The competitiveness situation of the EU meat processing and beverage manufacturing sectors

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Paper prepared for presentation at the 98th EAAE Seminar 'Marketing Dynamics within the Global Trading System: New Perspectives', Chania, Crete, Greece as in: 29 June – 2 July, 2006

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Abstract. The status of competitiveness for the two most important food and beverage manufacturing sectors (meat processing and beverage manufacturing) in 13 EU countries is analysed empirically, using 1995-2002 Eurostat data. After a review of earlier agribusiness competitiveness studies an industrial competitiveness index is proposed as a composite measure for multidimensional economic performance, covering profitability, productivity and output growth. The index approach enables relative competitiveness comparisons across industries, countries and over time. The results show that during 1999-2002 as compared to 1995-1998 for both sectors overall competitiveness in real terms slightly increased. At the same time, overall competitiveness seems to also have converged slightly across countries, implying that sector performance has become more similar. However, the two country rankings differ considerable as do the change patterns during the analysed period. [JEL classification: F23, L66, Q13.]

Keywords: European Union, competitiveness, meat processing, beverage manufacturing, index

1 Introduction

Competitiveness matters. In a world with – assumed – limited resources one would like to see that these are used as efficiently and effectively as possible, thus leading to enhanced living standards for all today and in the future. While there is much agreement on the economic and social importance of competitiveness, it is less clear what exactly competitiveness is and what its most important determinants are (Martin, 2003).

In the literature, different definitions of competitiveness exist. The OECD (1996, p. 24) defines it as "... the ability of companies, industries, regions, nations, and supranational regions to generate, while being and remaining exposed to international competition, relatively high factor income and factor employment levels on a sustainable basis". The EU Commission (2003, p. 21) uses as a definition of competitiveness "... the ability of an economy to provide its population with high and rising standards of living and a high level of employment for all those willing to work, on a sustainable basis." More specific definitions include the one of the United Nations Conference on Trade and Development (UNCTAD, 2002, p. 117) of international competitiveness "... from meaning simply higher exports to diversifying the export basket, sustaining higher rates of export growth over time, upgrading the technological and skill content of export activity, to expanding the base of domestic companies able to compete globally." Yet another definition which is more focused on the manufacturing sectors states: "... competitiveness in industrial activities means developing relative efficiency along with sustainable growth" (Lall, 2001, p. 6). Finally, agribusiness competitiveness has been defined as "The sustained ability to profitably gain and maintain market share"

[1] The authors gratefully acknowledge financial support from the H. Wilhelm Schaumann Stiftung, Hamburg, Germany.

(Martin et al., 1991, p. 1456) or in a more consumer-oriented way as "... the ability of a firm or industry segment to offer products and services that meet or exceed the customer value currently or potentially offered by the products and services of rivals, substitutes, and possible market entrants" (Kennedy et al., 1997). The existence of these different definitions indicates that the concept of competitiveness in fact is multidimensional in nature and that as a consequence it is difficult to deal with theoretically as well as empirically.

This paper has as main objective the empirical analysis of the current state of the competitiveness of the two most important (as measured by the 2001 share in total food and drink (F&D) processing/manufacturing industry value added) F&D sub-sectors: the production, processing, preserving of meat and meat products (NACE 151, 17.7% share in F&D value added) and the manufacture of beverages (NACE 159, 17.8%) (Lienhardt, 2004). Given that the F&D industry is Europe's second largest manufacturing sector (as measured by value added) which employed about 4.4 million people in 2001, and the strong competitive horizontal and vertical pressures the industry is confronted with, an analysis of the "economic health" of this industrial activity is of particular importance.

The paper's structure is as follows. After this introduction, an integrated approach of sector competitiveness is discussed theoretically and, using several measures, a composite indicator measuring sector competitiveness is derived. In the third section, the results[2] from calculating the Industrial Competitiveness Index (ICI) for 13 EU countries, covering the period 1995-2002, are presented and discussed. The last section concludes.

2 Theory and measurement

Although no generally-accepted theoretical framework exists, competitiveness – technically – could be described as superior and lasting multidimensional economic performance. In other words, competitiveness is a construct comprising different aspects of complex economic activity.

At the macro-level, some well-received and widely-acknowledged studies which use an index approach in order to summarise a whole range of different competitiveness aspects (mostly determinants) are the Global Competitiveness Report by the World Economic Forum (WEF) and the World Competitiveness Yearbook compiled by the Swiss-based International Institute for Management Development (IMD).[3] While the assessment of country competitiveness is not without criticism (see, for example, Krugman, 1994) it nevertheless shows the popularity of an index-based measurement approach.

As for the analysis of the sector competitiveness (i.e., in our case, competitiveness in agribusiness or food manufacturing industries), most previous studies have tended to not aggregating the multiple competitiveness dimensions and instead to focus on one or a few aspects of the construct.

[2] While we have done the analysis for all F&D sub-sectors, we report and discuss results for the two most important sub-sectors only, due to space limitations.

[3] Both reports combine data from official statistical sources and from additional surveys of business executives. The WEF report uses about 180 criteria affecting competitiveness while the IMD report uses about 290. Both reports give the 'soft' (i.e., survey) and 'hard' (i.e., official statistical) data equal weight but the methodology differs in the way the various data series are aggregated into a final country ranking.

2.1 Previous sector-level studies

One strand of the literature draws on profitability (PRO_S) and market shares (MS_S) as relevant sector competitiveness ($COMP_S$) indicators (e.g., Martin et al., 1991; Martin and Stiefelmeyer, 2001). That is, competitiveness may be seen as a function of these two indicators. More formally,

$$COMP_S = f(PRO_S, MS_S). \quad (1)$$

As for profitability several definitions exist, most of which distinguish between accounting and economic profits (Besanko et al., 2000; EU Commission, 2005).[4] While the former is the difference between sales revenues and accounted financial costs, the latter attempts to also assess opportunity costs of the involved resources. However, real opportunity costs are in general difficult to quantify. Therefore, one often has to rely on accounting profits. Value added is a proxy for these accounting profits at industry level. It is the gross income from operating activities (i.e., financial and extraordinary results are not included), calculated as production value minus the expenses for purchases of input goods and services (Eurostat, 2004). Apart from actual profits, value added contains labour costs and the capital to be devoted for necessary investments. This makes value added only an imprecise profit measure in cross-country and cross-industry studies due to two reasons. First, labour costs can vary considerably across countries. Second, different industries usually have different capital intensities implying different investment requirements. Another problem is of how to normalise the indicator in order to make it comparable across different economic entities (i.e., countries, industries or companies). Value added as a percentage of turnover is a kind of profit margin while value added per labour unit is rather a productivity measure. Using the number of establishments for normalising industry value added yields a comparable profitability measure in monetary unit (e.g., € or $) terms. However, the value-added-per-establishment ratio may reflect more differences in average company sizes rather than in profitability. Despite all these problems involved, profitability certainly is a key variable for assessing sector competitiveness (EU Commission, 2005), while the use of market shares in general may be more problematic.

Market shares are usually defined as the proportion (percentage) of the total available market (or market segment) output or sales that is produced or sold by a company or an industry (Werden, 2002). While widely used to measure company performance, there is one problem with market shares at the aggregate country or sector level: how to normalise them in order to allow for meaningful comparisons? Market shares of aggregates do not only reflect performance but they are in general also a function of an aggregate's size.[5] For instance, the aggregate market share of a high-performance food sector in

[4] In the literature, sometimes a distinction is made between 'profit' and 'profitability'. While the latter expression is occasionally described as the 'capacity to generate profits', others use the term 'profitability' as a synonym for 'profit ratios' (e.g., profit as a percentage of turnover). In this paper we make no such distinction. However, when we speak of 'profitability' we generally mean normalised profits, i.e., absolute returns made comparable across differently-sized companies or industry sectors.

[5] Companies can grow independently of the size the country they are located in, sectors cannot and must per definition be smaller than (or equal to) country size. On the other hand, larger countries can be expected to have larger sectors and thus larger shares in the sector's global market.

a small country can be smaller as the one of a low-performance food sector in a large country, simply because of adding up the market shares of many tiny enterprise can result in a higher figure than the sum of few large ones. Another problem with market shares is that they are sometimes negatively related to profit margins: at least in the short run, market share can be 'bought' by under-pricing (Buckley et al., 1988). For example, Fraering and Minor (1994), using meta analysis, find an overall weak negative relationship between market share and profitability across different sectors and countries. In summary, while being a useful competitiveness indicator at the company level, when analysing aggregates, the market shares may be problematic.

Other studies equate competitiveness with comparative advantage and use trade-based measures such as the index of revealed comparative advantage, RCA (e.g., Fertö and Hubbard, 2002; Drescher and Maurer, 1999; Traill and da Silva, 1996). That is, a sector is perceived as being competitive if a country is specialised in that sector, as measured by a relatively superior sector export (trade) performance. While the RCA was originally introduced as a measure of "export performance of individual industries in a particular country" by Balassa (1965, p. 105), it is more appropriately to be seen as an indicator for the international specialisation of countries (De Benedictis and Tamberi, 2001; Hinloopen and Van Marrewijk, 2001; Laursen, 1998). The approach may be summarised as

$$COMP_S = f(SPEC_C) \quad (2)$$

where $SPEC_C$ stands for country specialisation.

Specialisation arises from the need to build and to exploit comparative advantages which may result from either differences in technology (Ricardo), factor endowments (Heckscher-Ohlin) or increasing returns to scale (Krugman, Helpman). In practice, however, it may be difficult to find an optimum level of specialisation, since very high degrees of it can also have negative consequences. In particular, with higher degrees of specialisation, economic risks usually increase since specialisation implies de-diversification (Kalemli-Ozcan et al., 2003). Apart from using RCA indices, the specialisation (of countries) can be assessed using other indicators such as concentration ratios, Herfindahl indices, specialisation rates etc., calculated from trade or production data (Aiginger, 2000).

The drawbacks of the RCA approach for the assessment of sector competitiveness are both conceptual and technical. Conceptually, comparative advantage is not the same as competitive advantage. Comparative advantages refer to a horizontal (i.e., different activities of an economic entity) comparison while competitive advantages refer to a vertical (i.e., one particular activity across different entities) situation. Comparative advantage of an economic entity describes the position of different economic activities in terms of opportunity costs relative to each other. For instance, a country is said to have a comparative advantage in a given sector if production costs are lowest in one sector relative to the production costs of other sectors in that country. The country should then specialise in the activity with the highest comparative advantage and internationally exchange these goods for those in the production of which it has no comparative advantages. In a two-country, two-sector world, absolute cost differences then do not matter. However, in a reality with hundreds of countries and different sectors, many countries may be best (relative to other sectors in the country) in the same activities. In other

words, they may have similar comparative advantages. With fixed real demand for many goods, comparative cost advantages are then not enough. What counts in such a situation is to serve customers by delivering best products at competitive prices. Hence, absolute cost differences are relevant in a situation where many economic entities have comparable comparative advantages. More technically, RCA indices have been shown that the numbers which they produce are not directly comparable across differently-sized countries. This is because the maximum index score is a function of country size as measured by total country exports (or imports, or net exports) and thus maximum index scores can be dozens of times larger for small countries than those for large countries (De Benedictis and Tamberi, 2001; Hinloopen and Van Marrewijk, 2001).

Yet other approaches to assess sector competitiveness use efficiency (EFF) and growth (GRO) as indicators (see Lall, 2001, op. cit.). This view can be summarised as

$$COMP_S = f(EFF_S, GRO_S) \quad (3)$$

Economic efficiency can be defined as the degree to which outputs are generated in terms of inputs of any system. However, even if efficiency is a commonly used measure of performance, some argue that competitiveness is more than efficiency (or productivity, its measurable indicator). For instance, Buckley et al. (1988, p. 195) state that "competitiveness includes both efficiency (reaching goals at the least possible cost) *and* effectiveness (having the right goals)". Reinert (1995, p. 3) claims that competitiveness is "divorced from the issues of productivity or efficiency as such. Although it is difficult to be competitive if you are not efficient and have a high productivity, it is by no means obvious that being the most efficient producer of an internationally-traded product makes a country competitive".

As for growth, Lall refers to 'income growth', but without further specification of how income, or its growth, is defined. The EU Commission (2005) proposes three growth variables as sectoral competitiveness indicators: growth rates of value added in constant prices, employment and labour productivity per hour. The OECD's (1996) portfolio of globalisation and competitiveness indicators, as well as the UK's Department for Environment, Food and Rural Affairs (DEFRA, 2002) in its collection of competitive indicators for the food chain industries, do not include explicit growth variables. Nevertheless, in our view, growth rates are important since they give a dynamic view of key competitiveness aspects as opposed to static cross-country or cross-sector comparisons.

Finally, some studies use production costs (or occasionally other costs) as measures for agribusiness sector competitiveness (e.g., Hoste and Backus, 2003; Hitchens et al., 1998; Kennedy et al., 1998). More generally, the domestic resource cost approach for assessing sector competitiveness may also fall into this category. One major disadvantage of this approach is that costs may be useful competitiveness indicators only if one can control for product quality. However, this is usually difficult when working with aggregate (sector) data of (branded) consumer goods. Higher product quality naturally incurs higher costs, but on the other hand also commands higher prices. Focussing on cost comparisons may therefore only be justified in standardised-quality commodity markets. In summary, this approach can be expressed as

$$COMP_S = f(COST_S). \quad (4)$$

1.1 Measures used in this analysis

In the following, we will try to synthesise the different previous approaches and define competitiveness as a function of profitability, productivity and growth.

$$COMP_S = f(PRO_S, PROD_S, GRO_S). \quad (5)$$

That is, we will calculate a composite measure for relative and multidimensional economic performance as measured by profitability, productivity as well as output growth.

In our view, efficiency in most cases can be characterised as a *sine qua non* for long-term competitiveness but not as a sufficient condition. Contrary to efficiency, the focus of effectiveness, measured by profitabilty, is the achievement as such, not the resources spent, so not anything that is effective has to be efficient, but anything that is efficient also needs to be effective. In addition to static measures of efficiency and effectiveness we add a dynamic facet of competitiveness (growth). In this way, it is possible to consider at the same time two different business strategies both having their right to exist: (i) a mass-market strategy with high productivity but low profitability per produced unit and (ii) a high-quality strategy with high profit margins per unit tending to result in relatively lower productivity. Thus, overall, we simultaneously consider competitive performance (effectiveness as the status of competitiveness), competitive potential (efficiency reveals something about the ability to be competitive in the future) and competitive process (growth is our dynamic aspect of competitiveness) (Buckley et al., 1988, p. 183).

Profits may be an indicator for effectiveness, commonly defined as the extent to which stated goals or objectives are achieved. Since the purpose of economic entities in general is generating income, the amounts of earned profits reflect how well this goal has been met and hence an entity's effectiveness. As a profit measure, we use gross operating surplus (GOS; in €), or the balance that is generated by operating activities after the labour factor input has been recompensed. GOS is calculated from the value added at factor cost less expenses for personnel. Thus, GOS is the surplus available which allows for the compensation of the providers of own funds and debt, to pay taxes and eventually to finance all or part of its investment.[6] We prefer GOS over value added because, as argued above, the latter measure may be inflated by labour costs, thus resulting in countries with a more highly-skilled (and hence a probably more expensive) labour force to lead ranking tables, although real profits may be low. For our analysis we use the share of GOS in turnover (TURN), an indicator which may also be called gross operating profit margin:

$$M_1 = \frac{GOS}{TURN}, \text{ in } \%, [0, 1).$$

In addition, we calculate value added per employee (as suggested by Martin et al., 1991) as a productivity measure. Value added-based labour productivity is the single most frequently computed productivity statistic and is often called "apparent labour productivity" (OECD, 2003). This expression points out that labour productivity is clearly influenced by changes in capital, as well as technical, organisational and efficiency change (within as well as

[6] Income and expenditure classified as financial or extra-ordinary in company accounts is excluded from gross operating surplus (Eurostat, 2004).

between firms), the influence of economies of scale, varying degrees of capacity utilisation and measurement errors. Thus, the ratio of value added to employees depends to a large extent on the concomitance of other inputs. Nevertheless, measuring value added- based labour productivity is useful: with the costs of intermediate inputs already excluded, it relates to the single most important factor of production. "Labour productivity reflects how efficiently labour is combined with other factors of production, how many of these other inputs are available per worker and how rapidly embodied and disembodied technical change proceed" (OECD, 2001, p. 20). In addition, it is an intuitively appealing and relative easy measure and, last but not least, data availability is comparatively good. In contrast to the use of GOS as a profit measure, VA yields better results in terms of (apparent) labour productivity exactly because it contains labour costs. Thus, implicitly the skill of labour is measured. We use value added (VA) at constant prices in order to make sure that different inflation rates across EU countries do not cause an additional bias and thus reduce cross- country comparability of our data. Eurostat's national Harmonised Indices of Consumer Prices (HICP) for food and beverages are used for deflating the VA series.

$$M_2 = \frac{VA}{EMPL}, \text{ in } €, [0, \infty).$$

M_1 and M_2 may both potentially be biased if the capital intensity of EU food processing industries varies considerably across countries and/or industries. More precisely, more capital- intensive sectors will tend to display higher levels of GOS (and VA) even if real profitability is low since these sectors require higher investments. Furthermore, more capital- intensive industries in general employ fewer staff. However, empirical findings on the capital intensity in EU food processing industries, and in particular cross- country comparisons are scarce. Therefore, the potential scale of the bias is difficult to assess.

For the assessment of output growth, the annual change of production value is calculated.

$$M_3 = \Delta PROD, \text{ in } \%, (-\infty, +\infty).$$

We use production instead of turnover because the production value comprises total operating activities including changes in stocks and capitalised production and thus reflects real output within a given period. Turnover corresponds to market sales only (Eurostat, 2004), and thus may be slightly less accurate.

1.2 Index calculation

Several possibilities for condensing the information contained in multiple variables exist. The most conventional method is probably the calculation of an index, i.e., a single composite measure aggregating different variables by taking averages or summation (eventually after normalising when dealing with data measured on different scales). Another possibility, which avoids the need for averaging, is the method of outranking, a family of algorithms developed in operation research theory (Laise, 2004). A further method for aggregating the information contained in different variables is the use of factor analysis, a multivariate statistical technique (see, e.g., Andersen and Herbertsson, 2005).

In this analysis, given the multidimensionality of our data and our interest in tracking changes in competitiveness levels (and not only ranks) over time, industries and countries, we decided using the first aggregation approach. It

is computationally the simplest method among the three just discussed but it is a widely used approach (see footnote 2). Thus we calculate a single composite index, called Industrial Competitiveness Index (ICI), on which a final ranking of the analysed industries and countries is based. The construction of the ICI builds on the methodology used for the calculation of the United Nations' Human Development Index (see UNDP, 2002). First, we transform all above presented measures into individual indices which are combined into three component indices (one each for profitability, productivity and growth). These component indices are then aggregated into the ICI.

To start with, for the construction of the three individual measure indices we use a standardisation procedure which transforms the absolute measure values onto a scale reaching from 0 to 100. Contrary to the method used by UNDP, and in order to identify overall competitiveness differences between miscellaneous industries and to track changes in the index levels over time, we use overall maximum (M_k^{max}) and minimum (M_k^{min}) values rather than the extrema of every particular year and every industry in the calculation process. Thus, the lowest value recorded across countries (i) and industries (j) in our period of investigation (years t) will have a zero score for a particular measure (k), while the highest overall value will receive the score of 100. Hence, the individual index scores (I_k^{tij}) are calculated as follows:

$$I_k^{tij} = \frac{M_k^{tij} - M_k^{min}}{M_k^{max} - M_k^{min}} \cdot 100 \quad . \tag{6}$$

In the next step, the individual indices are combined into the ICI by calculating simple means. In this way it is assured that profitability, productivity and growth all have equal weight. Figure 1 summarises the calculation process.

(Figure 1 around here)

3 Empirical application

The theoretical competitiveness concept discussed above is now applied to the EU meat processing and beverages manufacturing sectors. That is, we investigate the occurrence and nature of any shifts of relative economic performance of industrial F&D manufacturing activities, using the most recent available data.

1.3 Data

The raw data for our empirical analysis were taken from Eurostat databases covering structural business statistics (including parts of the former New Cronos database). In the annual enterprise statistics, economic sectors are classified according to the statistical classification of economic activities in the European Community ("Nomenclature statistique des Activités économiques dans la Communauté Européenne", NACE) (Eurostat, 2004). For the food processing sector (DA15) and its sub-sectors (DA15x), gross operating surplus (GOS, in €m), value added (VA, in €m), turnover (TURN, in €m), production (PROD, in €m) and number of employees for 13 EU countries[7] were available.

The period of investigation was determined by the temporal availability of New Cronos data: 1995 to 2003 only (however, the 2003 data still being

[7] Due to a lack of data for Luxembourg and an apparent low reliability of the data for Greece, the analysis focuses on only 13 countries of the EU-15.

incomplete). In order to buffer the inherent year-to-year volatility in our data and thus to base our index calculation on more 'structural' cross-section comparisons, we calculated two four-year averages (arithmetic means), the first for 1995 to 1998 and the second for 1999-2002. In this way we were able to assess the competitiveness situation individually for the two four-year periods and how it changed from the first to the second period.

All data were thoroughly checked for outliers, given the significance of the overall maxima and minima in the index calculation. By looking at the density functions of the individual variables we were able to detect and to remove outliers in five cases (all in M_3 data). Missing or provisional values (e.g., due to confidentiality in small countries) occurred mainly in New Cronos data. However, due to the calculation of four-year averages, the impact of missing data was minimised. Table 1 reports the descriptive statistics of the used index variables.

(Table 1 around here)

1.4 Results and discussion

The results for the meat processing industry are presented in Table 2. The competitiveness ranking is headed by Denmark (overall ICI in 1999-2002 of 29.2). For Denmark – after years of strong market consolidation as a result of merger and acquisition activities – the co-operative Danish Crown is the second largest pork processor in Europe and accounts for 90% of Danish market share, as measured by pig slaughter (Rabobank, 2003). Danish Crown is vertically integrated for both pork and beef, in the sense that the company is also active in the downstream markets for the sale of fresh meat, meat processing and meat trading (EU Commission, 1999). In addition, more and more Danish meat is sold abroad. Those facts, combined with the well-known Danish investments in slaughter and processing technologies may have led to the high productivity and growth indices. Besides Denmark, Sweden (+2.3) and Spain (+1.3) were the only countries which gained significantly in overall competitiveness. Especially Spain, having lowest pig production cost in Europe, is expanding its position on Europe's and international pork markets (Rabobank 2003, pp. 4-5). In the current table, the UK is ranked second (ICI of 27.5) and thus has lost the former first rank position. Primarily due to environmental regulations combined with animal disease problems (e.g., BSE, swine fewer, etc.), in the UK livestock production had experienced some serious problems. This development is reflected in strong declining profitability and growth indices. In sum, the United Kingdom lost 2.6 ICI points while Italy (-0.8) and Austria (-0.6) also lost in overall competitiveness.

(Table 2 around here)

Table 3 summarises the results for the EU beverage manufacturing industry. This sector comprises both alcoholic and non-alcoholic beverages. Furthermore, it includes geographically mobile industrial activities such as beer brewing and soft drink manufacturing, but also location-tied sub-sectors such as wine making and mineral water bottling. This implicit heterogeneity of the beverage industry makes a meaningful cross-country comparison of the findings difficult. Nevertheless, our results show that Ireland (ICI score 88.2), the UK (54.3) and Finland (52.9) led the field in 1999-2002. The countries which gained most in overall beverage manufacturing competitiveness in

1999-2002 as compared to 1995-1998 were Sweden (+7.3 ICI points), Finland (+6.8) and France (+5.2). In Ireland, the beverage industry contributes a quarter to the overall food industry output and more than 40% to its exports and with many world-leading national and international companies having operations there (e.g., Diageo, Pernod Ricard, Heineken, Brown Forman, Coca Cola, Pepsi Cola, C&C, Beamish and Crawford, DD Williamson, etc.) plus the Guinness brewing for the entire UK market now taking place in Dublin (Relay, 2005), the sector is truly outstanding as compared to other EU countries. Nevertheless, while the Irish beverage industry competitiveness is still way ahead, a 2.6 points growth decline dented its ICI score in 1999-2002. As for Finland, finding the country in the 'first league' seems to be a surprise. However, while the country's overall beverage industry competitiveness increased at the end of the 1990ies, growth in both Finnish domestic beer and soft drink sales was particularly high in 2001 and 2002, leading to strongly improved industry profits in 2002 (Finnish Brewing Industry Federation, 2003). With 2001 profits also being above their previous 6-year average, the resulting increase in the growth index pushed Finland to the third ICI position. The countries with the lowest competitiveness in beverage manufacturing in 1999-2002 were Germany (ICI score 35.5), Italy (35.5) and Portugal (36.2). With regard to Germany, this classical beer-brewing country has experienced especially large drops in per capita beer consumption in the past, leading to strong consolidation pressures which have forced the brewing industry to concentrate (The Brewers of Europe, 2005). In addition, international brewing corporations have recently started to enter the fragmented German beer market (Zwick, 2003) and given the importance of economies of scale in the brewing business, future profitability and thus competitiveness may be expected to rise as plant production volumes increase.

(Table 3 around here)

2 Conclusions

This analysis has aimed at developing an Industrial Competitiveness Index as a composite measure for relative and multidimensional economic performance of EU F&D manufacturing industries, covering differences in levels and development of profitability, productivity and growth. The main advantage of this approach is the aggregation of the different dimensions of the competitiveness concept into one final index score, on which an overall assessment can be based. In this way, country and industry ranking tables can be obtained. However, given the novelty of this approach for sector competitiveness analysis, its main drawback perhaps is that the obtained results cannot easily be compared to the results described in other empirical investigations, thus making cross-study validation of the findings difficult.

Our results show that in 1999-2002 as compared to the average of the period 1995-1998 overall competitiveness in the meat processing and beverage manufacturing sectors (in real terms) has slightly increased, as measured by the average of all ICI scores. (The un-weighted arithmetic mean of ICI 1999-2002 scores across the 13 analysed countries for has increased by 0.2 and 0.4, respectively.) At the same time, overall competitiveness seems to also have converged slightly across countries, implying that the performance of EU countries in F&D manufacturing has become more similar. (The standard deviation of the ICI scores in 1999-2002 as compared to 1995-1998

has decreased by -0.7 and -0.4, respectively.) While the increase and convergence of this sub-sector competitiveness may have several causes, it could well indicate ongoing and accelerated EU market integration as it has been expected not least due to the introduction of the euro as a common currency.

A future intensification of competition in the EU F&D industries, as a result of EU east enlargement and upcoming WTO obligations, is likely to put even more pressure on their competitiveness. Given the particular significance of agricultural production in eastern European countries, one could expect that the manufacturing of (unbranded/lowly processed) food products made from commodities in the production of which those countries have an advantage (e.g., meat, eggs, etc.) may shift to the east in the medium to long run. On a global stage, however, the competitiveness of an enlarged EU-25 may increase as a result of a better access to low-cost agricultural raw materials. At the same time, an enlarged European market with 450 million consumers and further scope for deeper vertical integration and improved market orientation of EU farming should offer significant potential for the development of internal strengths. The WTO-induced reduction of EU market support has already prompted the EU Commission to shift from market support mechanisms to private-sector capacity building. For instance, the EU Commission has initiated pan-European research into topics such as improving direct marketing and entrepreneurial skills of farmers as well as an evaluation of the potential of improving economic relations along the food chain.

Future research should evolve in two directions. First, from a methodological point of view, more reflection is maybe needed as to whether the chosen indicators in the ICI are best for measuring the complex competitiveness construct. Second, once a widely-accepted measurement approach has been found, the geographical scope of the empirical analysis should be expanded to all EU member states as well as non-EU countries.

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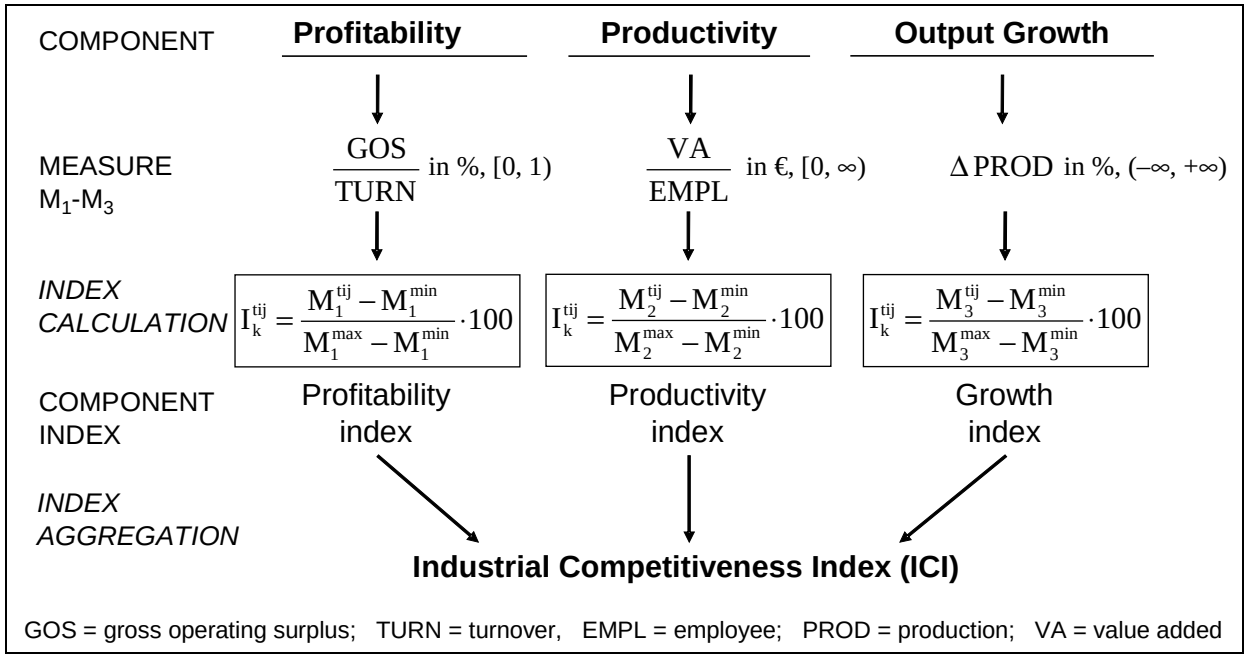
Appendix

Figure 1. The Industrial Competitiveness Index (ICI)



Source: authors' draft.

Table 1. Descriptive statistics of the employed index variables

	GOS/TURN	VA/EMPL	Δ PROD
Max	32.1	233.2	162.7
Min	- 8.9	6.9	69.1
Mean	9.0	51.6	100.9
Std dev	4.8	26.4	10.4
N	951	942	801

Source: authors' calculations from Eurostat data.

Table 2. ICI* ranking and indices of profitability, productivity and growth of NACE 151 (production, processing, preserving of meat, meat products)

Country	*Rank Ø 1999-02*	*Rank Ø 1995-98*	*ICI Ø 1999-02*	*ICI Ø 1995-98*	*Δ Rank*	*Δ ICI*	*Profitability index 1999-2002, 1995-1998 and Δ 95-98 to 99-02*			*Productivity index 1999-2002, 1995-1998 and Δ 95-98 to 99-02*			*Output-growth index 1999-2002, 1995-1998 and Δ 95-98 to 99-02*		
Denmark	1	2	29.2	27.4	1	**1.8**	38.5	3 8.2	0.2	19.9	1 7.4	**2.5**	34.6	2 8.0	**6.6**
United Kingdom	2	1	27.5	30.1	-1	**-2.6**	40.9	4 7.2	**-6.4**	14.1	1 2.1	2.0	37.0	4 0.4	**-3.4**
Belgium	3	3	26.5	27.0	0	-0.5	35.4	3 6.0	-0.7	17.6	1 8.2	**-0.6**	33.5	3 2.2	1.2
Finland	4	6	26.5	26.4	2	0.1	36.5	3 9.3	**-2.7**	16.4	1 4.3	2.1	34.7	3 3.0	**1.6**
Italy	5	4	26.1	26.9	-1	**-0.8**	36.5	3 7.4	**-0.9**	15.7	1 5.1	0.6	33.2	3 9.9	**-6.7**
Austria	6	5	26.1	26.7	-1	**-0.6**	39.8	4 0.1	-0.3	12.3	1 1.5	0.9	32.9	2 3.8	**9.1**
Ireland	7	7	25.8	24.9	0	0.9	37.4	3 8.0	-0.6	14.3	1 1.8	**2.5**	31.5	3 2.3	-0.8
Netherlands	8	8	24.5	24.7	0	-0.2	32.5	3 2.4	0.1	16.5	1 6.2	0.3	31.1	3 3.9	**-2.7**
Spain	9	9	24.4	23.1	0	**1.3**	38.0	3 5.9	**2.1**	10.8	1 0.1	0.7	36.9	3 6.1	0.8
Germany	10	*n/a*	23.5	*n/a*	*n/a*	*n/a*	37.4	*n/a*	*n/a*	10.2	*n/a*	*n/a*	25.8	*n/a*	*n/a*
Sweden	11	10	23.2	20.8	-1	**2.3**	30.7	2 8.7	**1.9**	15.7	1 3.1	**2.6**	32.0	3 1.3	0.7
France	12	11	21.1	20.1	-1	1.0	31.0	3 0.1	**1.0**	11.2	1 0.3	0.9	32.3	3 4.7	-2.3
Portugal	13	12	19.2	18.7	-1	0.5	34.4	3 4.3	0.1	4.0	3.1	0.9	31.8	3 0.5	1.3

Note: *detailed construction and calculation of the ICI and the component indices are described in the text and in Figure 1. N/a = not available.

Source: authors' calculations from Eurostat data.

Table 3. ICI* ranking and indices of profitability, productivity and growth of NACE 159 (manufacture of beverages)

Country	*Rank Ø 1999-02*	*Rank Ø 1995-98*	*ICI Ø 1999-02*	*ICI Ø 1995-98*	*Δ Rank*	*Δ ICI*	*Profitability index 1999-2002, 1995-1998 and Δ 95-98 to 99-02*			*Productivity index 1999-2002, 1995-1998 and Δ 95-98 to 99-02*			*Output-growth index 1999-2002, 1995-1998 and Δ 95-98 to 99-02*		
Ireland	1	1	88.2	89.9	0	**-1.7**	91.8	91.1	0.7	84.7	80.6	4.1	35.1	37.7	**-2.6**
United Kingdom	2	4	54.3	49.4	2	4.9	63.4	60.4	3.0	45.2	36.7	**8.5**	34.3	33.4	0.9
Finland	3	5	52.9	46.1	**2**	**6.8**	69.8	62.9	**6.9**	33.0	26.5	6.5	36.6	34.2	**2.4**
France	4	6	48.9	43.7	**2**	**5.2**	56.5	51.0	**5.5**	41.5	33.3	**8.2**	34.4	34.8	-0.4
Sweden	5	8	48.8	41.5	**3**	**7.3**	61.2	53.5	**7.7**	36.3	24.9	**11.4**	36.2	38.1	-1.9
Spain	6	7	46.3	43.1	1	3.2	62.4	60.7	1.7	30.1	24.8	5.3	36.4	37.2	-0.8
Denmark	7	3	42.0	51.8	**-4**	**-9.8**	54.6	67.9	**-13.3**	29.5	29.2	0.3	34.0	36.9	**-2.9**
Belgium	8	9	41.8	41.1	1	0.7	50.4	50.3	0.1	33.2	32.4	0.8	35.0	23.6	**11.4**
Austria	9	10	38.1	36.6	1	1.5	49.8	47.4	2.4	26.4	23.7	2.7	34.4	25.9	**8.5**
Portugal	10	11	36.2	35.3	1	0.9	57.3	58.5	**-1.2**	15.1	12.0	3.1	31.7	32.7	-1.0
Italy	11	12	35.5	33.1	1	2.4	46.3	43.7	2.6	24.7	21.4	3.3	32.5	38.2	**-5.7**
Germany	12	*n/a*	35.5	*n/a*	*n/a*	*n/a*	45.3	*n/a*	*n/a*	26.9	*n/a*	*n/a*	29.7	*n/a*	*n/a*
Netherlands	*n/a*	2	*n/a*	52.4	*n/a*	*n/a*	*n/a*	62.0	*n/a*	*n/a*	42.3	*n/a*	*n/a*	32.0	*n/a*

Note: *detailed construction and calculation of the ICI and the component indices are described in the text and in Figure 1. N/a = not available.

Source: authors' calculations from Eurostat data.