

A Comparison of Dairy Supply Chains in Finland and in the Baltic Countries

IAMA Symposium 2009

Budapest

Csaba Jansik, Ph.D.
Principal Research Scientist,
MTT Agrifood Research Finland
Economic Research
Luutnantintie 13
00410 Helsinki
Finland
csaba.jansik@mtt.fi

Abstract. Finland and the Baltic states comprise a group of countries with favourable conditions for dairying in Northern Europe. Despite their proximity, the four countries have significant differences in their dairy supply chains. This paper reviews the structural differences at various levels of the supply chain including milk production, procurement and processing. Export performance is one of the indicators to measure international competitiveness of a particular sector. Dairy exports have traditionally been strong in all four countries. In this comparative review Balassa indices are used to verify the competitiveness of the Finnish and Baltic dairy sectors for the period of 1998-2005.

Key words: Finland, Estonia, Latvia, Lithuania, dairy chain, RCA indices

Introduction

The dairy industry has been globalising fast for the past ten years. Globalisation has been arising through the increasing foreign trade of dairy goods and capital, a process well-perceived also in Northern Europe.

Accession to the EU in 2004 has accelerated the development in the Baltic dairy sectors. Hygienic conditions, raw material quality, and processing technologies have improved rapidly. The dairy supply chains have strengthened in the Baltic countries so that they produce well over the domestic need. They have managed to orientate the excess production to the EU common markets and to third countries' markets.

The objective of this analysis is to compare their performance on the field of milk production, processing and foreign trade to that of a neighbouring old EU member state, Finland.

Productivity has increased in both the Finnish and the Baltic dairy sectors and they are all strongly export oriented. Yet, the four countries differ from each other in a number of structural indicators. The set of indicators used in order to enlighten the differences and similarities include milk productivity, milk production, milk farm structure development as well as revenues and profitability, and the structure of the dairy industry.

The dairy supply chain has traditionally been the most significant field in the agri-food sectors of both Finland and the Baltic countries. Although in Finland meat industry has recently overtaken the dairy industry in terms of sales revenues, milk is still the largest single commodity in agricultural production. In the Baltic countries, the entire dairy supply chain has clearly been the flagship of agri-food sector for the past 20 years.

Comparative Review of the Structure of Dairy Supply Chains

Milk production

Tendencies in the dairy farm structure differed notably among the four countries in the 1990s, although it equally turned to concentration in the recent years.

At present, milk production in the four countries can be classified into three typical groups as far as dairy farm structure is concerned:

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

The dairy farm structure in Finland is dominated by mid-scale farms, 80 % of the dairy cows were situated in farms with 10-49 cows in 2007. At the same time, over two-thirds of the cows in Estonia were located in large-scale farms with over 100 cows, whereas in Latvia and Lithuania farms with under 10 cows still make up the largest group accounting for 45 % and 57 % of dairy cows (Table 1).

The current composition in the dairy farm structure can be explained by the nature and direction of recent developments in each country. In Finland, a gradual shift occurred from the dominance of small-scale farms to a more mid-scale farm dominated structure, a process, which took several decades.

Table 1. Changes in the dairy farm structure in Finland and in the Baltic countries

Number of dairy cows (1000)	2001			
	Finland	Estonia	Latvia	Lithuania
Farm size				
under 10 cows	28.1	31.0	201.4	360.4
10-49 cows	300.8	16.8	78.8	17.3
50-99 cows	14.3	7.4	14.6	3.8
over 100 cows*	4.5	72.7	70.5	34.8
Total	347.8	128.0	365.3	416.3

Number of dairy cows (1000)	2007			
	Finland	Estonia	Latvia	Lithuania
Farm size				
under 10 cows	15.0	9.7	82.1	226.4
10-49 cows	235.8	13.4	47.7	94.7
50-99 cows	30.8	8.7	17.2	22.7
over 100 cows*	14.4	76.2	35.3	54.6
Total	296.1	107.9	182.3	398.4

Sources: Information Centre of the Ministry of Agriculture and Forestry in Finland (Tike), Statistics Estonia, Central Statistical Bureau of Latvia and Statistics Lithuania.

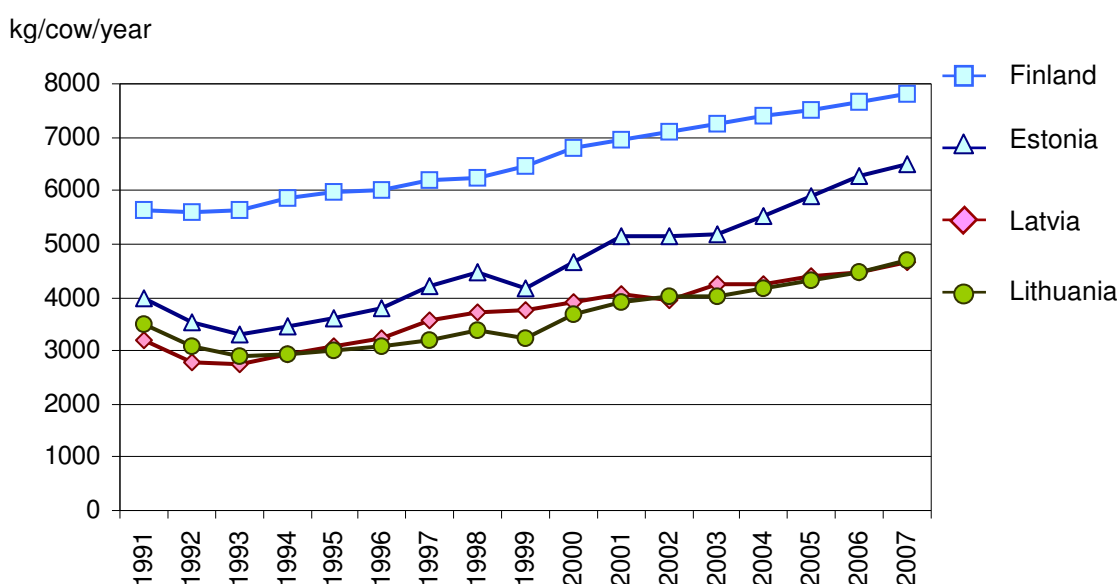
**Note: Farms with over 75 cows for Finland.*

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 originated from large state- or cooperative farms. 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 the emergence and enforcement of small-scale family farms, which lead to fragmented farm structure. The majority of dairy farms had 1-2 cows. Less than 50 % of these home supply farms delivered some milk to dairy processing companies.

Milk farms have concentrated into larger units both in Finland and in the Baltic countries 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 1999 farms with over 10 cows accounted for only 13 % of the dairy cows in Lithuania and 27 % in Latvia. By 2007, the share of these large and middle-scale farms in the total number of cows rose to 43 % in Lithuania and 55 % in Latvia. Expanding and strengthening mid- and large-scale farms take over the market shares of thousands of quitting 1-2 cow farms every year.

The amount of milk production dropped in all Baltic countries to 50-60 % from the end of the 1980s to the beginning of 1990s. The decrease was attributed to the reforms, uncertainty, the deep structural crisis in agriculture, and the sudden detachment from the Soviet Union's vast internal markets. The problems experienced in milk production created sales difficulties for actors throughout the entire dairy supply chain both in the domestic and export markets. The new private farms suffered from shortage of capital and even more so from the cost-price squeeze effect. The average quality of raw milk declined and quality also varied notably across the farms.

Figure 1. Average milk productivity in Finland and in the Baltic countries.



Sources: Information Centre of the Ministry of Agriculture and Forestry in Finland (Tike), Statistics Finland, Statistics Estonia, Central Statistical Bureau of Latvia and Statistics Lithuania.

The technology applied in the milk farms, however, has been modernised over the last ten years and quality improved substantially. Thousands of milk farms have invested into modern milking and cooling equipment with the support of EU or national subsidies or dairy manufacturing companies. Well over 90 % of the milk delivered for processing was high quality – first or elite grade – by the accession to the EU in 2004.

Average milk productivity per cow also declined alarmingly during the first years of reforms and agricultural crisis. However, productivity turned to growth in the mid-1990s and continued to rise due to the upgraded milk production technology, improved market situation, and increase in the average farm size and total amount of milk.

Average milk productivity was about 4700 kg/cow in Latvia and Lithuania, nearly 6500 kg/cow in Estonia and 7800 kg/cow in Finland in 2007. The increase is predicted to continue in the future, however a gap between the countries is expected to prevail at least for the next few years.

Milk procurement

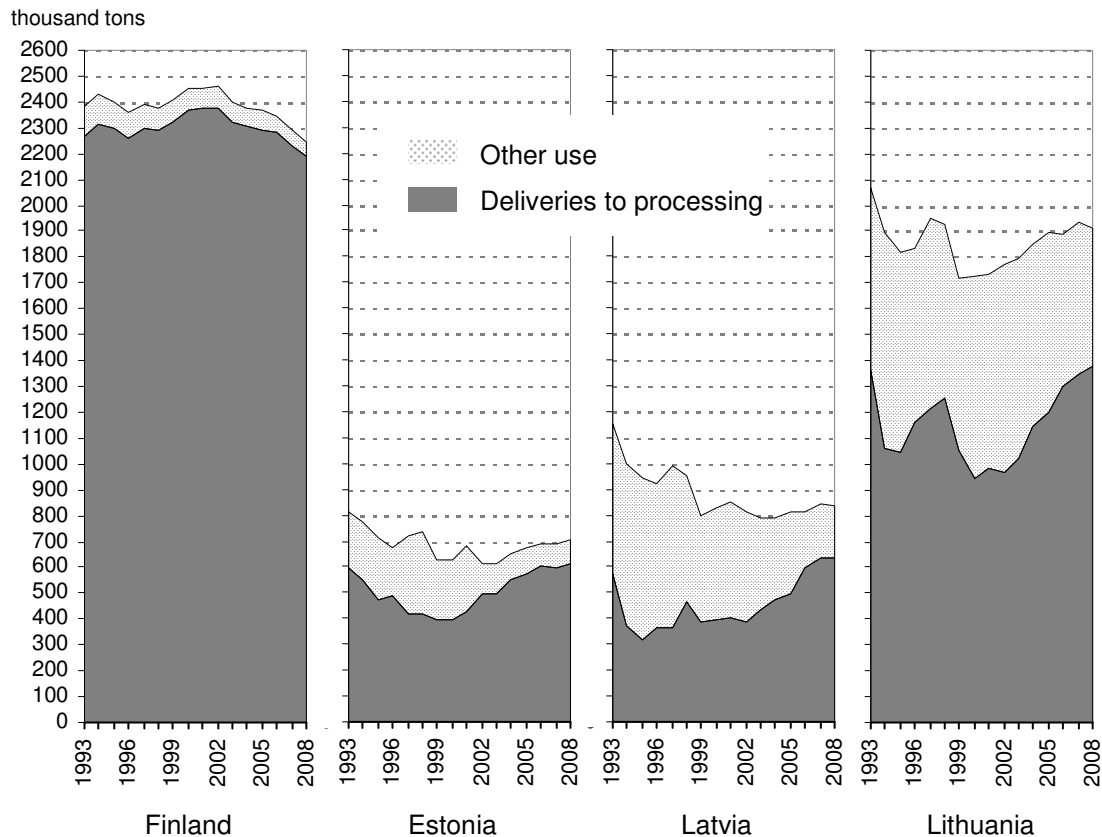
The share of milk delivered to processing companies varies considerably among the four countries. In Finland it has exceeded 95 % the beginning of 1990s, unlike in the Baltic countries; where it dropped to 55-70 % in Estonia, 35-45 % in Latvia and 55-65 % in Lithuania by the middle of the 1990s. The amount of milk purchased by dairy processing companies decreased in all Baltic countries after the crisis in the Russian market in 1998, but turned again to growth in the beginning of the 2000s.

The decline of other milk use – farm use, feed use and sales on the local markets – has been strongly connected to the recent tendencies in the farm structure: the elimination of the smallest home-supply farms and the concurrent growth of middle- and large-scale farms. Out of the three Baltic countries, the Estonian structure of milk use is closest to the Western-European composition, which is explained by the high weight of large-scale farms and the milk collection system.

The amounts of deliveries to processing companies have increased throughout the Baltic milk sector steadily since 2002, which is attributed to the improved market prospects both on domestic and foreign markets:

- (1) On the domestic markets, the GDP in the Baltic countries increased rapidly in the 2000s, favourably affecting food consumption. Rising incomes also induced increasing demand of dairy products.
- (2) The Baltic dairy companies have already had access to the EU markets as early as in the beginning of the 2000s, but their rapid modernisation and the 2004 accession to the common markets opened even more export opportunities.
- (3) The demand in the markets of third countries has also increased over the recent years.
- (4) The significance of direct sales channels declined with the evolvement and spread of modern wholesale and retail chains.

Figure 2. The structure of milk use in Finland and the Baltic countries in 1993-2008.



Sources: Information Centre of the Ministry of Agriculture and Forestry in Finland (Tike), Statistics Finland, Statistics Estonia, Central Statistical Bureau of Latvia and Statistics Lithuania.

Deliveries to processing companies have increased fast during the first years of EU membership particularly in Latvia and Lithuania. By 2007 the proportion of milk delivered to processing amounted to over 87 % in Estonia and 76 % and 72% respectively in Latvia and Lithuania.

Milk price levels in the candidate countries used to differ both from each other and the prices of EU-15. Hence, the eastern enlargement of EU induced substantial changes in the raw milk markets in Europe; an instant trade of raw milk emerged across the borders. Several hundred thousands tons of milk has been sold in Central-Europe both amongst the new member states and from the NMS to EU-15 such as to Italy and Germany. The trade of raw milk has brought about the convergence of price levels within the entire EU and the earlier price gaps have shrunken in the recent years.

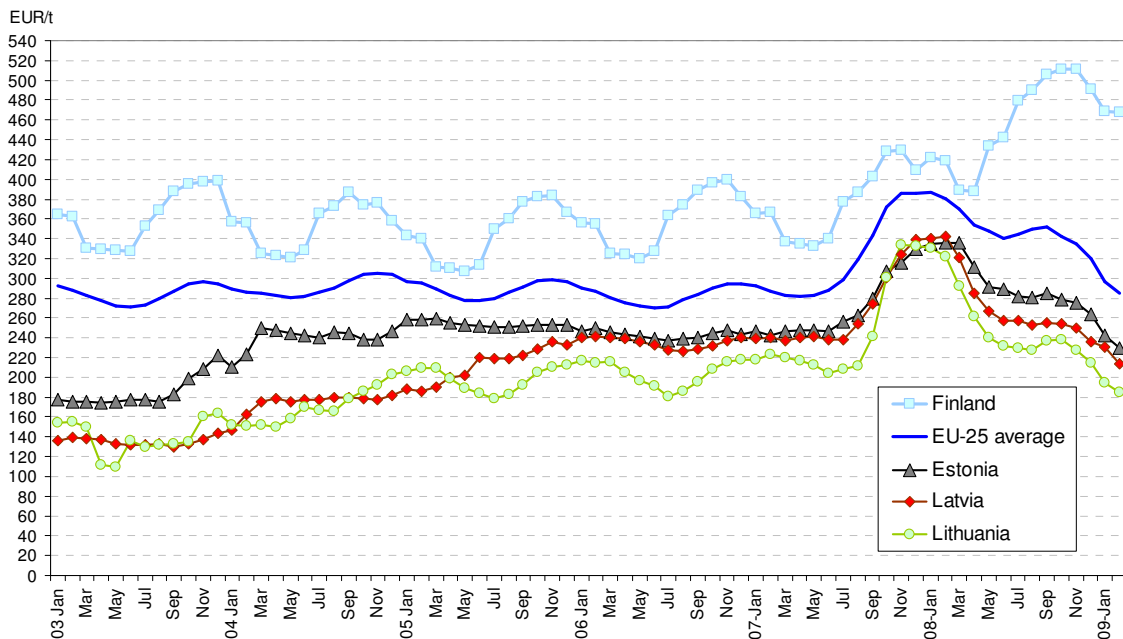
The same tendencies can be perceived in the Baltic countries. Sound markets and improving prospects for the dairy sector generated higher demand for dairy products. The processing companies entered into a fierce competition for raw milk and procured milk even from the neighbouring countries. In 2006 Latvian companies purchased 55 thousand tons of milk from Estonia and similarly, Lithuanian

manufacturers bought 130 thousand tons from Latvia. The raw milk trade has narrowed the price gaps and made prices converge to each other and to the average EU price.

The cross-border trade of raw milk did not concern Finland despite its expensive milk producer prices. There are several reasons for this: (1) Finnish milk production has so far met the domestic market demand, (2) the vast majority of Finnish milk processing capacity is operated by cooperative based processors, which buy raw material from their owner-members, and (3) transportation over the sea imposes a natural barrier to large-scale imports of unprocessed bulk milk.

Due to the different milk farm structures in the four countries, the dairy processing companies have ended up establishing largely differing milk procurement mechanisms and logistic systems. The amount of milk produced by large- and middle-scale farms in Estonia and Finland facilitates the direct transportation of milk from farms to the processing plants. Direct transportation can not be possible to the same extent in Latvia and Lithuania, where several thousands of small farms are scattered in the countryside. Dairy companies, therefore, have established milk collection points to villages and municipal centres. Small farms take their milk to these collection points, from which dairy companies can get the milk in larger quantity.

Figure 3. Monthly prices of milk in 2003-2009.



Sources: Information Centre of the Ministry of Agriculture and Forestry in Finland (TIKE), Estonian Institute of Economic Research, Latvian State Institute of Agrarian Economics, Lithuanian Dairy Association.

The Latvian and Lithuanian dairy companies tend to make small farms pay for the additional logistic and transportation costs. In practice, this is done by paying lower price to small milk suppliers. For instance, in Lithuania the price paid to small producers can be as much as 20-30 % lower than average, while the price paid to large-scale producers can be notably higher than average. In Finland, there are almost no

differences in pricing based on farm size, mainly because the leading – cooperative based – dairy company pays the same price to all producers and it has a price-setting role due to its dominance on the market. Nevertheless, minor deviances in milk producer prices can also occur in Finland; prices provided by smaller dairy processors or in certain regions may deviate from the mainstream.

The world milk market entered a turbulent era in 2007-08. Adverse weather conditions in the two major dairy producers, Australia and New Zealand resulted in a scarce supply and a sharp price rise of milk, butter and milk powder in the world markets. The EU average milk price also increased instantly and prices in the three Baltic countries followed the trend converging to each other closer than ever before. Having reached the peak, however, Lithuanian milk price soon returned to be the cheapest of all EU countries. The primary reason for the low milk prices in Lithuania and Latvia has definitely been the disperse farm structure and high milk collection expenses.

Milk prices in Finland apparently did not follow, but rather diverged from the major trends. While world and EU market prices rocketed, Finnish prices did not change significantly compared to their own previous level, however, they set to a sharp rise subsequently, when prices declined everywhere else. This surprising development can be explained by the peculiar set-up in the domestic market. Supply contracts between dairies and wholesale and retail chains used to be made on an annual basis. Consumer prices of Finnish dairy products stayed on their previous level until the end of 2007. The dominant dairy processor then negotiated a price rise and a change to the annual-based supply contract system at a time when world market prices hit a peak level and there were scarcity of inexpensive dairy products in the international markets. The record high Finnish milk prices have thus been one-year delayed reflections of world market prices. They turned to a decline at the end of 2008, but the decrease has been so far held back by other domestic factors.

Dairy industry

The structure of Finnish dairy industry has been stable over the past 15-20 years. Although the last decade has witnessed numerous mergers and structural changes on the field of cooperative dairy associations, they did not affect the structure of dairy industry. The leading dairy is owned by cooperative dairy associations, which in turn are owned by milk producers. This dominant concern is followed by a middle-sized private owned dairy and nearly 50 small-scale milk processors. The small dairies specialise in certain product groups such as fresh cheese or other fresh products or they only procure milk. In 2008, small dairies contributed less than 10 % to the total sales revenues of the Finnish dairy industry.

Compared to Finland, the structural development of the Baltic dairy industries was a stormy process especially in the first years of independence in the 1990s. The giant dairy processing companies inherited from the previous economic system were split into several small production units, which were privatised separately. In Estonia 11 large dairy companies were divided into 36 smaller units and at the same time 60 % of processing capacity was transferred into the ownership of milk producers or their cooperatives. The rest of processing capacity was sold to domestic private investors.

Milk producers were also favoured in Latvia and Lithuania, so the privatisation process resulted in a similar ownership structure throughout the Baltic countries by the end of the 1990s.

Market difficulties put dairy companies to a serious test through the 1990s and dozens of them quitted or were squeezed out of the market at latest in the bankruptcy wave caused by the Russian crisis in 1998. This set the stage for a development period characterised by strong concentration, i.e. mergers and acquisitions. The CR4 (concentration ratio 4; the share of the four largest companies in the total sales of the industry) increased e.g. in Lithuania from 29 % in 1994 to 56 % in 1998. Concentration finally resulted in a structure dominated by 2-3 strong dairy companies in each Baltic country by now. The rest of the dairy manufacturers are middle-sized companies or small specialised processors which target small market segments.

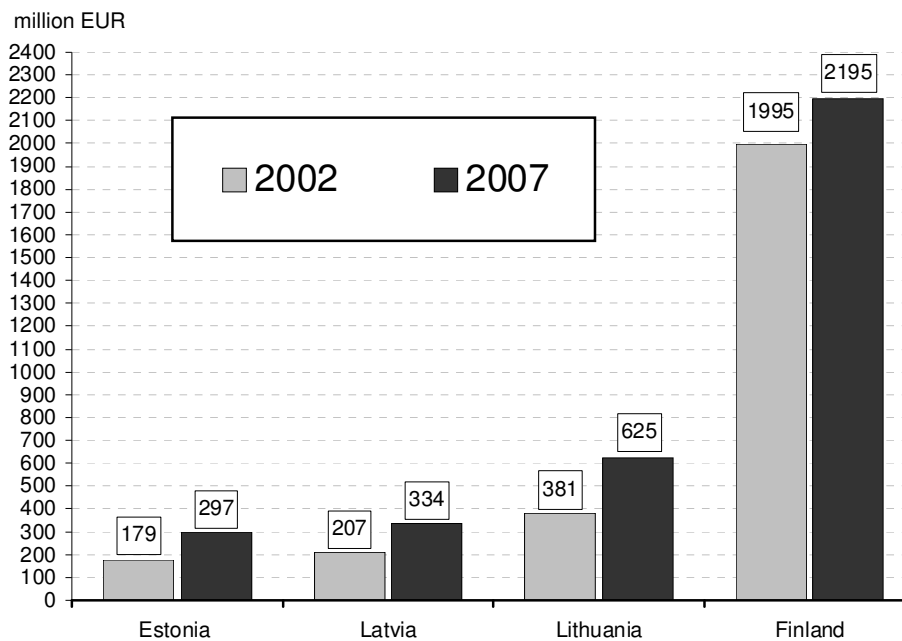
The first foreign investors arrived to the Baltic dairy industry in the end of 1990s. Estonia has been the most popular target country, where the share of foreign ownership in the aggregate company capital of dairy industry amounts to nearly 40 %. The share of foreign ownership is 15 % in Lithuania and 8 % in Latvia. The shares of foreigners were even slightly higher prior to the accession to the EU, but domestic investors have purchased back some of the foreign-owned capital in Estonia and Lithuania. Due to recent transactions, the share of foreign ownership also increased in Finland exceeding 15 % in the aggregate company capital of dairy industry.

The sales revenues of dairy industry increased between 2002 and 2007 in each of the four countries. The pace of growth, however, differs between Finland and the Baltic countries. During those four years the sales revenues in Finland grew 10 %, while the growth rate was much sharper in Estonia (65 %), Latvia (61 %) and Lithuania (64 %). A parallel difference can be observed in the growth rates of sales revenues per employee, which figure increased in Finland 8 % between 2002 and 2007, while it jumped up notably in Estonia (84 %), Latvia (81 %) and Lithuania (61 %). The absolute levels are obviously much lower in the Baltic countries than in Finland. Dairy processing is still generally a more labour-intensive field in the Baltic countries.

Profitability in dairy processing has varied by countries and especially by companies. In each of the four countries, there has been at least one manufacturer which clearly has stood out of the average with much higher profitability.

The average profit to sales ratio in the Finnish dairy industry has remained under one per cent over the recent two years. EU membership has increased the differences in profitability among the Baltic dairy industries. The average profit to sales ratio in the Estonian dairy industry declined to about zero right after acceding to the EU. Low profitability was caused probably by the sudden, almost 50 % price rise of raw milk, which occurred already in the end of 2003 as a result of EU membership expectations. Within the Baltic countries, the Estonian dairy companies paid apparently the most expensive prices for milk in the first years of EU membership. Yet, profitability improved in Estonia to 3-5 % by 2006 and 2007. The average profit to sales ratio was around 2-3 % in Latvia and even higher, 3-4 % in Lithuania. The current world market situation definitely affects adversely the profit making of all Baltic dairies through sales difficulties on the export markets.

Figure 4. Sales revenues of the dairy industry.



Source: Statistics Finland, Statistics Estonia, Central Statistical Bureau of Latvia and Statistics Lithuania.

Comparison of Export Performance

Foreign trade of dairy products

The milk sector suits naturally the agricultural production conditions in the northern countries. The production of milk and dairy products largely exceeds domestic demand in all four countries. Self sufficiency ratio stayed well over 100 % even during the crises in the 1990s i.e. the economic and structural reforms in the Baltic countries, the economic recession in Finland, or the set-back in the Russian markets.

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 of dairy products increased sharply in several Central-European NMS, the development in the Baltic countries has been much more moderate. The share of domestic manufacturers in the Baltic dairy markets remained high, between 87-92 %. More recently the level stayed firm in Estonia and Lithuania, but declined to 81 % in Latvia by 2007. In the Finnish market, the long-lasting share of domestic manufacturers of over 93 % in the 1990s went down to slightly under 90 % by 2007.

The trade balance of milk and dairy products has been positive, i.e. exports have surpassed imports in all four countries in the 2000s. In Finland the positive dairy trade balance has slightly declined primarily due to the expanding imports. In the Baltic

countries EU membership has brought about rapidly growing exports, and consequently constantly 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 perceived in the export structure.

Table 2. The value of foreign trade of milk and dairy products in Finland and in the Baltic countries (million €).

	Finland			Estonia			Latvia			Lithuania		
	Import	Export	Balance	Import	Export	Balance	Import	Export	Balance	Import	Export	Balance
1999	112	198	86	15	39	24	15	26	12	11	113	102
2000	118	266	148	20	52	32	25	31	7	42	159	117
2001	116	278	162	21	63	42	34	38	5	39	182	143
2002	120	277	158	23	65	42	32	29	-3	16	160	144
2003	135	270	134	43	63	19	31	30	-1	13	162	149
2004	159	281	122	24	79	55	31	46	15	17	229	213
2005	179	302	123	20	87	68	38	65	27	39	255	216
2006	204	321	117	20	100	80	57	101	44	65	293	228
2007	221	369	148	29	133	104	68	129	61	89	394	305
2008	257	370	112	38	135	97	81	125	44	117	380	263

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

Methodology and results

The fast increase of dairy exports raises the question of how competitive these countries' dairy sectors really are in an international comparison. A commonly used indicator is the revealed comparative advantage (RCA) index.

Balassa (1965) derived the index that measures a country's revealed comparative advantage (RCA) in the trade of a branch of the economy, an industry or even a specific product group or a given product by its share in the country's total exports relative to the particular industry's or product's share in the total world export.

The formula of the index is:

$$RCA_{ij} = 100(X_{ij} / X_{wj}) / (X_{it} / X_{wt}),$$

where X_{ij} is the export of country i in the case of product j ; w denotes world export and t the export of all products or total export. If the index takes the value of over 1, the

country has comparative advantages in the given product group, in other words the country is specialised in producing and exporting this product in international trade.

As Havrila and Gunawardana (2003) pointed out, the indices have been widely applied in empirical studies, but there is not a consensus on how to interpret them. In the dichotomous sense the RCA indices are used for the plain verification of comparative advantages. The cardinal interpretation is used to measure the magnitude, while the ordinal interpretation the ranking of the countries or sectors. The ability of the indices for ordinal and cardinal measures has been disputed in the literature, and most analyses stay with the dichotomous interpretation.

RCA indices signify all four dairy supply chains having comparative advantages. The indices also shed light on the considerably different degree of specialisation in dairy exports in the four countries. The comparative advantage has evidently been stable both in the Baltic countries and in Finland, although the time series through the examined period show some fluctuation. The development of other sectors, their size and export performance also have an impact on the level of Balassa indices.

Table 3. Balassa (RCA) indices of the Finnish, Estonia, Latvian and Lithuanian dairy supply chain.

	1998	1999	2000	2001	2002	2003	2004	2005
Finland	1.1	1.1	1.4	1.3	1.4	1.3	1.4	1.5
Estonia	4.9	3.5	3.5	3.7	4.0	3.4	3.7	3.3
Latvia	1.6	1.4	4.3	3.7	3.4	3.6	3.0	3.9
Lithuania	2.5	8.3	9.5	7.8	6.5	5.5	6.1	5.7

Source: own calculations using FAO and Eurostat statistical databases.

Conclusions

The milk supply chain has long been the flagship of the Finnish and Baltic agri-food sectors for obvious reasons. In the northern latitude it would be unrealistic to specialise in crop products such as grains or fruits and vegetables, so the climate conditions and fertile pasture areas determine an orientation into milk production.

The four countries feature similarities but also considerable differences in their dairy sectors. They all have traditionally been dairy exporters, but the structural development in their dairy supply chain has been rather different. Ownership throughout the dairy chain is an essential issue, which has an effect on the overall performance. Ownership of the dairy industry varies from the dominance of milk farmers to private domestic or foreign capital. Ownership also shapes the long term strategies of the dairy processing companies and indirectly the entire chain.

Although productivity has increased in both the Finnish and the Baltic dairy sectors and they are all strongly export oriented, the four countries differ from each other in the structural indicators. Latvian and Lithuanian milk production sectors are dominated by small-scale farms, whereas Estonian milk production by large-scale

farms. Finnish milk production represents the third type, as most of the milk is originated from middle-scale farms. The different milk farm structures lead to various collection patterns and shares of milk delivered for processing in each country. Concentration ratios of the dairy industry also show notable differences. The CR₄ vary from 52 % in Estonia to 97 % in Finland.

The foreign trade performance and statistics verify that Finnish and Baltic dairy sectors have comparative advantages in export markets. Although the dairy sectors in these countries differ from each other with respect to the structure of milk farms, dairy companies and ownership relations, they all have achieved strong positions – compared to their size – in the foreign trade of dairy products.

The Baltic countries have traded among themselves some dairy products and increasingly raw milk. However, competition between Finland and the Baltic countries is not typical on each others' market apart from a few special dairy items. In the case of the processed dairy products the strongest competition among the four countries can be perceived on the third markets. Since the accession to the EU, Baltic dairy exporters have succeeded in recapturing their positions on the Russian markets which they lost in the 1990s and nowadays are rivals to the Finnish dairy products.

Besides the expanding foreign trade of goods, the globalising environment has facilitated the increase of trade in capital. Foreign investors showed the highest interest quite interestingly in the smallest milk supply chain out of the four countries; Estonia has attracted foreign investments both to dairy processing and milk production from several countries. Finland and Lithuania have also received notable foreign investments into their dairy industry.

It is anticipated that all four dairy sectors take part in the foreign direct investment (FDI) flows in the coming years. The Baltic countries most probably continue to be recipients of foreign capital, while Finland can participate in the internationalisation process either as an investing or as a host country.

References

- van Berkum S., Zemeckis R., Gapšys A., Mikeliūnaitė D., Eicaite O. & Girgždiene V. (2009): An Assessment of the Competitiveness of the Dairy Food Chain in Lithuania. Published in www.agripolicy.net
- Balassa, B. (1965): Trade Liberalization and Revealed Comparative Advantage, *The Manchester School of Economic and Social Studies* 33, 99-123.
- Havrila I. & Gunawardana P. (2003): Analysing Comparative Advantage and Competitiveness: An Application to Australia's Textile and Clothing Industries. *Australian Economic Papers*, Volume 42, Issue 1 (p 103-117)
- Hein P. (2006): Competitiveness and Comparative Advantage in the Estonian Milk Sector – A PAM analysis for different farm types and processing enterprises, PhD dissertation, Humboldt Universität, Shaker Verlag, Aachen.
- Janskis C. (2008): Comparison of the Finnish and Baltic Dairy Sectors. Published in "Farms in Central and Eastern Europe – Today and Tomorrow, Institute of Agricultural and Food Economics", No 98.1, Warsaw, pp. 201-212.
- Niemi J. & Ahlstedt J. (2007): Finnish Agriculture and Rural Industries 2007. MTT Agrifood Research Finland, Economic Research, Helsinki.

Lithuanian Institute of Agrarian Economics: Rinkotyra. Žemės ūkio ir maisto produktai, Vilnius. Various issues from 2004-2008.

Saron T. (2006): Estonian Dairy Sector in 2005. Eesti Piimaliit, Tallinn, mimeo.

Pyykkönen P. & Virolainen M. (2007): Osuusmeijerit myötätuulessa. Osuustoiminta 4/2007, pp. 36-38.

Databases and publications of the national statistical institutes: Statistics Finland, Statistics Estonia, Central Statistical Bureau of Latvia and Statistics Lithuania.

Interviews with researchers, association and business representatives of the Finnish, Estonia, Latvian and Lithuanian dairy supply chains.