Competitiveness of the EU dairy industry

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G.M.L. Tacken (ed.)
with contributions from:
M. Banse
A. Batowska
C. Gardebroek
K. Nesha Turi
J.H.M. Wijnands
K.J. Poppe

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The European dairy industry is confronted with losing market share in the global competition. This is mainly a result of changes in agricultural trade policy. This report studies the competitiveness of the dairy industry in more detail. The report is the result of a background study for a project commissioned by the European Commission, DG Enterprise and Industry.

The report is based on work done in 2008 for a project on the competitiveness of the European Food Industry, commissioned by the European Commission, DG Enterprise and Industry. The responsibility for the conclusions lies with the authors, and conclusions are not future policies of the EU.

Orders
+31.70-3358330
publicatie.lei@wur.nl

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Content

Preface

Two years ago LEI and Wageningen University carried out a study for the European Commission DG Enterprise and Industry on the competitiveness of the European Food Industry. In November 2007 that study played an important role in a conference on this issue in Brussels, where the European Commission Vice-President announced the installation of a High Level Group for the Food Industry. Recently a follow-up study has been commissioned to the same project team, to study a number of issues in more detail for the dairy industry as a representative sector in the food industry. One of the topics of this study was the the competitiveness of the dairy sector. This background report presents the results of that study. They will be integrated with other topics in a final report published by the European Commission.

Jo Wijnands, LEI Wageningen UR, developed the methodology of this part of the research. Students Agnieska Batowska and Kedir Nesha Turi carried out detailed research on innovation and business dynamics, under the supervision of Jo Wijnands and Koos Gardebroek (Wageningen University). The report was written by Jo Wijnands, Gemma Tacken and Krijn Poppe.

We thank DG Enterprise and Industry for their support in this study. We hope and expect that the results will be useful in the discussions of the High Level Group and that they are inspirational for future scientific work on this issue.

Prof. dr. R.B.M. Huirne
General Director LEI Wageningen UR

Summary

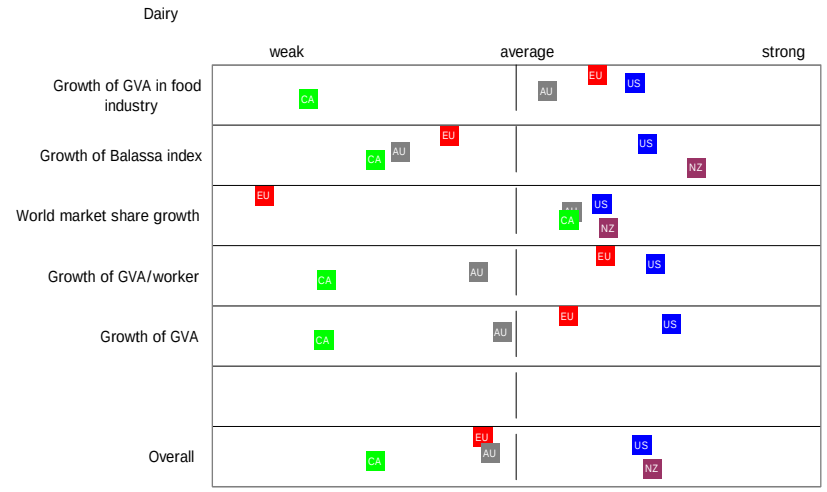
The local consumption of milk products is increasing slightly due to increased consumption of cheese and yoghurts. Milk consumption is slightly decreasing in most countries. In the EU-12 the dairy industry is growing in importance in the total food industry.

The EU dairy industry is very dominant in the world market. The EU-25 exports amount €21 bn worth to other countries, while Oceania exports amount to €3.8 bn and NAFTA to €1.1 bn. Although the export value is increasing the world market share of the EU is decreasing, since the world market is growing faster than the EU can meet. New Zealand profits most from the increasing world market demand. Brazil is still an unimportant player in the world market but in the local food industry the importance of the dairy industry is increasing very fast. Due to increasing competition of especially New Zealand in the milk powder market the EU specialises more in cheese.

Within the EU the companies innovate mostly on products and less in marketing, organisation and process. Product innovations are mostly done on varieties, but also very important are innovations on new ingredients (in functional foods). SMEs as well as large companies, including the packaging and ingredients industry, all contribute to innovation. In north-western Europe the dairy industry is dominated by large firms. In the Netherlands the dairy industry is most concentrated. France and Germany have a small number of large firms and quite a large number of medium and small firms. Italy has a high number of medium and small firms and the highest number of new entrants. The turnover of the top 10 dairy companies has increased between 2004 and 2006. In the large majority of countries labour productivity has improved.

In conclusion, the EU dairy industry can be characterised as innovative and a global player, but it is losing market share. The competitive position is just below average, mainly due to the loss in world market share. The world market is growing faster than European exports. Compared to the previous report (Wijnands et al., 2007) the improvement in labour productivity and the growth in value added compensate for the loss in market share. New Zealand performs well because of the high increase in world market share.

Figure 1 **Overall competitiveness of the dairy sector**



It is unlikely that this situation will improve much in the future. Abolition of quotas would increase the volume of production as the sector is then less restricted in supplying of raw material. However, full liberalisation would make some dairy farming uncompetitive and the production volume would decrease. Australia and New Zealand would profit most from liberalisation. Employment in the sector would fall with about 3%. But it would generate welfare - and the analysis shows that the size of the sector is also very dependent on total GDP and the size of the population. Improved productivity at farm or industry level helps to improve the competitive position.

1 Introduction

1.1 Introduction

The importance of the EU Food Industry is growing. A fair number of leading food enterprises are located in the EU. However, competitiveness of the European Food Industry is weak compared to the US and Canada. In this report the competitiveness of the dairy sector is analysed using the proven methodology of Wijnands et al. (2007). The performance of this subsector will be benchmarked within the EU countries as well as the main competing countries (USA, Australia, Brazil and Canada).

In this report the competitiveness analysis of the dairy sector presented in the report of Wijnands et al. (2007) is updated. In addition, an analysis of the chain performance (including the primary sector), innovation and business performance is added.

The methodology of 2007 is broadened with an analysis of the innovation in the dairy industry, as innovation and knowledge diffusion are key drivers for competitiveness. The aim of this adjustment is measuring and analysing the dairy industry's innovativeness.

In addition to innovation, the business dynamics are analysed. A dynamic industry is induced by entry, growth and exit of individual firms over time. In the dynamic process inefficient firms are assumed to be replaced by efficient firms. Dairy processing industry dynamics is expected to follow the same process. In this study the dynamics focus on entry, exit and firm growth rates, which are explained by financial and other firm-specific and industry variables. The dynamics in the industry are partly determined by interaction of idiosyncratic firm characteristics and turnover of firms (entry and exit). For instance, firm's growth is governed by financial structure (internal and/or external finance).

To investigate the future position of the dairy industry, a number of model calculations under different scenarios have been carried out.

1.2 Aim

The aim of this part is threefold:

(1) To update the competitiveness analysis of Wijnands et al. (2008);

(2) To give indications of the innovativeness of the EU dairy sector;
(3) To analyse the dynamics of dairy firms in the changing industry structure.

For innovation the following sub-questions have been formulated:

1. Is there one, most popular type of innovation?
2. Do the companies compete between each other or do they perhaps cooperate to achieve better results in innovation?
3. Does the dairy industry have leading innovators?
4. Does the size of the company influence its innovativeness?
5. Do innovative firms have higher profit margins?

For business dynamics the following sub-questions have been formulated:

- How do entry rate, firm size, and exit rate vary among selected EU member countries?
- What is the extent of concentration in the industry among selected EU member countries?
- What is the trend of entry, exit, merger and concentration over time?
- What are the dynamics of profitability among different size classes of firms and countries?
- What is the variation in capital structure among different sized firms and countries?
- Do firm-specific factors (size, age, capital structure, financial performance, investment in innovation) systematically influence firm growth dynamics?

1.3 Structure of the report

In chapter 2, the methodology of the project is decribed as well as the datasources that have been used. In chapter 3, the most important dairy products are described. In chapter 4, international trade in dairy products is presented and analysed. In chapter 5, the results of the innovativeness study are presented and in chapter 6, the results of the business dynamics study. The competitiveness at country level analysis can be read in chapter 7. Chapter 8 shows the results of a GTAP analysis of different scenarios of international policy developments.

2 Methodology

2.1 Measuring competitiveness

This report aims to identify the strengths and weaknesses of the European dairy chain. The methodology is based on the methodology of Wijnands et al. (2008). Here a summary is given to help understand the results in the next sections. The selected indicators to quantify the competitiveness of industry, which will be used in this report, are:

- growth of real value added for a specific industry in the total food industry. This reflects the competition for product factors between different industries within a country;
- growth of Balassa Index. This index reflects the export specialisation level in one category of goods from one country;
- growth of the export share (absolute deviation) on the world market. This performance indicator reflects the outcome of the competitive process;
- growth of the real labour productivity. This affects the unit labour costs and thus the relative prices;
- growth of real value added reflects the industrial dynamism.

The selected indicators are based on the approach to the theory of international economics. The value added is deflated by the food price index. Several other disciplines also deal with competitiveness (Gaasbeek et al., 1998). Some important disciplines are:

- *Industrial Economics*
  This approach is elaborated in the renowned works of Porter (1980, 1990). Porter emphasizes strategies (costs and differentiation) as well as the aspects of the value chain;
- *Strategic management*
  Hamel and Prahalad (1994) and Hunt and Morgan (1995) are important representatives of this approach. Enhancing the core competence of the resources is one of the key elements;
- *Marketing*
  Market orientation, product differentiation and innovation are some important key determinant. Fulfilling specific market niches is the major orientation (Deshpande and Webster, 1989).

These approaches generally focus on the decision making of individual firms. The selected approach in this study is more suited to compare countries and continues building on other approaches used for EU studies (see e.g. O'Mahoney and Van Ark, 2003). In the descriptive parts of each industry, several other variables are discussed, such as the consumption, self-sufficiency, import and export patterns of the main countries, the structure of the industry and the leading companies. These variables are related to the outcome of the aforementioned 5 indicators but also provide some evidence to support conclusions related to other scientific disciplines. The variables are presented at nominal level, in order to increase the recognition by stakeholders from the industry. In conclusion, the final overall qualification of competitiveness is based on international indicators, but the descriptive part also gives information linked to the theories based on the decision making of individual companies.

The European dairy industry will be benchmarked against the US and Australia, Brazil and Canada. The selection of these countries is based on the importance of their exports. Unless stated otherwise, the EU-15 is selected because the EU-25 started in 2004. Second, in the benchmark with third countries, the extra-communitarian trade figures are used, while the intra-EU trade is excluded.

Some important countries like China, India and Japan are not included due to lack of data with an equal detail as the EU and selected countries. Furthermore, the 15 EU countries will be presented, benchmarked against all EU-25 countries. In this case the export of each country is taken, including the intra-communitarian trade. It also presents the internal EU competition on the domestic EU market.

The aforementioned indicators have different scales. To compare the different scales, the values will be standardised. All variables will have the same dimension and can then easily presented in one figure. Furthermore, the mean of these values can be calculated as an indication of the overall competitiveness. In this case, the implicit assumption was that the weight or importance of each indicator is equal.

However, this method also has a disadvantage. The standard scores depend on the number of countries and the levels of indicators in the sample: the standard scores are not fixed. If the benchmark countries or the levels of indicators change, the position of a specific country will also change.

The terminology to qualify the competitiveness is taken from the SWOT analysis method: Strong and Weak. These are relative qualifications: since the performance is compared to other countries. The selected countries influence the qualification. The qualification might be quite different if other countries are selected as benchmark.

2.2 Innovation: definition

In addition to the competitiveness the performance in innovation is analysed. Many authors base their innovation studies on Schumpeter's theories and many publications modify his typology just slightly. We also follow that approach, as does the OECD.

In this study innovation is defined as an

> 'implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations' (OECD, 2005).

According to Joseph Schumpeter, the five types of innovation are (see OECD, 1997, p. 16):

1. *product innovation*
   the introduction of a new good (or service)- that is one with which consumers are not yet familiar- or of a new quality of a good;
2. *process innovation*
   the introduction of a new method of production, which need by no means be founded upon a discovery scientifically new, and can also exist in a new way of handling a commodity commercially;
3. *marketing innovation*
   the opening of a new market that is a market into which the particular branch of manufacture of the country in question has not previously entered, whether or not this market has existed before;
4. *organisational innovation*
   the introduction of an adapted organisation, like cooperation with customers, suppliers or knowledge centres;
5. *the conquest for a new source of supply of raw materials or half-manufactured goods*
   again irrespective of whether this source already exists or whether it has first to be created- element not mentioned in the OECD's typology.

Most types are divided into sub-categories. These are presented in chapter 5 and discussed in Batowska (2008).

Cases are selected if they meet following criteria:

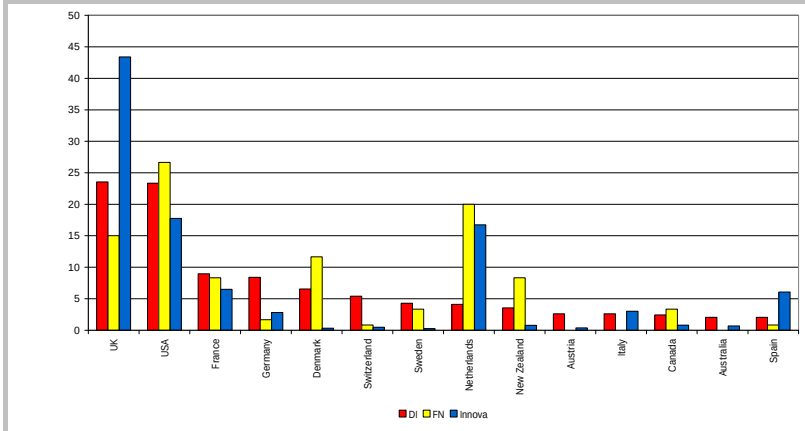
1. an innovation, as mentioned in above; and

2. dairy products and ingredients based on cow milk. The research does not cover the milk ingredients such as soya drinks or milk from other animals.

This means that all cases that have an influence on dairy products are included e.g also development in packaging or ingredients. The companies are therefore not only dairies but also suppliers or customers.

The data sources are Food Navigator, Dairy Innovation and Innova database. The main question is whether these databases are biased. Do companies sponsor the newsletter or magazine and are they therefore mentioned more often? Does language restricts retrieval of information (both are English written sources)? The Innnova database is used for evaluating this bias. Figure 2.1 presents the observations of the three sources. As we cannot classify the Innova database according to types of innovation the comparison is based on country level. Figure 2.1 present the shares of innovation cases and product launches by country. The distribution of the cases from Dairy Innovation and Food Navigator and product launches from Innova shows an almost simular pattern. The USA, Denmark, and Switzerland have a relatively low level of new product launches, the UK has a high level. The cases of Food Navigator are relatively high in Denmark and New Zealand, whereas the Netherlands has a relatively low level of cases in Dairy Innovation.

Figure 2.1 **Shares (%) of total of innovation cases and product launches by country as recorded by Dairy Innovation, Food Navigator and Innova database. Countries ranked by their share of all innovation cases**



Sources: Own research and Innova database.

The cases in the developed database are far from exhaustive. First, not all available cases are included. Dairy Innovation issues 8 till 12 and 14 are not analysed. The changes in the distribution of cases over countries, firms, and types of innovation did not change much after analysing the first 5 issues of Dairy Innovation. The limited available resources are directed to analysing the data. Second, we used just two sources.

Finally, it should be mentioned that the database does not provide an overview of all new product launches. In our database, 'only' 739 cases are included, whereas Innova already mentioned 4,721 cases, which is also not exhaustive. Furthermore, 'innovation' is defined broader than product launches. Our conclusion is that the number of cases and a more or less similar distribution over countries between the three different sources gives a sound foundation to use this database as a representation of innovations in the dairy industry.

2.3 Business dynamics

This study also covers the business dynamics of the dairy industry. In studying the dynamics of the dairy processing industry the focus is on entry, exit and firm growth rates, which are explained by financial and other firm-specific and industry variables. The dynamics in the industry are partly determined by interaction of idiosyncratic firm characteristics and turnover of firms (entry and exit). For instance, a firm's growth is governed by financial structure (internal and/or external finance). Hence, access to both internal and external finance sources have influence on the size and growth dynamics of firms. High entry may indicate the presence of profit in the industry while capital stock in the industry may serve as entry barrier for new entrants as new entrants may lack financial capacity to invest in technology and expansion. These dynamics of entry, growth and exit, to our knowledge, have not been studied, yet are specific to the EU dairy processing industry. Until now, existing studies have generally been applied to food manufacturing industries or at more aggregate level across many industries. These may not identify peculiarities in the dynamics of dairy processing firms which are important for new policy formulation or application of existing policy. Therefore, it is crucial and relevant to study how firm-related factors play complex roles in the dynamics of dairy processing firms.

This section describes the country selection, source, and type of data. The first part discusses the selected countries and how and why they are selected into the study. The second part explains the type of data we use to achieve our

objective. Then, some descriptive statistics are given to understand the nature of the data and to lay the foundation for further econometric analysis. In addition entry-exit demography, concentration and financial performance of firms are analysed.

Country Selection

Due to time constraints to cover all EU member countries, six countries have been selected for the study sample. The sample includes countries characterised by Small and Medium Enterprises (SMEs) and countries characterised by large enterprises. The selection criteria are:

a. countries characterised by a large proportion of SMEs and countries with large companies;
b. new versus old EU member state. Most new member states have a milk production below 1% of the EU-27 total. Among these countries only Poland and Hungary have a significant share of milk production. Hungary has 1.2% and Poland 6%. We propose to incorporate Poland to represent the industrial structure of the new EU member states;
c. northern versus southern countries. Northern countries (except for Germany) are characterised by a high concentration of dairy enterprises.

Based on the above criteria Italy, France, the Netherlands, UK, Germany, and Poland have selected in the study sample. Italy and France are southern EU countries with a large number of SMEs that are characterised by strong competition (Wjnands et al., 2007). France and The Netherlands each have 2 or 3 firms in the top 20 world dairy players. In terms of shares of total EU milk production Germany, with a share of 21%, and France with a share of 11%, are large producers. The other countries that follow are the UK (11%), Italy (8%), the Netherlands (8%) and Poland (6%). These six countries contribute to a total share of 61% of EU 27 milk production (Wijnands et al., 2007).

EU firm size definition

It is important to define the size class of firms in order to analyse the dynamics among different size classes of firms. The classification of firm size into small, medium, and large is usually based on number of employees, turnover, and total asset (Europa, 2005). The EU official website (EUROPA) definition of micro, small, medium, and large enterprises is given in the table 2.1.

Table 2.1	EU classification of firm size (year 2005)		
	Classification criteria		
Enterprise category	**employee**	**turnover**	**total asset**
Large	>250	>€50 m.	€43 m.
Medium	50-249	€11-50 m.	€11-43 m.
Small	10-49	€2-10 m.	€2-10 m.
Micro	<10	<€2 m.	<€2 m.

Source: EUROPA website.

2.4 GTAP

The analysis of the future developments of the dairy industry under different scenarios is based on a global general equilibrium model, GTAP. The existing model has been adjusted specificly for this project. Details about the model nd adjustments made for this project are presented in appendix 2.

2.5 Data sources

The update of the competititiveness analysis is mainly done on basis of Eurostat data, Comtrade data and national information from countries outside the EU. These data are made comparable by identification of the base definitions. The dairy industry is able to produce different products: milk, cheese, yoghurt, butter, milk powder, condensed milk and some specific industrial raw materials. For this dairy analysis NACE code DA 15.5 is used and some subcodes for these products.

In the analysis the competitiveness of the industry is evaluated using several industry indicators such as gross value added, labour productivity and international trade indicators. In international trade statistics only products are observed.

The aim of the research is to assess the competitiveness of EU against the US, New Zealand, Australia, Brazil, Canada. The EU-25 started in 2005, so whenever possible, EU-25 data are used. If recent data are not available only the EU-15 is benchmarked. The trade data have reporting countries as starting point: trade to third countries either inside or outside the EU. To get a clear picture of the EU outside the community, the trade to third countries has been de-

rived. That means that the export from the EU to third countries (non-EU-15 countries) is benchmarked with the exports from the US and other countries.

Data sources innovation

The chosen research strategy was desk research. So far, three sources have been explored:

1. Food Navigator, a publicly available e-newsletter (all cases come from the Food Navigator's archive). This database provided 145 cases concerning innovations from 2003 to 2008 (August 2003 - January 2008). See FoodAndDrinkEurope [newsletter@foodanddrinkeurope.com].
   Although the main research was based on 143 articles (cases) from the Food Navigator, some of the innovations were classified into more than only one subgroup (the subgroups are presented in chapter 4) and, because of that, some statistics are made on the group of 355 observations;
2. Dairy Innovation. This magazine covers all innovation in the dairy industry. The magazine published 15 issues up till now. The first issue is published in 2005. (see: dairy.foodbev.com/issues/issues.aspx). At the time of the research issue 1 till 7 and number 13 and 15 are classified in our database system: 596 cases, resulting in 1,046 different innovations. Cases already mentioned in Food Navigator are excluded in the overview of Dairy Innovation;
3. Innova database (see: www.innova-food.com/home/index.rails). Innova is primarily an online new product-development tracking tool, using a network of international field researchers to report on new food and drinks launches. So it includes only product and marketing innovations. These innovations take up two thirds of all innovations. All product launches with the key words dairy, cow, or milk have been selected from January 2003 to February 2008. This resulted in 4,721 product sheets worldwide.

Business dynamics data sources

The data for this study have been obtained from the Amadeus database and the Eurostat database. Eurostat data have been used to support the Amadeus database in descriptive analysis and for evaluation and validation.

The Amadeus database contains financial information of over five million private and publicly owned firms across 34 Western and Eastern European countries from which dairy processing companies in six countries are selected. Most of the financial ratios are calculated and readily available. The database includes up to ten years of information per company, from 1994 to 2007, but the coverage varies among countries. However, the accuracy and availability of the data

at the beginning years are not very good. Hence, only data from between 1996 and 2006 have been used.

The Amadeus database includes firm-level accounting data in a standardized financial format for 22 balance sheet items, 22 income statement items, and 26 financial ratios. The accounts are transformed into a universal format to enhance comparison across countries, though coverage of these items varies across countries. In addition to financial information, Amadeus so provides other firm-level information. The non-financial information includes legal status, ownership, number of subsidiaries and year of incorporation.

Amadeus assigns companies a four-digit NACE code (the European standard of industry classification). NACE 155 is used, except for the Netherlands. For the Netherlands, in addition to companies with primary code NACE 155, Campina and Friesland Food are added to the sample. If only the NACE 155 is considered, the selection accounts for just 2% of the turnover made by dairy processors in the Netherlands as calculated in the Eurostat database.

Type of account

In Amadeus the reported type of firm accounts are both consolidated and unconsolidated accounts. To avoid repeated measurement of the same company, firms with consolidated accounts (code C1), when available, and firms with unconsolidated accounts (code U1) in other cases are included in the sample. Aggregating the subsidiaries to the holdings was thought at first to construct consolidated accounts. However, there are inconsistencies in the availability of account reports of all subsidiaries and the relation between mother and daughter company is not absolute. The relation rather depends on the percentage of share holdings. This complicates the account consolidation and may result in wrong data.

Beside using NACE codes and account report type as search criteria, companies without financial report and companies with limited variables (companies for which data is available only for one or two irrelevant variables) were removed from the sample. In order to avoid sampling of the companies under the same management companies with the same top manager, the same address and the same ultimate domestic owner were separated and reselected. Whenever companies possess the same manager or address or ultimate owner, the larger company is selected based on its turnover and total asset. When companies are similar in other aspects and one has a consolidated account this is given priority. Furthermore, companies with only one year of data were removed from the sample because in the estimation of the growth model, growth is measured

over 2 years. On average about 7 years of data is available per company, with lots of missing data in each variable.

Based on the above criteria in total 2,635 firms are identified and included in the sample. The following table shows the number of companies included in the sample by country.

Table 2.2 **Total number of sample dairy processing firms extracted from Amadeus database (from 1996 to 2006)**

Country	Number of firms
France	579
Germany	92
Italy	1,427
Netherlands	50
UK	299
Poland	188
Total	2,635

Coverage of sample

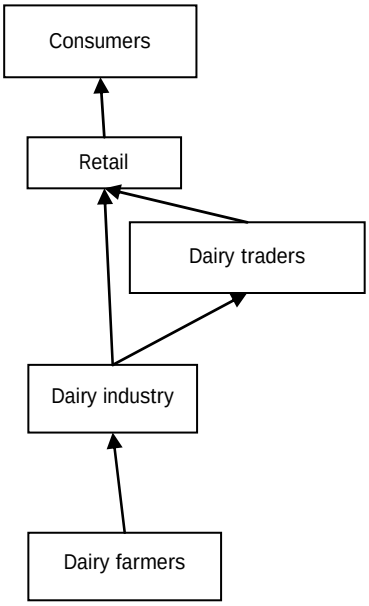
The Eurostat data is collected through a census survey, hence it is assumed to reflect the actual situation of the countries' dairy processing status. Therefore, efforts were made to make the sample from the Amadeus database comparable to the Eurostat data. For most of the countries the coverage in terms of turnover is nearly 40% on average (table 1.2). At the beginning years the Amadeus database firm coverage is low, which is also reflected in our sample coverage. For the Netherlands it is more than 100% because the sample for the Netherlands includes Campina and Friesland which are multinational food processors with substantial dairy activity.

Table 2.3		Amadeus sample turnover (in € million) coverage compared to Eurostat country-level turnover								
		1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
DE	Eurostat			20,300	20,945	22,296	21,322	23,624	24,006	23,028
	Amadeus			1,943	1,307	7,096	8,444	11,100	11,300	11,000
	%			10	6	32	40	47	47	48
FR	Eurostat	22,786	22,943	22,229	22,932	24,862	25,022	25,134	25,176	24,059
	Amadeus	7,273	8,263	8,461	9,189	9,589	10,000	11,000	10,800	9,924
	%	32	36	38	40	39	40	44	43	41
IT	Eurostat	13,550	15,172	16,068	15,145	17,293	16,096	18,262	16,690	17,189
	Amadeus	4,160	4,292	4,724	5,330	5,840	6,370	6,812	7,062	6,972
	%	31	28	29	35	34	40	37	42	41
NL	Eurostat	6,477	6,447	6,375	6,706	7,560	7,081	7,099	6,917	7,220
	Amadeus	6,854	7,462	7,530	6,960	7,074	7,395	7,104	6,514	6,762
	%	106	116	118	104	94	104	100	94	94
PL	Eurostat	2,670	2,719	2,630	3,228	3,879	3,669	3,369	3,909	4,690
	Amadeus	933	430	576	2,095	3,000	2,667	2,601	3,657	3,078
	%	35	16	22	65	77	73	77	94	66
UK	Eurostat	10,768	10,852	10,778	10,385	10,027	10,498	10,208	9,871	9,897
	Amadeus	7,012	8,082	9,214	9,135	9,353	7,938	7,097	9,389	8,986
	%	65	74	85	88	93	76	70	95	91
By using these sources we expect to give the most suitable information.										

3 Dairy chain and dairy products

In this chapter dairy products from cow milk are discussed. The main products that are made of cow milk are: fresh milk, cheese, yoghurts, butter and milk powder. These dairy products are partly produced for the local market, due to the relative short shelf life of some dairy products like fresh milk, yoghurt and (fresh) cheese. In addition, several products are traded globally, such as butter, cheese and milk powder. The dairy chain consists of the parties as shown in figure 3.1.

Figure 3.1 Dairy chain



The EU dairy industry is very dominant in the world market. The EU-25 exports €21 bn worth to other countries, while Oceania exports amount to €3.8 bn and NAFTA €1.1 bn. EU-27 is responsible for 72% of the total international trade when intra-EU trade and intra-Oceania trade between countries is included but intra-state trade within the states of the US and Canada is excluded. In relation to the exports of 2002-2004 (Wijnands et al., 2007) this is a further

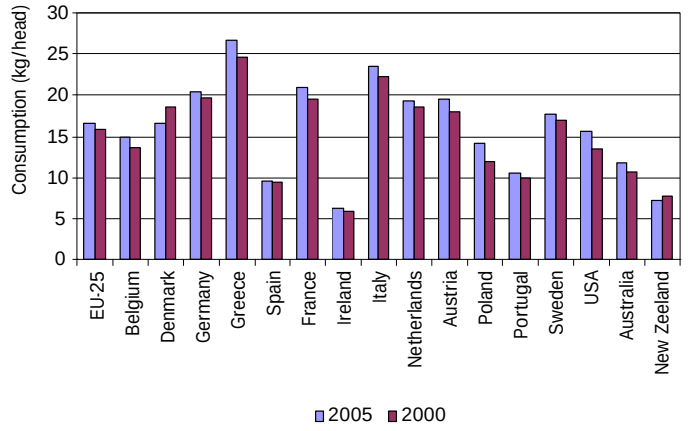
decrease. When intra-EU trade is excluded, the EU is still the largest trader in the world and responsible for 14% of world trade. But Oceania is approaching the EU very fast.

Consumption

The EU dairy industry in first instance produces for the home market. This home market is an increasing market for cheese and a fairly stable market for milk. The milk consumption in EU-27 was 71 kg per head on average in 2006. In most countries the milk consumption is stable or slightly going down, while in a few countries demand is rising. In 2000 the EU-27 milk consumption still was 73 kg per head, while in 2005 the milk consumption was 71 kg/head. The diversity in milk consumption is also very high (see figure 3.3).

The cheese consumption is going up in most countries. The average cheese consumption in the EU-25 was 15.9 kg per head in 2000 and 16.6 kg in 2005. Cheese consumption has increased most in the USA and in Poland.

Figure 3.2 **Cheese (based on cow milk) consumption in kg per head in major EU and benchmark countries**

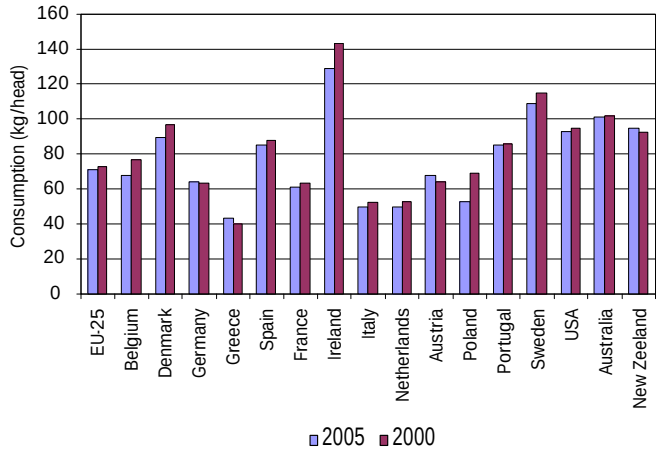


Source: Dutch Dairy Board.

The milk market and the cheese market seem to be complementary. The countries with a high milk consumption mostly have a relatively low cheese consumption and vice versa. For Western Europe yoghurt consumption is also very

relevant in dairy consumption. Finland, Sweden, the Netherlands and France are the most important yoghurt consumers in the EU.

Figure 3.3 **Milk consumption (in kg per head) in major EU and benchmark countries**



Source: Dutch Dairy Board.

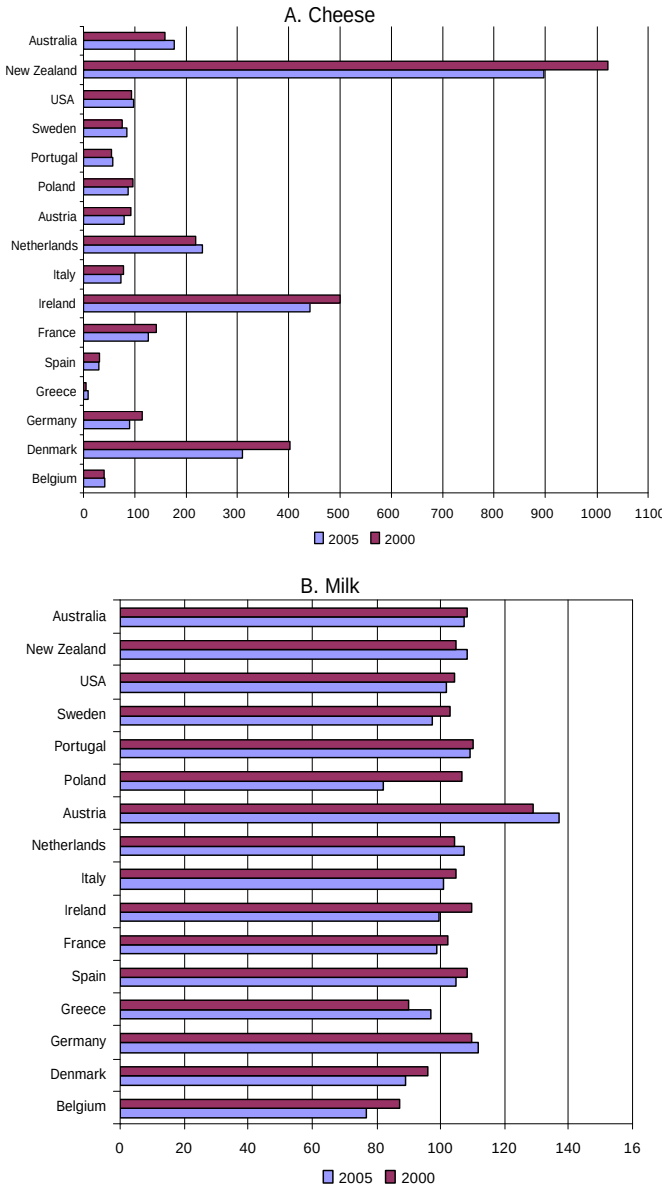
Self-sufficiency

In self-sufficiency there are large differences between drinking milk and eating cheese. For milk most countries have a self-sufficiency of near 100 (a score of 100 means self sufficient) while in cheese some countries are not self sufficient while others are more than self sufficient.

Most EU countries had a higher self-sufficiency for cheese in 2005 than in 2000, except the Netherlands, Poland, Portugal and Sweden. The self-sufficiency of New Zealand increased to more than 1,000 in 2005. This does not mean, however, that New Zealand produces high quantities of cheese in relation to European countries (see also table 4.2). The local consumption is very low, which automatically leads to a higher self-sufficiency.

Within Europe the self-sufficiency of cheese is low in Greece, Belgium and Spain. This is very remarkable, since cheese consumption is average and above average in respectively Belgium and Greece. Spain has a relatively low cheese consumption.

Figure 3.4 **Self-sufficiency for cheese and drinking milk (except cream)**

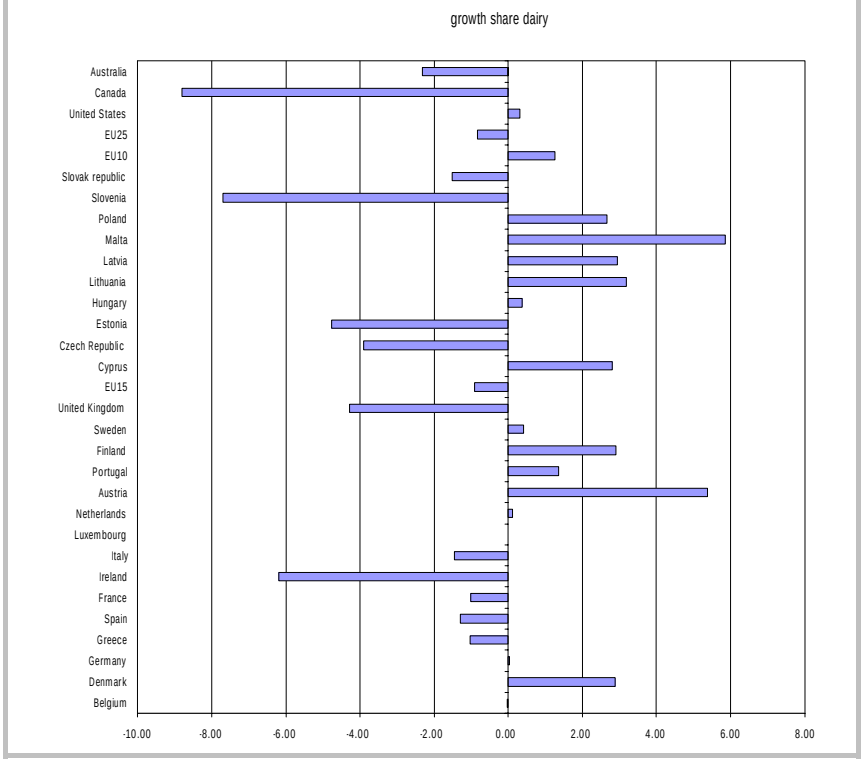


Source: Dutch Dairy Board; data can differ from Eurostat.

Ireland has the highest self-sufficiency in Europe, which is mainly to be explained by the relatively low consumption in the home market. Denmark has also increased production. The export of Denmark is mainly to Germany and to the United Kingdom. In both markets growth has been realised in recent years.

The annual growth figures of the dairy industry and the food industry show that the new EU-12 countries have the highest growth in real value added in the dairy industry. In the southern European countries, except Portugal, the share of dairy industry in the total food industry has decreased. However, in the new entrants to the EU the share of the dairy industry in the food industry increased above average. The United States show a small growth in relation to the EU and Australia and Canada show respectively a small and a large decrease in the total food industry.

Figure 3.5 **Annual growth of the real value added of the dairy industry in the total food industry**



Source: Eurostat.

4 International trade

The EU is the biggest exporter of dairy products in the world and the export value continues to grow. However, the market share of EU-27 in the world market is decreasing very rapidly. In the mid-90s the EU had a market share in international exports of 79% while in '04-'06 only 72% was left. If only extra-EU trade is included trade decreases from 18% to 14% of world trade.

Table 4.1	**Major exporting countries of dairy products**					
Region/country	**Export share**			**Import share**		
	'95-'97	**'04-'06**	**Difference**	**'95-'97**	**'04-'06**	**Difference**
EU 27	79	72	-6.2	68	64	-4.0
EU-15	75	67	-8.7	66	61	-5.3
EU-new	3	6	2.5	1	3	1.3
EU-15 <> non-EU-15	18	14	-3.5	3	5	1.7
Germany	17	15	-2.0	14	12	-1.8
France	15	12	-3.0	8	6	-1.4
Netherlands	14	11	-3.4	9	6	-2.6
New Zealand	8	8	0.9	0	0	0.0
Belgium/Luxembourg	8	7	-1.0	9	7	-1.5
Denmark	6	4	-1.1	1	1	0.5
Australia	4	4	-0.2	1	1	0.2
Italy	3	4	0.7	11	9	-2.3
Ireland	5	3	-1.5	1	1	0.3
United Kingdom	4	3	-1.0	6	7	1.0
USA	2	3	0.7	3	4	1.1
Poland	1	2	1.3	0	0	0.1
Austria	1	2	1.1	1	1	0.5
Spain	1	2	0.6	3	5	1.1
Argentina	1	1	0.5	0	0	-0.2
Canada	1	1	-0.3	1	1	0.3
Brazil	0	0	0.2	2	0	-1.8

Source: UNSD Comtrade.

In 2002-2004 the extra-EU trade was still 16% of world trade. So, demand on the world market is increasing more than the exports from EU countries. In particular, the new EU member states and developing countries outside the EU are able to increase their market share on the dairy export market. Notwithstanding this growth the market share of the new member states is still in no relation to the market share of the EU. EU-27 is also the world's largest importer of dairy products. But these imports of the EU have decreased accordingly. This could imply that companies concentrate on their home markets or that companies expand their activities to countries in which they have a large market share.

These export and import tendencies are subsequently related to production. The data in table 4.2 show specialisation in production for the EU and New Zealand. Australia, USA and Canada maintain production levels on most products or decrease production only minimally. The European dairy companies have shifted their production from milk powder to cheese from 2000 to 2005, while New Zealand mainly increased milk powder production and did not expand cheese production further (see also the chapter on self-sufficiency). This tendency was not found to be so strong in Wijnands et al. in 2007.

For Brazil no comparable production figures were available and from a world market viewpoint the export share is negligible.

Table 4.2 Production of dairy products (in million kg)

Product groups	EU-25		USA		New Zealand		Australia		Canada	
	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
Milk	30.923	33,316	26,890	27,365	346	385	1,992	2,099	2,621	2,738
Cheese	7,001	7,718	3,744	4,133	270	280	361	360	360	379
Butter	1,944	1,949	578	607	347	240	179	83	80	83
Condensed milk	1,269	1,167	259	290	2	-	105	60	77	52
Milk powder										
Skimmed	1,239	1026	658	540	210	250	255	218	75	77
Non-skimmed	952	854	51	15	420	675	190	170	4	-

Source: Dutch Dairy Board (2006).

It was to be expected that the EU specialises in cheese, since the EU has a cheese production tradition and is innovative (see chapter 5 on innovation). Of the total world export of cheese, 81.5% comes from EU-27. Germany, France and the Netherlands together export 45% of the total world export in cheese. An important part of this export is intra-EU trade. A total of 18,5% of cheese exports of the EU-27 goes to third countries. Nafta and Oceania together take a share of less than 8%. The Europeans, then, are market leader in the cheese export.

For cheese every continent has its own specialty products and the consumers in those countries also prefer specific cheeses. Within continents the favourite types are a commodity, which has implications for the tradability and the prices.

The imports in fresh cheese of the EU originating from the USA and New Zealand show considerable fluctuations. Australian fresh cheese has lost market share to New Zealand from 2000 until 2006. The export of grated or powdered cheese in the same period to the EU from New Zealand has grown as well. Australia lost its position in the EU market also. This decrease can partly be explained by a lower milk production in Australia and partly by international competitiveness of New Zealand.

The export from the USA is nearly stable at €325 mn. per year. Blue-veined cheese is not imported by the EU and mainly traded within the EU and exported from the EU to third countries. New Zealand and the USA also produce this type of cheese but export it mainly to other continents than the EU. New Zealand and Australia are the most important exporter of other cheeses to the EU. They exported a value of €73 mn. to the EU in 2006. The imports from the USA are nearly a quarter of this value: USD20 mn.

The main importers within the EU are Germany, the Netherlands and France. The main exporters are the same countries and Ireland, Denmark and Belgium.

New Zealand has increased the production of milk powder from 2000 until 2006 and is therefore improving its market position very rapidly. In skimmed milk powder products, EU-27 counts for 41% of international trade (EU intra-trade included) and New Zealand for 28% of trade. The production of New Zealand has nearly reached the level of EU-27 altogether. EU-15 imports from outside the EU came mainly from New Zealand in 2006. Since 2000 imports have been fluctuating a lot, however. Australia, New Zealand and the USA are competing strongly on this product for the European market. The most important importer is Algeria (ZMP, 2006).

In the category of non-skimmed milk powder, the main product is unsweetened non-skimmed milk powder. The EU is the biggest exporter (41% of total exports) in this market, followed by Oceania (34%). Asia is market leader in sweetened milk powders (43% of total exports). In this market the EU has 11% market share. The most important importer of non-skimmed milk powder was Algeria (ZMP, 2006).

Fresh milk and yoghurts are mainly produced for local markets. Fresh milk is mainly produced and consumed locally. As far as it is traded between countries, this trade is within the continent.

Germany and France are the most important producers of yoghurts. The Netherlands are third at a distance. Poland is the number four in production and growing very strongly.

EU-25, then, is the largest exporter of dairy products, but this is mainly intra-EU trade and the global market share of the EU is decreasing rapidly. The EU-15 countries in particular are losing market share fast, while the new EU countries are slightly winning market share. The EU entrants and developing countries are the fasest growers in the world market. The total market share of New Zealand is slightly increasing and the market share of Australia is slightly decreasing. Brazil is gradually emerging but still hardly visible from a world-market viewpoint.

This country analysis cannot directly be translated to a company viewpoint. Most European multinationals are investing in the new EU member states and developing countries. This investment policy directly benefits the mother company in the EU, but is not reflected in the export developments from the country perspective.

Competition: Balassa Index and share of value added

The performance of an industry on the international market can be measured firstly by the Balassa (Revealed Comparative Advantage) index and secondly by the growth of the real value added compared to the rest of the industry. The Balassa Index indicates the specialisation degree of the export portfolio, i.e the degree of external orientation. A growth of the index indicates a better performance.

Dairy is an important food product for the EU food industry, with an emphasis on intra-EU trade. In relation to the USA dairy is important, but in relation to New Zealand it is unimportant. The level of the Balassa Index of New Zealand indicates that dairy products are very important in New Zealand's exports. The low value of the United States indicates that dairy exports are relatively unim-

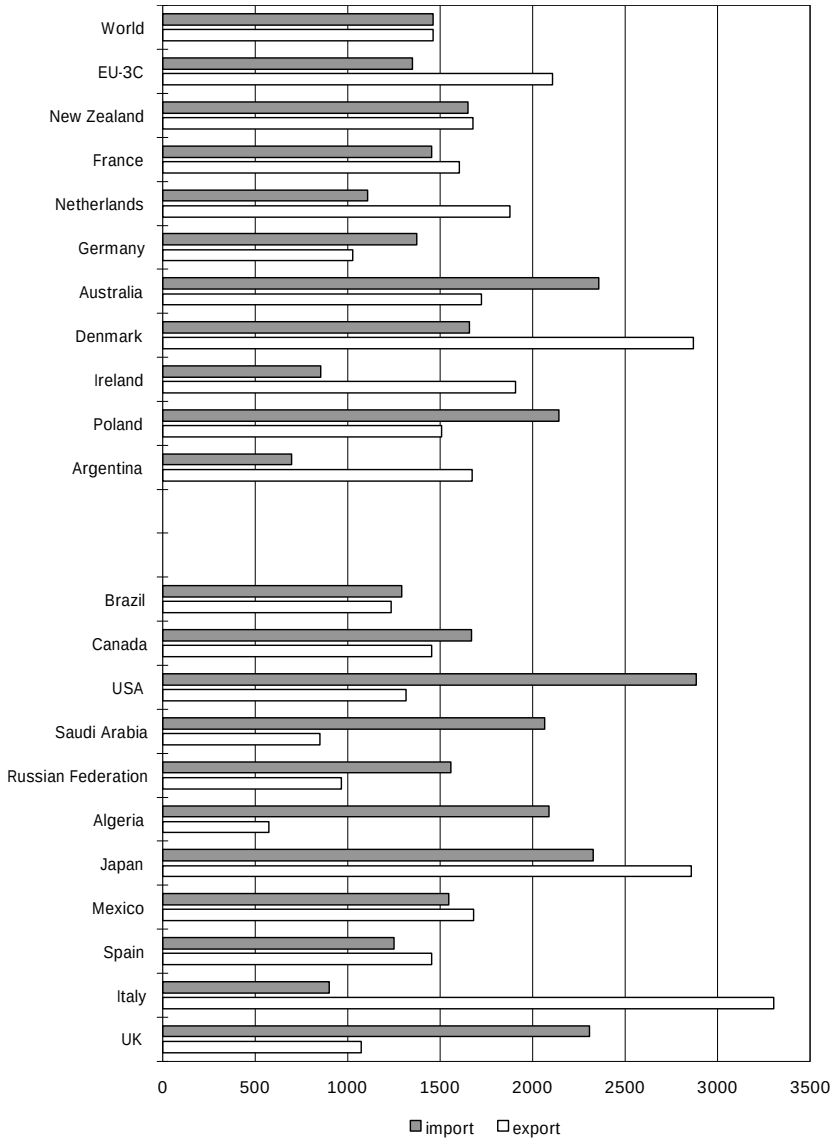
portant in the trade of the US. Although Brazil is hardly visible in the world market the importance of the dairy sector in Brazil has increased enormously. Furthermore, the dairy trade has diminished in total food trade within the EU.

Table 4.3	Revealed comparative advantage (Balassa Index) and growth rate from 1996-1998 to 2004-2006		
Region/country	**1995-1997**	**2004-2006**	**Annual growth %**
EU 27	1.81	1.79	-0.1
EU-15	1.82	1.81	-0.0
EU-new	1.67	1.56	-0.8
EU15 < > non-EU	1.12	0.97	-1.6
Germany	1.65	1.53	-0.9
France	2.67	2.79	0.5
Netherlands	3.94	3.32	-1.9
New Zealand	26.38	39.13	4.5
Belgium/Luxembourg	2.23	1.89	-1.8
Denmark a)	5.48	5.31	-0.3
Australia	3.70	3.94	0.7
Italy	0.70	1.09	5.0
Ireland	4.81	2.94	-5.3
UK	0.78	0.76	-0.3
USA	0.16	0.30	7.1
Poland	1.99	2.45	2.4
Austria	0.87	1.76	8.1
Spain	0.68	0.99	4.2
Argentina	2.01	3.55	6.6
Canada	0.20	0.15	-2.8
Brazil	0.04	0.24	21.2

a) 1995-1996 and 2005-2006.
Source: UNSD Comtrade, LEI calculations.

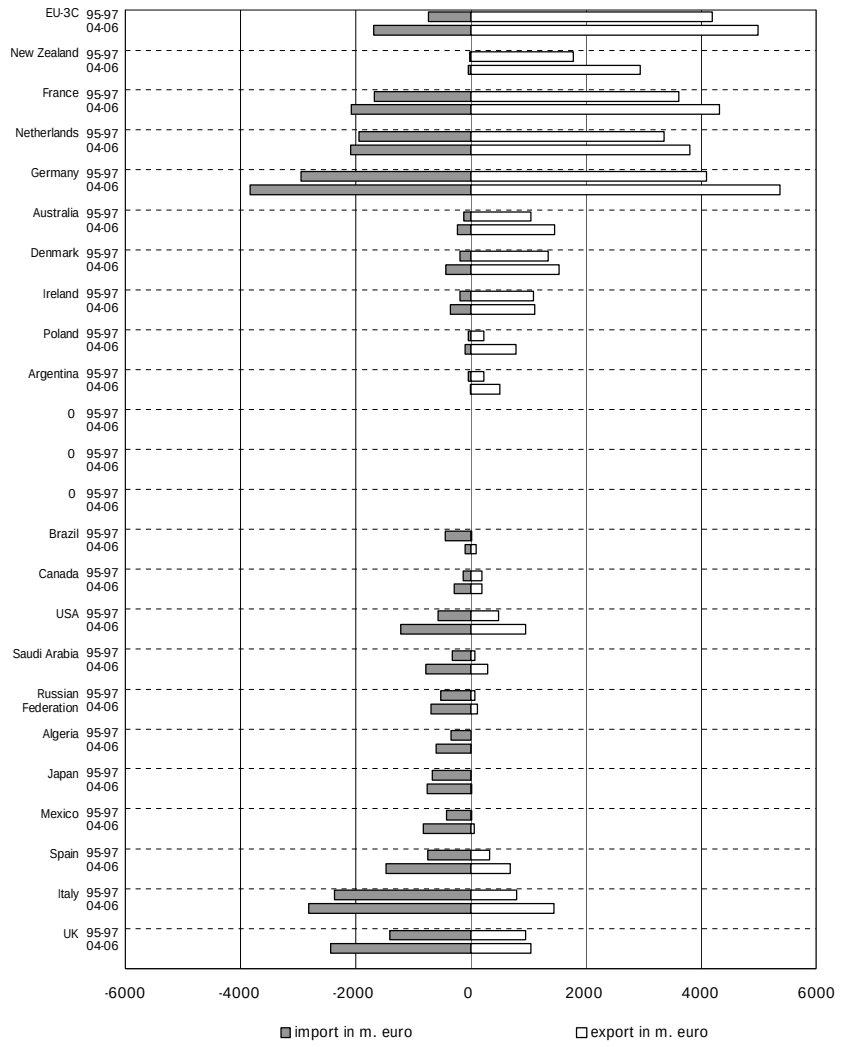
Figures 4.1 to 4.3 show that EU trade in dairy products is leading on the world market. Even when intra-EU trade is excluded, EU is the largest exporter. The increase of demand on the world market is also visible in these figures. Exports from all exporting countries have increased between 1995-1997 and 2004-2006. On the import side demand for dairy products has also increased in the main importing countries.

Figure 4.1 **Average price of dairy products (in euro/ton) in 2004 - 2006)**



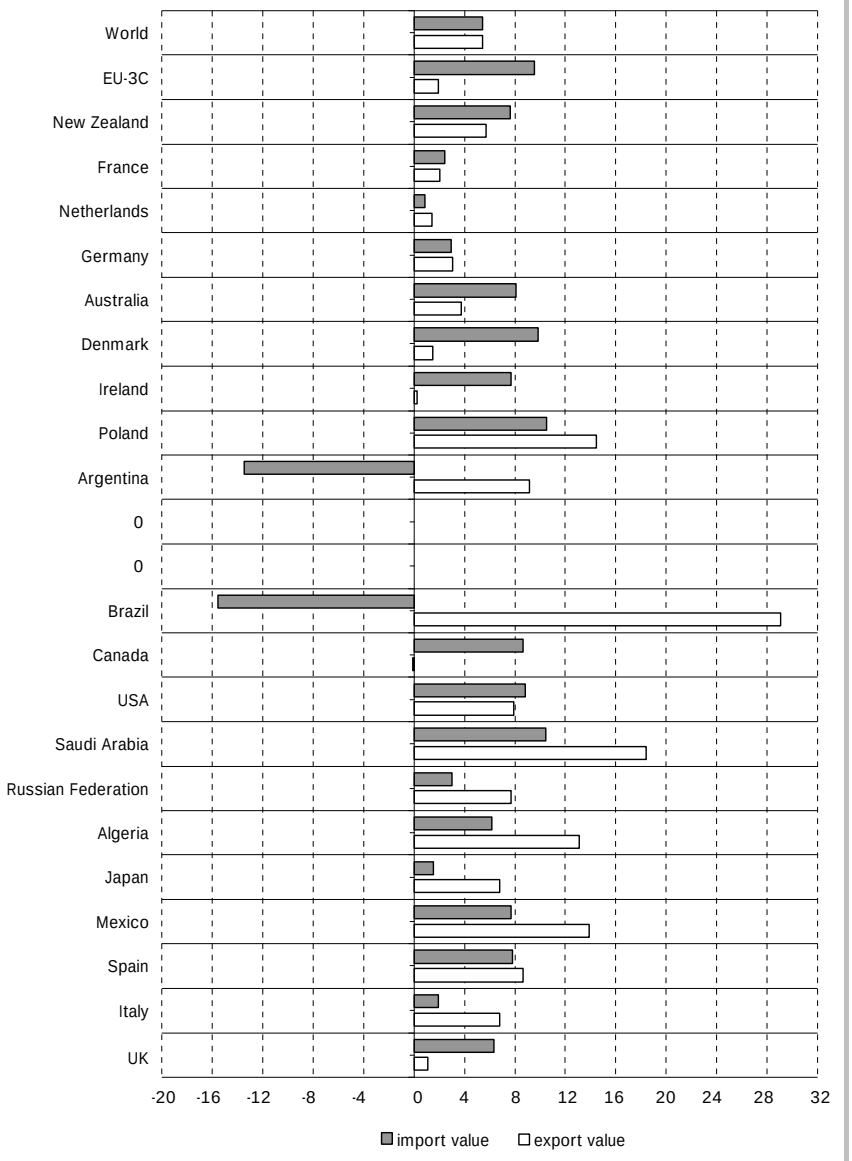
Source: UNSD Comtrade.

Figure 4.2 **Main net importers and exporters**



Source: UNSD Comtrade.

Figure 4.3 **Annual growth rate of export and import value in 1995-1997 vs 2004-2006 in %**



Source: UNSD Comtrade.

Brazil, Germany and the USA are the most striking countries in the list, with (very) high imports and also (high) exports. These countries' trade results are even more striking given the fact that the average import price is higher than the average export price. Australia and Poland have the same pattern, only the value of imports is much lower than the value of exports in both countries. From price relationships Italy has the best dairy trade balance from the value viewpoint: Italy imports low value dairy products and exports high value products. From the global viewpoint, in which the EU-15 dairy production is much more expensive than dairy production elsewhere, specialisation in products with the highest added value is therefore most effective for a country with a low self-sufficiency. The relationships between average import and export prices do not give any indication on profitability however.

The annual growth rates show clearly that the developing countries, such as Southern America, are gaining world market share. The southern American countries in particular grew very strongly. This figure also makes clear that the increase in EU imports is higher than that of exports. This is easy to understand, as the EU CAP makes it impossible for countries to increase production in a situation of growing demand in the world market.

5 Innovation in the dairy industry

5.1 Overview of innovations

This chapter describes the innovativeness of the European countries. This analysis is done on the basis of Food Navigator, Dairy Innovation and the Innova database (see chapter 2 for details).

Product-innovation is the main type of innovation (table 5.1) in the dairy industry. In the functional foods market in particular, the dairy industry is very active and the biggest group next to the fruit or vegetable beverages. The next popular type of innovation is marketing innovation. Organisational innovations rank third.

However, the databases show some differences in types of innovations: Food Navigator reports less product innovations and has a higher level of marketing innovations. Food Navigator is more research oriented. For several cases, the contribution of research is mentioned whereas Dairy Innovation seldom gets mentioned. Process and sourcing new products are sparsely observed.

The first 4 types of innovations in table 5.1 are divided into subtypes. Below we will discuss the difference of these four more in depth. The cases of both databases are merged and the differences will not be discussed separately. Batowska (2008) discusses some differences between the databases, where relevant.

Table 5.1 Overview of types of innovations (in % of total)

Type of innovation	Dairy Innovation	Food Navigator	Total
Product	44	34	42
Process	9	9	9
Marketing	26	35	28
Organisational	19	18	18
New source of materials/goods	2	5	3
Total	100	100	100

Source: Own findings.

5.2 Product innovations

The dairy industry offers a wide range of products from raw milk to the specialist products aimed at special markets or consumers and offers ingredients to other industries. Consumers are rather conservative and cautious in accepting entirely new food products, and prefer to look for new benefits in more or less familiar products (Jongen and Meulenberg, 2005). Consequently, innovation is more successful in applying new technologies, or new products formulations, that fulfil consumer needs than in radically new products. This is reflected in the collected data (table 5.2). Innovation activities within the dairy industry focus on finding new product varieties (45%) and applying new ingredients which add a new functionality (22%). This suggests that dairy companies in this research more often pursue a defensive or analytical, organisational strategy than a prospective strategy.

Table 5.2 Product innovations

Sub-category product innovation	Number	(%)
New bacteria/spread	9	1,5
New properties of ingredients (way of use)	71	12,2
New ingredient (functionality)	129	22,2
New product variety	262	45,1
New final product	22	3,8
Packaging	88	15,1
Total	581	100,0

Source: Own findings.

As the range of dairy products is becoming wider, producers need to develop new ways to attract consumers, resulting in an increased importance of packaging innovation. Consumers demand not only healthy and tasty products but also convenient, complex, and creative solutions. Packaging partly fulfils those requirements, reflected as third most important sub-group between the product innovations with a share of 15% in total innovations (table 5.2).

Hall (2007) reported the following on the current trends in new product development in the dairy industry, as well as on the key trends in the industry:

- milk, non-dairy milk and yoghurt drinks had the largest share (one third) in product releases in 2006, more than other dairy categories;
- new product development in milk concentrated on healthier milks addressing fat and cholesterol; organic milk with low fat varieties, new flavourings and single-serve products were also important;
- for cheese the orientation of innovation was on health and convenience (functional cheese, individually wrapped portions, new blends, long-life packaging, table-ready packaging);
- new yoghurt products comprise mainly new flavours (wintery flavours such as plum, cinnamon, American heritage flavours and exotic fruits); there is also intense competition to differentiate between health benefits;
- the most innovative category of 2006 was margarine, butter and spreads with new flavourings, more convenient packaging, long-life and healthier butters;
- strawberry remains the most common flavour, mango the fastest growing;
- the role of functional foods is increasing, now that they have also become incorporated in more indulgent categories; the three key trends of ethical, health and indulgence are increasingly combined in one product;
- emphasis on brain health is gaining momentum (omega-3);
- 'natural' is an important trend for the future with lower tolerance for artificial preservatives, sweeteners and flavourings;
- low-fat and wellbeing products are becoming an up-market trend;
- premium trends are on the rise, particularly foods which have a strong regional or local identity;
- gourmet is becoming a mass market with real gourmet producers introducing even more unusual flavourings (Italian/French cooking flavours such as truffles, spicy Indian or Hispanic flavours);
- the convenience trend is likely to expand with several innovations in the area of portability, based on new technology that allows for extendend, unrefrigerated storage.

5.3 Process innovation

Process innovation counts for 9% of the total observed innovations. Table 5.3 shows the occurrence of the two distinguished possibilities. New production technology seems dominant.

Table 5.3	Process innovations	
Type of innovation	**N**	**%**
Way of production	42	32,8
Production equipment and technology	86	67,2
Total	128	100,0
Source: Own findings.		

5.4 Marketing innovation

Marketing innovation (28% of total innovations) mainly focusses on reaching new groups of consumers by promotion activities or addressing special target groups (table 5.4). Development of new markets is rather low.

Table 5.4	Marketing innovation	
Type of innovation	**N**	**%**
New market	55	13,9
Special target group	170	43,0
Promotion activity	170	43,0
Total	395	100,0

5.5 Organisational innovation

The collected data reveal that companies find the benefits in cooperation with other companies or with research institutes (table 5.5). This is an answer to, the second research question, showing companies' positive approach towards co-operation for innovations.

Table 5.5	Organisational innovation	
Type of innovation	**N**	**%**
Cooperation	118	45,7
Patenting	6	2,3
Licence	34	13,2
Market position	100	38,8
Total	258	100,0

5.6 Stages of market introduction

In addition, product innovations are also classified according to the stage of market introduction: research, clinical trials, and commercialization (table 5.6). The addition of this classification highlighted the domination of the research stage in the Food Navigator's cases (43%) and the commercialization stage in Dairy Innovation (95%). Obviously, this classification is only based on information given in Food Navigator and Dairy Innovation magazine articles and might be influenced by the target readership of the trade journals. In Food Navigator research is presented in a precompetitive phase, while Dairy Innovation shows new products or technologies the moment the product is launched.

Table 5.6 Innovations in the level of market introduction

Level of market introduction	Number			%		
	FN	DI	total	FN	DI	total
1. Research	47	14	61	43,1	3.6	12,3
2. Clinical trials	39	5	44	35,8	1.3	8,9
3. Commercialisation	23	369	392	21,1	95.1	78,9
Total	109	388	497	100,0	100.0	100,0

Source: Own findings. FN= Food Navigator, DI = Dairy Industry.

5.7 Innovation new to the market

Most of the innovations have a general character. Given the cultural differences in Europe a higher level of local innovation had been expected, an exploiting of the cultural difference.

Table 5.7 New to the market or company

Type of innovation	N	%
General	168	72
Local	67	28
Total	235	100

Source: Own findings.

5.8 Most innovative countries

Table 5.8 present the number of innovations by region and country and figure 5.2 presents the innovations in EU countries. Although the UK leads the USA, experts in the industry do not see the UK dairy companies as very innovative. They refer to the problems the UK has in using its full milk quotum and the problematic financial situation of a large part of the industry (Plimsoll, reported in Dairy Industry Newsletter, 1.7.2008). However, in a benchmark report KPMG LLP (2007) reports the competitiveness of the UK dairy industry as rather favourable, based on the high labour productivity.

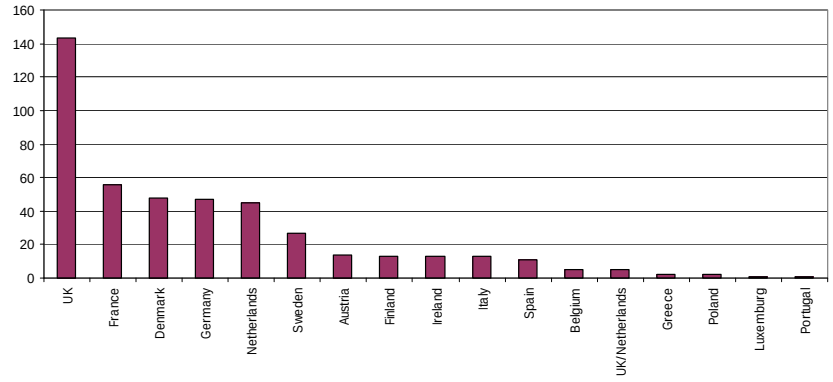
There is coherence between our findings and the experts in that certainly in the UK the innovation is led by the retail (sometimes directly in combination with farm groups) and by related industries like packaging and ingredients. This view can contribute to the impression that the dairy companies themselves are not the most innovative. Also KPMG LLP (2007) reports lower levels of revenue per unit of milk processed in the UK, probably due to lower overall investment in R&D and it recommends investment in innovation. In our analysis on the next pages, we are not able to link innovation in the UK to higher economic results, which also raises questions. So for the mean time the conclusion should be drawn that, owing to pressure from retail, the dairy industry at large in the UK is perhaps more innovative than the companies' factories and profits suggest, but not as innovative as our analysis of trade journals suggests.

Table 5.8 **Number of innovations classified according to benchmark countries**

Region / Country	Number	%
EU-27	449	61
USA	142	19
New Zealand	29	4
Canada	16	2
Australia	12	2
Brazil	1	0
Switzerland	30	4
Japan	10	1
Other countries	50	7
Total	739	100

Source: Own findings.

Figure 5.2 **Total number of innovations in the EU-member states**

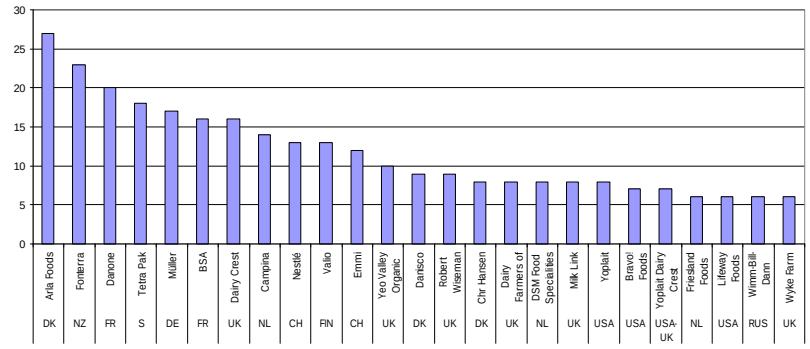


The EU accounts for over 60% of all innovations. The results correspond more or less with the national dairy companies' presence on the international market. It should be recognized that New Zealand has almost two-thirds of the level of innovations compared to Denmark or Germany, and half compared to France. Most other benchmark countries have low levels of innovation.

5.9 Top 25 innovative companies

The innovation database is used to classify the leading innovative firms. In the database, 311 different companies or organisations (e.g. research institutes) have at least one innovation. The top 25 is presented in figure 5.3. The leading innovative companies are not only dairy processors but also packaging firms (Tetra Pack) and suppliers of ingredients (Danisco, Chr. Hansen and DSM). Fonterra's second place shows its leading position. This company combines an abundance of raw materials with innovativeness, also in industrial products. Eight of these companies are listed in the top 20 of global dairy companies.

Figure 5.3 **Top 25 of innovative companies in the innovation database**



Recently Business Insights, a consultancy (Hall, 2007), asked industry executives to name innovative manufacturers in the dairy industry. The result (see table 5.9) confirms our findings on Danone and Arla. Danone is very active in functional foods and recently introduced a so-called cosmeceutical ('Essensis'), a beauty product that claims to feed the skin from within. Nestlé scores high on this list as it is well known for its adaptation to local needs, especially in emerging markets. The survey by Business Insights also confirms Valio and Campina's innovative reputation.

Table 5.9 **Top 10 innovative dairy manufacturers according to industry executives**

Company	% of respondents
Danone	25
Nestlé	15
Arla	5
Dean Foods	5
Valio	4
Innocent	3
Kraft	3
Campina	2
F&N Dairies	2
Glambia	2

Source: Hall (2007).

5.10 Innovations and economic performance

5.10.1 Introduction

This section focusses on the link between innovation and economic performance. To do this, three different databases are used:

1. our innovation database based on journal entries in Dairy Innovation and Food Navigator;
2. Eurostat Structural Business Statistics (Eurostat-SBS) of the EU, providing national data comparable of those used in national accounts;
3. Amadeus database, providing economic data of individual companies. In this database most but not all companies are included. Small firms in particular are not obliged to provide data.

Table 5.10 provides an overview of the coverage of Amadeus compared to Eurostat SBS for the total turnover. Only firms with the primary NACE code 155 are selected. Firms with another code but partly active are not included: examples are Nestlé and Unilever. An exception is made for the Netherlands: the two leading dairy companies are registered as a general Food Processor with NACE Code 150. This resulted in a coverage of above 100% since both companies have a small share in other food processing. The result of linking the innovation data to Amadeus reduces the number of innovations as well as firms. So the number in this section will differ from previous sections.

We will present the results of 3 leading dairy countries: Germany (21% of total EU milk production), France (18%) and UK (11%), which together account total 50% of total production. We will start with the UK case because the number of innovations is highest. This enables a more extensive analysis.

5.10.2 Innovations and business performance: the UK Case

The UK is the third raw milk producer in the EU, after Germany and France. In total 203 innovations are classified on 93 different dairy processors, suppliers to or buyers from the dairies. Figure 5.4 presents the top 10 dairy processors with the highest number of innovations. These 10 processors represent 46% of all innovations. In the top-5, Müller and Arla Foods are foreign investors. The top 10 does not include packaging or ingredients suppliers.

Table 5.10	Comparison of the total turnover of selected firms in Amadeus with Eurostat SBS in % (SBS=100%)	
Country	**2004**	**2005**
Germany	58	62
France	52	46
Italy	56	48
Netherlands only DA 155	2	2
Netherlands DA155 +Friesland+Campina	118	113
Poland	86	59
UK	94	91

Figure 5.4 **Top 10 innovative dairy companies in the UK**

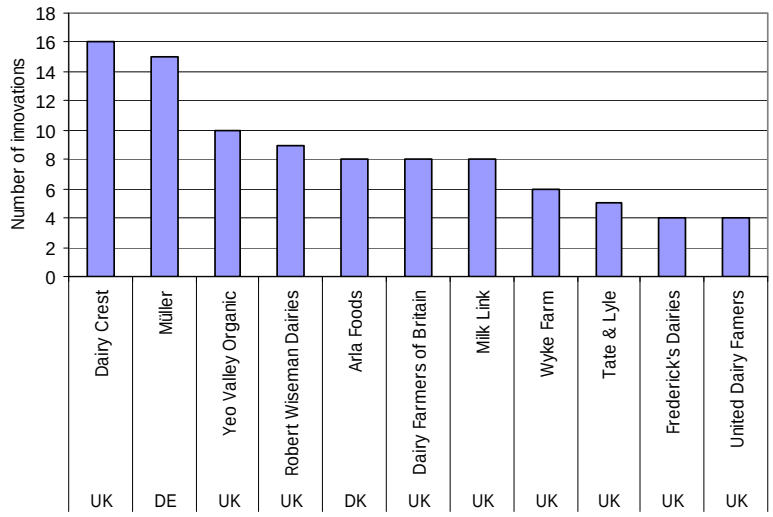


Table 5.11 shows that the share of the number of large firms is 3% in the total, but the share in turnover and employees is over 60% in 2005. The UK's dairy industry is rather innovative given the difference in the size of the dairy industry. The shares of innovations follows the shares of turnover and employees.

Table 5.11	Key figures of the dairy industry in the UK				
		Micro-firms	**Small and medium-sized firms**	**Large firms**	**All firms**
Firms	Number	349	168	17	534
	Share (%)	65	31	3	100
Turnover	€m,	182	3,400	6,315	9,896
	Share (%)	2	34	64	100
Employees	Number	1,164	9,846	17,897	28,907
	Share (%)	4	34	62	100
Innovations	Number	4	32	47	83
	Share	5	39	57	100

Source: Eurostat SBS data 2005, Innovation own database linked to Amadeus.

Small and medium-sized firms (SMEs) are frequently mentioned as a main source for innovations. In our research, we linked the innovative firms with the business data from Amadeus. We selected a total of 265 specialised dairy processors (NACE da155): among 21 we registered innovations. Almost half of the large firms (2% of all firms) are innovative, with over 50% of registered innovations of all firms (table 5.12). From the SMEs 20% (13 out of 65) are innovative. The large firms have on average 9.4 innovations per firm, the small and medium sized 2.5. In this respect the largest firms contribute most to innovations. This analysis suggests that all firms need to be innovative, which in reality is not the case. For instance, some (often medium-sized) companies that focus on producing private labels, have to follow the market closely, but do not need to develop new products - they copy. However, from the point of view of the promotion of innovations, small as well as large companies are important.

Table 5.12	Innovation and performance							
Firm category	**Micro**		**Small & medium**		**Large**		**Total**	
Innovative	Yes	No	Yes	No	Yes	No	Yes	No
Firms	3	186	13	52	5	6	21	244
Innovations	4	-	32	-	47	-	83	-

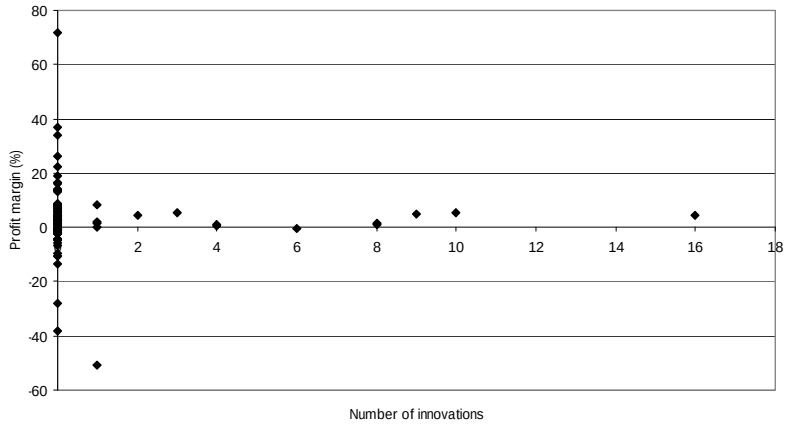
Source: Innovation own database and profit margin from Amadeus.

Despite the a priori expectations no clear relation between the number of innovations and profit margins can be found. Figure 5.5 shows a large distribution

of the profit margin of non-innovative firms. A reason might be the impact of co-operatives. Cooperatives have as goal to reach the best possible results for their members, i.e. a high price paid to farmers for their raw milk.

An alternative explanation might be that in the highly competitive UK market the benefits of innovation are quickly transferred to retailers and consumers. This would mean that innovation is first of all a licence to supply the retail.

Figure 5.5 Profit margin and number of innovations



5.10.3 Innovations and business performance: the German Case

Germany is the largest raw milk producer in the EU. Table 5.13 shows that the share of the total number of large firms is 3%, with a share in turnover and employees iof over 60% in 2005. The German dairy industry is not leading in innovation, considering the size of its dairy industry: it ranks number 4 in list of EU countries. Table 5.13 shows the key figures. The number of innovations is more or less in line with the turnover or number of employees: 65% of the turnover is realised by the large companies and they account for 68% of the innovations. The micro-firms have a relatively large share in the total innovations (5%) compared to the turnover (0.3%) but not compared to the share of employees (3%).

Table 5.13	Key figures of the dairy industry in Germany				
		Micro-firms	**Small and medium-sized firms**	**Large firms**	**All firms**
Firms	Number	261	155	37	453
	Share (%)	58	34	8	100
Turnover	€m.	77	8,051	14,901	23,028
	Share (%)	0.3	35	65	100
Employees	Number	1,741	11,929	26,177	38,847
	Share (%)	2	31	67	100
Innovations	Number	1	6	15	22
	Share (%)	5	27	68	100

Source: Eurostat SBS data 2005; Innovation: own database linked to Amadeus.

In total we linked 14 innovative firms to economic performance data from Amadeus. This is about 8% of the selected 221 firms, almost on the same level as in the UK. The number of innovations is just a quarter of the level of the UK. The financial analysis gives a similar picture as in the UK.

5.10.4 Innovations and business performance: the French Case

The French dairy industry differs just slightly from the other cases. Despite a relatively low share of large firms 60% of the turnover is generated by these firms (table 5.14). Note that only large firms could be linked to the classified innovations. The pattern of the number of innovations and profit margin resembles the UK situation and the results will not be presented here.

Table 5.14	Key figures of the dairy industry in France				
		Micro-firms	**Small and medium-sized firms**	**Large firms**	**All firms**
Firms	Number	1,041	369	52	1,462
	Share (%)	71	25	4	100
Turnover	€ m.	1,131	8,451	14,447	24,059
	Share (%)	5	34	60	100
Employees	Number	1,740	21,944	36,485	60,169
	Share (%)	3	37	61	100
Innovations	Number	0	0	39	39
	Share	0	0	100	100

Source: Eurostat SBS data 2005; Innovation: own database linked to Amadeus.

6 Business dynamics

6.1 Firm demography

In the business dynamics study the Eurostat database is used. This database gives a complete demographic picture of dairy processing companies in selected countries. Eurostat contains data of companies from 1995 to 2005 which nearly coincides with the time period in our sample data. The population of enterprises in each country is indexed based on 1996 data, except for Germany, which is indexed based on 1999 due to absence of data.

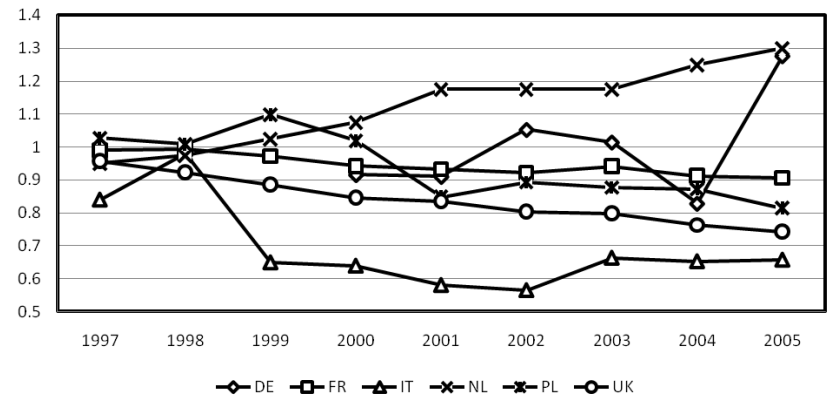
Table 6.1 **Number of selected firms and their share in the total turnover**

Country	Number of firms	Share (%) in total turn-over in 2005	Firm entry 1996-2005 (number)	Firm exit 1996-2005 (number)	C4-ratio (NL CR3) in 2005
France	579	41	159	30	43
Germany	92	48	13	-	43
Italy	1,427	41	458	99	12
Netherlands	50	94	14	-	77
UK	299	91	18	27	n.a.
Poland	188	66	144	16	27
Total	2,635		806	172	

Source: Eurostat SBS database.

As shown in figure 6.1, the population of firms is substantially declining for Italy, the UK, and Poland while the change for France is only slight. In contrast, the number of firms in the Netherlands is increasing. This is a surprising result, given the well-known dairy companies have gone through a series of mergers. Most likely these Eurostat data reflect the development by some farmers and traders of new dairy or ice-cream companies (Heida zuivel, among others). For Germany, it is difficult to determine the trend but it is increasing if we smooth out the fluctuations.

Figure 6.1 **Trend in firm population trend per country (indexed, 1996= 1)**



Source: Constructed from Eurostat SBS database.

Firm age

Age is measured by deducting the date of incorporation from the year under analysis so that it reflects increase in age as the panel year increases. For example, firms that enter the industry in 1996 have an age of one year in 1997, two in 1998, and 10 years by 2006. The age of the sample firms ranges between 1 and 136. The oldest company is in Germany and in one of the large size classes. The mean age is 26 years and higher for medium and small firms.

Firm entry

Firm entry to the industry is traced from 'date of incorporation' of the firm. On average about 81 firms enter the industry every year. The higher entry was in 2002 and 2003 when 115 and 111 firms entered the industry respectively (table 6.2). The highest entry numbers are registered in Italy and France, which is not surprising considering the high total population of firms in these countries. The rate of entry does not show any increasing or decreasing trend. The average size of entrant firms is high in the UK and Germany (appendix 1, table 1). The lowest average size of new entrants is in Italy and France. The Netherlands and Poland are between these two groups of countries. In general the new entrant firms have 112 employees, a €17 m turnover and €8 m in total assets on average.

Table 6.2	New firm entry (number) per year per country						
	France	**Germany**	**Italy**	**Netherlands**	**Poland**	**UK**	**Total**
1996	15	2	35	3	1	6	62
1997	22	3	42	3	2	8	80
1998	18	2	45		2	9	76
1999	19	3	48	2	4	12	88
2000	14		60	1	2	13	90
2001	16		61			12	89
2002	16		66		3	30	115
2003	19	2	45	3	3	39	111
2004	17	1	41		1	11	71
2005	3		15	2		4	24
Total	159	13	458	14	18	144	806

Source: Eurostat SBS database.

Firm exit

According to the Amadeus database, firm exits are caused by bankruptcy, merger, liquidation and receivership. Between 2002 and 2006 a total of 172 firms became inactive in the six countries. The Netherlands and Germany have not shown any type of exit in the sample. It means there is no high rate of exit in the population as well. Italy has both a high firm entry and exit. France and the UK are in second place with nearly the same exit number. This result can be attributed to the high competition in these countries, where small and medium firms dominate compared to other countries (except for Poland, which looks concentrated due to data biases). The mean turnover of exiting firms is 30% of the mean of incumbents' and the mean total asset of exiting firms is 27% of incumbents'. In terms of mean employment it is about 53% of incumbents' mean employees.

Industry concentration

To analyse industry concentration we use four-firm concentration ratios (CR4) for France, Germany, Italy, and Poland. A three-firm concentration ratio (CR3) is used for the Netherlands due to data limitations and compared to the Eurostat totals. For the UK no concentration ratio could be calculated due to lack of sales data.

Table 6.3	Legal status of firms in the sample (active and inactive firms)	
Country	**Type of exit**	**No. exit**
FR	Receivership	9
	Bankruptcy	3
	Merger	1
	Liquidation	5
	Inactive(no precise reason)	12
	Total	30
IT	Bankruptcy	19
	Dissolved	3
	Liquidation	73
	Inactive (no precise reason)	4
	Total	99
PL	Merger	10
	Liquidation	6
	Total	16
UK	Receivership	1
	Dissolved	21
	Liquidation	5
	Total	27
Total		172

Source: Eurostat SBS database.

As can be seen from table 6.4, the Netherlands has the highest concentration among the five countries. The Eurostat data suggest that the concentration ratio is declining, but that seems hardly credible. It can be attributed to the increasing number of firms as already shown under 'Firm demography'. Germany and France are in second and third position, respectively. The lowest concentration of dairy processing is found in Italy. Poland is between France and Italy.

Firm size

To investigate profitability and the relation with firm size, the Amadeus database is used. This database sets a criterion for the company to be registered in the database. This criterion is a minimum turnover of €1.5 m. This biases the sample mean upwards to some extent. The sizes of the companies in the Netherlands

Table 6.4	Four-firm sales concentration (CR4) in dairy processing industry of five EU countries (Netherlands: CR3)								
Country	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2004**	**2005**
FR	40	37	38	39	40	40	40	40	43
DE	48	47	49	51	56	47	43	42	43
IT	15	14	14	13	13	12	12	12	12
NL	92	94	94	95	90	90	89	78	77
PL	64	64	61	26	24	24	23	25	27

Source: Eurostat SBS database.

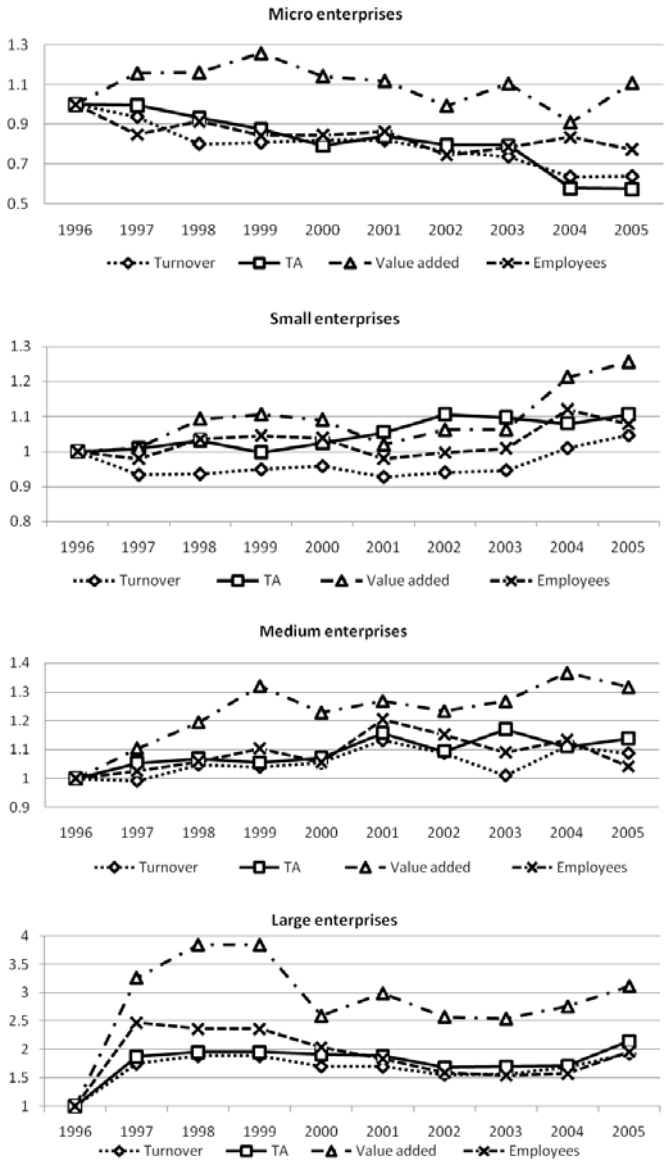
Table 6.5	Mean firm size (€1,000) in different countries measured by different variables a)					
Variables	**FR**	**DE**	**IT**	**NL**	**PL**	**UK**
Operating Revenue	40,641 (106,833)	213,227 (293,907)	9,471 (17,514)	2,084,139 (1,675,960)	21,240 (32,156)	210,231 (347,122)
Employee	94 (260)	370 (630)	24 (38)	996 (2252)	215 (192)	870 (1,772)
Total Asset	17,561 (47,791)	67,369 (79,510)	8,128 (15,501)	92,121 (372,032)	8,934 (14,534)	119,760 (134,126)
Added Value	5,704 (22,805)	23,232 (28,893)	1,372 (4,204)	272,146 (229,464)	3,173 (7,511)	45,569 (104,419)

a) Numbers in bracket are standard deviations.
Source: Amadeus.

are large by most standards because the sample includes large international players such as Campina and Friesland. The second larger size is in UK where the average total asset even surpasses the Netherlands. Italy has relatively small firms.

The other important dimension is the change of the size of firms longitudinally as measured by four different variables. This gives an idea whether the size classes mean size is shrinking or growing over a ten-year span. Figure 6.2 shows the trend in size classes of enterprises. The numbers are indexed on the base year 1996 and the actual numbers are presented in appendix 1 (table 4).

Figure 6.2 **Mean firm size trends for different sizes of enterprises (index 1996 = 1, TA= total assets)**



Source: Calculated on the basis of Amadeus.

The mean size of micro-enterprises shows a declining trend. Small and medium enterprises are increasing in size very slightly while for large enterprises the change in mean size is cyclical. The average size dropped between 2000 and 2003 and then started to increase, can be attributed to the increase in demand of dairy products on the international market. This encourages companies to build their capacity to meet increasing demand. In contrast, the scope of micro enterprises has dwindled to niche market segments. As a result micro enterprises survive mostly as farm-processing enterprises, or as special product producers, i.e. Italian ice-cream.

6.2 Financial performance

This part of the study provides a descriptive analysis of financial performance in general, differences among companies operating in different countries and differences among companies of different size classes. Differences in profitability, productivity and financial structure are given in the following discussions.

Profitability

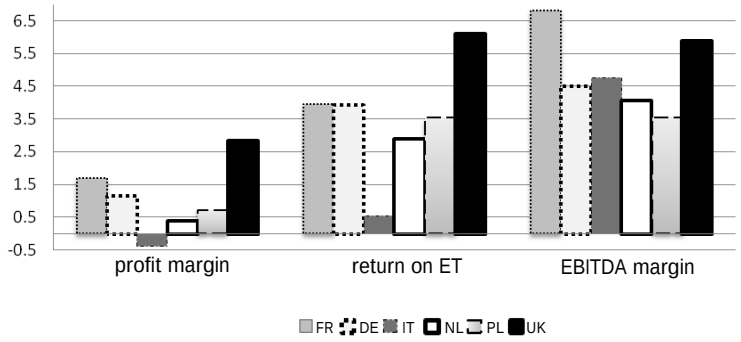
The most-often used profitability ratios are rate of return on total asset (ROTA), profit margin, and Earnings before interest, taxes, depreciation, and amortization margin (EBITDA). One of the problems of investigating profitability in the dairy industry is that cooperatives pay out part of their profits in the price of raw milk to the farmers/owners. Unfortunately, since this cannot be corrected in the data available, some conclusions have to be interpreted carefully.

Figure 6.3 depicts the mean profitability difference among dairy processing enterprises operating in different EU member countries. The profit margin reflects cost of production and/or output price. In terms of profit margin companies operating in the UK are earning the highest profit while companies operating in Italy are losing. France, Germany, the Netherlands and Poland follow in decreasing order. The reason for Poland to be in a better position than Italy might be the impact of foreign direct investment together with cheap labour. Foreign direct investment (FDI) induces capital and technology, which increases the processing and marketing efficiency while cheap labour reduces the cost of production. For Italy the milk price is 20% higher than the EU average (Plowman et al., 2005), which makes the production cost higher and suppresses the profit margin. Companies operating in the UK pay lower taxes than other EU countries, which gives the advantage of high

profits. This makes comparison difficult between countries that have different taxes, inflation rates, capital prices and labour costs.

Return on total assets (ROTA) measures a company's ability to generate profit net of expenses. It also measures the ability of the manager to generate profit using company resources. Based on this measure the UK, France, Germany, the Netherlands and Poland are ranked one to five respectively. Italy remains the least profitable country in this regard. ROTA can give a biased picture due to a different tax and capital structure effect. The EBITDA margin offsets this problem. Measuring profitability using the EBITDA margin, France dairy firms are the most profitable followed by UK. Italy, Germany and the Netherlands follow with a more or less similar EBITDA margin. Poland dairy processors have the lowest EBITDA margin.

Figure 6.3 **Mean profitability (%) of dairy processing enterprises operating in six EU countries**

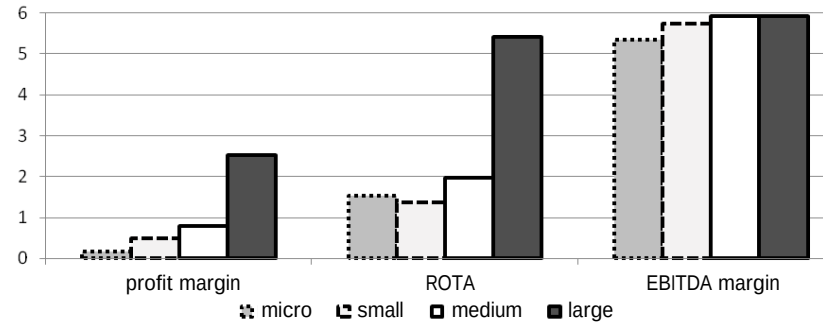


Profitability may directly be related to size due to the cost-scale effect. Therefore, it is not surprising that profitability increases from micro to large enterprises: as the scale of production increases, the production cost goes down. This can be observed from the profit margin (figure 6.4). The gap in profit margin between large and medium enterprises is bigger than the gap between other size classes (medium and small or small and micro enterprises). This implies the scale effect is more important when a company size grows from medium to large.

Looking at the return on total assets, large companies obtain very high returns from assets compared to micro, small and medium enterprises.

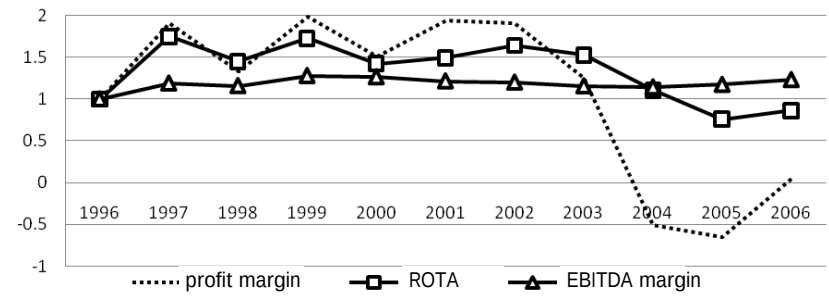
The EBITDA margin shows the capability of the companies to generate cash income. The EBITDA margin shows that larger-sized enterprises have sligthly higher profit than small-sized enterprises but there is not much difference between the different size classes.

Figure 6.4 **Profitability (in %) differences among different-sized classes of firms**



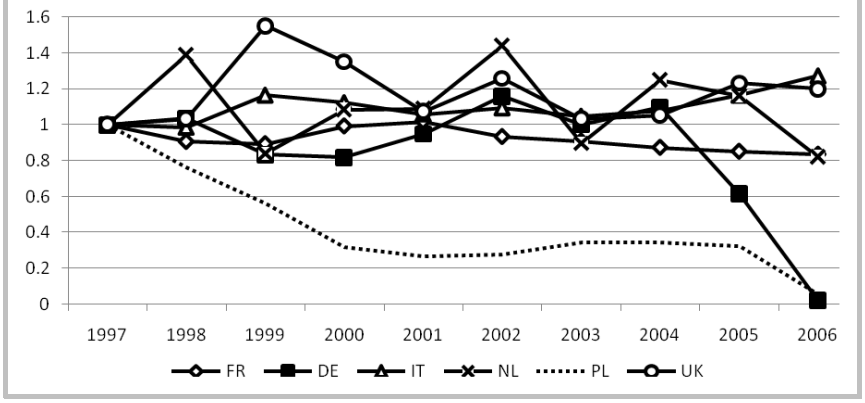
Calculating mean profitability of all sample firms per year for a 10-year period gives a clue about the profitability trend of the industry. The numbers in figure 6.5 are indexed based on 1996 data. As depicted in this figure the mean profitability of firms in the industry dropped in 2004 and 2005. The profit margin in particular was negative during this period mainly amongst Italian firms.

Figure 6.5 **Mean profitability trend of total sample (index 1996 = 1)**



The trend across countries varies. Figure 6.6 shows the decomposed trend indexed on the base year 1997. The profit is given by the EBITDA margin to exclude the influence of tax, interest rate, depreciation, and amortisations, which vary across countries. Generally, the profit level is high in 2002 and 2003 for most of the countries. For Italy and the United Kingdom the trend is increasing while it is decreasing for France. Germany shows an increasing trend until 2002 and it falls in 2005. For the Netherlands, it fluctuates from year to year. Poland experienced continuous decline up to 2001 and stabilises till 2005 and decreases again in 2006.

Figure 6.6 **Mean profitability (EBITDA margin) trend (index, 1997 = 1) for different countries**

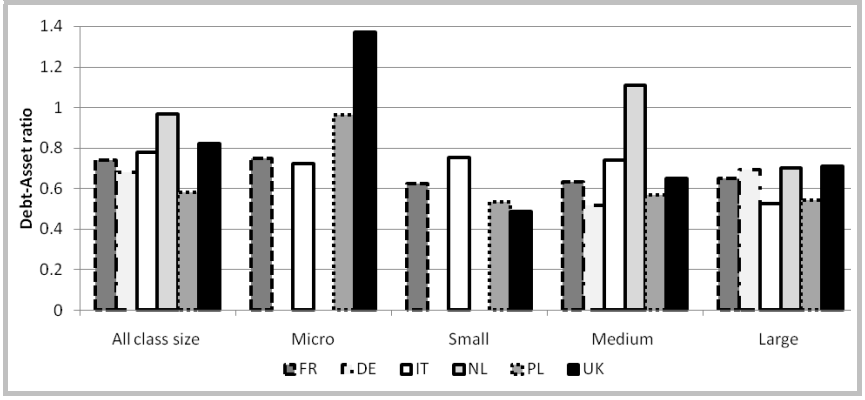


Financial structure

Firm financial structure is a very important indicator of a firm's performance. Two financial structure variables, leverage and current assets, are discussed. Leverage is calculated by dividing total liability by total assets. If a company's debt ratio is greater than one, it indicates that the company has more debts than assets. If less than one, its assets are greater than its debts. Accordingly, companies in all six countries have an average debt-asset ratio of less than one (figure 6.7). Average debt-asset ratios of companies operating in Netherlands are highest. Average debt asset ratios per country are greater than 0.6 except for Poland, where the lowest average debt-asset ratio is found. This may indicate the presence of friction for the firms to get access to credit due to inefficiencies in the financial sector or information asymmetries.

Figure 6.7 shows how different class size of enterprises finances their growth investment. Generally, most size class firms have average debt-asset ratio less than one which indicates their growth financing behaviour incline towards internal source. However, this ratio decline as we go from micro to large enterprises indicating that larger firms finance their growth from internal finance compared to smaller firms.

Figure 6.7 **Average capital structure of different sized classes of dairy processing enterprises**



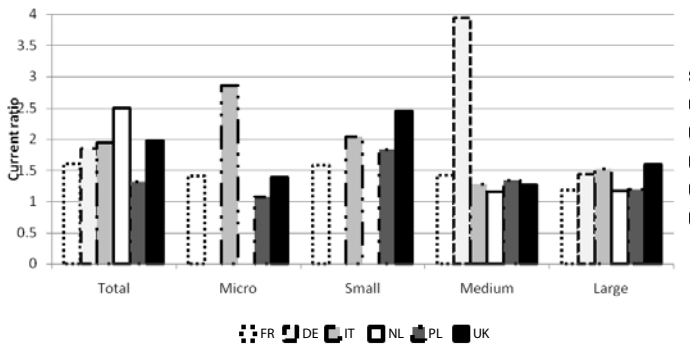
Based on the classification of size classes by country the highest average debt-asset ratio can be found among micro-enterprises operating in the UK, followed by the Dutch medium-sized enterprises. The debt-asset ratios of UK micro-enterprises and Dutch medium enterprises are greater than one, which implies that micro-sized class enterprises in UK (above 1) and medium sized in the Netherlands tend to finance their investment more from external sources. These two classes sizes of the respective countries are more vulnerable compared to other size classes of enterprises.

The current asset ratio is important because if the firm is not able to meet its short-term liability the company is not in a healthy status. We use the current ratio to analyse current asset, which relates the current asset to current liability. A current ratio of less than one suggests that the company is unable to pay its current liability. Hence, the current ratio should be at least greater than one and as high as possible. Accordingly, the Netherlands has the highest average current ratio, followed by the UK, Italy, Germany and France (figure 6.8). Poland is the lowest in average current ratio. Across size classes the average current ra-

tio is high for small-sized enterprises and decreases as we move to large-sized enterprises.

Medium enterprises in Germany have the highest current ratio. The smallest current ratio can be found in Poland, micro enterprises with a ratio just above one. For France, the UK and Poland the highest average current ratio is among small-sized enterprises. In Italy micro enterprises have the highest current ratio. In the Netherlands medium and large-sized enterprises (for which data are available) have the same level of current asset. For the UK and Poland small-sized enterprises have a higher average current ratio.

Figure 6.8 **Average current ratio of enterprises by country and size classes**



7 Competitiveness at country level

7.1 Business performance of the dairy industry in detail

In this section the dairy industry of the selected (groups of) countries is compared.

Table 7.1 Key characteristics of the dairy industry

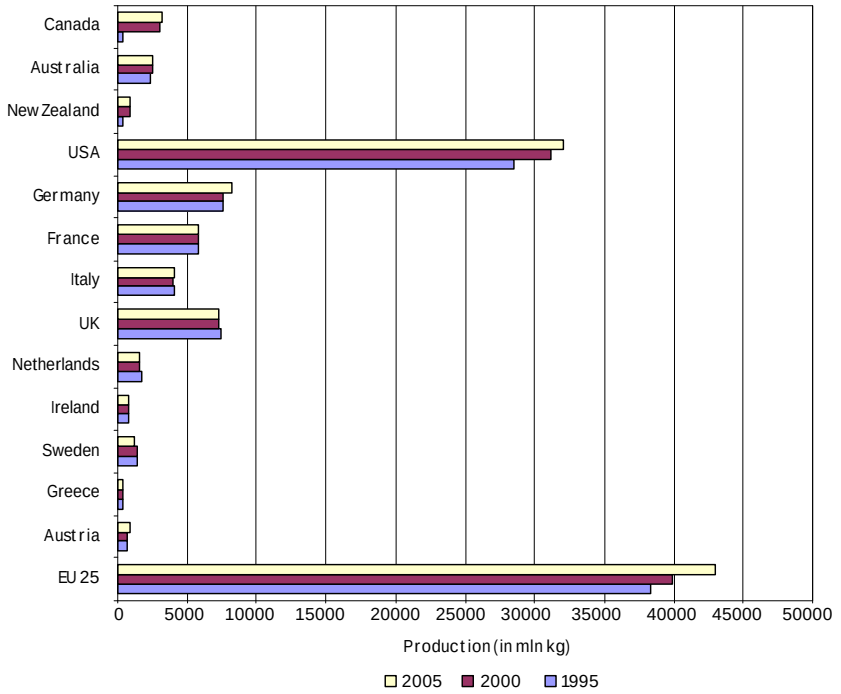
	EU15		EU25		USA		Australia		Canada	
	1999	2005	1999	2005	1999	2005	2001	2005	1997	2002
Number of enterprises	9,232	10,570	10,835	12,091	1,770	1,592	#N/A	#N/A	243	436
Production value (€)	93,030	10,1111	98,390	10,9452	57,914	47,136	5,256	5,769	5,556	6,537
Value added at factor cost (€)	15,158	16,249	16,085	17,568	17,519	2,0397	1,074	1,154	2,164	1,685
Purchases	87,742	95,049	93,082	103,168	40,455	41,618	3,274	4,057	6,203	5,661
Personnel costs (€)	9,545	9,937	10,140	10,681	4,120	4,273	490	625	613	522
Number of employees	294,528	261,530	403,843	35,0135	131,865	128,374	19,100	18,500	20,992	19,534

Source: Eurostat.

In all countries the employment in the dairy companies has decreased. The number of companies has however increased in the southern European countries, the new member states and in Canada. Given the low increase of the production value, this indicates that these new entrants into the market are mainly small companies.

The production value is lower than the purchases plus value added. Since the production value is the turnover, plus or minus the changes in stock and work in progress, this indicates that the stocks have increased. Since Europe has a high level of production of cheese with a long shelf life, it is expected that the deviations between purchases and value added and production value are highest in these countries.

Figure 7.1 **Dairy production (butter, cheese, milk) in million kg**

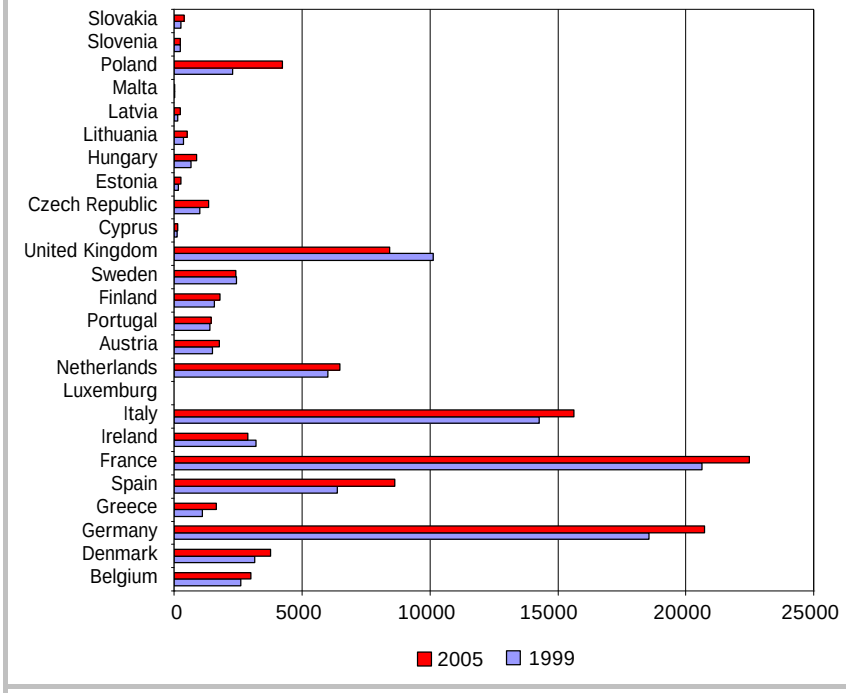


Source: Dutch Dairy Board.

The production value is growing in the three largest dairy countries: Germany, France and Italy. In the United Kingdom it has decreased, which is mainly caused by a decrease in milk powder production (skimmed and non-skimmed) and condensed milk. The production value has nearly doubled in Poland. This country has surpassed the production value of Denmark and Belgium already and is approaching the production value of the Netherlands.

On average the value added of the EU-25 has decreased, while the value added of the EU-10 has increased. Since the export share of the EU-10 countries has decreased, this means that EU-10 have shifted their production to high value products. The decrease in value added of EU-25 is mainly caused by Ireland, the United Kingdom en Slovenia. Lithuania, Cyprus and Austria are the largest growers in value added.

Figure 7.2 **Production value of dairy companies per country in 1999 and 2005**

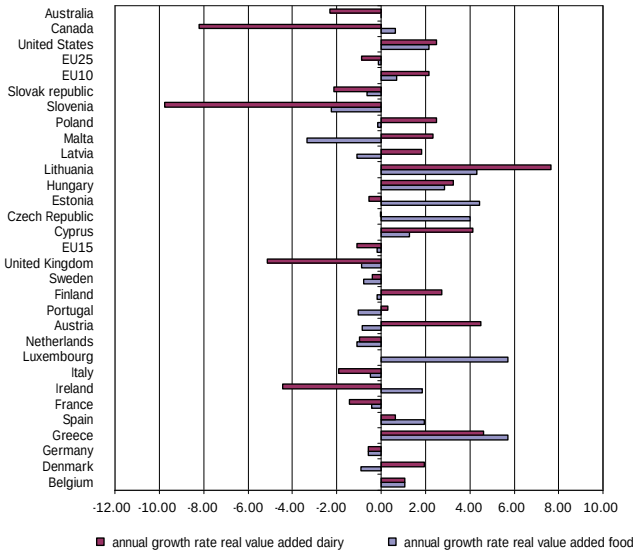


Source: Eurostat.

On average, the labour productivity has increased within the EU. But in Malta, Slovenia, Latvia, Cyprus, Italy, France and Greece the labour productivity has decreased. In Slovenia, France and Italy this is expectably partly caused by the decrease in value added, that has not translated in a decrease in the number of employees yet.

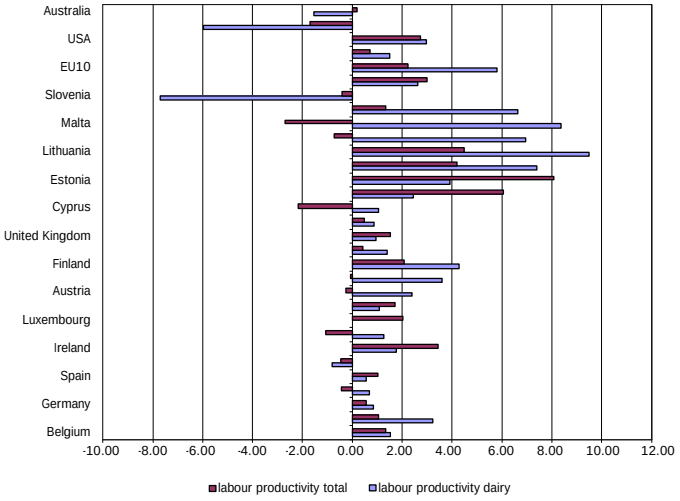
In France and Slovenia the labour productivity in the total food industry has decreased as well, which may indicate that innovation in production methods is not implemented as quickly in those countries as in other countries. In all other countries the labour productivity has increased in total food production, despite the decrease in the dairy sector.

Figure 7.3 **Growth of real value added in the dairy industry (1999-2005)**



Source: Eurostat.

Figure 7.4 **Growth of labour productivity in the dairy industry (1999-2005)**



Source: Eurostat.

Table 7.2	Top 10 European dairy companies by turnover (2004-2006)		
	Turnover (€ bn.)		
	2004	2005	2006
Nestlé	14.9	15.0	15.8
Lactalis	n.a.	n.a.	9.6
Danone	6.9	7.2	7.9
Arla Foods	6.4	6.2	6.1
Friesland Foods a)	4.4	4.4	4.7
Unilever	4.6	4.5	4.5
Campina b)	3.6	3.6	3.6
Parmalat	n.a.	n.a.	3.4
Bongrain	4.1	3.3	3.3
Müller	2,0	2.1	n.a.
Nordmilch	2.1	2.0	2.0
Sodiaal	1.9	2.0	2.0
Dairy Crest	1.8	1.9	2.0

a) Friesland Foods and Campina are merging in 2008. After the merger their total turnover will be €9.1 bn.
b) Ibid.
Source: Amadeus and annual reports.

Table 7.2 shows that the largest dairy companies in the EU dairy industry are in the Western European countries except Parmalat in Italy. In comparison to 2004 most large dairy companies increased or maintained their turnover. Only at Arla, Unilever, Bongrain and Nordmilch the turnover decreased. Bongrain seems to have lost market share to medium-sized companies that have bundled their activities, while Nordmilch seems to have lost market share to small entrants into the market.

In Germany, Spain, Italy and the Netherlands the number of companies with fewer than 20 employees increased between 1999 and 2005. In Belgium some small companies seem to have expanded to 20 to 49 employees. In Spain and the Netherlands the number of companies with between 50 and 250 employees increased.

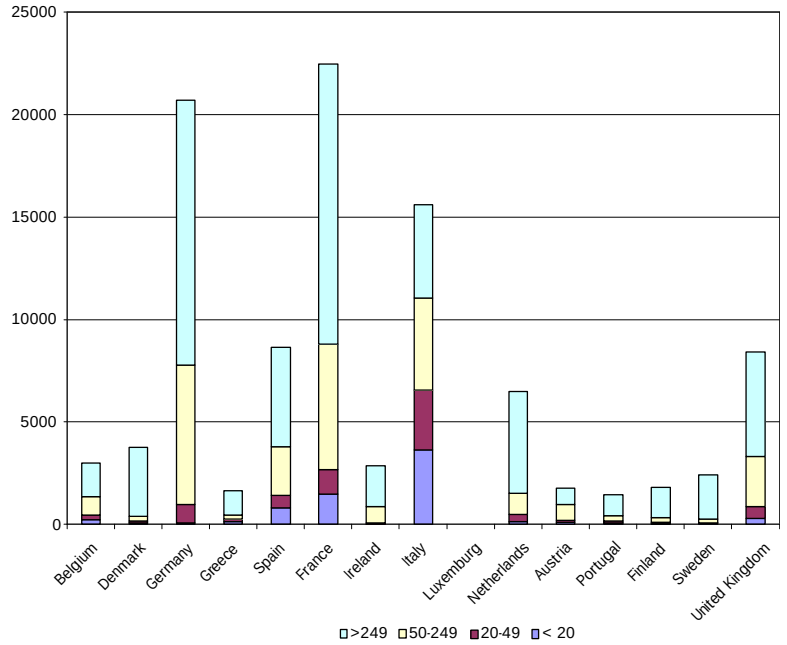
In Spain the number of large companies decreased, which could mean that they have been competed out of the market by others. In the Netherlands the growth of the number of medium-sized companies cannot be explained from the figures. Perhaps they are mergers of some very small companies.

Table 7.3	Number of dairy enterprises per size class in number of personnel					
		< 20	20-49	50-249	>249	Total
Belgium	1999	406	10	16	8	440
	2005	343	14	15	8	380
Denmark	1999	47	11	6	5	69
	2005	50	10	8	3	71
Germany	1999	164	51	102	38	355
	2005	296	37	83	37	453
Spain	1999	842	82	42	22	988
	2005	1,353	82	49	18	1,502
France	1999	1,236	155	131	47	1,569
	2005	1,150	130	130	52	1,462
Ireland	1999	21	8	25	8	62
	2005	15	6	13	8	42
Italy	1999	3,948	223	103	12	4,286
	2005	3,986	219	114	20	4,339
Netherlands	1999	180	10	7	5	202
	2005	220	10	25	5	260
Austria	1999	88	9	18	2	117
	2005	139	8	18	4	169
Sweden	1999					
	2005	100	6	6	5	117
United Kingdom	1999	482	59	62	34	637
	2005	404	53	60	17	534
EU15	2005	9,196	626	554	194	10,570

Within the EU, the large companies are mainly responsible for the production value in the dairy industry. In France, Italy and Spain the companies with fewer than 20 employees have a substantial position in the market altogether, but in all other countries the production value of companies with fewer than 50 employees is negligible.

In Germany, France, Italy, Spain and the United Kingdom medium-sized companies together have a substantial part of the market. In most other countries the large companies dominate the market.

Figure 7.5 **Production value according to size class (2005)**



Source: Eurostat.

In general, in the dairy industry in the EU the major part of the production value comes from large companies. In some countries there are small entrants into the market, whereas in others small companies are bundling their activities. In most countries the labour productivity improved. The value added of the dairy industry has not increased in any country.

The economic performance between companies is also varied (see table 7.4). The multinationals have the highest ROE (return on equity) and added value, while the more locally oriented companies have lower returns.

This diversion in economic performance between dairy companies is partly caused by the branding policy of the companies. The firms with the highest share of added value in turnover are brand oriented. Nestlé and Danone rank in the top 100 of global brands. Unilever also has strong brands, but no company brand like Nestlé and Danone. The other dairy companies only have local brands instead of global brands.

Table 7.4	Economic performance of the top 10 dairy companies (%)		
	Return on equity Average 2004-2006		**Share of added value in turnover Average 2004-2006**
Unilever	47,9	Nestlé	29,5
Danone	30,1	Unilever	28,1
Nestlé	23,7	Danone	27,6
Friesland Foods	20,9	Dairy Crest	22,6
Dairy Crest	19,8	Bongrain	21,5
Müller	16,3	Parmalat	20,1
Arla Foods	13,8	Arla Foods	17,6
Bongrain	13,7	Müller	17,3
Parmalat	11,2	Friesland Foods	14,1
Nordmilch	8,7	Campina	11,3
Campina	4,0	Nordmilch	8,9
Sodiaal	-3,9	Sodiaal	6,5

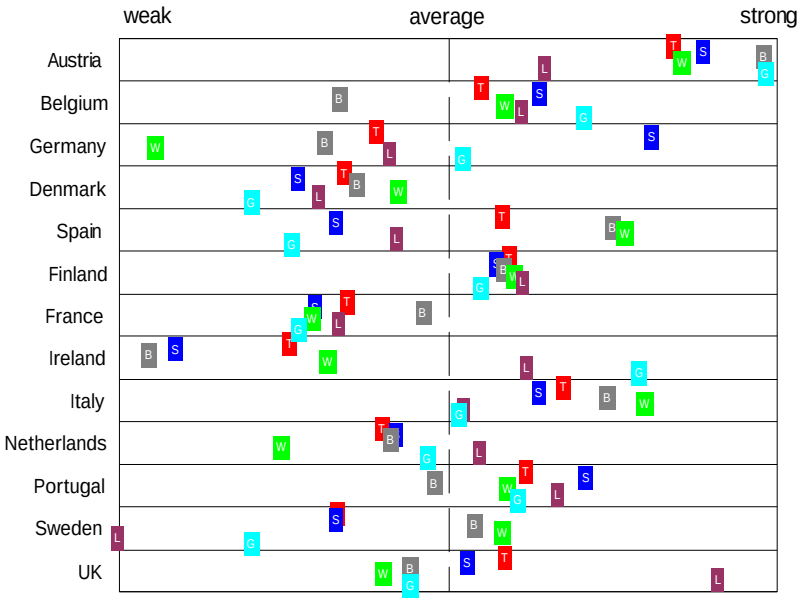
Source: Amadeus.

The company comparison is however not to be translated directly to the country comparison. The main reason for the differences is that the large companies are not always representative of the total dairy sector in a country. As chapter 6 showed, micro, small and medium companies have a different financial performance. And in some countries these firms are responsible for a large part of the processing capacity. As mentioned before, this is especially the case in Germany, France, Italy, Spain and the United Kingdom.

In figure 7.6 the country comparison of Wijnands et al. (2007) is updated. The main conclusions are that Germany, France, Denmark, Ireland, the Netherlands and Sweden rate below average. This is mainly caused by the loss of market share on the world market. This is striking because especially those countries have dairy multinationals operating on the world market. This could imply that these companies have an incentive for decreasing exports and expanding with foreign direct investment into countries in which they sell.

In general this summary on country level shows that the total situation has not changed much since the analysis in Wijnands et al. (2007).

Figure 7.6 **Competitiveness of the dairy industry in EU countries**



T=total; S=growth value added food industry;
B=growth Balassa; W=growth world share;
L=labour productivity; G=growth value added dairy.

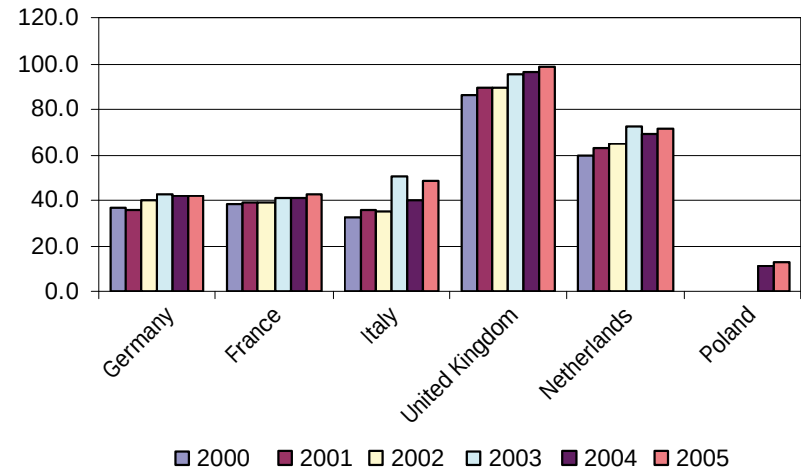
7.2 Cost of raw material: business performance of dairy farms

In the previous study (Wijnands et al., 2007) it was shown that the costs of raw material and productivity at farm level are important factors for the competitiveness of the food industry. Therefore, in this section dairy farming in the selected countries is compared.

There are two types of companies in dairy farming: specialised farms and mixed farms. In this analysis only specialised farms are compared since the mixed farms mostly have a very small scale and are not representative of the majority of milk production.

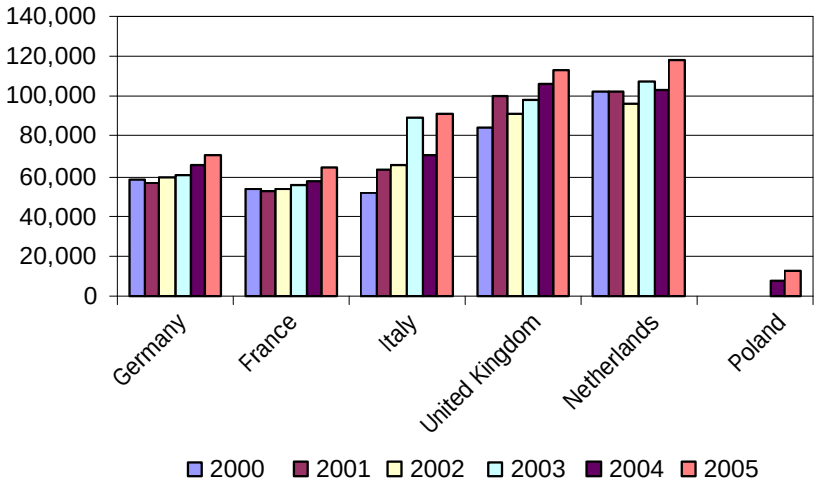
The scale of the specialised companies has increased since 2000, especially in Italy, the United Kingdom and the Netherlands.

Figure 7.7 **Average number of cows in specialised dairy farms**



Source: FADN.

Figure 7.8 **Average added value of specialised dairy farms**



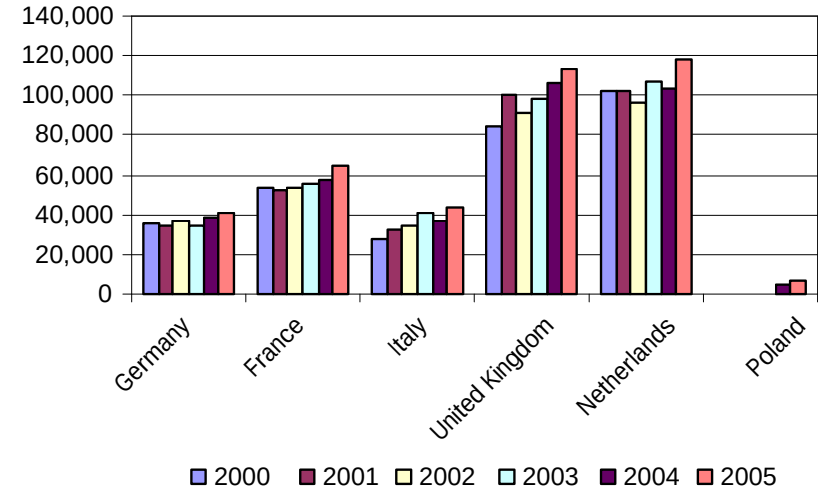
Source: FADN.

In Germany and France the number of cows of specialised farms has not increased but the added value has, perhaps due to higher milk prices, but also by forward integration on the farms, that is, making consumer products themselves. In Italy, the United Kingdom and the Netherlands the added value development is in line with the scale increase of the farms.

The added value per employee shows that this indicator has increased most in the countries with scale increase. In Germany and France the added value per employee has not risen as much as in the other countries.

The cost price at farm level per litre of milk in the EU is higher than in other parts of the world (LEI, 2002). This is mainly due to the costs of milk quotas, animal welfare regulations and the relatively high costs of land and labour. Among the competitors the cost price is lowest in New Zealand, Australia and South American countries like Brazil and Argentina. Within the EU the cost price is highest in the mountain areas like the Alps. Compared with the distance to the global cost price, the cost price does not differ much between the UK, France, Denmark and the Netherlands.

Figure 7.9 **Added value per employee at specialised dairy farms**



Source: FADN.

8 Development of the CAP and trade policy: projections with GTAP

8.1 Introduction

The EU's Common Agricultural Policy is changing and WTO negotiations on the DOHA round are still pending. As the cost of raw material and the quota system have an important effect on the competitiveness of the dairy industry, this chapter provides some future projections that are made with GTAP for the dairy sector of the EU. The current setting of the EU CAP is the starting point of this study. In the second scenario the consequences of quota abolition are described. In the third scenario a full liberalisation is described.

For the setting of the scenario calculated in this study one has to distinguish between those drivers or developments that are assumed to be exogenous. These *exogenous drivers* are not directly influenced by policies in the short or medium term. They are population growth, macro-economic growth, consumer preferences, agri-technology, environmental conditions and world markets. The second element of drivers describes *policy-related* drivers, and these will certainly have a discernable effect within the short and medium term. They are EU agricultural and fishery policies, enlargement decisions and implementation, WTO and other international agreements and environmental policy.

8.2 Scenarios

We start with the current setting of the Common Agricultural Policy of the EU, after the 2004 and 2007 enlargements with 12 new member states and the implementation of the 2003 reform (decoupling of direct payments and the partial reform of the sugar market organisation). As the database which is used for this study is based on 2001 (GTAP Version 6.5) the model is updated to reflect the actual CAP of 2007, e.g. the proposed policy changes of the Health Check are not included in this reference scenario. This reference scenario, which provides a projection from 2007 to 2015 is the *Base* scenario.

Several choices have been made for the development and analysis of scenarios. The second step is that the policy-related drivers are then coupled to the baseline scenario in different iterations.

The *Quota Abolition (Quota)* is the second scenario, in which current policies as well as exogenous drivers are considered to be the same as under the Base scenario, with the exception of the abolition of milk quotas in the EU. As proposed under the Health Check, the price support (i.e. export subsidies and import tariffs) for milk and dairy products are kept unchanged relative to their 2007 levels. This scenario identifies the impact of the abolition of production quotas on the European dairy industries. The abolishing of the quotas is modelled by an extreme increase in production quotas above a level where quota margins become zero and quotas are not binding anymore. For further details of the technical implementation of production quotas, see the technical appendix with the model description.

Under the third scenario, *Full Liberalisation (Lib),* the assumption of unchanged price support for dairy and milk is dropped and the dairy sector faces full liberalisation without quantitative restrictions in terms of production quotas as well as price support in terms of export subsidies and/or import tariffs.

Apart from alternative policy settings the performance of the European dairy sector depends on productivity changes in the agricultural and the dairy sector itself. The next two scenarios analyse the impact of productivity growth on the milk processing sectors. Within the last decade dairy production in countries such as India and China strongly increased, which led to a decline in export opportunities of other countries on these markets. Consequently, higher productivity growth in the European milk production and improvements in productivity in the dairy sector in developing countries might have a strong impact on export opportunities also for European agricultural and food processing sectors. The two scenarios analysing higher productivity growth rates for milk processors in Europe - *High productivity European dairy (HPDairy)* - and the high productivity growth rates for milk producers in the developing countries - *High productivity milk (HPMilk)* - are based on the *Full Liberalisation (Lib)* scenario which assumes full market access to European dairy markets.

Apart from different developments in technologies in agriculture and milk processing the growth of population and income at global level determines the performance of European food industries. Growing economies in other regions of the world will also provide export opportunities for European agricultural and food processing sectors. An additional scenario analyses the impact of population and income growth on production and trade in food products. This scenario

is based on the assumption of *Equal growth rates (EqualGR)* of population across all countries. Under this scenario we kept the global population growth at the same level as assumed under the base scenario. Total world population growth, then, remains constant while the country-specific growth rates differ from the base scenario. To identify the impact of different population growth rates amongst regions, we adjust for GDP growth keeping the growth rate of the GDP per capita constant, relative to the base scenario. Therefore, countries with high population growth rates above average growth rates at global level in the base scenario will have a lower GDP growth rate under the *EqualGR* scenario.

The presented scenarios focus on the policy changes implemented by the EU. Within the framework of this study WTO proposals such as from the EU, US, G10, G20 are not analysed (See Wijnands et al., 2007 for more information)

Table 8.1 Outline of Policy Scenarios in the EUFI Project

	Acronym	Scenarios	Description
1	Base	Baseline: 2001 - 2015	Update of policy measures and EU-accession of EU12, Implementation of 2003 CAP Reform with a continuation of current (2007) CAP
2	Quota	Abolition of milk quota	- as 1) but abolition of milk quota only
3	Lib	Full Liberalisation	- as 2) plus full cut in price support of milk and dairy products
3a	HPDairy	High productivity European dairy	- as 3) + enhanced growth rates in technical progress in European dairy industries (100% higher compared to scenario 3)
3b	HPMilk	High productivity milk	- as 3) + enhanced growth rates in technical progress in Developing countries' milk production (100% higher compared to scenario 3)
3c	EqualGR	Equal growth rates in population	- as 3) + equal growth rates of population across all countries with same growth rates in GDP per capita as under base

8.3 Data

Version 6.5 of the GTAP data for simulation experiments was used. The GTAP database contains detailed bilateral trade, transport and protection data characterising economic linkages among regions, linked together with individual country input-output databases which account for intersectoral linkages. All monetary values of the data are in USD m. and the base year for version 6 is 2001. This version of the database divides the world into 88 regions. An additional interesting feature of version 6 is the distinction of the 25 individual EU member states. The database distinguishes 57 sectors in each of the regions. That is, for each of the 88 regions there are input-output tables with 57 sectors that depict the backward and forward linkages amongst activities. The database provides quite a great detail on agriculture, with 14 primary agricultural sectors and 7 agricultural processing sectors (such as dairy, meat products and further processing sectors).

Table 8.2 Regional Aggregation in this study

No.	Code	Description	No.	Code	Description
1	belu	Belgium and Lux.	19	pol	Poland
2	dnk	Denmark	20	svn	Slovenia
3	deu	Germany	21	svk	Slovakia
4	grc	Greece	22	apeu	Romania, Bulgaria
5	esp	Spain	23	reur	Rest of Europe
6	fra	France	24	tur	Turkey
7	irl	Ireland	25	fsu	Former Soviet Union
8	ita	Italy	26	nafta	USA, Canada, Mexico
9	nld	Netherlands	27	ram	Rest of America
10	aut	Austria	28	bra	Brazil
11	prt	Portugal	29	oce	Australia, NewZealand
12	fin	Finland	30	jp_ko	Japan, Korea
13	swe	Sweden	31	chi	China
14	gbr	United Kingdom	32	ras	Rest of Asian countries
15	euis	Cyprus, Malta	33	me	Middle East
16	cze	Czech Republic	34	naf	Northern Africa
17	euba	Baltic countries	35	ssaf	Sub-Saharan Africa
18	hun	Hungary	36	saf	South Africa

Source: GTAP database, version 6.5.

The social accounting data were aggregated to 36 regions and 23 sectors (see tables 8.2 and 8.3). The sectoral aggregation distinguishes agricultural sectors that use land and sectors engaged in the Common Agricultural Policy (CAP). The regional aggregation includes all EU-15 countries (with Belgium and Luxembourg as one region) and all EU-10 countries (with Baltic regions aggregated to one region and with Malta and Cyprus included in one region) and the most important countries and regions outside the EU.

Table 8.3 Structure of Sectoral Aggregation in this study

No.	Code	Description	No.	Code	Description
1	pdr	Unprocessed and processed rice	13	vol	Vegetable oil
2	wht	Wheat	14	ofd	Compound feed
3	grain	Cereal grains nec	15	agro	Other agr-food products a)
4	oils	Oil seeds	16	frs	Forestry
5	sug	Sugar cane and beet	17	c_oil	Crude oil
6	hort	Vegetables, fruit, nuts	18	petro	Petroleum products
7	crops	Other crops	19	gas	Natural gas
8	cattle	Cattle, sheep, goats, horses	20	coa	Coal
9	oap	Animal products nec	21	ely	Electricity
10	milk	Raw milk	22	ind	Other industries
11	dairy	Dairy products	23	ser	Services
12	sugar	Sugar			

Source: GTAP database, version 6.5.

The huge amount of results for different variables are presented in aggregated form for the relevant economic indicators (production value, value added, employment, trade) and indicators used to measure the competitiveness.
The selected indicators for quantifying the industry's competitiveness are:

- annual growth in production volume of total food industry and for the dairy sector;
- annual growth in real value added of the food industry including subsectors;
- annual growth in each food industry's share of real value added compared with growth in the total food industry;
- growth in the export share of food industries at world market;
- annual growth in terms of the Balassa Index.

8.4 Production

Figure 8.1 indicates that the production of the aggregated food industry is not very much affected by the different policy scenarios. Only for the Liberalisation scenario (and the subsequent scenarios) the volume of food production strongly increases in New Zealand and Australia. Here, the dairy industry plays a dominant role amongst the different food processing sectors. The output under full market access to the European markets (under *Lib*) is almost 15 percentage points higher relative to the baseline and the quota abolition scenario.

Under the *EqualGR* scenario, food processing increases especially in the EU. This result indicates that - apart from policy measures such as tariffs and subsidies - the performance of European food production is mainly determined by macro-economic trends, such as population and income growth.

Figure 8.2 provides details about the production of the dairy sector under the different policy scenarios. For the European dairy industry the abolition of the milk quota regime will lead to an expansion of the output, while under full liberalisation the output of dairy industries declines, see *Lib* scenario.

Figure 8.1 **Food production volume of selected regions under different scenarios for 2015, relative to initial level in 2001=100**

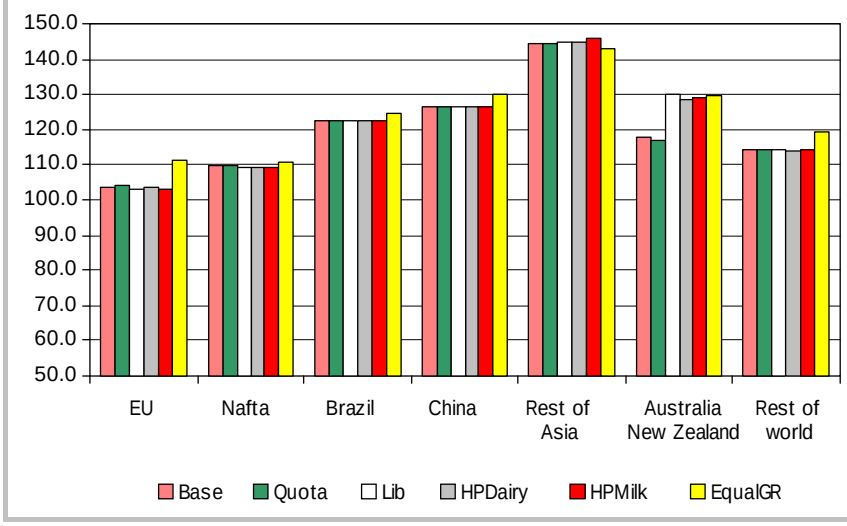
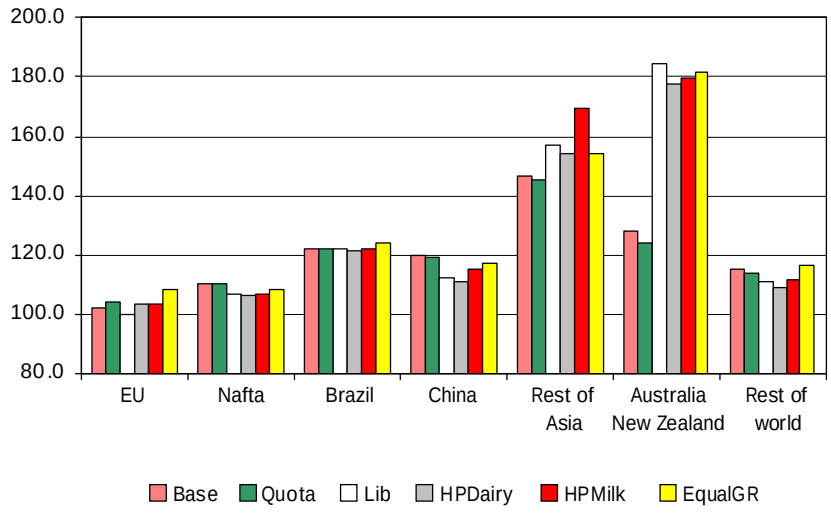


Figure 8.2 **Dairy production volume of selected regions under different scenarios in 2015, relative to initial level in 2001=100**



Higher rates of productivity in the dairy sector will have a positive effect on the output level in EU. As already discussed for the aggregated food sector, the New Zealand and Australian dairy sector strongly expand dairy production under full market access conditions.

8.5 Food export and international competitiveness

The following figures present results for the export performance of the food industries of the different policy scenarios calculated for this study. In general, the first scenario which analyses the consequences of the continuation of the current polices (*Base*) and the scenarios analysing the abolition of milk quotas (*Quota*) and the full withdrawal of any support in the dairy sector (*Lib*) show a decline in competitiveness of European food processing industries both at international level and at national level.

Figure 8.3 **Food export shares of selected regions under different scenarios for 2015 (in % of world food expert, 2001=100)**

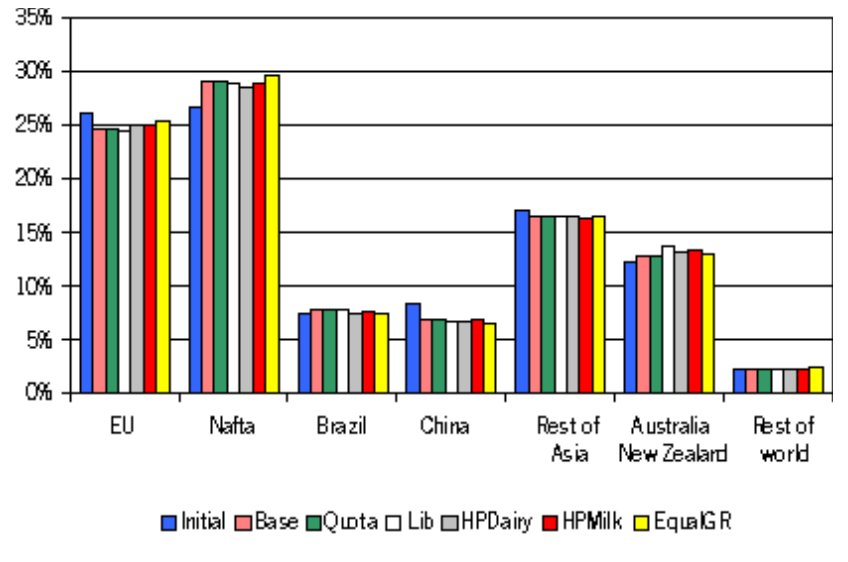


Figure 8.3 describes the development of food export shares in the total world food export. Under the initial 2001 situation (*Initial*) the EU has a food export share of more than 25%. It should be mentioned that under all scenarios calculated for this study the EU remains together with the Nafta region one of the largest exporter of processed foods. However, the declining export shares between 2001 and 2015 indicate a loss in international competitiveness, see *Base*. This decline is due to the consequences of the decline in agricultural support as the consequence of the implementation of reform of the CAP between 2001 and 2007. The CAP instruments also affect the prices of processed food prices. As a consequence, production in agri-food sectors decline in the EU-15 and excess supply disappears. In this scenario other regions in the world gain export shares: highest relative increases are in the Nafta region and Brazil. Strongly growing economies such as China also loose export share in world food markets which is mainly due to a strong growth in domestic demand which reduces the excess supply available for exports.

An enhanced productivity growth in European dairy industries (scenario *HP Dairy*) will compensate for the above mentioned decline in European share of food products in world total food exports. It is assumed that productivity growth

rates in the other regions and sectors are as high as under the *Base* Scenario. The higher productivity growth will reduce costs in production in Europe relative to other competitors on world markets. In the scenario *HPDairy* and *HPMilk* enhanced productivity growth is assumed to take place at dairy farm and at dairy processing level. Under this scenario European export shares in world market will increase significantly.

Full liberalisation, which also includes full market access for foreign competitors on European dairy markets, will lead to a dramatic drop in the export share of EU agri-food products in total food exports. Under this *Lib* scenario all domestic support to farmers is also withdrawn, e.g. phasing out of coupled and decoupled direct payment. This cut in agricultural support together with full trade liberalisation will lead to a reduced agricultural output and an increased domestic consumption in agri-food products as a consequence of declining food prices. This effect also contributes to the decline in food exports.

In relative terms Brazil and Australia and New Zealand benefit most under the liberalisation scenario with an increase in the food export share of 3% and 8%, respectively (figure 8.3). The changes in agricultural policies are also reflected in the specialisation level in different commodities amongst the trading partners. Here the Balassa Index shows the share of a product in total national exports relative to the share of all exports of this product in the sum of world exports. A value larger than 1 indicates a relative specialisation for that commodity. The changes in the Balassa Index under different scenarios are presented in the following table 8.4.

Compared to the Baseline scenario the Balassa Index values show very little changes under the policy scenario for the non-dairy products, which can be expected due to the fact that policies for these products remains unchanged. For dairy products, however, the abolition of the milk quota (*Quota*) shows the strongest change in the Balassa Index values. The increase in dairy products reflects the increase in milk production in the EU as a consequence of the abolition of the milk quota regime which is modelled under this scenario.

Australia and New Zealand and the Nafta region show an increase in specialisation in the meat sector under the *Quota* scenario. Also the specialisation in dairy production in Australia and New Zealand continues under this scenario.

Table 8.4	Development of the Balassa Index under different scenarios in Food Processing Industries					
	EU	**NAFTA**	**Brazil**	**China**	**Rest of Asia**	**Aus / New-Zealnd**
Baseline						
Meat	0.95	1.32	0.37	0.10	0.17	23.05
Oils and fats	0.84	0.43	0.47	0.09	3.73	0.83
Dairy	2.01	0.23	0.01	0.01	0.17	14.00
Sugar	0.01	0.01	10.30	0.00	0.02	0.81
Other Food	1.14	0.89	0.27	0.56	1.46	1.77
Quota abolition						
Meat	0.96	1.34	0.32	0.10	0.17	23.78
Oils and fats	0.85	0.44	0.40	0.09	3.80	0.85
Dairy	2.17	0.21	0.01	0.01	0.16	12.89
Sugar	0.00	0.01	8.87	0.00	0.02	0.64
Other Food	1.16	0.91	0.23	0.57	1.49	1.82
Full liberalisation						
Meat	0.99	1.40	0.33	0.11	0.18	22.16
Oils and fats	0.85	0.44	0.40	0.09	3.80	0.81
Dairy	1.68	0.29	0.01	0.02	0.46	19.37
Sugar	0.00	0.01	8.93	0.00	0.02	0.59
Other Food	1.16	0.91	0.23	0.57	1.49	1.71
High productivity European dairy sector						
Meat	0.99	1.39	0.33	0.11	0.18	22.35
Oils and fats	0.85	0.44	0.40	0.09	3.80	0.81
Dairy	1.81	0.26	0.01	0.02	0.42	17.89
Sugar	0.00	0.01	8.91	0.00	0.02	0.59
Other Food	1.16	0.91	0.23	0.57	1.49	1.73
High productivity developing countries milk production						
Meat	0.99	1.39	0.33	0.11	0.17	22.26
Oils and fats	0.85	0.44	0.40	0.09	3.78	0.81
Dairy	1.74	0.28	0.01	0.02	0.57	18.88
Sugar	0.00	0.01	8.91	0.00	0.02	0.59
Other Food	1.16	0.91	0.23	0.57	1.48	1.72

As already mentioned for the development of export shares, the *Full Liberalisation* scenario also leads to a decline in the Balassa Index value for European dairy industries. Higher productivity growth rates at European dairy farm and processing level partly compensates for the loss in competitiveness under the *Full Liberalisation* scenario. Consequently, enhanced productivity growth in European dairy sectors will improve the competitiveness of European food products on world markets. Under *Full Liberalisation*, the European food industries show a decline in specialisation for dairy products. These results mirror the decline of Europe's food export share in total world food exports as described in figure 8.3.

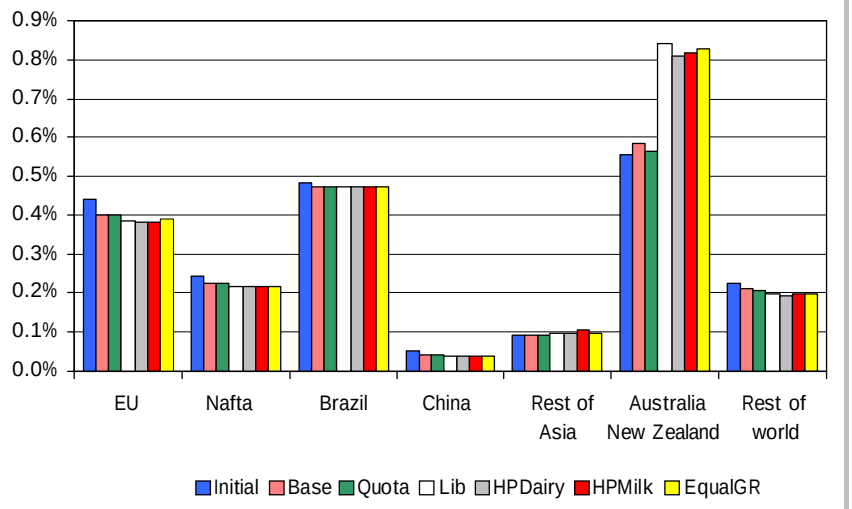
8.6 Economic performance of dairy industries

The dynamic of income growth in different regional is significantly affected by growth in productivity. Different assumptions on sectoral productivity growth rates as analysed under the scenarios *HPDairy* and *HPMilk* have only a marginal impact on total GDP. Therefore, the impact of alternative dairy policy options is negligible for the overall economy. However, policy options in the European milk sector are projected to have a strong impact at sectoral level. The scenario *Lib* reveals the consequences of trade liberalisation in the dairy sector which also contributes significantly to the sectoral contribution of the sector to the national GDP and employment. Because structural change also occurs under the *Base* scenario the results presented in the figure 8.4 should be compared to the results of the base scenario. Brazil, China and the Rest of Asia region are those regions with the highest increase in national income under the baseline. Growing economies are also characterised by severe changes in the structure of the total economy with a decline in primary sectors such as agriculture and an increase in high-tech industries and services. Internal competition for resources, intermediate inputs and production factors, amongst different industries at national level can be described by the growth in real value added of a specific industry in the total industry. To illustrate the contribution of the food industry to total income the following figure 9.4 illustrates the development of the share of the dairy processing industries value added in total national value added.

The quantitative results of this study indicate that in the near future in the EU, like other industrialised countries presented in this analysis, the contribution of dairy industries continues to fall and share of activities, e.g. services continues to increase. To assess these results it should be stated that these projections reflect the long-term effect of the policy reforms analysed here. Regions

with high shares of agriculture and industries may be vulnerable to this process with regard to employment and income growth, as the structural change process is often characterised by adjustment processes and related costs. It takes time for people to adjust their skills, for industries to grow, etc. Even in Brazil sectoral share in value added will tend to decline. Food industries in these countries can participate only partly in high income growth. This development is due to the fact that income elasticity for services and manufactures are higher than for agricultural and food products.

Figure 8.4 **Development of dairy industries' value added shares (% of regional value added) in selected regions under different scenarios for 2015**



The other policy scenarios indicate that this development is independent from the assumptions of productivity growth rates. In all scenarios, the contribution of food processing is less than under the base scenario. However, an enhanced growth rate in productivity in primary agriculture and/or food processing can partially compensate for the decline value added share of the food processing. An increase in milk supply under the *Quota* scenario will lead to a higher level of value added of the dairy sector. An enhanced productivity in agriculture and milk processing industries (*HPDairy* and *HPMilk*) and the full liberalisation, however, will lower the contribution of European dairy industries to total GDP.

An increase in productivity in European agri-food sectors has a small negative impact on the economic performance of the food processing industries in other regions.

As presented in the figure 8.4 full liberalisation will have a significant negative impact on European milk processing. The share in food industries' value added continues to decline under this scenario. In the other countries, however, this share increases. In Australia and New Zealand the contribution to total national income is even higher compared to the initial situation.

8.7 Employment in milk processing industries

The impact of different policy scenarios on employment is described in the table 8.5. The decline in the contribution of the European food processing industries to total GDP under *Full Liberalisation* is also mirrored by the development of employment in the European milk processing industries.

Full Liberalisation will lead to a decline in sectoral employment by around 3.2% in EU milk processing. Employment in the other regions or countries increases under the Liberalisation scenario reform between 7.2% in the Rest of Asia and almost 44% in Australia/New Zealand. In these countries employment in milk processing increases, which is also reflected in an increase in the sectoral shares in total GDP, see figure 8.7. However, due to factor substitution the increase in labour employment leads also to an increase in capital use and capital is partly substituted by labour. However, in the EU the opposite development is the case. Here labour in dairy industries is substituted by capital.

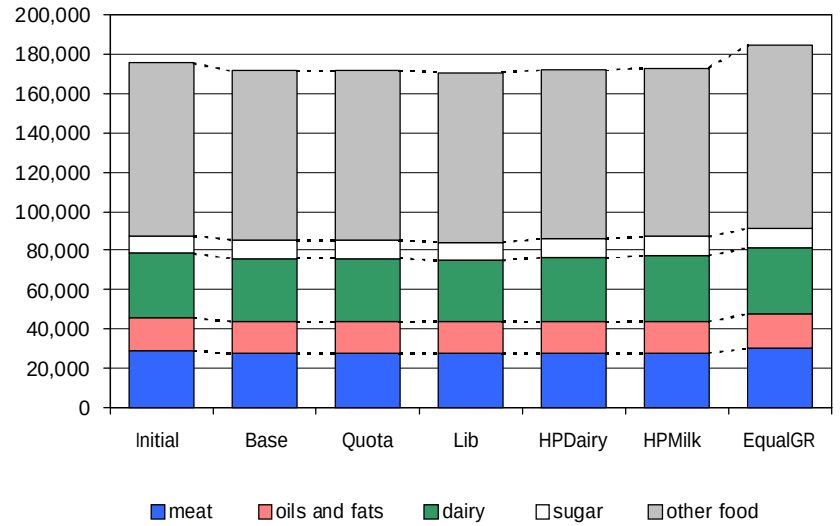
Enhanced growth in sectoral productivity in primary milk production and dairy processing are modelled under the scenarios *HPDairy* and *HPMilk*. Both will lead to a small decline in employment. However, the impact of productivity on employment is rather small compared to the consequences of trade liberalisation modelled under the scenario *Full Lib*. The main reason for the moderate impact of different assumptions on productivity growth in European agriculture and food processing industries can be explained by the limited economy-wide relevance of the food processing sector in total and especially for the dairy sector. Changes in sectoral productivity growth will have an impact on the output level but almost no impact on the economy-wide factor markets. Therefore, different growth rates of productivity in food processing and primary agriculture have only little impact on the level of factor prices.

Table 8.5	Impact of policy scenarios on sectoral employment under different Scenarios in Milk Processing Industries, for 2015 (Base = 100)					
	EU	**Nafta**	**Brazil**	**China**	**Aus / NewZeald**	**Rest of Asia**
Base	100.00	100.00	100.00	100.00	100.00	100.00
Quota	100.91	99.81	99.90	98.94	96.76	99.18
Lib	96.80	96.91	99.69	93.67	143.92	107.16
HPDairy	95.78	96.44	99.47	92.17	138.44	105.57
HPMilk	96.10	96.68	99.64	95.85	140.19	115.98
EqualGR	105.79	98.50	101.78	97.95	141.71	104.72

8.8 Sectoral Income in food processing industries

Figures 8.5 to 8.9 illustrate the composition and the development of the value added in food processing industries in the EU, the NAFTA region, Brazil, Australia and New Zealand and China. All values are in USDm. presented for the initial year 2001 and of the final year of the projection period which is 2015. Under the scenarios with enhanced productivity growth rates in the European dairy farming and processing the EU value added in the European food processing sector gain in total terms. The strongest effect in terms of total sectoral income, however, is due to the macro-economic drivers, i.e. population and income growth. Under the final *EqualGR* scenario income of EU food processing strongly increases due to the improved demand of dairy products at global level. In all other regions the expansion of European food processing industries has a small negative impact. However, under full liberalisation in the European dairy industry total value added in food processing industries remains relatively constant in the EU while it expands especially in Australia and New Zealand.

Figure 8.5 **Development of the composition of value added food industry in the EU15 under different scenarios, in USDm., 2001 and 2015**



If we compare figure 8.3, which presents the changes in European food exports, with figure 8.5 it becomes clear that the loss of export shares at world level does not coincide with a general decline in value added of European food industries. Total value added in European food industries remains relatively stable between different scenarios. There are some changes in the composition of total value added, e.g. the abolishment of milk quotas will increase the share of the dairy sub-sector. However, a constant value added in food processing does not imply a constant or stable level of employment. Due to the fact that increasing productivity requires less labour to produce the same amount of output. The positive changes in total value added under the scenarios with higher productivity growth are not mirrored by significant increase in sectoral employment.

Figure 8.6 **Development of the composition of value added food industry in the Nafta region under different scenarios, in USDm., 2001 and 2015**

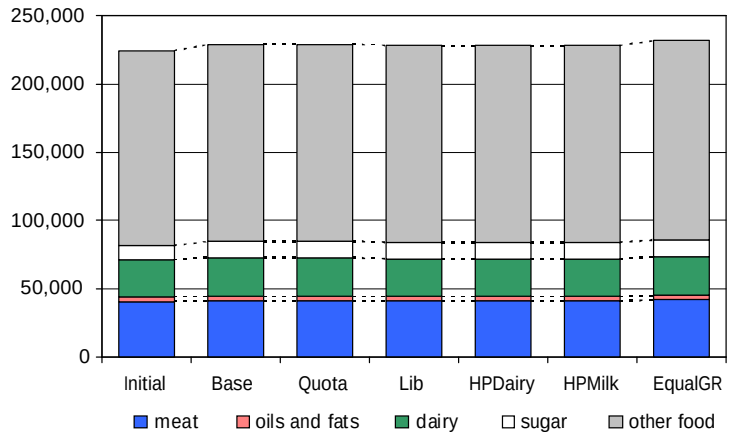


Figure 8.7 **Development of the composition of value added food industry in Brazil under different scenarios, in USDm., 2001 and 2015**

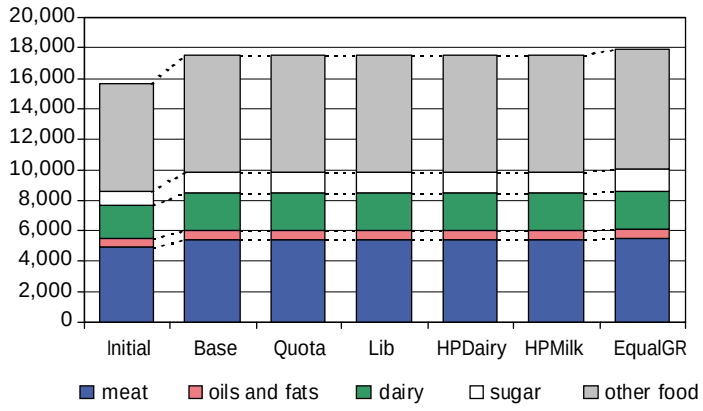


Figure 8.8 **Development of the composition of value added food industry in Australia and New Zealand under different scenarios, in USDm., 2001 and 2015**

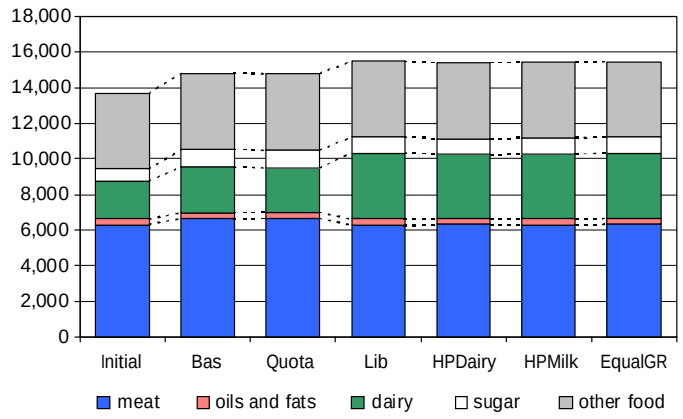
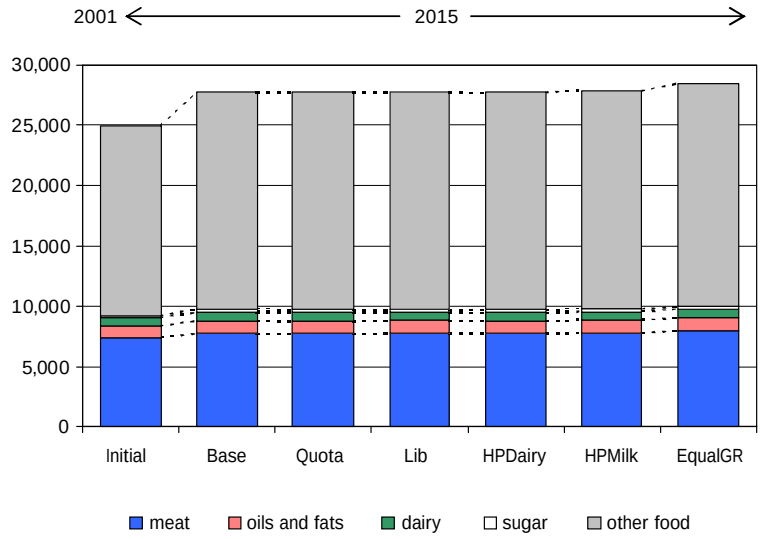


Figure 8.9 **Development of the composition of value added food industry in China under different scenarios, in USDm., 2001 and 2015**



9 Conclusions

Europe is the largest exporter of dairy products in the world, even excluding intra-EU trade. World trade in dairy products is concentrated in cheese, butter and milk powder. In growth of exports New Zealand surpasses the EU. Within the New Zealand food industry dairy is much more important than in the EU, Australia and the USA. The world market growth in combination with the CAP quota restrictions, mainly benefits New Zealand. Over the last years the European Union has quickly lost market share in the world trade.

For milk products the EU has met more competition from Oceania and Asia since 1999. Milk powder production in New Zealand already approaches the total EU production. The EU reacts to this development by specialising on cheese, another strong product in international trade. Of total world trade in cheese 45% originates from France, the Netherlands and Germany. The USA and Canada choose to maintain their position on all products. In world trade this strategy is reflected by a detoriating position for Canada.

On the basis of the publicly available sources, like the e-newsletter Food Navigator and the professional magazine Dairy Innovation, insight has been gained into innovation in the dairy industry. Most innovations are product innovations and marketing innovations. The product innovations are mainly line extensions: new sizes or flavors in the existing product category. But innovations in new ingredients are also very numerous.

The main innovators in the European dairy industry are the large dairy companies (e.g. Arla, Danone, Müller, BSA Lactalis, Dairy Crest or Campina), suppliers of ingredients (Danisco, Chr Hansen, DSM) and packaging (Tetra Pack) in Europe. The large firms have a share of over 60% in the industry's total turnover and employment and a share of over 50% in innovations. This implies that innovations are proportionally distributed over smaller and larger companies. Arla presented the highest number of innovations, Fonterra (New Zealand) ranks number 2.

A fair amount of the mainly large corporations works closely together in innovation with research institutes. This cooperation turns out to be a major part of organisational innovations. This suggests an open innovation model where promoting innovation benefits from the promotion of cooperation between partners in the food chain.

No evidence has been found that innovative firms have higher profit margins. There is evidence, however, that the larger companies have a higher added value in turnover. This finding can be due to data problems, but it could also suggest that profits from innovations are quickly transferred down the chain of competitive markets and that the consumers are the main beneficiaries of the innovation.

The EU has more innovations than all other benchmark countries: the UK, France and Denmark are leading in this respect. This supports the view of experts in the industry that the EU industry is innovative and even exports these innovations to for instance the US market.

The mean size of micro enerprises shows a declining trend. Small and medium enterprises are increasing in size very slightly while for large enterprises the change in mean size is cyclical, but on average strongly increasing. The average size of a large enterprise dropped between 2000 and 2003 but rised onwards in the last 5 years. The concentration of the industry is - in the investigated countries - highest in the Netherlands and lowest in Italy.

Large companies have grown in the last couple of years and they tend to merge and acquire companies that do interesting innovations. Entrance into the market is mainly the case on primary level were farmers start to process milk to end products themselves. The exits are mainly primary farmers that stop processing themselves and mergers of large firms.

In the period 1996-2004 the profit margin and the return on total assets (ROTA) dropped after 2003 drastically, the EBITDA remained almost on the same level). It is not surprising that profitability increases from micro to large enteprises as the scale of production increases the production cost goes down. The large companies dominate the market in the EU. In some EU countries medium and small countries also have a substantial position in the market. In France, Italy and Spain the companies with fewer than 20 employees have a substantial position. In Germany, France, Italy, Spain and the United Kingdom medium-sized companies still have altogether a substantial part of the market. In all other countries 'economies of scale' dominates as a business strategy, which implies that entrance to the market needs large set up costs or - for small and medium enterprises - should be based on a different business strategy. This development is also reflected in the turnover figures of the large companies; most large companies have improved their turnover since 2004.

In the large majority of countries the labour productivity of the dairy industry has improved as well as the production value. The added value has not im-

proved in any of the countries. It is remarkable that the added value in EU-10 has decreased in some countries.

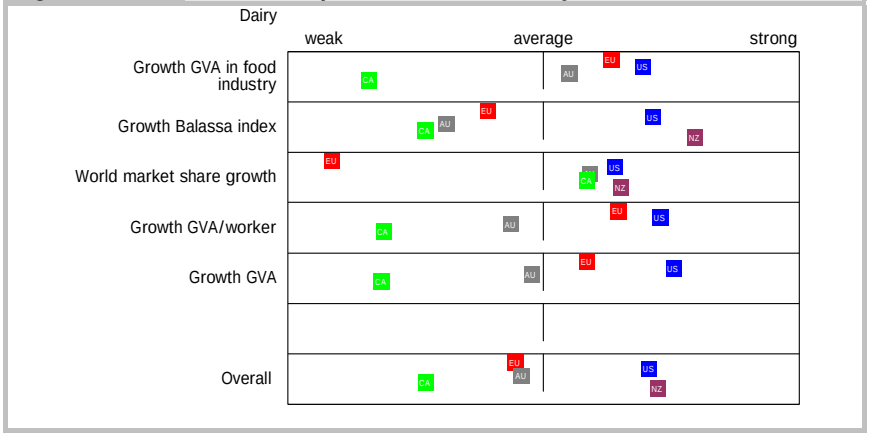
Raw material prices and productivity at farm level influences the competitiveness of the food industry. In Italy, the United Kingdom and the Netherlands the scale of dairy farms has increased considerably since 2000. In Germany and France the scale has only slightly grown. Although the number of cows did not increase considerably, the added value of dairy farms has grown disproportionally in those countries. This did not lead to a higher added value per employee, however.

The EU dairy sector performs just below average, despite the loss in world market share. Compared to the previous report (Wijnands et al., 2007) the improvement in labour productivity and the growth in value added compensated for the loss in market share. New Zealand performs well because of the high increase in world market share. The USA has a high score on all indicators, despite the fact that the companies do not specialise. Compared to the previous benchmark, Australia improved its position (thanks to more value added) and Canada looses out on all indicators.

Within Europe, Italy, Austria and United Kingdom are the most competitive countries. The postion of the UK is remarkable, as it has problems to use its whole milk quotum. And indeed the development in market share is rather weak for the UK, but it has a superb improvement in labour productivity. This shows the importance of the general economy for the dairy industry, in this case a booming economy and a relatively liberal labour market.

In the future scenarios the strongest effect in terms of total sectoral income, however, is due to the macro-economic drivers, i.e. population and income growth. Under the final *EqualGR* scenario income of EU food processing strongly increases due to the improved demand of dairy products at global level. In all other regions the expansion of European food processing industries has a small negative impact. However, under full liberalisation in the European dairy industry total value added in food processing industries remains relatively constant in the EU while it expands especially in Australia and New Zealand. Quota demolition will effect Europe positively, since increasing world market demand can be answered. This will affect mainly the position of New Zealand and Australia.

Figure 9.1 **Overall competitiveness of the dairy sector**



The analysis shows clearly that in general Australia and New Zealand will profit most from liberalisation. Brazil's position doesn't improve very much. This could be caused by the fact that their world share in dairy is negligible at the moment. China's position on the world market improves also hardly in the scenarios. This is expectable since the local wealth is increasing which results in local demand increases.

References

Alcamo, J., Leemans, R., E. Kreileman, *Global Change Scenarios of the 21st Century. Results from the IMAGE 2.1 Model,* Elsevier, London, 1998.

Batowska, A., *The European dairy industry's innovation; Ambition or a need to maintain competitiveness?* 2008.

Berkum, S. van, and H. van Meijl, The application of trade ad growth theories to agriculture: a survey. In: *The Australian Journal of Agricultural and Resource Economics,* 44(4), pp. 505-542, 2000.

de Janvry, A., *The Agrarian Question and Reformism in Latin America.* Baltimore: Johns Hopkins University Press, 1991.

Deshpande, R. and F.E. Webster, 'Organisation Culture and Marketing: Defining a Research Agenda'. In: *Journal of marketing.* 53(1), p3-15, 1989.

Eickhout, B., van Meijl, H., Tabeau, A. and H. van Zeijts, *Between Liberalization and Protection: Four Long-term Scenarios for Trade, Poverty and the Environment,* Presented at the Seventh Annual Conference on Global Economic Analysis, June, Washington, USA, 2004.

Europa. *EU sectoral competitiveness indicators.* Office for Official Publication of the European Community, Luxembourg, 136 pp, 2005.

Fischer, G., K. Frohberg, M.L. Parry, and C. Rosenzweig, The potential effects of climate change on world food production and security. In: *Global Climate Change and Agricultural Production* [Bazzaz, F. and W. Sombroek (eds.)]. John Wiley and Sons, Chichester, United Kingdom, 345 pp. 1996.

Food and Agriculture Organisation FAO, *Agriculture towards 2030*. Rome, 2003.

Francois, J., van Meijl, H. and van Tongeren, F*., Economic benefits of the Doha round for The Netherlands (also world and EU level)*, Agricultural Economics Research Institute, Report 6.03.02, 2002.

Francois, J., van Meijl, H. and van Tongeren, F., *Trade Liberalization and Developing Countries Under the Doha Round*. CEPR Discussion Paper no. 4032. London, Centre for Economic Policy Research. http://www.cepr.org/pubs/dps/DP4032.asp. 2003.

Gaasbeek, A.F. van, Hack, M.D., Van Meijl, J.C.M. en de Vlieger, J.J., *Concurrentiemonitor: het instrument om de concurrentiekracht van sectoren periodiek te kunnen meten*. PR 98.03. LEI, Den Haag, 1998. .

Hall, R., *Innovation and NPD in dairy*. Business Insights, 2007.

Hamel, G. and C.K. Prahalad. *Competing for the future: Break through strategies for seizing control of your industries and creating the markets of tomorrow*. Harvard Business Press, 1994.

Harrison, J. and Pearson, K., *Getting started with GEMPACK: Hands-on Examples.* Monash University, 2002.

Hertel, T and Keening, R., *'Assessing the Impact of WTO Reforms on World Agricultural Markets: A New Approach',* 2003.

Hertel, T.W., 'Global Trade Analysis: Modelling and Applications'. In: *Cambridge University Press,* Cambridge, 1997.

Hertel, T.W., Anderson, K., Francois, J.F., Hoekman, B. and Martin, W., *Agriculture and non-agricultural liberalization in the millennium round.* Paper prepared for the World Bank's integrated program of research and capacity building to enhance participation of developing countries in the WTO 2000 Negotiations, Presented at the Conference on Agriculture and the New Trade Agenda in the WTO 2000 Negotiations, Geneva, 1-2 October, 1999.

Huang, H., van Tongeren, F., Dewbre, J. and van Meijl, H., *A New Representation of Agricultural Production Technology in GTAP,* Paper presented at the Seventh Annual Conference on Global Economic Analysis, June, Washington, USA, 2004,

Hunt, S.D. and R.M. Morgan. 'The comparative advantage theory and competition'. In: *Journal of marketing*. 59, pp 1-15, 1995.

IMAGE-team, *The IMAGE 2.2 implementation of the SRES scenarios. A comprehensive analysis of emissions, climate change and impacts in the 21st century*. RIVM CD-ROM publication 481508018, National Institute for Public Health and the Environment, Bilthoven, The Netherlands, 2001.

Jongen, W.M.F., Meulenberg, M.T.G., *Innovation in agri-food systems: product quality and consumer acceptance*. Wageningen Publishers, 2005

KPMG LLP*, International competitiveness of UK dairy processors*. 2007.

Krugman, P.R. and M. Obstfield, *International Economics. Theory and Policy*. Harper Collins, 1994.

Leemans R, Eickhout B, Strengers B, Bouwman L, Schaeffer M., *The consequences of uncertainties in land use, climate and vegetation responses on the terrestrial carbon Science in China (Series C) Vol. (45)*, pp. 126-141, 2002.

Leemans, R., Eickhout, B., 'Another reason for concern: regional and global impacts on ecosystems for different levels of climate change'. In; *Global Environmental Change Part A 14*, pp 219-228, 2004.

Meijl, H. van, T. van Rheenen, A. Tabeau and B. Eickhout, *The impact of different policy environments on land use in Europe, Agriculture, Ecosystems and Environment, Vol. 114*, pp 21-38, 2006.

Netherlands Bureau for Economic Policy Analysis CPB, *Sectoral TFP Developments in the OECD*. CPB Memorandum No. 58, 2003

OECD, *Proposed Guidelines for Collecting and Interpreting Technological Innovation Data ('The Oslo Manual'), 2nd Edition*. Paris, 1997.

OECD, *Market Effect of Crop Support Measures*. Paris, 2001.

OECD, *OECD Agricultural Outlook 2003-2008*. Paris, 2003.

OECD, *Agricultural Policies in OECD Countries 2000. Monitoring and Evaluation. Organisation for Economic Co-operation and Development*, Paris, 2003.

O'Mahoney, M. and B. van Ark, 'EU productivity and competitiveness: An industry Perspective'. In: *Office for Official Publication of the European Community*, Luxembourg, 273 pp, 2003.

Parry, M.L., Rosenzweig, C., Iglesias, A., Livermore, M., Fischer, G., 'Effects of climate change on global food production under SRES emissions and socio-economic scenarios'. In: *Global Environmental Change 14*, 53-67. 2004.

Porter, M.E., *Competitive strategy. Techniques for analysing industries and competitors.* Free press, New York, 1980.

Porter, M. E., *The competitive advantage of nations.* The MacMillan Press Ltd., London, 1990.

Rosenzweig, C., M.L. Parry, and G. Fischer, 'World food supply'. In: *As Climate Changes: International Impacts and Implications [Strzepek, K.M. and J.B. Smith (eds.)].* Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 27-56, 1995.

Wijnands et al., *Competitiveness of the European food industry; An economic and legal assessment,* EU, Luxembourg, 2007.

Wijnands, J.H.M., Bremmers, H.J., van der Meulen and Poppe, K.J. *An economic and legal assessment of the EU food industry's competitiveness.* Agribusiness 24 (3), 2008.

ZMP, *Marktbilanz Milk 2006,* ZMP, 2006.

Appendix 1

Business dynamics

Table B1.1	Population of dairy processing firms by country and year									
Country	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
DE				355	325	323	342	360	294	453
FR	1,615	1,596	1,602	1,569	1,520	1,503	1,486	1,519	1,471	1,462
IT	6,604	5,546	6,466	4,286	4,218	3,830	3,727	4,378	4,307	4,339
NL	200	190	195	205	215	235	235	240	250	260
PL	888	911	895	975	904	754	793	779	774	723
UK	720	689	664	637	609	601	578	574	549	534

Source: Eurostat.

Table B1.2	Mean Average size of new entrants (between 1996 and 2006) by country a)		
Country	**Operating Turnover**	**Total Asset**	**Employee**
FR	9,136	3,803	27
	(3,075)	(1,254)	(7)
DE	186,643	90,569	404
	(22,591)	(8,450)	(46)
IT	9,047	8,258	24
	(908)	(1,143)	(2)
NL	15,601	1,4352	74
	(1,578)	(835)	(1)
PL	11,710	5,156	103
	(2,441)	(784)	(15)
UK	735,103	38,6740	
	(134,627)	(74,389)	2,925
			(515)

a) Figure between brackets is standard error of mean.

Table B1.3	Summary statistics of firm age by country and enterprises size classes				
		Mean	**St. deviation**	**Min**	**Max**
Country	FR	25	27	1	122
	DE	40	39	1	136
	IT	26	21	1	106
	NL	26	26	1	108
	PL	33	28	1	122
	UK	20	18	1	81
Enterprise size classes	Micro	24	23	1	106
	Small	28	20	1	100
	Medium	31	24	1	123
	Large	27	27	1	136

Table 4	Mean size of firms by size class and year										
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Operating revenue											
Micro	1,305	1,224	1,047	1,055	1,072	1,071	1,000	963	831	834	742
Small	5,795	5,406	5,420	5,497	5,551	5,372	5,447	5,481	5,853	6,065	5,766
Medium	27,104	26,882	28,402	28,203	28,586	30,692	29,505	27,403	30,144	29,499	28,240
Large	381,780	667,473	719406	753,595	648,905	646,637	593,905	598,476	644,029	736,241	916,985
Total asset											
Micro	1,059	1,054	989	927	839	890	841	840	613	607	605
Small	4,434	4,475	4,574	4,419	4,536	4,676	4,903	4,861	4,786	4,906	5,013
Medium	18,919	19,949	20250	19,967	20,299	21,908	20,710	22,155	21,011	21,551	22,962
Large	168,798	316,657	330,452	372,349	323,022	319,794	284,554	287,926	288,643	362,497	563,340
Employees											
Micro	5	4	5	4	4	5	4	4	4	4	4
Small	21	21	22	22	22	21	21	21	24	23	21
Medium	97	100	103	107	103	117	112	106	110	101	99
Large	932	2,300	2,197	2,260	1,899	1,710	1,483	1,439	1,466	1,823	2,584
Value added											
Micro	164	190	191	207	188	184	163	182	150	182	152
Small	857	866	938	949	935	875	911	911	1,040	1,076	1,005
Medium	4,004	4,421	4,784	5,288	4,918	5,080	4,939	5,074	5,469	5,273	5,190
Large	36,546	119,383	140,537	118,493	94,757	109,292	94,115	92,986	100,923	113,971	171,173

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