purchasing a heifer or by raising one. Some of the largest farms are apparently not concerned about the costs of frequent replacement because they “raise sufficiently many heifers in a cost efficient way”, so they keep on focusing on milk yields by eliminating cows below a threshold milk productivity level. This requires a constant supply of heifers, which only the largest farms can afford. Many other farms, however, have to take the challenge of fertility-yield trade off very seriously.

In Sweden – as well as in some other countries – record levels in the total milk produced by one cow in her lifetime is becoming a tightly monitored indicator and a subject of farmers’ proud. Heikkilä et al. (2008) showed that, due to high replacement costs and increasing milk yields by lactation, optimal timing for replacement is well over the third lactation. Both Ayrshire and Holstein breeds reach their maximum production capacity by the fifth lactation period.

A peculiar feature can be observed in the milk productivity trends of Denmark, Sweden and Finland (see Figure 32 on page 108). As soon as they exceed the average milk yield of 8000 kg/cow, the steady growth has flattened out. The declining marginal increase may be attributable to numerous reasons in farms such as success in the timing of inseminations, in the prevention of udder inflammations, and in the feeding of animals. Better management and careful skilled labour play key roles in achieving higher milk yield level on a farm basis. On the country level, the Finnish average milk yield growth may have stayed moderate due to structural reasons, many highly efficient high yield farms have recently quitted production and the new expanded farm units have not reached the productivity level of established farms yet.

In any ways, breeders and economists agree that breeding programs should equally take into account fertility and milk yields in the future. Especially in the current situation when Northern European dairy farms have increasingly shifted to a monobreed dairy cow stock with their constant pursue of higher milk yields.

Table 20. Partial productivity of dairy farms.

	Germany	Denmark	Sweden	Finland	Estonia	Latvia	Lithuania	Poland
	Milk yield							
	Level (kg of milk/dairy cow)							
1995	5538	6392	7630	6865				
2004	6747	7900	7955	8165	5653	4629	4476	4682
2010	7493	8537	8329	8592	7318	5450	5213	5056
	Annual growth (%)							
1995-2010	2.0	1.9	0.6	1.5				
2004-2010	1.8	1.3	0.8	0.9	4.4	2.8	2.6	1.3
	Labour requirements							
	Level (hours/dairy cow)							
1995	127	69	140	321				
2004	93	46	111	222	258	341	404	319
2010	83	33	85	148	163	264	340	290
	Annual growth (%)							
1995-2010	-2.8	-4.7	-3.3	-5.0				
2004-2010	-1.8	-5.3	-4.4	-6.5	-7.3	-4.2	-2.8	-1.6
	Labour Productivity							
	Level (kg of milk/hour)							
1995	44	92	55	21				
2004	73	170	72	37	22	14	11	15
2010	90	255	98	58	45	21	15	17
	Annual growth (%)							
1995-2010	5.0	7.0	4.0	6.9				
2004-2010	3.7	7.0	5.4	7.9	12.6	7.2	5.6	2.9

Labour productivity is also dependent on labour requirements, measured by the number of hours of labour per dairy cow in Figure 33 and Table 20. The results indicate that this component is much more important than yields in explaining differences in levels and growth of labour productivity. For instance, in year 2010 a Lithuanian dairy cow required on average ten times more labour than a Danish cow, and it is clearly in that dimension that Finnish farms are performing poorly compared to their competitors, with a requirement of 148 hours per dairy cow in 2010. This is more than four times the corresponding figure for Danish cows, and nearly twice the labour requirements for German and Swedish cows. It is also worth noting that Estonia is also catching up with Finland in that dimension.

Changes in the structure of milk farms have direct impacts on both components of labour productivity and this is what ultimately explains the peculiar similarities between the evolution of average farm size and labour productivity. As a general rule larger family farms tend to pay more attention to milk output per cow than smaller ones. It especially applies in the new member states to the expansion of tiny farms with few cows

Milking on a German farm.

to more market oriented production units with 10 to 60 cows.

The quick catch up of Estonian milk farms' labour productivity to the German level is also attributable to the special patterns of Estonia's dual milk farm structure and its concentration. Estonia has a few thousands of "small" herds with less than 10 cows, but over three fourth of the dairy cows are held in large herds of over 100 head. Most of the large herds feature extremely high labour productivity by international standards. Concentration is quick because the rapid exit rate of small farms, which results in the much higher weight of large farms. Consequently, labour productivity improves very fast.

Average farm size affects the labour requirement per cow through the special features of the organisation and utilisation of work at dairy farms. Up to 60-100 cows dairy farms can in principle be operated with the bare utilisation of labour input from the owner-farmer and his family members Dairy farms include a lot of fixed work phases regardless of the number of animals such as general management of the farm, maintenance of fixed assets and servicing of the equipment. Even feeding and milking involve phases such as cleaning of the milking equipment or transport of feeds on the farm, which require the same amount of work for 20 or 50 cows. The bigger the herd, the less work is needed per unit of output,

Mobile manure scraper on a latted floor.

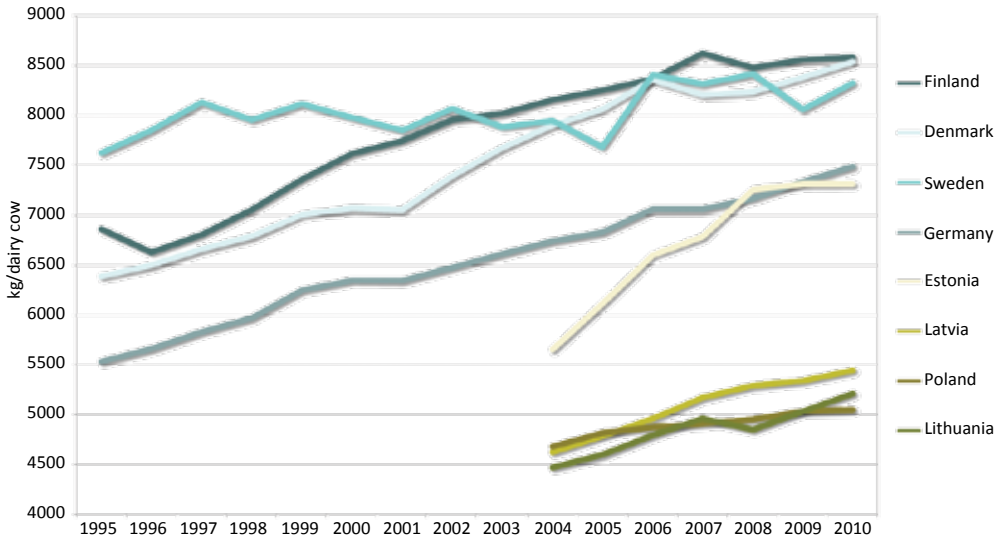


Figure 32. Evolution of milk yields.

Note: Milk productivity trends are calculated on the basis of the FADN data set and may deviate from the ones published by the national statistical institutes.

because the marginal use of labour is sharply decreasing for an additional milk cow.

In the farm size categories of over 80 cows technological development and the replacement of labour with capital have driven labour productivity growth to entirely new levels. One milking robot usually serves a 70-head herd, but single robot is rarely installed on expanding farms. Milking robots have determined the stages of farm

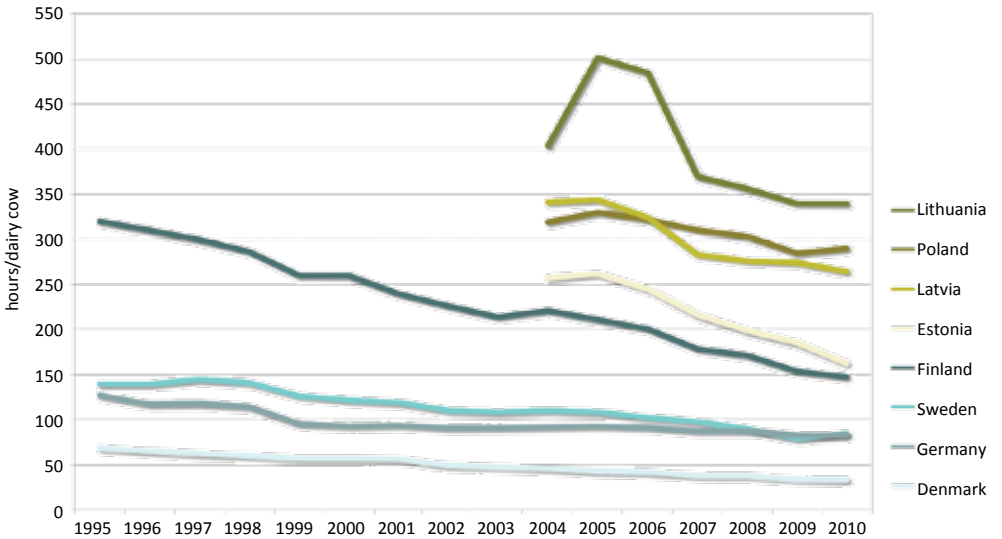


Figure 33. Evolution of labour requirements per dairy cows.

Milking robots on a Danish farm.

expansion into discrete 70, 140, 210 etc units. If robots are to be used, most usually two or several of them are installed in expanding farms, which radically decreases the amount of labour needed for one cow. Similarly feeding, cleaning and manure removal have been automated to a great extent in the new investments of over 150 cows. These technological aspects explain the sharp labour productivity development in Denmark, where the average farm size jumped from 50 to over 130 cows in just about ten years.

Expanding farms achieve higher labour productivity in all countries due to higher use of capital and better organisation of work. The technology installed in the expanding farms of Germany, Sweden and Finland is the same as in Denmark. Nevertheless, it is the intensity of new investments and the number of expanding farms that determine the pace of farm structure concentration and concurrently the pace of labour development growth. This explains the different patterns of labour productivity growth across the countries.

Farm structure development has been relatively easy to forecast, because the tendency is rather steady – unless a sharp turning point occurs for some reason, which was the case in the mid 2000s in Denmark. Given the strong relation between the two indicators, labour productivity growth can also be forecast with fairly high accuracy.

Expectations concerning the milk farm structure changes suggest that Estonia will overtake Finland in the next few years and will approach Germany and Sweden within 10 to 15 years. Labour productivity of the Polish, Latvian and Lithuanian dairy sectors will continue to rise very slowly, in fact the gap between them and the old member

Milking is very labour intensive in small farms.

states will most probably widen in the next one or two decades due to the heavy weight of small farms and their relatively slow quitting rates. Concurrently, the quitting rates in the old member states, especially in Sweden and Finland is expected to speed up in the coming years – partly for policy reasons. In Finland, e.g. the age limit of a quitting farmer is planned to be extended from 56 to 59 years and the quitting subsidy eventually phased out. As a result, labour productivity in Finland and Sweden is supposed to set off to a sharper growth than in Germany. However, in exchange for the faster labour productivity growth the quitting wave will also imply a further decline in milk production volumes which the German milk farm sector will not suffer from. Due to an almost complete halt in farm investments in the Danish milk farm sector over the past three years, the labour productivity curve will flat out close to its current level.

Text box:
Danish dairy farms in a financial grasp

In Europe, structural change in dairy farming has been fastest and most radical in Denmark. Within only seven years from 2000 to 2007, the share of farms with more than 100 dairy cows increased from 27 % to 75 %, while average herd size almost doubled from 57 to 101 cows per farm. Further, that trend shows no sign of ending, as the latest figure for year 2013 gives an average of 164 cows/farm.

Extremely fast structural change and enormous investments have boosted labour productivity growth, so that the Danish milk sector now belongs to the most modern ones in the world. However, there is another side of the coin to this success story. Fast structural change took place at a time of economic boom by relying heavily on investments made possible by financial innovations but, in the wake of the latest financial and commodity crises, this has resulted in the severe financial vulnerability of many expanding farms.

Agriculture has traditionally been considered a stable sector in Denmark with little fluctuation in asset values and steady demand. During the years of economic boom before 2008, access to bank loans was made easy and banks competed fiercely to finance farm expansion in the dairy sector. According to some farmers, banks provided such easy access to loans that they contributed to the survival of badly managed farms, and the bankruptcy rate of farms fell notably in the mid-2000s.

The overheated period of investment stopped with the crisis of commodity prices in 2007-2009 and the global financial crisis in 2009. First grain prices rocketed in 2007/08, hence increasing feeding costs. Then global milk prices reached their peak in 2008 just to experience the following year their sharpest dive in decades. Fixed farm assets such as land, equipment and buildings got overvalued in the middle of 2000s, and the bubble burst in 2009, resulting in a serious devaluation of farms.

Several small and middle-size provincial banks fell victim to the sudden changes that brought about a high share of bad loans (Ward, 2011; Wienberg & Schwartzkopff, 2012). As a result of asset devaluation, loans to dairy farms were virtually frozen, which halted structural development and reduced trade of agricultural land and dairy farms drastically. Banks have now reduced their involvement in the agricultural sector, and new loan applications are scrutinised extremely carefully. Market entry has almost been non-existent for the past four years. The purchase of a dairy farm is currently out of the question, since no one has the starting capital nor access to loans to invest in the dairy sector.

The combined devaluation of assets and discontinued access to bank loans resulted in an extremely difficult situation for retiring/quitting dairy farmers, who intended to cash in the assets accumulated throughout their lifetime. Adjustments in asset prices have reduced the value of farms to about 50-60% of their level in the mid-2000s, but even this lower price is impossible to realise in the face of sluggish demand.

Danish dairy farms are extremely indebted, which is shown for instance by a low equity to assets ratio. The ratio has continuously declined over the past years, primarily because of the constantly increasing debt burden. On average own capital, or equity, made up 17 % of the dairy farms' total assets in 2012, but for plenty of large farms the share of own capital was lower than 10 %. Equity also decreased in absolute terms due to the writing off of fixed assets such as milk quotas and land devaluation. The bigger the farm is the lower the equity to assets ratio gets. Investment needs have been enormous in farms with over 320 cows, so that debt accounts for almost the totality of assets. The farms with less than 80 cows tend to have been in operation for a long time and their share of equity is consequently much bigger.

Farms also differ in terms of profitability, a fact primarily due to management techniques and organisational issues. The best third of farms achieve positive profit, while the worst third accumulate losses regardless of their size.

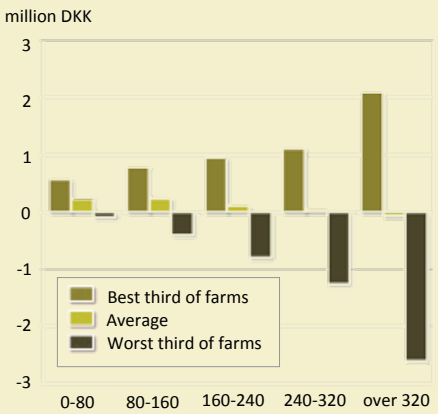
Average own capital and total assets of Danish dairy farms

Year	2007	2008	2009	2010	2011	2012
Equity (in million DKK)	11.5	9.5	7.6	7.3	5.2	4.7
Total assets (in million DKK)	25.9	29.6	28.4	30.2	29.0	28.1
Equity to assets ratio (in %)	44.5	32.0	26.8	24.0	17.9	16.7

Source: Andersen 2012 and 2013 (Produktionsøkonomi Kvæg).

The largest farms with over 320 cows have the toughest financial situation, as over half of them struggle with losses. These farms experienced a deep dive in profitability in the years following the financial crisis, but their average farm income ascended close to zero by 2012. Similarly the average loss of the worst third of farms also became smaller by 2012.

There is still a huge discrepancy within the group of the largest farms. Besides management techniques this is attributable to the amount and differences in the composition



Spread in farm income in 2012

Source: Krog in Andersen, 2013, p. 37.

of their debt. Within the total debt of all Danish milk farms 65 % is flexible mortgage debt, 23 % is bank loans, while the rest is fixed rate mortgage debt and non interest bearing operating liabilities (e.g. debt to supplies, VAT payable). Repayment time for the mortgage loans ranges from 10 to 30 years, their interest rates can be either flexible of fixed. About 85 % of farms have over 70 % of their mortgage debt with a flexible rate (i.e. category F1 of quickly changing rates, bound to the 3m, 6m or 12m Euribor). Furthermore, 56 % of dairy farms have their entire mortgage debt on flexible terms. These farms are considered to be in an extremely risky financial situation, so that the short term bank loans are given to them with an interest rate of up to 8-12 %. Some farmers have reached such a poor cash flow that they need revolving credit even for financing their interest payments.

The ability to service this high level of debt creates a serious risk for many farms. Currently interest rates are relatively moderate and milk prices are favourable, but a sudden change in either of these parameters would prompt a set of domino effects. According to expert estimates, a three percent increase in interest rate would push about 50 % of dairy farms out of business.

This raises the question of what would happen to milk production if a sudden financial crisis pushed plenty of large dairy farms into bankruptcy. Danish experts are convinced that even a series of bankruptcies would not disrupt milk production substantially. Since the assets of the bankrupt farms are owned by the banks, those would simply seize the assets, appoint a manager and, in the long run, resell the farm to a new entrepreneur. The Danish system is straightforward, with bankruptcies of farms being a part of everyday life. There is a functioning market for farms in Denmark, where taking over a farm from one's parent only represents one option among many for the transmission of farm assets. In the end, however, a relevant question remains: are there sufficient skilled and motivated entrepreneurs to manage and take over the assets of bankrupt farms from banks? Continuity in the management of large milk farms is an essential condition for the future success of the Danish dairy supply chain.

3.3.4 Total Factor Productivity

TFP growth

TFP growth will be investigated with a growth accounting exercise first focusing on the old EU member states. Figure 34 demonstrates graphically that in all four countries productivity of dairy farms has increased significantly from 1995 to 2010, with the total increase ranging from 43 % for Germany and Sweden to almost 60 % for Finland.

Although, overall, Finland displays the largest rise in TFP, differences among the four countries are small and vary from year to year, so that not too much should be read from the final ranking. In particular, we note that the increase in productivity in Finland has been very comparable to that in Denmark, and that in the last two years of the study period (from 2008 to 2010) Finland moved from third to first in terms of overall increase in TFP. Thus, TFP growth has been roughly comparable in the four countries considered here. Although dairy farms in Sweden and Denmark have experienced a sharp decrease in TFP in year 2010, the analysis suggests that this is only a temporary phenomenon. However, only the addition of more recent data will permit to check the validity of that conjecture.

Table 21 provides the full growth accounting results, from which it is clear that productivity growth in the four countries, although of a similar magnitude, has been achieved through different channels. Output per farm has expanded in all four countries, but the annual growth rate for Denmark (10.4 %) stands out as particularly high (the corresponding rate for Finland is only 6.4 %). We also note that growth in milk production in Finland accounts for a much larger share of total output growth than in the other countries (87 % versus 64 % for Sweden for instance). Thus, dairy farms in Finland are

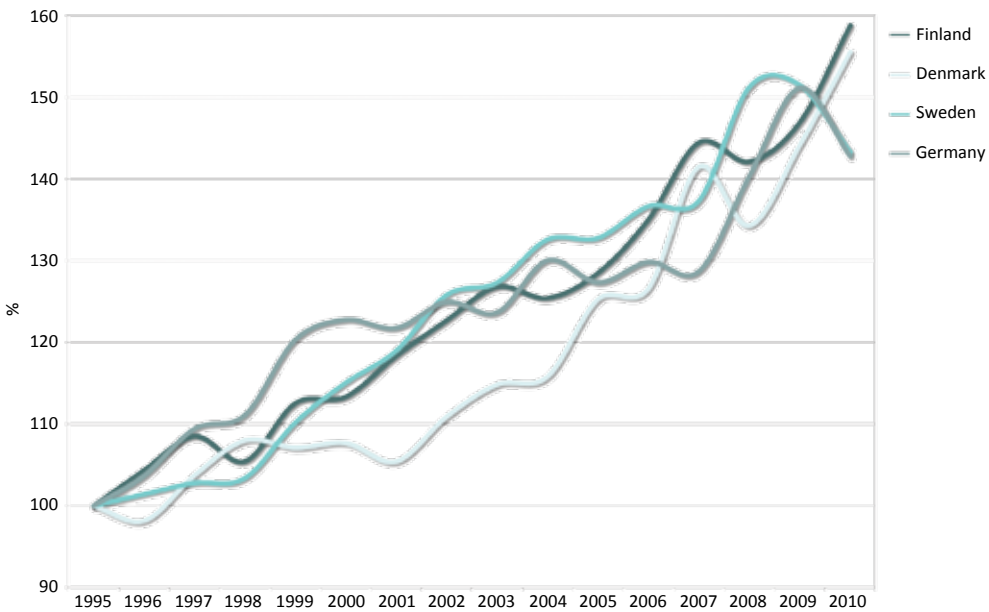


Figure 34. TFP growth in Finland, Sweden, Germany and Denmark, 1995-2010.

Table 21. Growth accounting - Finland, Sweden, Germany and Denmark, 1995-2010.

Country	Annual output growth (%)				Annual Input growth (%)					TFP growth (%)
	TOTAL	Milk	Crop	Livestock	TOTAL	Feeds	Capital	Labour	Other	
Germany	**5.6**	4.4	0.8	0.4	**3.1**	1.0	1.1	0.2	0.7	**2.4**
Sweden	**7.4**	4.8	1.9	0.6	**4.9**	2.2	1.3	0.9	0.4	**2.4**
Denmark	**10.4**	7.3	2.4	0.5	**7.2**	2.9	3.1	0.5	0.4	**3.0**
Finland	**6.4**	5.6	0.5	0.3	**3.2**	1.1	1.8	-0.1	0.3	**3.1**

becoming relatively more specialised than those in the other three countries.

The input side section of Table 21 reveals that a large share of the growth in output has been achieved by increasing the quantities of production factors, at an annual rate varying from 3.1 % for Germany to 7.2 % for Denmark. The countries with the highest output growth rates are also those with the highest input growth rates and there is therefore no "miracle growth". In all countries, other inputs are substituted for labour, but the relative contributions of feeds and capital to input growth vary. For instance, the contribution of capital investments to input growth is much larger in Finland than in Sweden, where the increase in feeds has played a quantitatively larger role. Denmark stands out by the importance of capital to input growth, which reflects the high level of investment by Danish dairy farms over the last two decades.

We now present the results of the growth accounting exercise for the four new entrants over the period 2004-2010. The evolution of the TFP index presented graphically in Figure 35 indicates that the situation for those countries is not very stable, with important year-to-year variations in the productivity of dairy farms. The shock of entry into the EU was followed by a decline in productivity, which stopped between 2006 and 2008, followed by some productivity growth, but TFP actually decreased again in three countries in year 2010. The frustratingly short time series make it difficult to infer long-term trends.

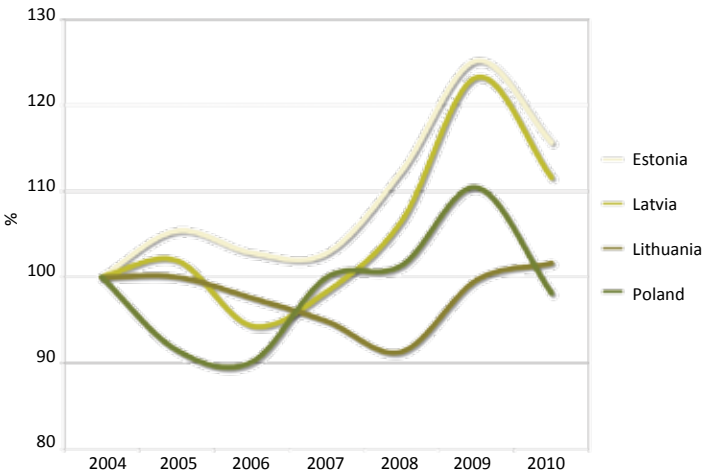


Figure 35. TFP growth in Poland, Estonia, Lithuania and Latvia, 2004-2010.

Table 22 presents the full growth accounting results for all eight countries from 2004 to 2010. Over that period, Finland had the second highest TFP growth rate, with farm productivity growing faster only in Denmark. TFP

Table 22. Growth accounting and TFP growth for milk farms, 2004-2010.

Country	Annual output growth (%)				Annual Input growth (%)					TFP growth (%)
	TOTAL	Milk	Crop	Livestock	TOTAL	Feeds	Capital	Labour	Other	
Germany	**5.7**	4.0	1.2	0.4	**4.0**	1.6	0.8	0.5	1.1	**1.6**
Denmark	**13.7**	7.1	5.5	0.6	**7.9**	5.1	1.7	0.5	0.5	**5.8**
Sweden	**4.5**	4.4	0.0	0.1	**3.2**	1.4	1.1	0.5	0.2	**1.3**
Finland	**6.7**	5.9	0.6	0.1	**2.6**	1.1	1.3	-0.4	0.5	**4.1**
Estonia	**6.1**	4.5	1.2	0.4	**3.6**	2.7	1.6	-1.1	0.4	**2.5**
Latvia	**0.8**	2.6	-1.4	-0.4	**-1.0**	0.1	0.3	-0.8	-0.6	**1.8**
Lihthuania	**7.3**	4.1	1.7	1.4	**7.7**	1.0	5.9	0.5	0.1	**-0.3**
Poland	**3.8**	2.5	0.3	1.0	**3.5**	1.1	1.8	0.2	0.4	**0.3**

growth was significantly larger in Finland than in the four newer EU members, and there is therefore no evidence that those countries are catching up in terms of TFP, as could have been thought at least for Estonia by focusing on partial productivity indicators. Overall, productivity growth does not seem to be slowing down in Finland: Over the 2004-2010 period, there is a gap in productivity growth rates between Finland and Sweden as well as Germany, but its significance should not be exaggerated as it depends heavily on the calculation for the last year of observations (i.e., and large decrease in TFP for both Sweden and Germany). Nevertheless, the finding gives an early indication that Finnish dairy farmers may be in the process of catching up German and Swedish dairy farmers in terms of productivity.

TFP levels

The results of the DEA (Data Envelopment Analysis) exercise are presented in Table 23. DEA is a benchmarking technique that measures the performance of a unit (e.g., firm, sector, country) relative to that of a peer group. The result is expressed as an efficiency score representing the share of maximum achievable output actually produced by the unit, given the state of the technology, which is inferred by observations on other units of the peer group. Hence, a 100 % efficiency score indicates that the unit is efficient within the peer group: it could not produce more, given its use of inputs and the state of the technology. A score of less than 100 % is indicative of inefficiencies.

Because a large number of observations are required to build the efficiency frontier, but that farm-level data were only available for Finland, and although that is not ideal, the peer group that is chosen is the set of dairy farms in the Finnish FADN. Two models are then considered: Model 1 includes the eight FADN country averages when estimating the efficiency frontier and Model 2 leaves them out. The countries were then compared using DEA and data for year 2004 – the latest year for which the Finnish farm-level data was readily available. We must acknowledge that this is far from ideal and may distort the comparison, as considerable structural change has occurred on Finnish dairy farms over the last ten years (i.e., in 2004 very few Finnish farms were comparable in size to Danish ones). This could also explain the large difference in the Danish efficiency scores between the two models, which reveals a relative lack of robustness of the results and hence invites caution when interpreting them.

Table 23. Cross-country differences in productivity levels (DEA efficiency scores in %).

	Denmark	Germany	Sweden	Finland	Lithuania	Poland	Latvia	Estonia
Model 1	100	86	70	63	65	62	61	70
Model 2	152	86	70	63	65	62	61	72

The results indicate that, as expected, Denmark is the clear productivity leader, although the size of the productivity gap depends on the choice of peer group. Among the old EU members, Finland has the least efficient dairy farms, although the cross-country productivity differences are not as large as suggested by the labour productivity indicator. For instance, the productivity difference between Finland and Sweden is a modest 11 % ((70 %-63 %)/63 %), which is much less than the difference in labour productivity between the two countries reported in Table 20. Nevertheless, the DEA results confirm that Finland suffers from a productivity deficit with respect to not only Denmark but also the old EU members of the Baltic Sea region (Sweden and Germany).

More surprisingly, the analysis indicates that farm productivity levels were comparable in Finland and several new EU entrants (Latvia, Lithuania, Poland) in year 2004. Estonia achieved the lowest level of productivity, but this was before the TFP growth evident in Figure 35. Although this DEA analysis should be treated with caution, it suggests that the farm dairy sectors of the four new EU entrants considered in this study are reaching productivity levels comparable to those in Finland. One reason for the relatively better results of the new member states is the coverage of FADN data, in which only farms with economic size of over 4 000 EUR are considered. The result are distorted by ignoring the smallest farms, since due to their high weight they'd make a great impact on the productivity results of Latvia, Lithuania and Poland.

3.4 Results for dairy processing

3.4.1 Partial productivity

Figure 37 and Table 24 report the levels of labour productivity in the dairy processing sector of the eight countries from 1995 to 2010, using as indicator the deflated value of output per worker. The four new entrants stand out by their relatively low levels of productivity compared to the older EU members, but also by relatively high rates of productivity growth. For instance, the productivity of workers in the Lithuanian dairy processing sector grew at the impressive annual rate of 10 % from 2000 to 2010, but this growth was achieved from an initially low level: in year 2000, a worker in Lithuania was producing 13 times less than an equivalent worker in Germany. Hence, a process of convergence in labour productivity in dairy processing has started, with the relative "laggards" growing faster than the relative leaders. As a result, in year 2010, the ratio of the highest level of labour productivity, for Germany, to the lowest one, for Latvia, had shrunk to seven. This also means that cross-country differences in labour productivity, while still large, are now smaller in the dairy processing sector than in primary production.

On the basis of the labour productivity indicator, the Finnish dairy processing sector appears to be competitive. Although output per worker is significantly smaller in Finland than in Germany, the difference

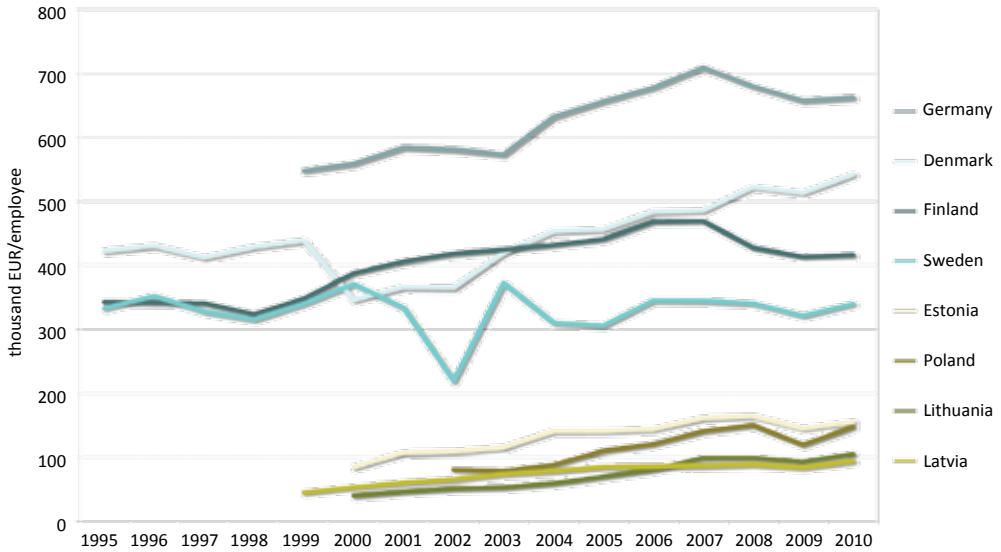


Figure 36. Labour productivity in dairy processing - output per worker in 2010 prices.

Note: data is also presented in Attachment 2.

disappears when expressing labour productivity in terms of value-added (rather than output) per worker (Table 25, Figure 36). This means that German dairy manufacturers use more intermediate inputs per worker than Finnish ones, which probably indicates a relatively higher level of processing of the agricultural raw material in Finland. Unfortunately, the data required to calculate value-added per worker in the Danish dairy processing sector is not available after 1999.

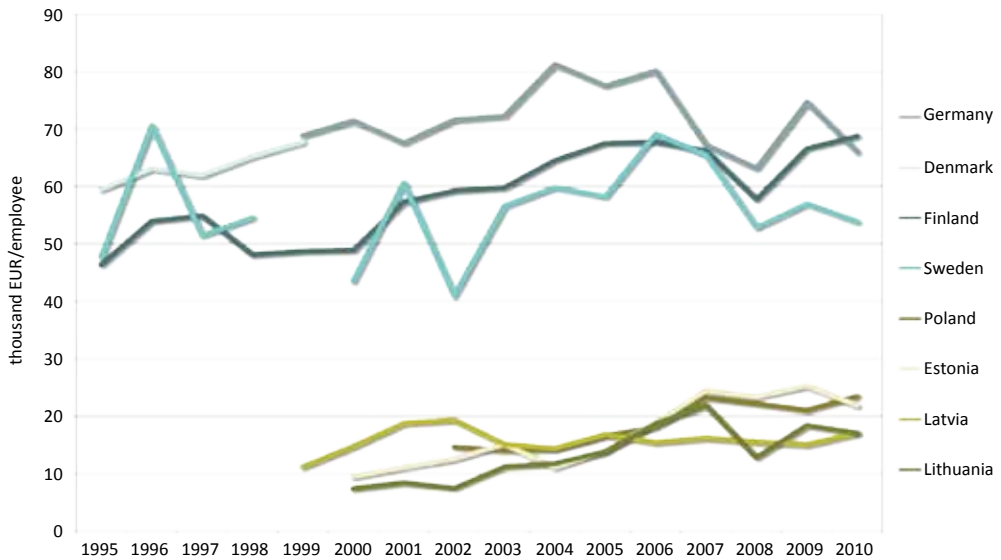


Figure 37. Labour productivity in dairy processing - value added per worker in 2010 prices.

Note: data is also presented in Attachment 3.

Yoghurt production line in Arla Foods' Braband dairy in Århus.

Focusing on the four older EU members, it is evident that growth in labour productivity has been much faster on farms than in the processing sectors. In the case of Finland, for instance, labour productivity grew 6.9 % a year on average in primary production (Table 20), while the corresponding figure is only 1.3 % in the processing sector. The same pattern is visible in the three other Western countries, with Sweden standing out by the quasi absence of labour productivity growth in its processing sector. Hence, most of the productivity growth in the dairy chains of the old EU members has been achieved on farms, while this is not necessarily the case for the four relatively newer EU members.

Labour input has typically been reduced in the dairy industries throughout Europe and together with the increasing real output it has resulted in some labour productivity growth everywhere. The share of labour input in the dairy industry's cost structure is however quite modest, under 10 % for most of the countries in the comparison. Due to its small weight the labour input's relative impact on total factor productivity is also rather low.

3.4.2 Total Factor Productivty

The results of the growth accounting exercise are presented in Table 24. Unfortunately, only seven countries are represented in the table because the required cost structure data for Denmark were not available. In the case of the four new EU members, satisfactory output data and price deflators could not be found prior to 2000 and the analysis therefore starts in that year. For the old EU members, the calculations are carried out from 1995, but the results of the growth accounting exercise are also reported in the table over the 2000-2011 period to facilitate comparison across countries. The full time path of the TFP index is also depicted in Figure 38.

The results of the TFP calculations are roughly consistent with those established on the basis of the labour productivity indicator. As for the processors in the old EU member countries, TFP in Finnish dairy processing grew at only 0.32 % annually over the full study period, which rate appears satisfactory in relative terms given that TFP actually decreased slightly in Germany and Sweden over the same period of time. In Finland, output of the dairy processing sector has been almost stagnant, but productivity has increased due to a slow and steady reduction in inputs – mainly labour and materials.

The finding that Finnish TFP growth in dairy manufacturing has been slow in

absolute terms but relatively fast by EU standards matches the evidence gathered in a report investigating the productivity of the Danish food processing sectors (Fødevareøkonomisk Institut, 2011). The report shows that TFP growth in food processing in the mature economies of the EU and the USA has typically occurred at a rate of less than one percent a year, with Finland ranking second in terms of that indicator in a comparison of 13 countries (Fødevareøkonomisk Institut, 2011, Table 2, p. 12).

The slowly eroding market positions of the Swedish dairy industry have been responsible for the half percent annual decrease in TFP. Sweden is the worst performer of the compared countries, and the decrease in TFP is explained primarily by a decrease in real output (-1.17 % annually) only partially compensated by a decrease in inputs (-0.71 % annually). The Swedish dairy industry has never been strongly export driven and it has lost considerable shares on its primary operating area, the domestic market, due to a constant increase in imports. The reduction in material inputs has only exacerbated the downward trends. Dairy companies have struggled with the scarcity of milk supply, preventing them from utilising their processing capacity fully. Although 50 to 110 million kg of milk was imported from Denmark between 2009 and 2011, that has not substantially solved the problem. Despite the potentially flexible solutions that the giant cooperative-based company provide between the two countries, the Danish farmers' interest is to utilise most of their milk within Denmark and maximise earnings via the exports of processed products. When comparing the TFP growth rates in dairy processing and primary production,

Cheese manufacturing in Germany. The production process is automated, and the German dairy industry had the highest labour productivity in the comparison.

Figure 38. Evolution of TFP in dairy processing, 2000-2011.

it is also evident that the bulk of productivity growth in the dairy chains of the older EU members has originated on farms.

When we extend the comparison to include the four new EU members, the results of the growth accounting exercise confirm the conclusion reached on the basis of the labour productivity indicator: productivity growth in the newer EU members is occurring at a faster rate than in the older EU members, so that the former are steadily catching up with the latter in terms of TFP. However, the situation is not homogenous: the dairy processing sectors of Poland and Lithuania have experienced much faster productivity growth than those of Latvia and Estonia (3.66 % and 2.39 % versus 1.49 % and 0.28 %). In the case of Poland, output growth (5.12 % annually) has outstripped input growth (1.40 % annually) by a large margin, hence suggesting that the sector has been particularly successful in adding value to the raw material that it processes and realising this value from the market.

The catching up process of new member states is apparently faster in the case of TFP growth in processing than in dairy farming. One can postulate that transferring technologies from the productivity leaders to the productivity "laggards" is easier in the manufacturing sector than in primary production, due to the typical difference in the size of firms as well as the more pronounced reliance of the primary sector on biological processes dependent on country-specific agro-ecological conditions.

We note that output has also grown quickly in the two countries performing best, supporting the idea that productivity growth is more easily achieved in the dairy sectors that are expanding rather than shrinking. The findings in Table 24 verify that the development of the output index largely determines the TFP results, since input changes tend to remain relatively more moderate.

Several factors explain the development of the output index and resulting TFP growth for the four new EU member states.

First dairy companies in Poland, Lithuania and Latvia have enjoyed the lowest milk prices in the EU. Due to the high share of milk in the cost structure of the dairy industry, this has granted a remarkable cost advantage to those countries. This, however, does not unveil the difference in growth among the three countries. Market performance is the most important factor that has explained the superb output and TFP growth of Poland and Lithuania. Poland has a vast domestic market, where disposable income has grown almost constantly between 1995 and 2008. The Polish market provided adequate ground for a spectacular growth for the widening assortment of highly processed fermented products, cheese and other dairy products of the domestic manufacturers.

Numerous foreign dairy companies entered the Polish dairy industry already in the 1990s and early 2000s from France, Germany and Denmark. Although they have never captured considerable market shares in the Polish dairy industry, they introduced a wide assortment of high value added dairy products at once. Polish dairy manufacturers have enjoyed the spill-over effects of FDI by adapting the management and marketing techniques, product development and other operational methods from the foreign-owned units. Strengthened by the volume growth on the domestic market, Polish manufacturers have become financially strong to conquer increasing shares in export markets, particularly in those of the other new member states, but their affordable dairy consumer products have also gained a foothold in the old member states. Another important precondition of the Polish success has been the abundant raw material available within the domestic market.

The Lithuanian success has had slightly different components. Since the domestic market is rather limited it's been a necessity for Lithuanian dairy companies to concentrate on export markets. Nearly 50 % of the industry's sales revenues originate from exports, a share comparable only to that of

Table 24. Growth accounting in dairy processing.

	Annual output growth (%)	Annual Input growth (%)				TFP growth (%)
	TOTAL	TOTAL	Materials	Labour	Capital	
	Period of 1995-2011					
Germany	**0.37**	**0.62**	0.82	-0.16	-0.04	**-0.25**
Sweden	**-1.17**	**-0.71**	-0.27	-0.45	0.01	**-0.46**
Finland	**-0.11**	**-0.43**	-0.30	-0.13	0.00	**0.32**
	Period of 2000-2011					
Germany	**0.51**	**1.09**	1.18	-0.06	-0.03	**-0.57**
Denmark	**1.48**	**..**	..	..	..	**..**
Sweden	**-1.41**	**-1.30**	-0.82	-0.49	0.01	**-0.11**
Finland	**0.53**	**-0.20**	-0.21	0.00	0.01	**0.73**
Lithuania	**5.29**	**2.83**	3.19	-0.36	0.01	**2.39**
Latvia	**1.89**	**0.39**	0.79	-0.46	0.06	**1.49**
Estonia	**-0.68**	**-0.96**	-0.78	-0.28	0.10	**0.28**
Poland	**4.87**	**1.75**	1.91	-0.22	0.06	**3.06**

Denmark. Lithuanian dairy manufacturers have shown astonishing capability since the 1990s to quickly reorient their exports from Russia to US or to the EU depending on the changing political and economic environment between.

By the EU accession it became clear that access to raw material is the biggest impediment to further growth of the Lithuanian dairy industry. Until the mid 2000s the three Baltic countries' dairy industry output indices developed hand in hand, but between 2005 and 2007 Lithuania detached from its two neighbours. Lithuanian dairy manufacturers started to purchase milk from Latvia and Estonia creating a scarcity of raw material and fierce competition for milk in both countries. This very phenomenon of Baltic cross country milk trade explains the concurrent output growth of Lithuania and output decline of Latvia and Estonia in the second half of the 2000s. By 2012 nearly one-fourth of the milk utilised by the Lithuanian dairy industry originated from the Baltic neighbours, while Latvia and Estonia exported 36 % and 23 % of all their collected milk, respectively. With a slight exaggeration we can say that to a high extent Lithuanian output growth was possible at the expense of Latvian and Estonian growth rates.

This raises the question of why the Estonian and Latvian dairy industry has not been able to fight more effectively against their dwindling raw material base. Differences in industry structure and foreign trade provide the answer. By the turn of the millennium Lithuania's dairy industry consolidated to three to five major companies, while dairy industries remained more fragmented in Latvia and Estonia. This resulted in a size difference of two to three times in favour of the Lithuanian companies by the early 2000s. A decade later the difference is still the same to the Estonian market leaders and the gap even widened in relation to the biggest Latvian dairies. Apart from the financial strength, Lithuanian companies have managed to build their export channels for their dairy products e.g. to Russia. Latvia's and Estonia's dairy exports to Russia were impaired by political disputes (border and minority issues) up until their EU accession. Finally, although the three Baltic countries are small, Lithuania has the largest domestic market. As a result of these factors, Lithuanian dairy industry had a better and stronger initial state for growth at the point of the Baltic countries EU accession, and that strong starting position was only reinforced afterwards.

3.5 Summary of the productivity calculations

Our analysis reveals that, in terms of productivity levels, Finnish dairy farms are lagging significantly behind farms in Denmark, Germany and Sweden. Average productivity of labour employed on milk farms is at least four times less in Finland than in Denmark, and 40% less in Finland than in Sweden. The DEA results, which include all production factors in the comparison, confirm that Finnish dairy farms suffer from a productivity deficit relative to farms in the old EU members of the Baltic region, although the magnitude of the deficit is much less than suggested by the partial productivity indicator.

Looking at the temporal evolution of the situation, we find that growth in farm-level production in the four older EU members has occurred through different channels, but that average annual TFP growth rates have been roughly comparable from 1995 to 2010 across countries. Hence, there has been no "miracle growth", in the sense that countries having experienced fast output growth have also expanded their use of inputs rapidly through investments and intensification of production. Altogether, the competitive position of Finnish dairy farms relative to their counterparts in Sweden, Germany and

Denmark has not changed greatly over the last two decades. The innovations, investments and restructuring that have taken place on Finnish farms have delivered fast improvement in efficiency, but the problem from a Finnish perspective is that other older EU members of the Baltic Sea region have followed a similar course. Unfortunately, given that Finnish farms started running on this "technological treadmill" with a relatively low productivity level, they remain lagging behind with regard to that competitiveness indicator. In fact, similar rates of TFP growth across countries imply that the absolute gap in productivity between Finland and the leaders is widening.

When focusing on the more recent past, however, the results are more encouraging, as we find that since the UE enlargement in 2004, TFP on Finnish farms has grown much faster than on German and Swedish farms. Altogether, Finnish farms may be in the process of raising their TFP levels to those of German and Swedish farms, while Danish farms seem in a league of their own in that competitive dimension. However, while acknowledging the efficiency of Danish farms, it is also important to recognise that the development of the Danish dairy sector, and in particular its heavy reliance on debt to finance investments, raises serious questions about its sustainability (i.e., once interest rates start increasing to levels considered normal by historical standards).

Cross-country differences in farm labour productivity are driven primarily by differences in labour requirements per cow, while differences in milk yields account for a much smaller share of the difference. This suggests that the key to high labour productivity in dairy is the farm structure and the adoption of mechanical innovations, while differences in adoption of biological innovations (e.g., genetic improvement, feeds) are relatively less important. This is reinforced by the finding that yield growth has been relatively slow in the old EU members and appears to become increasingly difficult.

Extending the comparison to include the newer EU members reveals that dairy farms in those countries are lagging behind their counterparts in the old member states in terms of TFP and are not catching up. Although Estonian farms, which are on average relatively large, have recorded impressive increases in yields and labour productivity, this has been achieved more by substitutions of other production factors for labour than real efficiency gains.

The processing level of the Finnish dairy supply chain appears more competitive when benchmarked against the processing sectors of the older EU members, although TFP growth has been slow in absolute terms (only 0.7% per year). Hence, most of the productivity gains achieved in the Finnish dairy sector originate from farms rather than the industrial sector, and a similar situation is observed in the other older EU members. This contrasts with the results for some of the newer EU members, and most notably Poland and Lithuania, where TFP in dairy manufacturing has increased at more than two percent annually since those countries joined the EU. Hence, a process of convergence in productivity has started in dairy processing, with some of the newer EU members making quick progress towards the productivity levels observed in the older EU countries, including Finland.

Given the increasing trade in processed dairy products across the Baltic Sea region, this represents a competitive threat to the dairy sectors in the old member states. The TFP growth of the Estonian dairy industry is similar in nature to the case of Latvian milk farms, productivity improved despite the shrinking output, because inputs have fallen even more severely. This sheds light on the difficulties of Estonian dairy companies to preserve their markets.

Results of the productivity calculations confirm that technology transfer to less productive countries can be achieved much faster in concentrated industries by large actors than in fragmented sectors, such as milk farming.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4 FOREIGN TRADE PERFORMANCE

4.1 Foreign trade balance of milk and dairy products

The trade performance trends suggest that Northern Europe has a comparative advantage in dairy production, as output of milk and dairy products largely exceeds domestic demand. Foreign trade balance is a complex competitiveness indicator, which compresses the effects of exports and imports, in other words the competitive positions of the dairy industry both on the domestic and export markets.

With the exception of Sweden, the foreign balance of trade in dairy products of the studied countries remained positive throughout the 1990s and 2000s despite a great deal of challenges and adverse market developments such as the set-back in the Russian markets at the end of 1990s, extensive economic and structural reforms in the Baltic countries and Poland, economic recession at the end of 2000s.

Production and processing capacity was modernised rapidly in the Baltic milk supply chains and the product-mix was shifted from conventional bulk products to more differentiated and higher value-added products such as fresh products, yoghurts and cheese. Income growth has induced increasing consumption of branded dairy products in the Baltic markets, where domestic dairy companies have managed to maintain their market positions in the first years of EU membership. While the imports

Table 25. Balance of trade in dairy products (million EUR)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Germany	1 560	1 670	694	1 170	1 540	1 728	1 294	1 803	1 836	1 704	2 192	2 390	2 552
Denmark	1 163	1 188	1 133	1 122	1 096	1 146	1 158	1 209	1 334	1 268	1 458	1 512	1 530
Sweden	-11	-29	-129	-134	-118	-143	-197	-191	-268	-319	-382	-451	-476
Finland	148	162	158	134	122	123	117	148	111	75	141	113	104
Estonia	32	42	42	19	55	68	80	104	98	67	102	119	115
Latvia	7	5	-3	-1	15	27	44	61	44	24	42	64	78
Lithuania	117	143	144	149	213	216	228	305	265	251	286	299	345
Poland	161	360	252	276	513	777	772	900	928	651	796	887	936

Source: Eurostat foreign trade database. Note: calculations include HS codes 0401-0406, 2105 and 3501.

of dairy products increased sharply in several Central-European new member states, the growth in imports in the Baltic countries and Poland has been more moderate.

In Finland the positive dairy trade balance has fluctuated and even declined slightly due to the growth in imports. In the Baltic countries, EU membership has brought about rapidly growing exports and a steadily improving dairy trade balance, which has been increasing even if the raw milk trade is ignored from the calculations. A shift towards highly processed and higher value-added or special products such as fresh dairy products and cheese can be noticed in the export structure.

4.2 Revealed comparative advantage

The revealed comparative advantage (RCA) or the Balassa index has been a commonly used indicator of trade competitiveness, which reveals the export efficiency of an entire branch of the economy, an industry, a specific product group or even a given product. The formula of the index is:

$$RCA_{ij} = 100(X_{ij} / X_{wj})/(X_{it} / X_{wt}) \qquad (5)$$

where X_{ij} is the export product j by country i; w denotes world export and t the export of all products (i.e., total export). If the index takes the value of over 1, the country is relatively specialised in the production and export of that product.

The concept has received much criticism due to its shortcomings and numerous articles have been devoted to improving it, such as Bowen (1983), Yeats (1985) and Vollrath (1991). The RCA indices cannot directly be compared among countries since their value depends on the size of the country and the export intensity of the rest of the economy. RCA values are therefore often investigated over time for a particular country and product group, but the changing trade performance of the rest of the economy will have a high impact on the dynamics of the index. For this reason RCA is often regarded more as a specialisation index rather than an indicator of competitiveness.

Table 26. Balassa (RCA) indices of the dairy supply chains in the Baltic Sea countries.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Germany	1.8	1.7	1.4	1.6	1.6	1.5	1.5	1.6	1.6	1.5	1.6	1.7
Denmark	6.9	5.9	6.1	5.8	5.8	6.0	6.0	5.5	5.6	5.9	6.1	6.0
Sweden	0.4	0.4	0.4	0.3	0.5	0.4	0.6	0.6	0.6	0.6	0.6	0.5
Finland	1.4	1.3	1.4	1.4	1.5	1.6	1.6	1.3	1.4	1.8	2.0	2.0
Estonia	4.1	4.6	5.1	4.3	3.7	3.3	3.0	3.8	3.7	3.4	3.9	3.3
Latvia	3.8	3.3	3.0	3.3	2.8	3.7	5.8	5.2	4.7	3.9	4.5	4.9
Lithuania	9.3	7.6	5.9	5.3	7.0	6.7	7.1	7.6	5.7	6.5	6.3	5.8
Poland	1.6	2.1	1.5	1.4	2.1	2.9	2.7	2.6	2.4	2.1	2.2	2.3

Source: own calculations using FAO and Eurostat statistical databases.

Fresh cheese packed onto pallets for exports in a small dairy.

RCA indices imply that seven of the eight dairy supply chains have comparative advantages due to their strong export activities. The indices shed light on the different degree of specialisation by country and the different development patterns over time. Denmark and the Baltic countries strongly specialise in dairy exports, whereas the level of specialisation is more moderate, albeit well above one, for Finland, Germany and Poland.

The time series for twelve years indicate a stable position of specialisation for the Danish and German dairy chains, while that position has been strengthening for Finland, Poland and Latvia. The decline for Estonia and Lithuania becomes even more pronounced when the time series are extended back to 1995. Then the indicator was 10-12 for both countries due to the significant weight of the dairy industry and dairy exports in the early years of their independence. The initial high degree of dairy specialisation fell inevitably as other export-geared sectors expanded.

5 GROWTH

In the fast globalising world economy, growth has become a measure of success, or indirectly one manifestation of competitiveness. An increase in competitiveness of the dairy sector also implies an enhanced ability to sell dairy products domestically or internationally. Hence, changes in output growth and competitiveness are intricately linked. Several indicators were selected to illustrate this linkage. The growth of milk production value captures the changing competitiveness of primary producers. The growth of dairy industry sales revenues decomposed into growth rates on the export and domestic markets are performance measures of the processing segment of the chain. Finally, the growth of dairy exports gives information more specifically about the change in the competitive position of the sector internationally.

5.1 Growth of raw material production

The growth of milk production volumes can generally be regarded as an indication of rapid changes in the structure of milk farms, favourable economic conditions for milk production and growing procurement markets. Milk production development can also capture the outcome of technological improvements although output growth by itself does not automatically imply increasing competitiveness. A timeframe of 1995-2012 was selected for the comparison, largely determined by the history of the eight countries.[15]

Milk production is also an indicator of the general well-being of milk farmers. Increasing milk production is a sign of a positive business environment, including a mix of favourable invisible or indirect factors such as subsidies, attitudes within the chain and in society at large, and very importantly, future prospects for production. Conversely, a falling milk production is a symptom of a discouraging mix of factors for dairy farmers. The development is an average outcome which portrays the national aggregate levels, while the performance of individual farms may vary greatly.

[15] The tendencies will be clean of any possible sharp effects attributed to the EU accession of Finland and Sweden in 1995. Poland and the Baltic States experienced a severe structural crisis and fall in agricultural output in the first years of the transition period in the early 1990s. By 1995 the deepest recession of agriculture was over and production figures started to recover, except for milk in Lithuania and Estonia, where the deepest phase ended only in 2000. The period of seventeen years is also adequate for Germany and Denmark, where the development was monotonous and not affected by extreme changes or conditions.

Table 27. The growth of milk production.

	Collected milk (thousand tons)			Annual growth rate (%)	
	Average of 1995-1997	Average of 2000-2002	Average of 2010-2012	1995-97/ 2010-12	2000-02/ 2010-12
Germany	26 917	26 817	29 515	0.6	1.0
Denmark	4 467	4 464	4 853	0.6	0.8
Sweden	3 259	3 271	2 858	-0.9	-1.3
Finland	2 355	2 446	2 266	-0.3	-0.8
Estonia	494	444	643	1.8	3.8
Latvia	348	395	669	4.5	5.4
Finland	2 355	2 446	2 266	-0.3	-0.8
Lithuania	1 321	967	1 318	0.0	3.2
Poland	6 649	7 151	9 390	2.3	2.8

Source: own calculations based on Eurostat data.

The milk collected and sold for processing was used in this comparison, because it constitutes the majority of production in the old member states and, even in the new ones, its weight has increased over the years. Direct sales of milk are primarily represented by minor milk farms, whose share in total production has diminished rapidly. In all eight countries the milk produced for collection is going to shape production levels in the coming years. As far as collected milk is concerned, the eight countries have followed different development paths, ranging from distinct growth to stagnation or even decline.

The fastest growth was detected in Latvia, where collected milk has more than doubled between 1995 and 2012. The main reason for this is that Latvia suffered from the deepest shock of the four transition countries in the 1990s. The structural disaggregation of milk production into two hundred thousand tiny units was a fundamental change, pushing down the volumes of collected milk. The share of milk delivered to processing within total milk production shrank from 76 % to just one-third between 1990 and 1995. The fragmentation of the milk farm structure was not as dramatic in any other countries. The re-concentration of milk farms and the emergence of middle and large-scale private and family enterprises appear to have resulted in a remarkable growth, albeit from the record low levels brought about by the shock of the economic transition.

For most of the countries growth rates do not change significantly when investigated over the shorter period from 2000 to 2012. The two exceptions are Estonia and Lithuania, where production figures reached their nadir in 2000 and have grown ever since. For these two countries growth rates averaged about 3-4 % annually in the 2000s. Similarly to Latvia, an increasing part of the production originated from large or expanding farms.

Denmark and Germany are characterised by fair annual growth, which in fact has accelerated in both countries in recent years. The growth is fuelled by the strong demand of the industry and a rapid change in farm structure, which in Germany took place particularly in the North-western federal states.

Sweden and Finland are the two countries where milk production has been declining and the tendency has reinforced over the recent years. The main explana-

tion is the same: every year hundreds of dairy farmers quit milk production, and the growth of output on expanding farms is not enough to compensate the disappearing volumes. The lack of motivation for dairying is one of the fundamental reasons for the decline at national level, although there are regional differences. In both countries, new investments contribute to maintaining milk output in specific regions, which slows down the fast drop in others. This results in an intensifying regional specialisation of milk production.

The subsidy schemes that support milk production and one of the highest milk purchase prices in Europe have slowed down the reduction of milk production in Finland. Sweden's sharper decline is a result of many factors. One of the most crucial one is the lack of a strong ambitious agricultural policy. In the other countries of the comparison, agricultural producers and policy makers jointly lobby for sustained domestic food production. In many countries the food supply chains are notable contributors to the economy and the food industry is the first or second largest branch of manufacturing. Furthermore, maintaining domestic food production is regarded as a commonly accepted basic imperative in the society. This common understanding of the need and significance of national food production prevails in the politics (including financial and economic policy), the press and among consumers. This public understanding of the society forms the basis for supporting agricultural producers and representing their interests within the EU Common Agricultural Policy. In Sweden this common understanding of the society is weaker than elsewhere: simply put, there is a lack of public concern for the well-being and continuity of Swedish agricultural production.

One rarely identified factor that affects the direction of milk production change is market entry. In Sweden and Finland entering milk production as a new entrepreneur is practically impossible, not only because dairy farming is a profession usually inherited from father to son, but because it requires a great deal of capital and personal motivation.

Text box:
"Mer mjölk" - a project to fight against falling milk production

Milk production growth has been a critical prerequisite for the competitiveness of the dairy supply chain. Sweden's declining milk production is an outcome of several reasons. Some of them are structural and cultural factors, which slow down the rate of investments and generation takeovers. Young farmers get a rather low start-up aid compared to the full costs of the takeover. They usually have not enough capital to finance the purchase of the farm on their own. Despite the long term business characteristic of milk production and high value of collateral, banks appear to be extremely cautious to grant loans for investments.

Milk production growth is also hampered by a cultural factor. Farms are seldom sold, even if there are no successors to continue milk production. Instead of selling, the farm may be transferred to a meat production unit to retain it in the family's ownership. "Wasting" the family property inherited through several generations would be considered inappropriate. This tendency impedes milk production growth in two ways. First, less milk is produced as the share of quitting dairy farms falls out and second, expansion of investing milk farms is impaired by the lower supply of land around if the quitting farms continue with meat production and they do not release their land to the market. By contrast, milk farms have been historically traded much more intensely in Denmark. Farming in general and milk farming in particular is less attached to specific families. Owners have less emotional ties and farms are often considered only a form of business there. This cultural distinction also explains the different pace of milk farm concentration (Olsson, 2010).

Farm expansion is also decelerated by land availability. Swedish dairy farms use a lot of rented fields which tend to be fragmented. The owners are often pensioners, old farmers. Some of them do not care so much about the rent fee, but they're not interested to sell the land either. The scattered location of the small rented plots usually adds up to the costs of the milk farms. Another peculiar feature of the Swedish land market is the coupled sale of fields and forests. Land is often for sale in one package with an average ratio of abut ¼ fields and ¾ forest. In Southern Sweden crop farms also compete for land, so the price of good cropland can be as high as 30-50 000 €/ha there. Even in the forest dominated regions of Småland and Västergötland, there has recently been increasing competition for land from outside the agrifood and forestry sectors. Nowadays industrial and financial investors consider forest land a good and secure investment, so they have increased the demand for land with their purchases.

Construction of a new cowshed in the Jönköping region.

Swedish milk farms – and farms in general – struggle in an operational environment, where the political atmosphere is not as favourable or supportive as in the neighbouring countries. This is partly the outcome of the historic political development of the country. The fact is that many different types of supports have been cut from the milk farmers over the past decades, especially around the time of accession in the 1990s. At the same time the administrative burden has been increased with demanding compliance with

animal welfare or environmental requirements, in several cases stricter ones than the EU directives.

Milk farms had 45 different administrative requirements or control measures, more than any other production branch in agriculture. Obviously livestock farms are more controlled than crop farms due to registry, feeding and veterinary rules, but milk farms also face specific requirements in insemination or obligatory grazing period among others (Clarin and Karlsson, 2012, pp. 10-16).

Costs of agricultural inputs including seeds, fertilisers, and feed have hampered the financial performance of the Swedish dairy farmers. One of the most expensive cost item is protein feed, especially because the more expensive non-GM soya has been used in Sweden. The strong Swedish crown does not alleviate the pressure on the cash-flow of the Swedish milk farms, either. Subsidies are calculated to member countries in EUR and in the best year i.e. when SEK was the weakest, farmers received 30 % more subsidies in local currency than today.

In order to overcome the above impediments and fight against the trend of decreasing milk production, a project called “Mer mjölk” (More milk) was launched in the Jönköping region in 2010 by Svensk Mjölk, the advisory service and the farmers’ organisation. The primary objective was to raise milk volumes in three years by 20 % around Jönköping, a region which contributes 8.5% to the total Swedish milk production. It was realised that the key elements of increasing milk production is the successful generational takeovers, the involvement of young ambitious farmers in investments, and strengthening their belief in the sector as well as promoting the importance of milk production within the economy to the public.

The “Mer Mjölk” project in the Jönköping region began to give positive effects in the middle of 2013. After a decrease in milk production with 9 % between 2001 and 2011 the milk production started to increase again. The increase for the region was 1.6 % in 2013. During the last three years more than ten similar projects have been launched all over Sweden. The purpose with all projects is to accentuate how important the milk production is for different regions and for all of Sweden. Main ingredients in the projects are to support dairy farmers who want to develop and enlarge their dairy production. The support consists of giving inspiration and knowledge about management, profitability, important factors in the surrounding world, exchange experiences and making study tours to dairy farms which have been successful.

In both countries young entrepreneurs have numerous other options and there is no tradition of entering the business or buying and selling dairy farms. Letting the farm of ancestry end in the hands of outside investors would be considered a failure and shame in the family-line. On the contrary, the opportunity for entry is seen as an important driver of growth in Danish milk production, and trading milk farms is just as ordinary as selling any other business. In terms of market entry, Poland, Latvia and Lithuania represent another case, where milk production has been a prospect for thousands of ambitious families, who move constantly from small to larger farm size categories. This way a high entry rate to the viable and big market oriented milk farms is guaranteed for the coming years. The milk sector has benefited greatly from these mass reserves of human capital in the three countries and farmers with expansion potential form a nearly inexhaustible resource for future growth.

It was pointed out in the section on milk supply that the availability of raw material is a crucial prerequisite for the competitiveness of the dairy supply chain. For Denmark, Sweden and Finland domestic production of milk constitutes the raw material basis for the industry. In the Baltic countries and in Central Europe, dairy companies also purchase milk from farms abroad (see section 2.2.3 on cross border milk trade). The growing volume of available milk is a condition for the growth of the dairy industries. Conversely, the declining raw material supply is reflected in the falling output component of the TFP of the Swedish dairy industry.

5.2 Growth in dairy processing

The growth of the sales revenues of the dairy industry is an indicator of their performance on markets. It captures developments of the competitive position on both domestic and export markets at the same time. Indices for the sales revenues in current prices show a spectacular growth for the Baltic countries and Poland because the initial level was very low and production prices change much more radically than in the old EU members. Therefore, the annual growth rate of dairy processing is only appropriate to express in real terms, which brings rates of the eight country to a comparable basis. This indicator is the same as the growth rate of output presented in the productivity chapter in Table 24 on page 121.

Although growth rate curves show the dynamics of national dairy industries, they do not reveal the significance of

Table 28. Sales revenues of the dairy industry at current prices and their share of the total for the Baltic Sea region (EU members).

	Sales revenues (million EUR)		Share in the Baltic Sea region (%)	
	2000	2011	2000	2011
Germany	20 945	25 717	64.7	59.5
Poland	3 228	6 567	10.0	15.2
Denmark	2 800	4 073	8.7	9.4
Sweden	2 755	2 793	8.5	6.5
Finland	1 899	2 380	5.9	5.5
Lithuania	341	969	1.1	2.2
Estonia	227	377	0.7	0.9
Latvia	170	324	0.5	0.7
Baltic Sea region	32 364	43 199	100.0	100.0

Source: own calculations based on Eurostat data.

each country in the region. Over eleven years the weights in the aggregate dairy industry output evolved in the Baltic Sea region. Germany's share fell under 60 % by 2011 and the drop of 5 percentage points was conquered by Poland alone. The other changes were smaller: Sweden's share declined by two percent points, approaching Finland's share by 2011. Despite their vigorous growth, the Baltic countries remained quite modest in terms of their share of the dairy market even by 2011. Yet, assuming a continuation of average growth rates observed over the 2000-2011 period, Lithuania would catch or overtake Finland and Sweden by 2025 in terms of the size of the dairy industry. Poland's share would expand to 22 %, while Germany's share would further decline to only 50 %.

5.3 Dairy industry sales growth in the domestic versus foreign markets

Growth rates in the dairy industry sales revenues capture the development of market output as a total. Sales revenues can be divided into domestic and export sales, so their contribution to overall growth can be separated. It was shown in the chapter on foreign trade performance that dairy industries of individual countries specialise into export markets at rather different rates.

Export intensity within the sales revenues of the dairy industry is another indicator which shows the country's relative specialisation into dairy production. Dairy industry companies are most oriented towards exports in Denmark and Lithuania, as nearly half of their production is sold abroad. Both countries have high export intensity, which has not changed notably over the study period. For Denmark, the share of exports was clearly lower between 2003 and 2009. This can be explained by the temporarily lower domestic milk production in the mid 2000s, the effects of muslim countries' boycott of Arla's sales, the high milk prices in 2008 and the reduced international trade due to the global financial crisis in 2009. Lithuania's export shares jumped through the years after EU accession in 2004 but were reduced by the financial crisis.

Several countries show a distinct growth in export intensity over the long run, the most prominent examples being Germany, Estonia, Latvia and Poland. Germany's export share of sales has increased steadily, while Poland's export share jumped sharply after the 2004 EU accession. At the same time dairy processors have huge domestic markets to supply in these countries.

The export share of sales has increased steadily for the Estonian and Latvian dairy industries as both countries are small with limited growth opportunities on the domestic market. Finland and Sweden have mature domestic markets for dairy products, although in Finland there is a clear specialisation towards exports.

Growth of real sales of the dairy industry were identified in Table 24 as annual output growth, which can be decomposed into growth rates on the export and domestic markets. Besides an understanding of export performance, this growth accounting exercise sheds light on the dairy industries' competitive positions on their domestic markets. Germany, Denmark, Sweden and Finland have mature markets for dairy products compared to those in the Baltic States and Poland, where the consumption of certain processed products such as cheese or yoghurts has risen noticeably with increasing income level. This, of course does not mean that consumption patterns do not change in the old EU member states. In fact, cheese consumption has grown in several of those countries. Even with no precise information on consumption development, the growth rates for the domestic market are indicative of performance, as zero or negative growth rate suggest a loss of market share domestically.

Export performance is apparently strong across the region, since all eight countries have experienced positive growth on export markets, with the rate varying from 0.2 % for Sweden to 2.6 % for Lithuania.

However, growth on the domestic market varies significantly across the Baltic Sea region. Dairy industries in Germany, Sweden and Estonia have lost

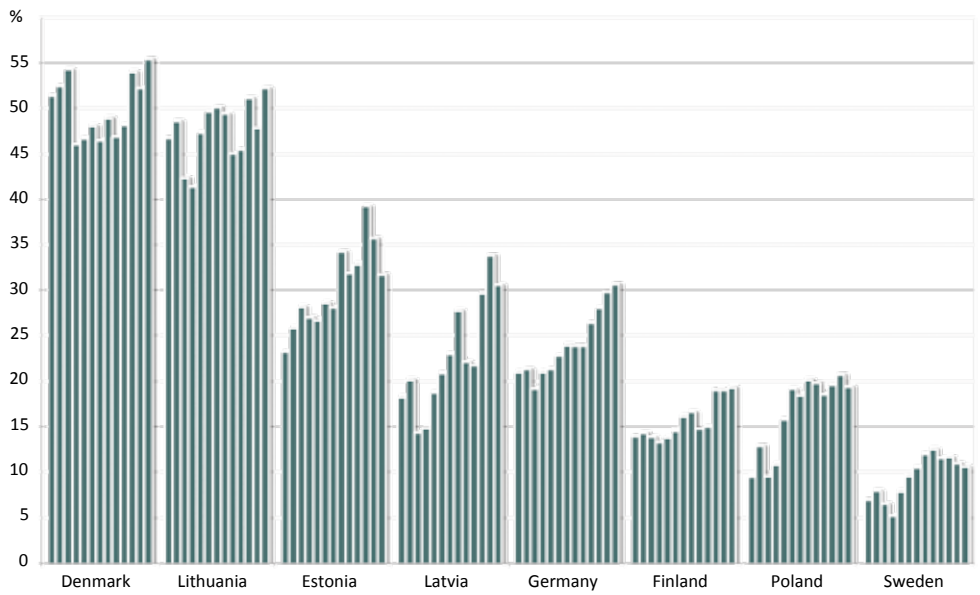

Figure 39. The shares of export markets in dairy industry sales in 2000-2012.

Source: own calculations based on data from Eurostat and national statistical institutes.

Table 29. Growth accounting - growth rates of dairy industries in the Baltic Sea countries by domestic and export markets.

	Total growth rate (%)	Growth rate on the domestic market (%)	Growth rate on the export markets (%)
Germany	0.48	-0.38	0.86
Denmark	1.48	0.64	0.83
Sweden	-1.40	-1.58	0.18
Finland	0.53	-0.01	0.55
Estonia	-0.68	-1.46	0.80
Latvia	1.89	0.21	1.68
Lithuania	5.29	2.61	2.61
Poland	4.61	2.75	1.82

Source: own calculations based on the figures of Eurostat and national statistical institutes. Growth rates are calculated by using real term sales revenues.

some of their domestic market, even if this loss was not even visible in the foreign trade balance figures of Germany or Estonia due to their excellent export performance. The fact is that, for both countries, sales growth domestically has turned negative at the time of the economic recession and high milk prices around 2008. Similarly to Estonia, growth on the domestic market slowed down considerably at the same time in Latvia, although it did not turn negative. Both countries' dairy industries lost market shares to foreign competitors, to a large extent from Lithuania. The dairy industry's domestic sales have almost stagnated in Finland, which means that the growth in the cheese market was captured entirely by imported products.

Growth has been pursued on export markets and often the successful exports of one country to another weaken the latter one's domestic market positions. These transactions crisscross the Baltic Sea even amongst the same countries. Competition has become fiercer and more straightforward. Ultimately, competitiveness on export markets, while a good thing, is not enough: it is of crucial importance for the national dairy industries to improve their competitiveness on domestic markets by saving or strengthening their positions. The larger the home economy, the more important this objective becomes.

6 INNOVATION

Productivity is fundamentally a dynamic process driven by innovation as well as the generation and exploitation of knowledge. Hence, current productivity levels reflect to a large extent investment decisions that were made in the past. Looking forward, it is therefore important to assess whether the dairy sector is taking the necessary steps to ensure that it will maintain or improve its position relative to competitors in the short to medium term. Given that productivity growth is primarily driven by technological change, this means that particular attention should be paid to investments in Research and Development (R&D) as well as the rate of innovation in the sector.

It is no surprise that the European food industry has invested in R&D much less than other manufacturing industries, such as the IT, car manufacturing or pharmaceautical sectors. What is more striking is that even in a global comparison of food industries, the EU ranks as one of the weakest in terms of R&D investments. As part of its competitiveness report (FDE 2011, 2012) FoodDrink Europe has benchmarked R&D investments by the European food industry against those of its main rivals since 2008. Data for the 2000s indicate that the EU food industry has not managed to catch up with global competitors, even if the share of R&D expenses increased from 0.3 % to 0.5 % from 2000 to 2008. By comparison, competitor countries, such as Japan, the US and Australia, spent already 0.6-1.0 % of their output on R&D in year 2008.

6.1 Innovation in the dairy industry

Data on R&D activities are scarcely available for the food industry and it is even harder to find comparable figures for the dairy industry. The latest figures date back to the end of the 2000s. The share of R&D expenses in value added was between 0 % and 1 % for the food industry of most European countries. Only Denmark, Sweden, Finland, Norway and the UK reported higher shares in the Eurostat database. The dataset is deficient as data are missing for several countries and years.

The dairy industry is an R&D intensive sub-sector of the food industry, since in all countries its share of R&D expenditure in value added is larger than for the whole of the food industry. Out of the eight countries subject to this report the highest R&D activity is observed in Sweden, then in Germany and Finland. Figures show a clear increasing trend in the latter two countries. R&D expenditure shares of value added in the new member states Estonia, Lithuania and Poland remain between 0 % and 0.6 %

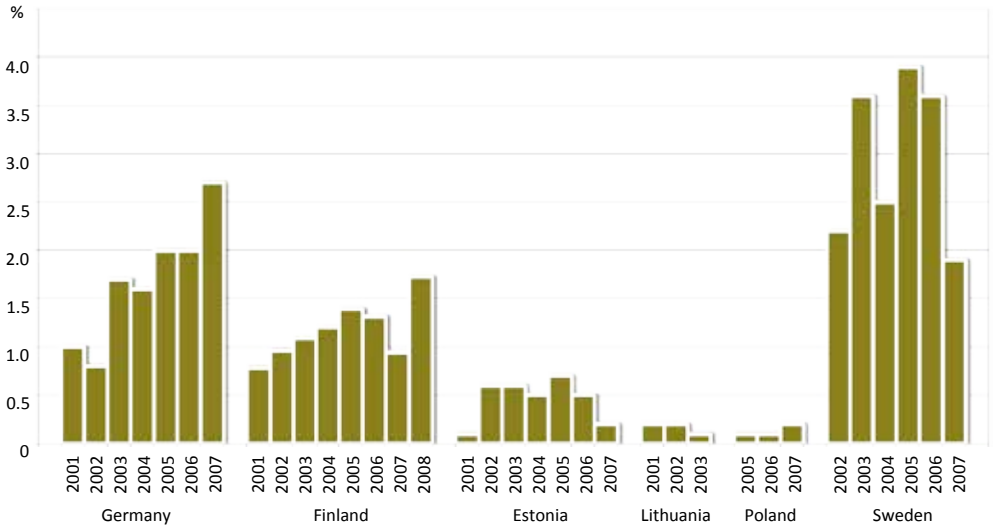

Figure 40. Shares of R&D expenditure in value added in the dairy industry of countries around the Baltic Sea.

Source: Eurostat.

the highest percentage being recorded for Estonia.

The corresponding figures for selected reference countries like France and the United Kingdom show that the dairy industry in the old member states is positioned to the high end of European R&D intensity. Norway has exceptionally high R&D intensity in its food industry by international standards and the same applies more specifically to its dairy industry. The figures for the Baltic States and Poland

Valio's research and development center in Helsinki.

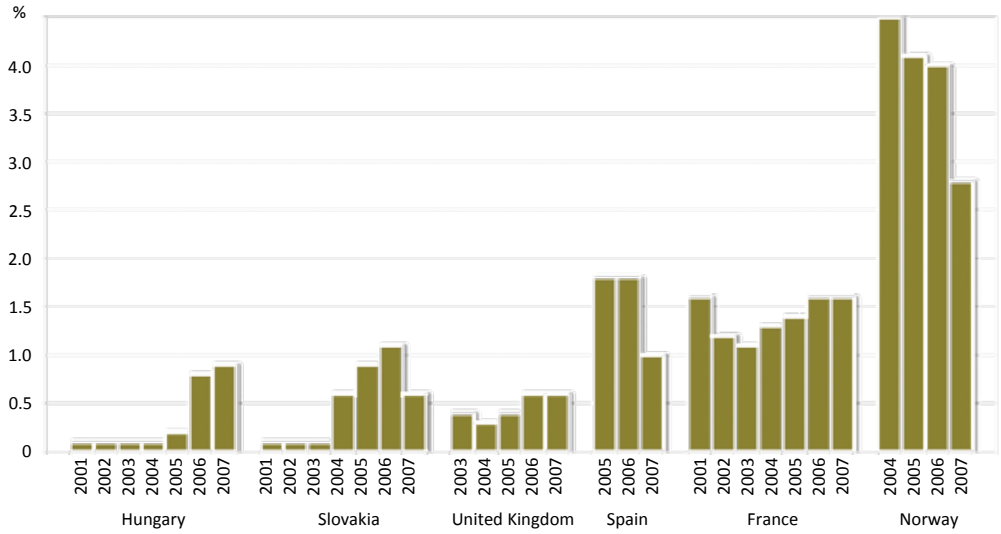

Figure 41. Shares of R&D expenditure in value added in the dairy industry of selected reference countries.

Source: Eurostat.

suggest that in terms of R&D intensity, those countries remain behind Hungary and Slovakia, which represent the group of new member states in the reference country chart.

Eurostat's data on R&D intensity is not available after 2007 and even years before that, figures for some significant dairy manufacturing countries such as Denmark and the Netherlands are missing.

In order to overcome industry level data deficiency, the research team at LEI took a different approach to analyse innovation in the dairy industry (Tacken et. al. 2009). They scanned three different innovation databases for dairy related innovation cases or new product launches. The number of innovation cases processed made up only part of the total population. It is really challenging to keep records of all cases since new products and organisational or technological improvements are done continuously. The other difficult issue is to translate the number of innovative cases into economic benefits. Various cases would contribute to the companies' value added or profitability to different extent. The study mentions the puzzle thrown by the UK dairy industry: the UK accounts for the highest number of innovation cases, but this innovation intensity did not show in the economic performance figures.

6.2 Innovation on the corporate level

Since there are no recent statistics available on innovation in the dairy industry, another way of establishing a comparison is to use corporate data. However, it is usually only the biggest companies that report their R&D activities in annual reports. As a result, this type of analysis would be biased towards large companies and ignore potentially highly innovative SMEs, although this may not

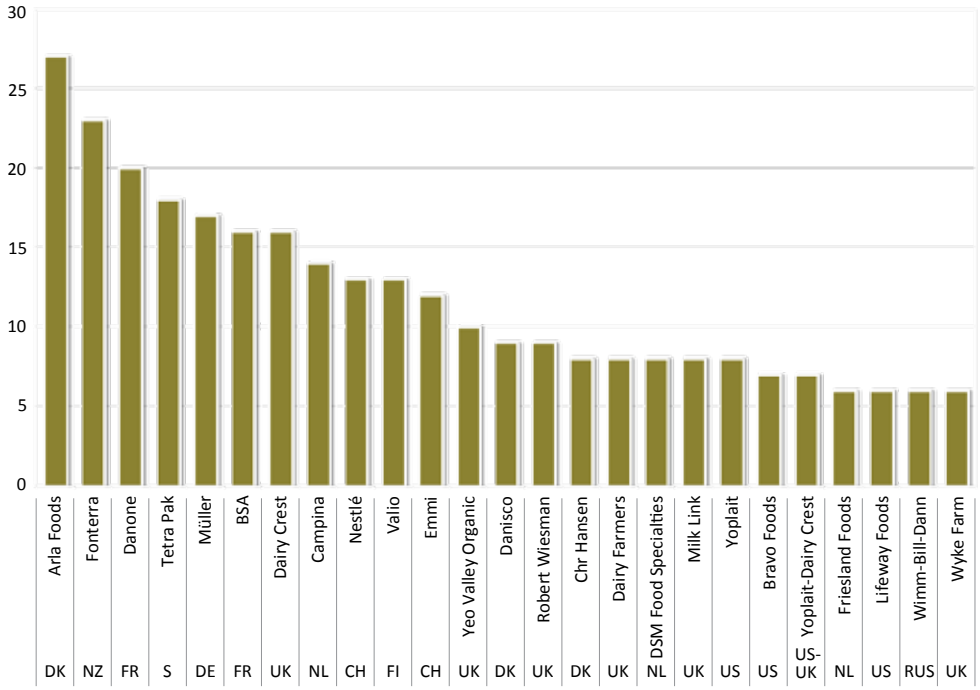

Figure 42. Top 25 innovative companies in the dairy-related innovation database used by Tacken et. al. 2009

Source: Tacken et. al. 2009, p. 43.

Danone's research and development center in France.

The construction of the new global research centre of Arla Foods will start in spring 2014. The centre will be located in Arhus and will provide premises for 120 researchers.

be crucial since large companies account for the majority of R&D.

The LEI report also presented innovation cases across companies. In their sample, six companies out of the TOP 25 were from the Baltic Sea region: three from Denmark and one each from Germany, Sweden and Finland (Figure 42). These results were put side by side with the findings of a consultancy report in which company executives were asked to name innovative dairy companies. Five out of the top ten companies in the questionnaire were also found in the ranking list of the innovative database: Danone, Nestlé, Arla, Valio and Campina (Tacken et. al. 2009)

Productivity is fundamentally a dynamic process driven by innovation as well as the generation and exploitation of knowledge. Hence, current productivity levels reflect to a large extent investment decisions that were made in the past. Looking forward, it is therefore important to assess whether the dairy sector in a country is taking the necessary steps to ensure that it will maintain or improve its position relative to competitors in the short to medium term. Given that productivity growth is primarily driven by technological change, this means that particular attention should be paid to investments in Research and Development (R&D) as well as the rate of innovation in the sector.

7 CONCLUSIONS

As globalisation proceeds, it is becoming clear that that competition within the agri-food sector has shifted to a rivalry of large multinational companies. On the global dairy market, an accelerating race characterises the activities of the 20-30 leading concerns. For giant multinational companies, national and even more so local interests are subordinated to corporate strategies in a constant pursuit to improve capacity utilisation, labour productivity, economies of scale, or in one word their competitiveness. The geographical balance of plant closures and new investment across countries is a great challenge for any company, but the problem is even more pronounced when owner-suppliers are spread in several countries.

Dairy supply chains play a significant role in the Northern European agri-food sectors. Measured by output, both dairy farms and dairy processors are leading subsectors of agriculture and the food industry in most countries around the Baltic Sea region. Present and future competitiveness of the dairy supply chains are, therefore, of crucial importance for the overall prosperity of these countries' agrifood sectors and related economic activities and services.

Separate indicators vs aggregate score for competitiveness

The competitive development and positions of the dairy chains in eight countries were analysed in this study via five groups of factors, which are either direct indicators or determinants of competitiveness.

Having examined the dairy supply chains with a wide set of indicators in five groups of competitive factors, the questions still remains: can the dairy chains of the eight countries be ranked in terms of competitiveness? Ranking is a fundamental objective of cross-country studies of competitiveness in the literature. In the case of a single segment of the chain, such as milk farms or the dairy industry, ranking is feasible. In particular, by considering one competitiveness indicator at a time, the order of the countries can be derived fairly easily, even if those rankings remain partial and cannot capture the complexity and multi-dimensional nature of competitiveness.

In some studies the set of indicators were aggregated into a single score in order to identify a clear ranking of countries. Thus, for food industries, Poppe et al. (2007) composed a rough competitiveness scale including five indicators and Tacken et. al. (2009) adapted the same methodology for measuring and ranking the competitiveness of dairy industries in European countries (p. 70). However, as far as the operation of the entire dairy supply chain is concerned, it is extremely hard to summarise the structural and industry-based indicators into a single summary score to compare the performance of countries. The various scales for fifteen indicators represent one

challenge, but the real problem arises from the weights to be placed on each indicators. Even considering only one indicator such as productivity growth, we observed substantially different rankings of countries depending on the level of the chain that was analysed, i.e. dairy farms or dairy processing. Since countries have different strengths in terms of structural, foreign trade and growth indicators, changing the weights would completely reshuffle the ranking order of a complex competitiveness score.

Ownership and industry structures, vertical relations within the chain

The originality of this study stems from its focus on the entire supply chain in its comparative assessment of the dairy sector's competitiveness. All the segments of the chain and the links between the actors should be strong in order to shape a competitive industry. Otherwise, the stronger actors of the chain tend to seek commercial alliances with firms in neighbouring countries, which gives rise to serious tensions within the country. This can be illustrated with reference to the Baltic countries. Lithuanian dairy processing forms the strongest link of the national dairy supply chain, which currently imports almost a fourth of its raw milk from neighbouring countries. By contrast, in Estonia large corporate farms enjoy a much stronger position than national dairy processors and, as a result, often decide to export their raw milk. In the last five years a quarter of the milk produced in Estonia and a third of that produced in Latvia has been exported to Lithuania for processing.

The intense competition for raw milk in the Baltic countries highlights the importance for the operation of the sector of ownership forms, long-term commercial partnership along the chain, and relative bargaining powers of the different actors. In all the countries included in the study, farmers control a significant share of the dairy processing capacity through cooperative arrangements. However, farmers' motivations and ability to influence the operation and strategies of processors vary considerably across countries.

Cooperatives have traditionally been strong in the dairy sector in Northern Europe. That situation is the result of an evolution of over a hundred years old of ownership structure in the dairy supply chains in the old member states (i.e., the three Nordic countries and Germany). As for the new member states, ownership has changed over the past decades repeatedly and radically. In the Baltic countries, dairy companies moved under state control during the early part of the economic transition, but then were privatised in the 1990s, when farmers were granted priority

to acquire shares of dairy processing plants. By the turn of the century, most dairies were bought by private investors until farms became strong enough to initiate themselves changes in the ownership structure of the processing level of the supply chain. In recent years, farmers-owned cooperatives have purchased an increasing share of total raw milk supply and, in a second step, have increased their ownership of dairy processing capacity.

The process has been rapid and also supported by the policy makers. Similar intent to raise farmers' ownership was seen in at least Latvia and Lithuania already at the time of dairy industry privatisation in the 1990s. With these recent changes in the Baltic countries the ownership structure in the eight countries of this comparison is about to have an important common characteristic, the significant role of dairy farmers as drivers of vertical integration. The recent progress of Baltic cooperatives also shows that the traditions of cooperative movement have relevance in today's modern capital allocation tendencies.

The country cases in Chapter 2 suggest that the utilisation of industry capacity and scale of economics in particular is a marked explanatory factor of the competitiveness of dairy industry. The importance of scale of economies for cheese production is a technological fact. It is also shown indirectly by the rationalisation strategy of the largest dairies to phase out and close the small cheeseries and invest into the biggest ones. The significance of scale of economies is also verified by the productivity difference among countries, the ones that have a more fragmented industry structure or smaller average company size struggle against companies in more concentrated markets with bigger market shares and size. The latter ones can take advantage of larger scale series of production and better capacity utilisation. Besides processing volumes a number of other factors contribute to the competitiveness of dairy companies, such as product portfolio, the geographical strategy and spread on the markets, proficiency in sales and marketing and investments into innovation.

In the dairy supply chain, foreign trade is used in several countries as a psychological ace card in price or contract negotiations: farmers threaten processors to take their milk abroad, processors to buy milk from abroad, while retailers also threatens to sell imported goods instead of domestic ones. While this argument may often used in price negotiations, retailers are ready to favour domestic products if consumers express such preference. In most countries consumer loyalty is fairly strong for drinking milk, but less pronounced for the processed dairy products.

As an interesting phenomenon some retailers take their own countries' dairy products to abroad either as private label products or under the manufacturers' brands. In particular German and Lithuanian dairies have an increased access to export markets through the activities of their internationalised retail chains. For discount store chains and their numerous private label products this may help the dairy industry companies in reaching volume, but margins remain low. There would be better opportunities for manufacturer to achieve higher margin with their own brands but consolidation of processors has been lower than retailers, and competition against other manufacturers' brands and the increasing share of private label has been fierce.

Across the Baltic Sea region, the most influential segment of dairy supply chains remains the retail sector. Following the recession in 2009, consumers' purchasing power has contracted and the popularity of discount retailers has consequently risen. The stronger retailers have responded to the increased price sensitivity of consumers by developing their offerings of private label products in the cheese and yoghurt groups as well as by giving new a new impetus to their strategy to conquer shares of the market for fluid milk.

Productivity

Total factor productivity (TFP) measures the efficiency of the process by which production factors are transformed into finished products, and that indicator was calculated for both milk production on farms and the dairy processing industry. TFP is often regarded as a crucial indicator of competitiveness, because it depends both on the technical efficiency of producers and their commercial ability to sell products on markets. The calculations for dairy processing indicate that productivity grows fastest in countries where firms are growing quickly. Cost reductions and rises in production efficiency alone do not result in significant productivity growth.

TFP of milk farms has grown at similar speeds in Finland, Germany, Denmark and Sweden. The productivity advantage of the leaders has not shrunk significantly in the last fifteen years. Structural differences across countries account for the bulk of productivity differences. Although production moves to larger farms in all countries, the

speed of this development varies. Currently the average milk farm is 31 dairy cows in Finland, as compared to 75 in Sweden and 164 in Denmark. The Danish lead seems insurmountable, but fast structural development in that country has been achieved through heavy investment and the resulting burden of debt that afflicts Danish milk producers makes them vulnerable to market fluctuations.

The fact that productivity growth rates have developed hand in hand for the dairy farms of the four countries over the past fifteen years offers two ways of interpretation. On the one hand dairy farms have achieved fairly similar growth, so their relative performance remains at the same level. On the other hand, given the different absolute stages from which the four countries' farmers started their productivity development in 1995, the initial differences did not change. The gaps did not close and the order in TFP levels remained the same, starting with the highest level in Denmark, followed by Germany, Sweden and Finland.

Among the four most recent EU members, TFP growth has been fastest in Estonia, as the relative importance of very small farms in Poland, Latvia and Lithuania has hindered structural development. The Latvian development illustrates an interesting case of productivity growth in a contracting sector. Namely productivity can grow even if farm outputs fall, provided that the utilised inputs drop even faster. Obviously this type of productivity growth is neither sustainable nor desirable for long term.

In dairy processing, the newer EU members are quickly closing their productivity gap with the leading countries of the comparison group. Since the turn of the century, annual TFP growth has taken place at the average rate of 3.7% in Poland and 2.4% in Lithuania, or much faster than in Finland where the corresponding figure is only 0.7%. At the same time, TFP in German and Swedish dairy processing actually declined.

Altogether, the evolution documented in this report is consistent with the view that transferring technologies and organisational forms from productivity leaders to productivity "laggards" is easier in the manufacturing sector than in primary production, due to the typical difference in the size of firms as well as the more pronounced reliance of the primary sector on country-specific agro-ecological conditions. A few large firms have apparently managed to catch up with the foreign leaders in the dairy industry through deliberate investments, R&D efforts and marketing and sales operations. Conversely, in Polish, Latvian and Lithuanian milk farming speedy catching up will require intensification and concentration of thousands of currently very small farms.

Ultimately, productivity – and competitiveness – boils down to two basic components: market performance and efficiency. Maintaining and increasing market shares domestically and on export markets is a key element of competitiveness, whereas the efficient use of resources (i.e., all production inputs) is the other key component. Those countries' dairy supply chains, which perform well on both counts, are competitive and will remain so in the future.

Export performance and growth

Climatic and natural conditions apparently favour milk production in Northern European countries, and this is reflected in the foreign trade performance of the eight countries in the study. With the exception of Sweden, all countries have produced milk and dairy products over their domestic needs during the last two decades. They have shown various degrees of success on export markets, but they all have a clear specialisation in dairy production within their export portfolios.

Geographical orientation is indicative of the strategy of dairy companies. Export of basic products to emerging markets is

the expression of a volume-based strategy, while exports of special products with high value added to developed markets reveals a value-creating strategy. Many companies apply a mix of the two strategies. Spreading sales geographically onto several export markets is a powerful way to reduce risks.

The more successful countries of the comparison group have managed to expand their sales both domestically and on export markets. Further, cross-country differences in productivity growth are closely associated with the relative market positions of the countries of the Baltic Sea region. While Poland and the Baltic countries only accounted for 12% of the turnover of the region's dairy industry in year 2000, that share reached 19% in 2011. Concurrently the market shares of the older EU members such as Germany and Sweden shrank by five and two percentage points respectively, and in the case of Finland that share decreased from 5.9% to 5.5%. In Germany, Sweden and Finland the positions of national dairy industries have weakened on domestic markets.

Further research

Several economic phenomena could be analysed further to explain the operation of the chain. Most of these can be explicitly studied and investigated by applying specific methodologies, but they would deserve further research on their own.

Those topics include: the effects of policy, subsidies and taxing systems (incl VAT) on the operation of the chain; the importance of transaction costs; the distribution of income within the chain; contracting and supply chain management; risk management and risk sharing in the chain; as well as multiplier effects and relations to the rest of the economic sectors e.g. banking sector, packaging by using input-output models.

What's next in the market?

World demand for dairy products is predicted to grow faster than supply as consumption expands steadily in emerging economies. The EU seeks to get its share of that growth, which will affect markets in, for example, China, Russia, the Arab world, and Africa. The removal of milk quotas in a year will profoundly modify allocation of production volumes across EU countries, as the large effects of the reform of the EU sugar policy, which took place a few years ago, may suggest.

The quota abolition will speed up a broad process of structural change that has been ongoing for years, and increase the geographical concentration of agricultural production in Europe. High grain and oilseed prices, and the resulting improved profitability of cash crop production, have attracted farmers in Central Europe to shift their focus to crop production. Concurrently, a milk production belt has been forming in the Northern coastal regions of the EU stretching from Ireland through to Brittany, the Benelux countries, and as far as the Baltic states to the East. Climate conditions have always favoured grazing and milk production in those coastal regions. However, their relative importance in milk production

Figure 43. Milk production belt in Northern and Western Europe.

Source: based on Lafougére (2012), modified by the authors.

will increase further, because the range of profitable cash crops becomes narrower and average yields lower as one moves northwards. In many parts of this region, milk production is the best alternative among all farming opportunities.

Geographical specialisation proceeds of course mainly in relative terms, with milk production gaining importance in coastal areas and crop production doing the same in Central Europe. This does not imply, however, the disappearance of milk farms outside of the "milk belt", but production is increasingly shifting to this area within the continent.

Some countries where production has been constrained by the quota system, such as Ireland, the Netherlands, Germany, Denmark and Poland, are eager to increase their production of milk. The importance of raw milk availability for the competitiveness of national dairy chains will rise in the future. With the expansion of milk production on farms, dairy industry can easily seize opportunities to conquer new markets. It is clear that the removal of milk quotas within the EU will boost production and exports to world markets, but a swing in world prices may also result in overproduction within the EU's common market. In periods of low world market prices, a large amount of "excess" dairy production would flow within the internal EU market, threatening further the positions of those dairies which predominantly operate domestically or within the EU. In this context, competitiveness of the sector also requires that its position on the domestic market be preserved.

The impact of public perception on competitiveness

Having discussed the results based on quantitative indicators, it should be stated that the competitiveness of the dairy supply chain is much broader than the technical or technological efficiency of the actors in the chain.

A number of qualitative determinants contribute to the effective functioning of the chain. A constant and thorough monitoring of eight countries' dairy chains for the past three years leads us to the conclusion that these intangible determinants play a crucial role in explaining cross-country differences in competitiveness. Those determinants encompass historic, cultural and psychological factors, the public's perception and view of the dairy industry, the operational and business environment of firms, and relations among the segments of the chain.

The role of psychological factors is not supposed to be ignored when it comes to the smooth operation of the chain and its competitiveness. Those factors affect business relations among actors in the chain and are therefore woven into price agreements and contract negotiations. As an

illustrative example, the threat of increased cooperation with foreign partners has been mentioned earlier.

Agrifood chains enjoy broad acceptance and support by society in some countries. In those, a public consensus on the importance of the agrifood sector may have developed for different reasons. Sometimes favourable conditions (e.g., climate and soils) or historic developments resulted in a strong agrifood sector, which was then seen as worthy of broad public support. Alternatively, the scarcity of natural resources and lack of relevant business alternatives that could contribute in a major way to the national economy may have generated public support for the agrifood sector. By contrast, in countries where other manufacturing or service sectors have traditionally carried the economy, the chance for strong public support remains much smaller.

Public support will be reflected in policy-making and politics, especially if agrifood sectors account for large shares of economic activity or employment. The influence and lobbying power of rural and farming populations and agrifood businesses differ by country. The attitude and level of commitment of national agricultural and other general economic interests towards the dairy supply chain manifest themselves in a multitude of ways, including: the availability of financial instruments and allocation of resources to investment and modernisation; the allocation of national resources to education, research and supportive infrastructure such as advisory services; and the encouragement of new businesses and entrepreneurs. It is also noticeable in cross-country differences in taxing systems, tax exemptions for farmers, corporate tax rates, and VAT rates for food, including dairy products.

In the specific case of the dairy sector, the significance of the sector may vary across regions or even municipalities. The continuation of milk production in microregions is again largely determined by psychological factors. Even in Sweden and Finland, where milk production has been declining slightly, the business atmosphere and appreciation for milk production may be radically different within a small area. The inspiring examples of young farmers investing successfully, the support of local authorities and the attitude of local banks have strong influences that can explain why milk production may increase or decline even in neighbouring municipalities.

The attitude of the general public and consumers towards the dairy sector is an important element of the broad support towards the domestic dairy supply chain. General expectations are reflected by the level of public discussion of environmental issues, animal welfare, corporate responsi-

bility, food hygiene and safety. On the other hand, consumers' positive attitudes manifest themselves by a certain level of loyalty towards domestically-produced milk and dairy products, and less emphasis placed on prices.

Actors of the dairy supply chains are apparently more ambitious in countries where they are appreciated by consumers, the media and politicians because of their contribution to the national economy and prosperity of the country. Considerable and growing export earnings usually increase the legitimacy of and support for the sector.

Moreover, in some countries a strong economic consensus has also been achieved. National dairy strategies with concrete objectives have been set up with the involvement of all actors in the chain together with advisory services, research centres and the government. Joint efforts of this type indicate a strong commitment to take advantage of future market opportunities and eventually have a great impact on the competitiveness of dairy supply chains.

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Attachment 1. The biggest dairy companies in the world ranked by their 2012 sales revenues.

Rank	Company	Country of headquarters	Sales revenues (billion €)
1.	Nestle	Switzerland	23.4
2.	Danone	France	15.1
3.	Lactalis	France	14.0
4.	Fonterra	New Zealand	12.5
5.	FrieslandCampina	Netherlands	10.5
6.	Dairy Farmers of America	USA	9.4
7.	Arla	Denmark/Sweden/Germany	8.4
8.	Deans	USA	6.9
9.	Saputo	Canada	6.5
10.	Meiji	Japan	6.0
11.	Unilever	Netherlands/UK	5.8
12.	Yili	China	5.1
13.	Morinaga	Japan	4.5
14.	Sodiaal	France	4.5
15.	Mengniu	China	4.5
16.	Kraft Foods	USA	4.4
17.	DMK	Germany	4.4
18.	Bongrain	France	4.1
19.	Schreiber Foods	USA	3.5
20.	Müller	Germany	3.3

Source: Rabobank.

Attachment 2. & 3. Labour productivity in dairy manufacturing.

thousand EUR of output per worker, at year 2010 price level								
Year	Denmark	Germany	Estonia	Latvia	Lithuania	Poland	Finland	Sweden
1995	423	-	-	-	-	-	344	334
1996	431	-	-	-	-	-	342	353
1997	413	-	-	-	-	-	342	328
1998	429	-	-	-	-	-	324	316
1999	438	548	-	46	-	-	349	341
2000	347	559	85	54	41	-	389	371
2001	366	584	107	61	47	-	407	334
2002	365	581	109	66	52	81	419	220
2003	420	573	116	75	54	79	426	373
2004	454	632	142	79	60	88	433	311
2005	456	657	142	86	71	111	442	306
2006	483	678	145	86	81	121	469	346
2007	486	710	162	87	99	141	470	345
2008	523	680	165	90	100	150	429	341
2009	513	658	146	85	94	120	415	322
2010	542	662	156	95	106	148	417	341
	Average growth rate of labour productivity (%)							
Period	1995-2010	1999-2010	2000-10	1999-2010	2000-10	2002-10	1995-2010	1995-2010
Value	1.7	1.7	6.3	6.9	10.0	7.7	1.3	0.1

thousand EUR of value added per worker, at year 2010 price level								
Year	Denmark	Germany	Estonia	Latvia	Lithuania	Poland	Finland	Sweden
1995	59	-	-	-	-	-	46	48
1996	63	-	-	-	-	-	54	71
1997	62	-	-	-	-	-	55	52
1998	65	-	-	-	-	-	48	55
1999	68	69	-	11	-	-	49	-
2000	-	71	9	15	7	-	49	44
2001	-	68	11	19	8	-	57	61
2002	-	72	13	19	8	15	59	41
2003	-	72	15	15	11	14	60	57
2004	-	81	11	14	12	14	65	60
2005	-	78	14	17	14	17	68	58
2006	-	80	19	15	19	18	68	69
2007	-	67	25	16	22	23	66	66
2008	-	63	23	16	13	22	58	53
2009	-	75	25	15	18	21	67	57
2010	-	66	22	17	17	24	69	54
	Average growth rate of labour productivity							
Period	1995-99	1999-2010	2000-10	1999-2010	2000-10	2002-10	1995-2010	1995-2010
Value	3.3	-0.4	8.7	3.8	8.7	6.0	2.7	0.8

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