INDUSTRIAL CONCENTRATION IN CROATIAN FOOD AND BEVERAGE INDUSTRY

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Abstract

The food and beverage industry represents one of the leading and most prospective industries in Croatia. Despite its importance, studies related to it are fairly rare, while the analysis of its market structure is non existent. Therefore, the aim of this study was to fill this gap and to analyse the change of industrial concentration in Croatian food and beverage industry during the period from 1999 to 2011. Exploration of the changes in industrial concentration can help perceive and predict important structural events within the industry. In that sense, it was discovered that Croatian food and beverage industry had become more consolidated during the years. Also, by applying different measures of industrial concentration and by performing correlation matrix, it was possible to detect the level in which one measure of industrial concentration can be substituted with another one.

JEL Classification: L66

Keywords: industrial concentration, Croatia, food and beverage industry

1. Introduction

The food and beverage industry is an important segment of every economy. According to the Croatian Chamber of Economy (CCE), in 2011 this industry participated with approximately 20 percent in gross value added and 20 percent in total employment in the manufacturing industry. Only a few industries in Croatia have managed to maintain stability during the last decade and the food and beverage industry is among them. Moreover, it is an industry which is increasingly gaining importance. This can be corroborated by the fact that, at a global level and over

the last three decades, this industry has grown at the rate of 1.6% per year, thus achieving a growth rate of leading industries in the world such as mining, textile and automotive industries (Selim; 2009, 2). According to the economic experts, the success of the food and beverage industry lies in the long manufacturing tradition that domestic corporations have maintained in this part of Europe. Due to its significant impact on the development of society, employment, foreign trade balance and the national GDP, the food and beverage industry is one of the most important economic priorities.

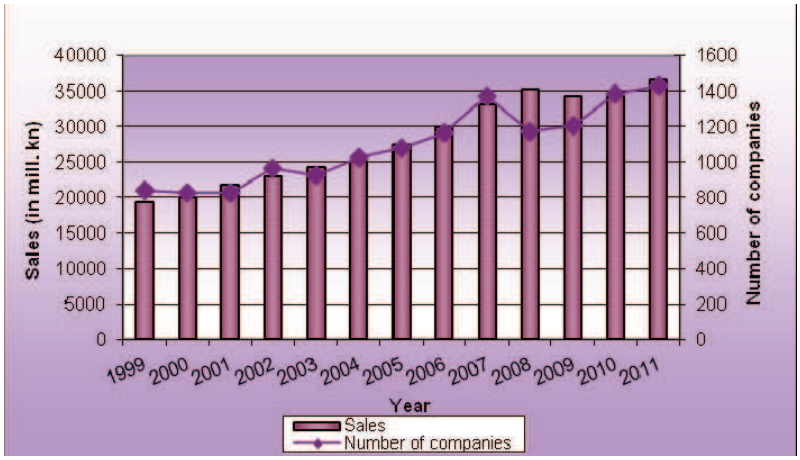
Despite the importance of this industry for the development of Croatian economy, studies related to it are fairly rare, while the analysis of its market structure is non existent. Having in mind that one of the dominant measures, which seek to describe the structure of a particular industry and the level of competitive forces existing within it, is industrial concentration, the objective of this paper was to analyse the change of industrial concentration in Croatian food and beverage industry during the period from 1999 to 2011.

2. Food and beverage industry

2.1. Food and beverage industry in numbers

In 1999 the manufacturing industry achieved a total revenue of 84.42 billion kuna, 22% of which was generated by the food and beverage (F&B) industry. The latter industry is very important for Croatia since the revenue it achieves suggests that it is one of the "generators of growth in industrial production". Specifically, the total revenue of the food and beverage industry was continuously growing during the period 1999 - 2011, and the growth rate for that period achieved the value of 89% (Figure 1). Furthermore, according to the CCE, in 1999, the manufacturing industry employed 271,736 people, while approximately 17% of them (i.e. 47,134) were employed in the food and beverage industry. The financial crisis that has shaken the global economy left almost an insignificant effect on the number of employees in the F&B industry during the analysed period. The number of employees in this industry amounted to 46 000 in 2011. Because of a noticeable decline in the number of employees in other branches of the manufacturing industry, the share of employees in the F&B industry increased to 20.4% in 2011.

Figure 1. Changes in total revenue and number of companies in Croatian food and beverage industry



Source: Author's calculations based on the data from CCE

Globalization and changes in consumer habits, as well as other lifestyle changes, have resulted in increased consumerism and massive production which facilitated the growth of companies in the food and beverage industry (Krznar; 2011, 16). This industry accounts for about 14% of the total number of manufacturing companies. According to the CCE data, the food and beverage industry in Croatia had 1428 of registered companies in 2011, which is 69% more than in 1999. The majority of enterprises were privatized and a large number of new small businesses were established. In 2011 more than 92% of companies registered in this industry were the small ones (up to 50 employees), while only 2.5% comprised large companies. Although the food and beverage industry is dominated by small companies, they have a small share in total income (about 8% in 1999, and about 14% in 2011). On the other hand, large companies achieved almost 69% of this industry's total revenue in 2011. It is clear that, due to the importance and the significance that large companies have, they can also affect the trends on this market.

The analysis of total revenue at the level of individual sectors within the food and beverage industry shows that the most of total revenue in the observed period was achieved by the following branches: the manufacturing of other food products, the dairy industry, the beverage industry and the meat industry.

2.2. Sample definition and data source

Selection of the period (1999 - 2011) and the sample of analysed companies (medium and large companies) in this research were primarily determined by the data availability of companies from the analysed industry. In order to ensure compatibility and continuity in the analysis of industrial concentration, NACE 2002 (i.e. National Classification of Economic Activities) was used in this study, since in NACE 2007 the analysed industry was separated in two categories: the food industry and the beverage industry. According to that, the number of analysed groups (three-digit level of the NACE 2002) was nine. All data used in this paper were collected from publications and/or web pages of the Financial Agency (FINA), the Croatian Chamber of Economy (CCE) and the National Bureau of Statistics (CBS). Although some companies were active during the whole analysed period, a certain number of them went out of business despite the known fact that due to the inelastic nature of income demand for their products, the food and beverage industry can successfully resist the economic crisis and numerous pressures from the environment. Our final sample consisted of 1652 units of observation.

3. Industrial concentration

Concentration is one of the basic elements in the analysis of market structure which can range from highly fragmented to firmly consolidated (Sarkaria & Shergill; 2001, 100). Consolidated industries are industries with a higher degree of concentration and a small number of companies controlling a larger part of total industry sales, while fragmented industries have a larger number of relatively small companies with approximately similar, smaller share of industrial sales, and neither company is in a position of dominance in the industry (Tipurić et. al.; 2003, 5). According to the Structure-Conduct-Performance (SCP) paradigm, the higher concentration may result in collusive behaviour of the enterprises that, by increasing the price, aim to directly affect profit growth. Due to the foregoing, the concentration is becoming an increasingly monitored phenomenon which public authorities try to control by many provisions (Harrison; 2004, 4).

3.1. Analysis of changes in concentration by applying weighted arithmetic mean

Over the last few years, companies in the food and beverage industry have been influenced by many factors from their immediate environment, government policies, global changes in business, consumer habits, etc. These events have led to the change of market structure and industrial concentration in the food and beverage

industry. In order to assess whether Croatian food and beverage industry has become more consolidated, the relative changes of concentration which occurred for the period 1999-2011 were determined (Table 1) at the level of each sector of this industry. Due to the simplicity of calculation and data availability, the concentration ratio (CR) represents one of the most commonly used measures of concentration, and therefore it was considered in this part of the analysis. CR shows the percentage of market output concentrated in the hands of the *largest n companies* (in our case four) in the industry. It can range from 0%, for a perfectly competitive industry, up to 100%, for a monopoly.

In most sectors of the food and beverage industry, a decrease in level of concentration occurred during the period covered by the analysis. The largest fall of concentration was recorded in the sector of Processing and preserving of fish and fish products (20.91%), while the smallest one was recorded in Processing and preserving of fruit and vegetables and Manufacture of vegetable and animal oils and fats (3.42% and 6.48%). The essential feature of the latter two industries is that the four leading companies in these industries account for more than 90% of market share (i.e. they form a tight oligopoly) and each of these industries has one dominant company (Shepherd; 1997, 16, Shepherd; 1972, 25) that controls more than 80% of the total market. Research of Setiawan et al. (2012, 475) for Indonesian food and beverages industry and those of Juhász et al. (2008, 67) for Hungarian food retail market also showed a presence of a high level of industrial concentration.

Table 1 Changes in industrial concentration for the period from 1999 to 2011

1	2	3	4	5	6
Sector	1999	2011	**Change (%)**	**Weight**	**Wi*Pi**
(NKD2002)	**CR_4 (%)**	**CR_4 (%)**	**Pi**	**Wi**	
DA151	58,24	58,88	1,10	0,16	0,17
DA152	68,73	54,36	-20,91	0,02	-0,34
DA153	94,45	91,22	-3,42	0,08	-0,26
DA154	96,41	90,16	-6,48	0,04	-0,25
DA155	86,62	88,69	2,38	0,20	0,47
DA156	52,13	74,16	42,25	0,05	2,00
DA157	57,32	51,32	-10,46	0,03	-0,36
DA158	42,27	38,72	-8,39	0,24	-1,99
DA159	49,00	64,97	32,61	0,19	6,35
					5,79

Source: Authors' calculations based on data from FINA

Note: $P_i = \frac{(CR_4)_{2011} - (CR_4)_{1999}}{(CR_4)_{1999}}$

Some of the possible reasons for the reduction of the level of concentration in certain sectors of the F&B industry are linked to the fact that, in 2008 and 2009, there were numerous changes in the economic field, such as a decline in industrial production and consumer spending, a rise in unemployment, a lack of investment, etc., which affected the operations of all companies in Croatia including companies in the food and beverage industry. Nevertheless, most of these industries (55.56% of them) in 2011 can still be characterized as sectors with strong oligopolistic structures.

On the other hand, the highest growth of concentration was recorded in the mill products industry (42.25%) which is followed by the beverage industry (32.6%). The number of companies in the beverage industry grew by 82% in 2011 when compared to 1999. Three of four leading companies in this industry were able to further strengthen their position by increasing their market shares and thus creating a tight oligopoly.

The use of a weighted arithmetic mean (where a participation of a certain activity in total sales realized at home and abroad is used as a weight) makes the conclusion about the average change of the degree of concentration in the observed sectors of the food and beverage industry possible. The results of the conducted analysis showed that for the 1999-2011 period, industrial concentration increased by 5.79% on average. These findings conform to those reported by Sadraei Javaheri (2009, 256), Fedderke & Naumann (2012, 2932) and Fedderke & Naumann (2012, 241).

Omnipresent globalization and the opening of Croatia to foreign markets introduced competition that together with automation, technological advancements (Hong & Fu; 2011, 2339), mergers and acquisitions (M&A) and changes in consumer habits significantly affects business activity of companies in the food and beverage industry. Consequently, in the last few years, an increased consolidation of companies has been recorded, together with an increased concentration on the industry.

3.2. Possible substitution of one concentration measure with another

Beside concentration ratio, some other indicators can be used for concentration measuring. In order to determine if one concentration measure can replace the

other, some additional measures of concentration were calculated in this research: Herfindahl-Hirschman Index (HHI), Comprehensive Industrial Concentration Index (CCI), Hall-Tideman Index (HTI), Entropy index (EI) and the Rosenbluth Index (RI). As a base for calculation of these measures, companies' sales were used.

As opposed to CR_4 that takes into consideration market shares of only four leading companies in the industry, HHI takes into account market shares of *all companies* in the industry. Its value ranges from 0 (perfect competition) to 10 000 (monopoly). The next measure of concentration, HTI, emphasizes the importance of the absolute number of companies. The assumption is that the entry on the market will be easier if the market already consists of a large number of companies. This index differs from the Rosenbluth Index (RI) only in the manner of ranking companies. In the case of RI, a smaller company will be ranked higher and therefore it will affect the index more than a larger company which will have a lower rank. CCI is the index that simultaneously shows relative dispersion among companies and the absolute number of companies. It is calculated by adding market share of the largest company to the summation of the squares of market shares weighted by a multiplier reflecting the relative size of other companies in the industry. EI is the only index that is inversely associated with concentration. The index value is approximately equal to zero on the market characterized as monopoly, while its highest value, calculated as ln(N), is obtained on the market categorised as perfect competition. Formulas for calculating previously presented measures of concentration are displayed in table 2.

Table 2 Formulas for calculating different measures of concentration

Concentration measure	Formula	Concentration measure	Formula
CR	$CR_n = \sum_{i=1}^{n} s_i$	RI	$RI = 1/\left(2\sum_{i=1}^{N} is_s - 1\right)$
HHI	$HHI = \sum_{i=1}^{N} s_i^2$	CCI	$CCI = s_1 + \sum_{i=2}^{N} s_i^2 (1 + (1 - s_i))$
HTI	$HTI = 1/\left(2\sum_{i=1}^{N} is_s - 1\right)$	EI	$E = -\sum_{i=1}^{N} s_i \, ln(s_i)$

Note: s_i denotes the market share of the company; N is the total number of companies in the industry; n is the number of the largest (leading) companies in the industry

In order to determine whether one measure of concentration can be replaced with another without influencing the final results and/or conclusions of the research, the correlation matrix was calculated and its results are shown in Table 3.

Table 3 Correlation matrix for different measures of concentration in Croatian food and beverage industry

	CR_4	HHI	CCI	HTI	RI	E
CR_4	1,000					
HHI	0,827**	1,000				
CCI	0,951**	0,955**	1,000			
HTI	0,730**	0,889**	0,842**	1,000		
RI	0,394**	0,341**	0,369**	0,672**	1,000	
E	-0,802**	-0,855**	-0,860**	-0,938**	-0,665**	1,000

Note: ** Correlation is significant at the level of 0,01
Source: Authors' calculations

The correlation coefficients between different measures of concentration are statistically significant at the 1% significance level. Correlation between measures of concentration is generally strong and positive. The only exception is EI which is, by its nature, negatively related to other measures of concentration. Namely, a higher entropy index indicates a lower concentration and consequently higher competition in the industry. Based on the results shown in Table 3, it is possible to conclude that there is a weak relationship only between RI index and the remaining indices of concentration which suggests that the use of Rosenbluth index could lead to different conclusions about the degree of industry consolidation in relation to the conclusions derived by the use of the remaining measures of concentration. Also, if someone wants to test the SCP paradigm and ascertain whether a higher concentration (due to the collusive behaviour of the companies) will result in higher profits, the application of Rosenbluth index could result in misleading conclusions. However, it should be noted that one of the possible reasons for obtaining these results for the Rosenbluth index lies in the fact that this research took into account only medium and large companies, while RI index, according to its definition, puts more emphasis on small companies.

4. Conclusion

The food and beverage industry is among a few domestic manufacturing industries that has managed to maintain during the time of war, post-war phase of privatization and present world crisis. In Croatia, this industry occupies a prominent place because it employs a significant number of people, it has a significant production capacity and it achieves the highest total revenue within the manufacturing industry.

During the last two decades, the food and beverage industry has been affected by many changes that influenced its structure. In order to assess whether Croatian food and beverage industry has become more consolidated during the years, we applied a measure which seeks not only to describe the structure of a particular industry, but also to indicate the level of competitive forces existing within it i.e. industrial concentration measure was applied. The results of the analysis indicated that the changes of concentration within different sectors of the food and beverage industry vary greatly. In order to assess the average change of the degree of concentration, the weighted arithmetic mean was used, and the results of the analysis carried out for the period from 1999 to 2011 showed that, on average, industrial concentration increased by 5.79%. The reasons for this industry consolidation, among others, can be found in the omnipresent globalization and the opening of Croatia to foreign markets, automation and technological advances, increased competitive pressures and mergers and acquisitions.

Additionally, the results of the correlation analysis between different measures of concentration, calculated at the three-digit level of the food and beverage industry, have led to the conclusion that there exists a relatively strong and statistically significant relationship between all analyzed measures of concentration (with a Rosenbluth index as an exception). A high level of correlation between the concentration indices indicates that any of these measures of concentration can be used for a high quality analysis of concentration in this industry, since each of them will indicate approximately the same changes in the structure of this industry. Of course, this does not mean that the indices needn't be considered mutually, since each provides additional information about the structure of the analyzed industry.

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