# Competitiveness and innovativeness of the EU Dairy Industry[1]

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## Abstract

This study provides the methodology to measure competitiveness and an assessment of the European dairy industry's competitiveness and innovativeness.

Several studies on competitiveness of industries are weakly theoretically founded, descriptive of nature or do not provide an overall assessment of all indicators used. This study provides an integrated and quantitative approach.

The EU dairy industry competitiveness turned out to be weak. Policy projections show that modest improvements for the EU are possible by abolition of the quota system.

A unique database on innovations in the dairy industry has been compiled. The number of innovation per firms' size classes follows the production value and employment. Small firms are as innovative as large firms measured as innovation per billion turnover.

Key words: Competitiveness, innovation, dairy industry, policy scenarios

## 1 Introduction and goal

Is the EU food industry the most dynamic, innovative, and competitive in the world? EU food legislation has developed tremendously over the last 15 years to respond to growing concerns with respect to food safety, consumer information and the functioning of the internal EU market. The food industry is experiencing a period of structural adjustment. Consumer preferences change because of income developments, shifts occur in population structure and new lifestyles develop. Globalization, liberalization of world trade and agricultural markets, and the opening of new markets (i.e. India and China) represent a second source for dynamism. In addition, major changes in technology, including information technology and biotechnology, have led to new products and new methods of organizing the food supply chain. The EU food industry is, with 11% of the value added of the European manufacturing industries in 2003, one of Europe's main sectors (Wijnands et al., 2007). The EU is also the largest exporter and importer of food products.

With the *Lisbon-Göteborg Agenda*, the EU aims to make its economy the most dynamic, innovative, and competitive in the world by 2010. The CIAA mentions "*Costs of inappropriate legislation negatively affect the competitive position of companies" (CIAA,*

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*2007).* There is only scarce empirical evidence to confirm these statements. Fischer and Schornberg (2007) assessed the competitiveness of the EU food and drink industries including their subsectors (Fischer *et al.*, 2007). Their research is restricted to EU-countries and on business performance data. It does not benchmark the EU against other countries. As far as we know, studies that benchmark countries and assess quantitatively the overall has not been conducted before. Even the renowned study of Trail and Pitts or other studies by ISMEA or Rama on this subject are based on case studies, without a systematic analysis of several EU and benchmark countries (ISMEA, 1999; Rama, 2005; Trail *et al.*, 1998). Differences between the EU and other economies in policies and regulatory framework can hamper the competitiveness of the EU Food Industry. The EU Common Agricultural Policy with quota systems restricts the sourcing of raw materials i.e. raw milk. Rules and regulations from food law have an impact on the food industry to safeguard food safety and on the administrative processes to certify compliance with the food safety systems.

*Objective and structure of this paper*

In this paper, we address the following questions:

1. How to measure competitiveness? The methodology is provided in section 2.
2. To focus the research the dairy industry as a specific sub-sector of the food industry has been selected. Section 3 discusses the selection criteria and provides some statistical information on the sector.
3. What is the state of the competitiveness of the EU food industry? Section 4 discusses the assessment of the actual competitiveness.
4. How is the competitiveness under policy scenarios that mitigate some weaknesses or threats for the EU dairy industry (section 5)?
5. How innovative is the food industry? As innovation is important issue in competitiveness , section 6 presents the innovativeness of the dairy industry,

The structure of this chapter follows the research questions. Section 7 provides the overall conclusions.

# 2 Quantifying competitiveness

This section aims at identifying the methodology to measure competitiveness. First, the concept of competitiveness is discussed and second the approach to measure competitiveness is proposed.

## 2.1 Competitiveness' definitions

Many definitions of competitiveness exist. It is a concept referring to relative positions. An illustration of the complexity of the concept is found in the following statement (Spence and Hazard, 1988 cited in Crouch *et al.*, 1999):

"*The problem of international competitiveness has been defined in highly diverse ways. These definitions (and the proposed solutions to the problem) are partially inconsistent, and thoroughly confusing to most academics, politicians, policy-makers, and business managers. There is good reason for this confusion. The collection of problems alluded to, as "competitiveness" is genuinely complex. Disagreements frequently occur not only at the level of empirical effects and of policies, but also in the very definition of the problem. Well-intentioned and reasonable people find themselves talking at cross purposes; sometimes it almost seems they are addressing different subjects".*

A selection of definitions of competitiveness, measurement levels, and determinants are summarized in table 1. The table shows that competitiveness can be measured on different levels. From a strategic management perspective, competitiveness refers to the conduct of companies in shaping *organizational advantages* (Thompson *et al.*, 2003; Wright *et al.*, 1998) and/or *market advantages* (Hamel *et al.*, 1994).

The Five Forces model of Michael Porter (1980), which is based on the industrial organization theory, is strategically oriented. Porter's diamond focuses on competition between countries within a macro-economic context (Porter, 1990). Its foundations are based on the causes for differences in productivity of companies. Porter's approach recognizes quantitative as well as qualitative variables. In practice, many qualitative variables are poorly available or insufficiently comparable between countries. We therefore chose to base the evaluation of competitiveness on indicators that are derived from the theory of international economics. Measuring competitiveness with international economic indicators has its roots in Adam Smith's trade theory. It explains differences in competitiveness by way of absolute cost differences between countries. However, the application of new trade theories entails incorporating a wide array of aspects in the analysis, such as product differentiation, innovation, economies of scale and productivity. O'Mahoney and Van Ark (2003) focus on productivity. In their study, productivity differences explain to a large extent differences in competitiveness (O'mahoney *et al.*, 2003). They use the growth in labour productivity (or value added) as performance indicator. This choice can be motivated based on a statement by Krugman and Obstfield "*...absolute productivity advantage over other countries in producing a good is neither a necessary nor a sufficient condition for having a comparative advantage in that good." (Krugman et al., 1988).*

| Source | Level | Determinants | Measurement |
|---|---|---|---|
| Report of the Select Committee of the House of Lords on Overseas Trade, 1985 | Firm | Firm production of products and services of superior quality and lower costs than its domestic and international competitors | Firm long run profit performance<br>Ability to compensate employees<br>Superior returns to owners |
| Competitiveness Advisory Group, (Ciampi Group). "Enhancing European Competitiveness", June 1995 | National | Productivity<br>Efficiency<br>Profitability | Achieving rising living standards<br>Increasing social welfare<br>These, in a non inflationary way |
| World Economic Forum, Global Competitiveness Report, 1996 | National | Ability to achieve sustained high rates of GDP per capita | Growth in GDP per capita |
| Agriculture Canada (1991, cited in Traill *et al.*, 1998) | Industry | Profitability<br>Sustained ability | Gain and maintain market share in domestic and/or foreign markets |
| Department of Enterprise, Trade and Employment, UK | Firm | Ability to produce products/services that people will purchase over those of competitors | Profitability |
| IMD's World Competitiveness Yearbook, 2003 | National | Ability to create and maintain an environment of value creation and prosperity | Enterprises value creation<br>People's prosperity |
| Krugman and Obstfeld, 2006 | Industry | Productivity and wage rate | Performance of determinants relative to foreign industry |

Table 1 Selection of definitions on competitiveness (Source: Cho *et al.*, 2000; Garelli, 2003; Krugman *et al.*, 2006; Sagheer *et al.*, 20009)

According to Porter, sustainable competitive advantage is the fundamental source for above-average performance in the long run (Porter, 1980, 1990). In line with Porter's viewpoints, competitiveness of the EU food industry is defined as the sustained ability to achieve profitable gain and market share in domestic and export markets in which the industry is active. *Growth rates* are used as indicators. High growth rates indicate high ex-post performance, compared to other industries of a particular country. Comparative advantage has two dimensions:

- Cost of uniqueness advantage. This requires a comparison between domestic and foreign sectors or products.
- Efficiency gap. Even if a sector performs well, other sectors may perform even better. In the long run, the sector that is thought to be successful performs less well than partial competitiveness studies predict The better performing sectors can pay an additional "rent" for the production factors (labour and/or capital) and outperform the high, but domestically lower performing sectors (Berkum *et al.*, 2000).

## 2.2 Competitiveness' indicators

Our selection of competitiveness indicators recognizes both dimensions: the comparative advantage of products and the competition for production factors. The selected indicators for quantifying the industry's competitiveness are (Wijnands *et al.*, 2008):

1. Annual growth in a dairy's share of real value added compared with growth in the total food industry. This reflects the competition for production factors (labour and/or capital) between different industries within a country.
2. Annual growth in terms of the Balassa Index. This index reflects the export specialization level in one category of goods from one country. In fact, it indicates the growing export focus of an industry. The Revealed Comparative Advantage (RCA, Balassa Index or "Specialization Index") measures the relative importance of an industry in the total trade.
3. Growth in export share on the world market. This performance indicator reflects the outcome of the international competitive process. We took the difference between two periods of a country's export share on the world market. The growth we measured is the absolute change and not an annual growth rate as for other indicators: the total sum of all changes is by definition zero. The definition of this indicator reflects the strong interdependency between the exports of the different countries.
4. Annual growth in labour productivity of the dairy industry. This affects the unit labour costs and in this way, the relative price levels. Growth in labour productivity improves industrial competitiveness in international markets. Labour productivity is often regarded as a crucial determinant of competitiveness. It expresses the sustained ability to gain profitable market share. Labour productivity, the real value added per employee, as such cannot be compared between different countries because of different levels of Purchasing Power Parities (PPP). That is why we take *growth* in labour productivity as a measure for comparing countries.
5. Annual growth in real value added of the food industry (or subsector). This indicator reflects industry dynamism. Creating value added is an important economic indicator. Total value added is not only based on the production factor labour, but also on the production factors capital and land. Their growth is taken as an indicator, so that countries can be compared despite differences in price level.

The different metrics of the mentioned indicators make it difficult to indicate the overall position in competitiveness of one country. For that purpose, the indicators are standardized in *Z*-scores, all with a mean of 0 and a variance of 1 (Abdi, 2007). Moreover, the mean of all indicator values is used as a measure for the overall competitiveness of a country. We assume

that each indicator is equally important and therefore has the same weight. It would have been possible to use different weights for each indicator. However, no empirical evidence is currently available for validating these weights. It should be kept in mind that the results of our analysis depict relative values. The standard scores depend on the specific countries taken into account. If the benchmark countries change, the position of a specific country will change as well, but relatively the positions will more or less the same. E.g. if only the strong countries are selected, some countries will be classified as weak within that selected group, if that country was less strong than the of the others. Competitiveness requires as well founded selection of benchmark countries.

# 3 Dairy industry as a specific sub-sector

Wijnands et al. analyzed the competitive position of the food industry and its sub-sectors (Wijnands *et al.*, 2007). As a follow up and as a focus, the dairy industry (classified as NACE 155) is selected for detailed research. This sector generates a large range of products with a short shelf life, such as fresh milk and dessert yoghurts, as well as preserved products like hard cheese, butter, or milk powder. The underpinning of this choice is:

- weak competitive position in relation to the USA;
- one of the largest sub-sectors within the food sector (14% of total production value of the food industry);
- significant international trade (17% of export value of the food Industry);
- rapid product innovation;
- high level of regulations;
- strongly affected by trade negotiations and CAP.

A selection of a limited number of EU and third countries was necessary to be able to retrieve sufficient data for in-depth analyses. Even in case of full compliance with communitarian legislation, institutions between countries differ, as do cultures (Hofstede, 1980). Institutions are embedded in norms and beliefs and are changing continuously but slowly. Williamson (2000) suggests periods of 10 to 100 years. A survey covering the EU-27 would blur the data, due to differences in institutional frameworks.

The selection criteria are:

a. New versus old EU member states. The former have had less time to adopt European Institutions. Most new member states have a milk production below 1% of the EU-27 total. Only Hungary has 1.2% and Poland 7%. This is in contrast with the EU-15 member states (except Luxembourg); they have all a share above 1.5%. We propose to include Poland as representative of the new member states;
b. Northern versus Southern countries. Northern countries are more formally oriented and in Southern informal arrangements are of larger importance (Hofstede, 1980);
c. Continental versus Anglo-Saxon oriented countries;
d. Non-EU benchmark countries.

The scores on the selection criteria and selected countries are presented in table 1. The selected 6 EU countries counts for 70% of the EU milk production. These selected 9 countries produce 36% of the total world production. The EU-25 has a share of 72% in the world export, the benchmark-countries 7.4%. Some important milk producing countries e.g. India (44 million ton production, China (34 million tons), Russia (32 million ton), Brazil (19.3 million ton), or New Zealand (15.2 million ton) are not included as benchmark country. These countries have all a share in the world trade below 0.5%, except for New Zealand that has a

share of 8.5%. The main reason not including these contries, is lacking publicly available data on economic performance of the industry.

| | Country | Cow-milk production 1,000 ton | Selection criteria |
|---|---|---|---|
| 1 | Italy | 10,358 | Southern European country, number of SMEs and strong competition |
| 2 | France | 23,814 | Number of SMEs and 3 top-20 firms |
| 3 | Poland | 9,112 | Representative for new member states |
| 4 | Netherlands | 11,295 | Northern country and 3 top-20 firms |
| 5 | UK | 13,350 | Representative Common Law (Anglo-Saxon legislation) |
| 6 | Germany | 26,933 | Weak competition and 2 top-20 firms |
| 7 | EU-27 | 133,939 | Total to compare with benchmark countries. |
| 8 | USA | 86,179 | Benchmark country: Largest non-EU producer 64% of EU level (Anglo-Saxon legislation) |
| 9 | Australia | 9,630 | Benchmark country for competitiveness |
| 10 | Canada | 7,819 | Benchmark country for competitiveness |

Table 1.Selection of countries

Table 2 provides characteristics of the dairy industry in the selected countries. The selected EU countries have a total share of two third of the total EU-25, and for the production value even 71%. The EU export includes trade between EU-member states: that is the majority of the trade, around 80% of the EU-trade.

Some differences between the countries might be noticed:

- Many firms in Italy, France, and Poland, resulting in a low average production value per firm.
- The production value per firm is relatively high in the USA compared to the EU but comparable with Germany and the Netherlands
- The USA and Canada have remarkably high levels of value added compared to the production value. Others countries has much lower values.

| Country | Enterprises | Production value | Production value/firm | Value added | Employees | GVA/ employee | Export |
|---|---|---|---|---|---|---|---|
| | Number | Million € | Million € | Million € | 1,000 | 1,000 €/ employee | Million € |
| Germany | 453 | 20,712 | 46 | 2,511 | 823 | 65 | 5,365 |
| France | 1,462 | 22,477 | 15 | 2,784 | 595 | 46 | 4,321 |
| Italy | 4,339 | 15,629 | 4 | 2,419 | 351 | 60 | 1,440 |
| Netherlands | 260 | 6,485 | 25 | 762 | 123 | 74 | 3,801 |
| UK | 534 | 8,425 | 16 | 1,408 | 463 | 49 | 1,043 |
| Poland | 723 | 4,251 | 6 | 614 | 422 | 14 | 779 |
| EU27 | 11,735 | 109,452 | 9 | 15,660 | 4,146 | 45 | 25,182 |
| USA | 1,592 | 47,136 | 30 | 22,375 | 1,439 | 174 | 950 |
| Canada | N.A. | 6,537* | N.A. | 2,385* | 271* | 122* | 190 |
| Australia | N.A. | 5,769 | N.A. | 1,622 | 196 | 88 | 1,451 |

Table 2. Key characteristics of the dairy industry of the selected countries in 2005 and export (average 2004-2006).

* Canada 2002 data

# 4 Assessment of competitiveness

Figure 1 presents the competitiveness of the selected countries and annex 1 provides the data. All mentioned countries are included in calculating the benchmark score. The EU-27 as a total is thus benchmarked against non-EU countries as well as against the 6 selected EU countries.
Poland has a good competitiveness, all indicators are above average, and Canada appears to be weak. The EU as total performs weaker than the USA and Australia, because of a decreasing share on the export market, which is directly related to the dairy quota system. This assessment based on 2005 data shows that the EU is far from the most competitive dairy industry.

Despite the weak position of the EU as total, Poland and the Netherlands perform above average. Their production values are 4% respectively 6% of the total EU value. The strong position might be a result of the accession of Poland to the EU: enlargement of market and restructuring of the industry. The UK (share in production value 8%) performs below average. The other countries are near average. The importance of dairy in the export portfolio of the Netherlands and France is increasing, indicated by growth in the Balassa index. The USA and Canada have an opposite development. All benchmark countries, Italy and Poland have an above average growth on the export market.

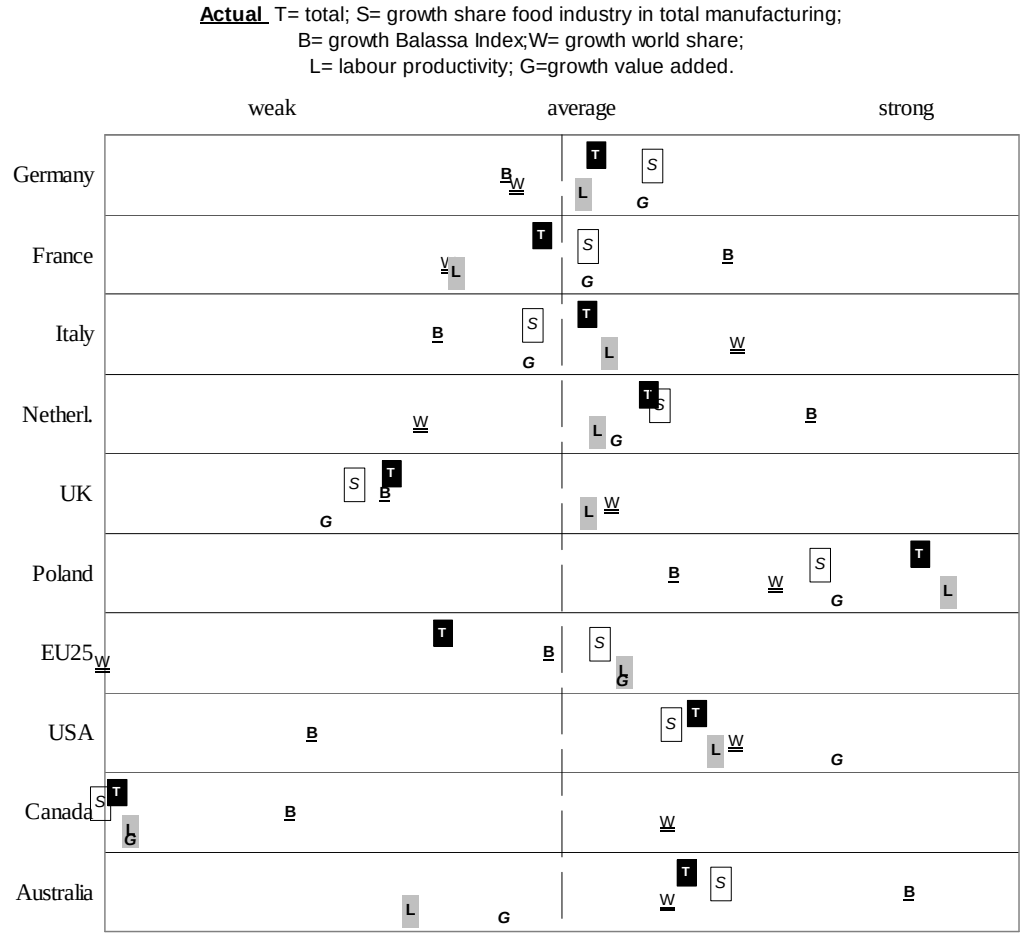


Figure 1 Competitiveness of the dairy industry for selected EU and benchmark countries in 2005
(Values outside the figure's parameters have been indicated in the margin: W for EU and S for Canada).

Compared to the 2007 report on competitiveness (Wijnands *et al.*, 2007) the improvement in labour productivity and the growth in value added in the EU compensated for the loss in market share. On country the differences compared to two years earlier are:

- The position of Germany, the Netherlands and Australia improved:
- The position of the UK and Canada weakened.

# 5 Outlook: policy scenario's

Between countries some differences exist that have an impact on the competitiveness. The EU dairy sector is dependent on supply of raw materials, which is restricted by the quota system of the Common Agricultural Policy. Second, one of the major causes for changing demand for food is population growth. Population growth in the EU (0.3% annually) is lower than in the benchmark countries (from 0.8% in the USA to 1.2% in Australia, see table 3). This results in a lower growth of demand for processed food in the EU. A lower demand will negatively influence the growth of value added. The question is "Will the EU's competitiveness improve if these abovementioned determinants are more favourable?"

| Country | Population (Million) | Annual growth 1998-2008 |
|---|---|---|
| Germany | 82 | 0.01% |
| France | 62 | 0.57% |
| Italy | 60 | 0.50% |
| Netherlands | 16 | 0.40% |
| United Kingdom | 61 | 0.45% |
| Poland | 38 | -0.14% |
| EU27 | 497 | 0.33% |
| United States | 304 | 0.86% |
| Canada | 33 | 0.89% |
| Australia | 21 | 1.22% |
| China | 1,326 | 0.56% |
| India | 1,140 | 1.33% |
| Japan | 128 | 0.08% |
| World | 6,692 | 1.10% |

Table 3 Population in 2008 and annual growth (World Development Indicators)

The competitiveness is projected by model of the Global Trade Analysis Project (GTAP). The standard GTAP model is a comparative, static, multiregional, general equilibrium model. In its standard version, constant returns to scale and perfect competition are assumed in all markets for outputs and inputs (Hertel, 1997)[2]. The most important aspects of the model are:

1. covering all world trade and production.
2. including intermediate linkages between sectors.

The regional household to which the income of factors, tariff revenues, and taxes are assigned represents the consumer side. The regional household allocates its income to three expenditure categories: private household expenditure, government expenditure, and savings. For private household consumption, the non-homothetic Constant Difference of Elasticities (CDE) function is applied.

[2] Detailed information is also available on the internet https://www.gtap.agecon.purdue.edu/

| | 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 | EqualGR | Equal growth rates in population | As 2) + full cut in price support of milk and dairy products + equal growth rates of population across all countries with same growth rates in GDP per capita as under base |

Table 4 Outline of the policy scenarios

Policy scenarios are summarized in table 4. The current setting of the EU CAP is the starting point of our study. In the second scenario, consequences of abolition of quota are described. 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. In the third scenario, a full liberalization of the Agricultural Policy is assumed. Apart from different developments in technologies in agriculture and milk processing the growth of population and income at a global level determine the performance of European food industries. To investigate the effects of population and income growth the very hypothetical scenario EqualGr assumes equal growth rates in population and GDP for all countries. Information on assumptions, the model GTAP used in this study and the data is given in the background report (Tacken *et al.*, 2009).

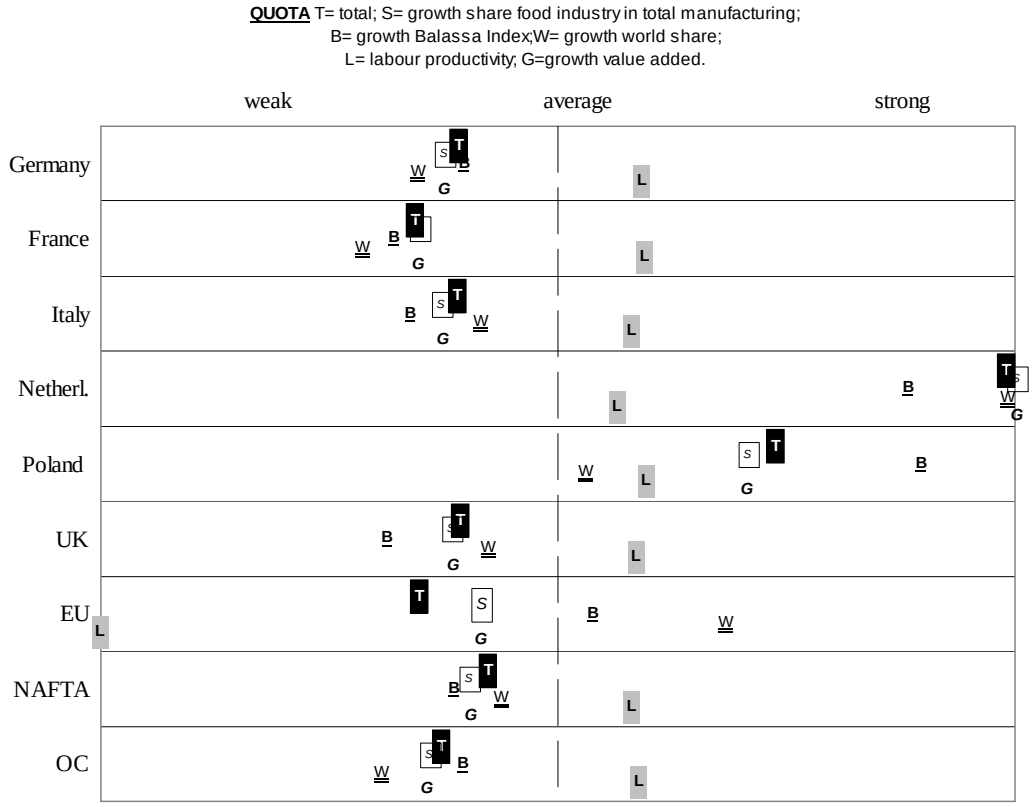


Figure 2 Competitiveness of the dairy industry for the quota scenario (OC=Australia & New Zealand).

The scenario 2 and 3 will be compared with the baseline scenario 1. Annex 2 present the values of all indicators for these policy indicators. In figure 2 the competitiveness for the quota scenario and in figure 3 for the EqualGr scenario are presented. In the GTAP model,

some countries are only available at higher aggregation levels: NAFTA represents the USA and Canada and Oceania represents Australia and New Zealand.

In the quota scenario, the competitiveness of the EU remains poor, but the benchmark countries perform also below average. The export share of the EU improves. The abolishment of the quota is very beneficial for the competitiveness of the Netherlands and to a lesser extent for Poland. The other countries are performing weakly.

The scenario with an equal population growth (EqualGr) has a negative outcome on the competitiveness of the EU: as more people need food, the export is influenced negatively. The competitiveness of Australia and New Zealand and the Netherlands improves strongly. Germany, France, and the UK, countries with a large population have a weak competitiveness in the EqualGr scenario. The assumed population growth improves the competitiveness of Australia and New Zealand considerable, due to the actual low growth rates in China and Japan (table 3).The beneficial outcomes for the Netherlands is line with previous research (Massink *et al.*, 2002).

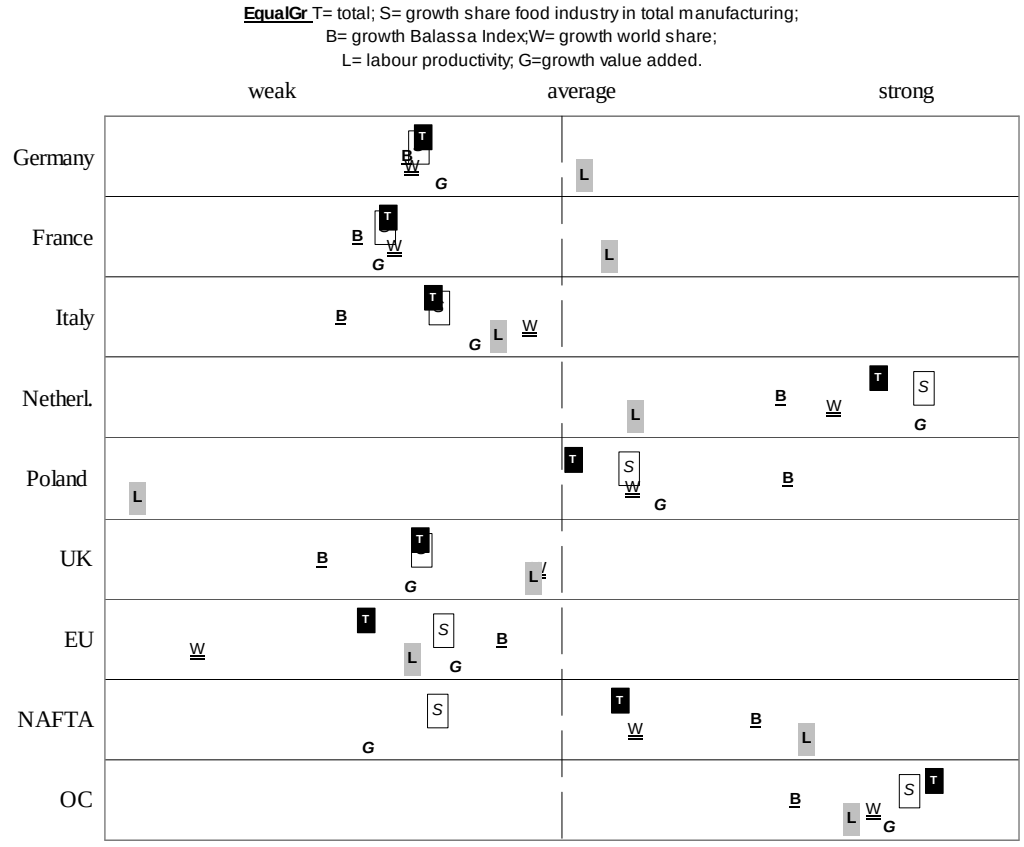


Figure 3 Competitiveness of the dairy industry for the EqualGr scenario (OC=Australia & New Zealand).

# 6 Innovations in the dairy industry

*Methodology*

Innovation and knowledge diffusion are seen as key drivers for competitiveness. The main question is *'Does innovation in the dairy industry differ within the EU member countries and from the US' dairy industry?'*

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 organizational method in business practices, workplace organisation or external relations' (OECD, 2005).
According to Joseph Schumpeter, the five types of innovation are (OECD, 1997):

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 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. Organizational innovation. The introduction of an adapted organization, 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.

*Data*

As a strategy for a data research, a desk research has been chosen. Three sources are explored:

1. Food Navigator, a publicly available e-newsletter. This database provided 145 cases concerning innovations from years 2003 to 2008 (August 2003- January 2008). (See: FoodAndDrinkEurope [newsletter@foodanddrinkeurope.com]).
2. Dairy Innovation. This magazine covers all innovation in the dairy industry. The magazine published 15 issues up to 2008. The first issue is published in 2005. (see http://dairy.foodbev.com/issues/issues.aspx). At this moment issue 1 to 7 and number 13 and 15 are classified in our database system: 596 cases. Cases already mentioned in Food Navigator are excluded in the overview of Dairy Innovation.
3. Innova database (see:http://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 include only product and marketing innovations. These innovations take two third of all innovations, as will be shown in table 5. All product launches with the key words dairy, cow, or milk are selected from the period January 2003 to February 2008. This resulted in 4721 product sheets worldwide.

Cases are selected if they meet following criteria:

1. An innovation, as aforementioned;
2. Dairy products and ingredients based on cow milk. The research does not cover the milk ingredients like soya drinks or milk from other animals;
3. Developments that have an influence on dairy products e.g. development in packaging or ingredients.

Thus the companies are not only dairies but also suppliers or customers.

A question is whether these databases are biased. Do companies sponsor the newsletter or magazine and are therefore more often mentioned? Does language restricts retrieval of information (both are English written sources)? The Innnova database is used for evaluating this bias. Figure 4 presents the observations of the three sources. As we can not classify the Innova database to types of innovation the comparison is based on country level. Figure 4 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 same pattern.

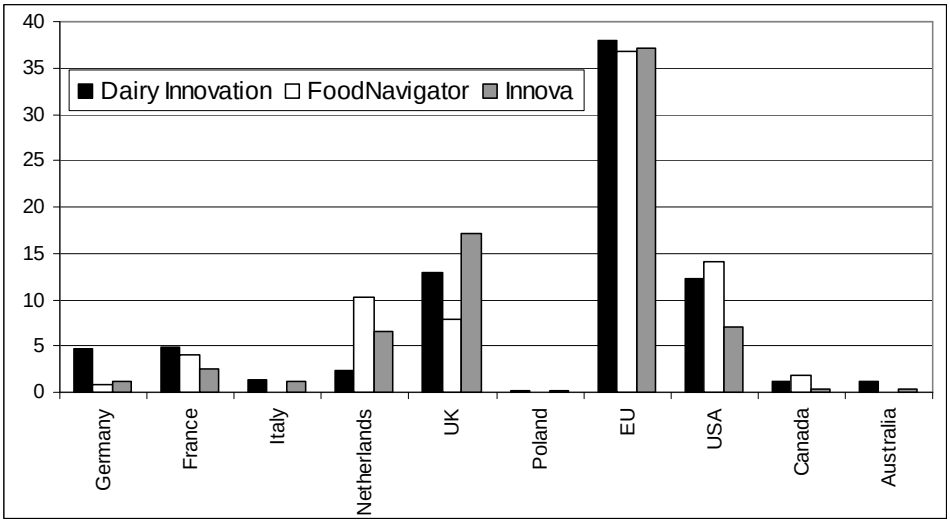

Figure 4 Shares (%) of total of innovation cases and product launches by country.
Sources: Own research and Innova database

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. Secondly, 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 mention 4721 cases, which is also not exhaustive. Furthermore, 'innovation' is defined broader then 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.

The database shows that the USA has a relatively low level of new product launches, the UK a high level. The Netherlands has a relatively low level of cases in Dairy Innovation. The EU has over one third of all innovation cases, the USA below 15%. In this respect, the EU dairy industry can be classified as most innovative.

*Overview innovations*
According to the collected data, product-innovation is the main type of innovation (Table 5). The reason of that is a fast development of the functional foods market where the dairy industry products is the biggest group next to the fruit or vegetable beverages. This observation shows that within the dairy industry, innovations are product oriented.

| 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 |

Table 5 Overview of types of innovations in %

The next popular type of innovation is marketing innovation. Organisational innovations rank third. The databases show some difference: Food Navigator recognizes less product innovation and has a higher level of marketing innovation. Food Navigator is furthermore more research oriented. For several cases, the contribution of research is mentioned whereas Dairy Innovation seldom does. Process and sourcing new products are sparsely observed.

Table 6 present innovations related to business indicators. The number of innovation per firm in the USA is higher than in the EU, due to the larger scale in the USA. The number of innovation per billion production value or value added is higher in Europe than in the USA. Most innovative is the industry in the UK and the Netherlands. Are countries with an innovative dairy industry more competitive? Figure 1 depicts that the actual competitiveness that is weak for the UK and high for Poland, the Netherlands, USA and Australia. At first sight, an undetermined relation exists between innovativeness and competitiveness under policy scenarios. Also no evidence is found that innovative firms have higher profit margins (Poppe *et al.*, 2009).

| Country | Innovations | Innovations per | | | |
|---|---|---|---|---|---|
| | | 1,000 Enterprises | € Billion production value | € Billion value added | Million employees |
| Germany | 47 | 104 | 2.3 | 19 | 57 |
| France | 56 | 38 | 2.5 | 20 | 94 |
| Italy | 13 | 3 | 0.8 | 5 | 37 |
| Netherlands | 45 | 173 | 6.9 | 59 | 366 |
| UK | 143 | 268 | 17.0 | 102 | 309 |
| Poland | 2 | 3 | 0.5 | 3 | 5 |
| EU27 | 449 | 38 | 4.1 | 29 | 108 |
| USA | 150 | 94 | 3.2 | 7 | 104 |
| Canada | 16 | n.a. | 2.4 | 7 | 59 |
| Australia | 12 | n.a. | 2.1 | 7 | 61 |

Table 6 Innovation and industry characteristics (Billion= 1,000,000,000)

Conventional wisdom tells that small firms are more innovative than large-scale firms are. A analysis is based on the UK. The UK‘s dairy industry is rather innovative given the difference in the size of the dairy industry. Table 7 shows for the UK case 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 share of innovations follows the shares of turnover and employees.

Table 7 Key figures of dairy industry in the UK.

| Indicator | Metrics | Micro firms | Small and medium sized firms | Large firms | All firms |
|---|---|---|---|---|---|
| Firms | Number | 349 | 168 | 17 | 534 |
| | Share (%) | 65 | 31 | 3 | 100 |
| Turnover | €million | 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 |

Eurostat SBS data 2005, Innovation own database linked to Amadeus

# 7 Conclusions

Competitiveness has many definitions and can be measured on different levels. In this study, the dairy competitiveness metrics are derived from the international economics. The EU dairy industry competitiveness turned out to be weak. Policy projections show that moderated improvements for the EU are possible by abolition of the quota system. Australia and New Zealand have a strong position in the policy scenarios with an equal population growth worldwide. The Netherlands benefits in both policy scenario strongly.

Competitiveness is a relative concept: it depends on the benchmark countries. The position will differ if a different selection of countries is made, relatively the position will more or less the same. E.g. if only the strong countries are selected, some countries will be classified as weak within that selected group. Competitiveness requires a well founded selection of benchmark countries.

Data on innovation in the Dairy industry are classified from the e-newsletter Food Navigator and the professional magazine Dairy Innovation. In total over 700 cases are included in the database. A comparison between these two sources and the Innova database with product launches worldwide shows comparable distributions of cases over countries. Results show that product innovation and marketing are the two main streams.

Large firms count for 3% of the total number of firms in the dairy processing industry. These large firms have a share of over 60% in the industry's total turnover and employment and a share of over 50% in innovations. No evidence is found that innovative firms have higher profit margins.

The relation between overall competiveness and innovation per business metrics suggests no relation. EU has more innovations than all other benchmark countries: UK and Netherlands of the selected countries are leading in this respect.

# References


Abdi H. 2007. Z-scores. In NJ Salkind (Ed.), *Encyclopedia of Measurement and Statistics.*: 1057-1058. Sage: Thousand Oaks (CA)

Berkum Sv, Meijl Hv. 2000. The apllication of trade ad growth theories to agriculture: a survey. *The Australian Journal of Agricultural and Resource Economics* **44**(4): 505-542

Cho D-S, Moon H-C. 2000. From Adam Smith to Michael Porter: evolution of competitiveness theory. World Scientific: Korea

CIAA. 2007. *CIAA Benchmarking report 2007 update. The competitiveness of the European Food and Drink Industry*. Confederation of the Food and Drink Industries of the European Union Brussels

Crouch GI, Ritchie JRB. 1999. Tourism, Competitiveness, and Societal Prosperity. *Journal of Business Research* **44**(3): 137-152

Fischer C, Schornberg S. 2007. Assessing the Competitiveness of Situation of EU food and Drink Manufacturing Industries: An Index-Based Approach *Agribusiness* **23**(4): 473-495

Garelli S. 2003. Competitiveness of nations: the fundamentals. IMD World Competitiveness Yearbook: Lausanne

Hamel G, Prahalad CK. 1994. *Competing for the future: Breakthrough strategies for seizing control of your industries and creating the markets of tomorrow.* Harvard Business School Press: Harvard

Hertel W. 1997. *Global Trade Analysis: Modeling and Applications*. Cambridge University Press: Cambridge

ISMEA. 1999. The European Agro-food system and the challenge of global competition. ISMEA: Rome
Krugman PR, Obstfeld M. 2006. *International Economics. Theory and Policy* (7th ed.). Pearson International Edition
Krugman PR, Obstfield M. 1988. *International economics:theory and implications* (6th ed.). Addison-Wesley: Boston
Massink H, Meester G. 2002. Boeren bij vrijhandel. De Nederlandse agrosector bij handelsliberalisatie en EU-uitbreiding:een verkenning. Ministerie van Landbouw, Natuurbeheer en Visserij: Den Haag
O'mahoney M, Ark Bv. 2003. EU-productivity and competitiveness: an industry perspective: 273. Office for Official Publication of the European Community: Luxembourg
OECD. 1997. Oslo manual: The Measurement of scientific and technological activivities. Proposal guidelines for collecting and interpreting technological innovation data. OECD: Paris
OECD. 2005. The OECD Committee for Scientific and Technological Policy (CSTP), the OECD Committee on Statistics (CSTAT) and the Eurostat Working Party on Science, Technology and Innovation Statistics (WPSTI), Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data
OECD: Paris
Poppe KJ, Wijnands JHM, Bremmers HJ, Meulen BMJvd. 2009. Food legislation and Competitiveness in the EU food industry. Case studies in the dairy industry. Office for Official Publications of the European Communities: Luxembourg
Porter ME. 1980. *Competitive strategy: Techniques for Analyzing Industries and Competitiors*. The Free Press: New York
Porter ME. 1990. *The competitive advantage of nations*. The MacMillam Press Ltd: London
Rama R (Ed.). 2005. *Multinational Agribusinesses*. Food Products Press.: New York
Sagheer S, Yadav SS, Deshmukh SG. 20009. Developing a conceptual framework for assessing competitiveness of India's agrifood chain. *International Journal of Emerging Markets* **4**(2): 137-159
Tacken GML, Banse M, Batowska A, Garderbroek C, Nesha#Turi K, Wijnands JHM, Poppe KJ. 2009. Competitiveness of the EU dairy industry:  100. LEI Wageningen UR: The Hague
Thompson AA, Strickland AJ. 2003. *Strategic management. Concepts and Cases*. McGraw Hill: New York
Trail WB, Pitts E. 1998. *Competitiveness of the food industry*. Blackie Academic and Professional: London
Traill B, Pitts E. 1998. *Competitiveness in the food industry*. Springer: London
Wijnands JHM, Meulen BMJvd, Poppe KJ (Eds.). 2007. *Competitiveness of the European Food Industry. An economic and legal assessment*. Office for Official Publications of the European Communities: Luxembourg
Wijnands JHM, Meulen BMJvd, Poppe KJ, Bremmers H. 2008. An economic and legal assessment of  the EU food industry's competitiveness. *Agribusiness* **24**(4): 417-439
Wright P, Kroll MJ, Parnell J. 1998. *Strategic Management Concepts*. Prentice Hall: London

Annex 1. Values of the indicators of the actual assessment

| | Growth share GVA dairy in food industry | Growth balassa | Difference export share | Growth labour productivity dairy | annual growth rate real value added dairy |
|---|---|---|---|---|---|
| Germany | 0.02 | 1.53 | -0.020 | 0.85 | -0.57 |
| France | -1.00 | 2.79 | -0.030 | -0.81 | -1.43 |
| Italy | -1.44 | 1.09 | 0.007 | 1.26 | -1.93 |
| Netherlands | 0.12 | 3.32 | -0.034 | 1.08 | -0.99 |
| United Kingdom | -4.27 | 0.76 | -0.011 | 0.94 | -5.13 |
| Poland | 2.67 | 2.45 | 0.013 | 6.64 | 2.49 |
| EU25 | -0.82 | 1.79 | -0.084 | 1.49 | -0.90 |
| United States | 0.32 | 0.30 | 0.007 | 2.95 | 2.49 |
| Canada | -8.80 | 0.15 | -0.003 | -5.97 | -8.20 |
| Australia | 1.11 | 3.94 | -0.003 | -1.54 | -2.32 |

Sources: Own calculations based on UN Comtrade for revealed comparative advantage and export share. The average values of the years 1995-1997 and 2004-2006 are taken. Eurostat SBS structural data year 1999-2005, US Census bureau, Canada 1999-2002 (IC) and Australia (Ausstat) 2001-2005.

Annex 2 Values of the indicators of the policy scenarios

| | Growth share GVA dairy in food industry | Growth balassa | Difference export share | Growth labour productivity dairy | annual growth rate real value added dairy |
|---|---|---|---|---|---|
| | | | Quota | | |
| France | -0.372 | -2.006 | -2.656 | 0.001 | -0.438 |
| Germany | -0.195 | -0.873 | -1.765 | 0.001 | -0.224 |
| Italy | -0.215 | -1.737 | -0.724 | 0.000 | -0.242 |
| Netherlands | 3.927 | 5.842 | 8.018 | -0.001 | 4.380 |
| Poland | 1.770 | 6.040 | 0.558 | 0.001 | 1.952 |
| UK | -0.140 | -2.102 | -0.615 | 0.000 | -0.158 |
| EU | 0.063 | 0.812 | 2.854 | -0.033 | 0.067 |
| NAFTA | -0.020 | -1.053 | -0.381 | 0.000 | -0.022 |
| OC | -0.294 | -0.914 | -2.356 | 0.000 | -0.365 |
| | | | EqualGR | | |
| France | -0.704 | -5.160 | -4.802 | -0.040 | -0.085 |
| Germany | -0.446 | -4.104 | -4.381 | -0.044 | 0.441 |
| Italy | -0.287 | -5.526 | -1.469 | -0.054 | 0.713 |
| Netherlands | 3.173 | 3.437 | 5.374 | -0.036 | 4.200 |
| Poland | 0.931 | 3.595 | 0.435 | -0.109 | 2.036 |
| UK | -0.425 | -5.915 | -1.220 | -0.049 | 0.174 |
| EU | -0.262 | -2.061 | -9.671 | -0.067 | 0.560 |
| NAFTA | -0.309 | 2.909 | 0.487 | -0.010 | -0.178 |
| OC | 3.065 | 3.760 | 6.375 | -0.003 | 3.946 |

Source: based on GTAP calculations. OC= Australia and New Zealand.