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Profitability of Czech Food Enterprises in Relation to Their Size

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Abstract : *The aim of the paper is to analyse profitability of enterprises in the food and beverages industry of the Czech Republic in time period of 2003-2013 and to evaluate the possible impact of the firm size on the firm profitability. First, the development of the average ROA of individual size groups of enterprises within ten food sub-sectors is analysed graphically. Second, the correlation between company size and the level of the ROA indicator is statistically validated by using parametric ANOVA. Based on the analysis it can be concluded that the level of profitability in the Czech food and beverages industry is relatively low, and moreover, there is a tendency to decrease during the observed period. The highest values of ROA are achieved by the largest companies (expressed by the number of employees) and on the contrary, the ROA values of the smallest companies are often negative and in the whole observed period there are significantly lower than ROA values of other size groups of enterprises, which is valid in almost all sub-sectors. The analysis has shown that the level of profitability is determined by the company size. Significant differences in the size of ROA in different size groups were also statistically verified with the use of ANOVA.*

Keywords: profitability, ROA, firm size, food and beverages industry

JEL Clasification: L11, L66

1 Introduction

The economic theory says, that under competition, profit rates will tend towards equality. However, the real markets are not perfectly competitive – industries are characterised by market imperfections such as high sunk costs, barriers to entry, asymmetric information and other impediments to competition – which can cause variations in firm profits.

The issues of whether larger firms are better in performance to smaller firms, or vice-versa, have generated large amounts of theoretical and empirical research in the economics and management. The theoretical postulates and empirical evidence are often equivocal on causal link between the size and firm-level performance because this relationship is very environment-specific, and highly dependent on a number of institutional factors which affect the performance of firms.

The hypothesis, based on Baumol´s proposition (Hall and Weiss, 1967), says that "large firms have all of the options of small firms, and, in addition, they can invest in lines requiring such scale that small firms are excluded". Therefore, higher rates of return should be found in large enterprises even in the long run and even in the absence of barriers to entry other than those directly associated with availability of capital.

As stated by Majumdar (1997), the size of a firm may affect the firm performance in many ways. An important feature is the ability to exploit economies of scale and scope and related formalisation of procedures. Due to the large size a firm may have diverse capabilities – large firms have the same opportunities as small firms, but may invest a much larger scale, of which the small firms are usually excluded. If the sector is suitable for large investments, these investments bring higher profits, then capital will move in response to these differences in earnings and in the industry there will be large companies that will be more profitable than small firms. However, there are also alternative views suggesting that the firm size is related to market power (e.g. Bajtelsmit and Bouzouita, 1998; Casu and Girardone, 2009; Allen et al., 2005).

An important issue when considering the dependence of the firm size and profitability is the choice of an appropriate measure of profitability, because various authors approach to performance measurement differently. As stated by Hult et al. (2008), the most used indicators that measure financial performance, are indicators based on sales and the indicator of return on assets (hereinafter referred to as "*ROA*"). According to Richard et al. (2009), who analysed papers published in economic journals in 2005-2007, the performance is mostly measured

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on the basis of financial statements and in at least half of cases only one indicator is used for the evaluation of performance. Šiška and Lízalová (2011) analysed indicators most suitable for measurement of long-term business performance in the Czech Republic and they identified two indicators – return on assets and growth of assets.

The effectiveness of enterprise can be assessed by various indicators, which are expressed quantitatively in order to compare or assess developments in terms of time. However, it is worth mentioning that the existence of a large number of performance indicators shows that there is no "ideal measure". (Blažková, 2015)

One of the basic indicators that express efficiency of business assets management and is also used in various studies, e.g. Hult et al. (2008), Richard et al. (2009), Šiška and Lízalová (2011), is indicator of return on assets. The indicator provides information about the profit, which was made through the investment in business, is responsive to current situation of a firm and also to the state of the sector and the national economy (Jindřichovská, 2013). Therefore, the return on assets (*ROA*) was chosen for purposes of this analysis concerned with the profitability of enterprises in the Czech food and beverages industry and evaluation of the possible impact of the firm size on the firm profitability.

2 Data and method

The aim of the paper is to analyse profitability of enterprises in the food and beverages industry of the Czech Republic in time period of 2003-2013 and to evaluate the possible impact of the firm size on the level of firm profitability. The analysis is implemented through two parts. First, the development of firms´ profitability in particular sectors of the Czech food and beverages industry is analysed with respect on the firm size. Second, correlation between the firm size and profitability is statistically validated with the use of parametric ANOVA. The statistical data and graphs were processed with the use of software Gretl and Excel.

The data for the analysis were obtained from the corporate database Albertina – Gold Edition (Bisnode, 2015). The analysed period was from 2003 to 2013. The sample of the accounting data of enterprises involved in the analysis was made of 12,343 observations across 11 years and 10 food sectors in the Czech Republic. The sectors[2] are defined based on the 3-digit level of the Classification of Economic Activities (CZ-NACE). Companies were classified in four size groups defined according to the number of persons employed – with 0-19, 20-49, 50-249 and 250 or more persons employed. The profitability was evaluated on the basis of the return of assets ratio defined as follows:

$$ROA = \frac{EBIT}{Total\ Assets} \quad (1)$$

The one-way ANOVA, which provides a statistical test of whether or not the means of several groups are equal, was used to determine whether there are differences at the level of the variable of profitability by particular size groups of enterprises. (Hocking, 2013)

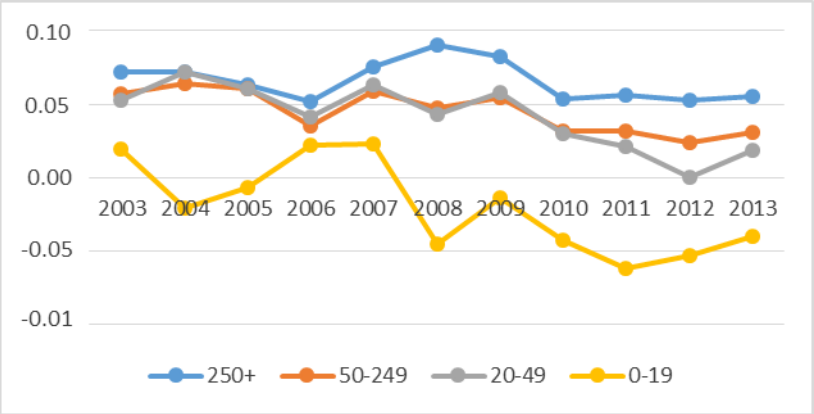
The null hypothesis says that means are equal (H_0: $\mu_1 = \mu_2 = \mu_3 = \mu_4$) and the alternative hypothesis says that not all means are equal, i.e. at least one of the mean values are different from others. The null hypothesis is rejected or accepted on the basis of statistical significance (the significance level $\alpha = 0.01$).

3 Results and Discussion

The development of average profitability (*ROA*) in particular size groups of food enterprises in the Czech Republic in 2003-2013 is shown in Figure 1. It can be seen that the development of *ROA* is not favourable in the Czech food and beverages industry. *ROA* values are relatively low in all years, moreover, there is a tendency to decrease during the analysed period. The largest companies (measured according the number of employees, i.e. with 250 or more employees) achieve definitely the highest values of *ROA* in all observed years except 2004 and 2005, when the similar profitability is reached also by smaller enterprises (with 50-249 and 20-49 employees).

[2] Namely CZ-NACE 101 Production, processing, preserving of meat and meat products; 102 Processing and preserving of fish and fish products; 103 Processing and preserving of fruit and vegetables; 104 Manufacture of vegetable and animal oils and fats; 105 Manufacture of dairy products; 106 Manufacture of grain mill products, starches and starch products; 107 Manufacture of bakery and farinaceous products; 108 Manufacture of other food products; 109 Manufacture of prepared animal feeds; 110 Manufacture of beverages.

Figure 1 Average *ROA* of the Czech food enterprises by size groups in 2003-2013



Source: Own processing

On the contrary, *ROA* values of the smallest enterprises (with 0-19 employees) are significantly lower than *ROA* values of other size groups of enterprises. Moreover, these enterprises often achieve a negative profitability.

When looking at particular sectors (see Figure 2), it is obvious that the situation is similar in most sectors with the exception of three sectors – CZ-NACE 104, CZ-NACE 106 and CZ-NACE 109.

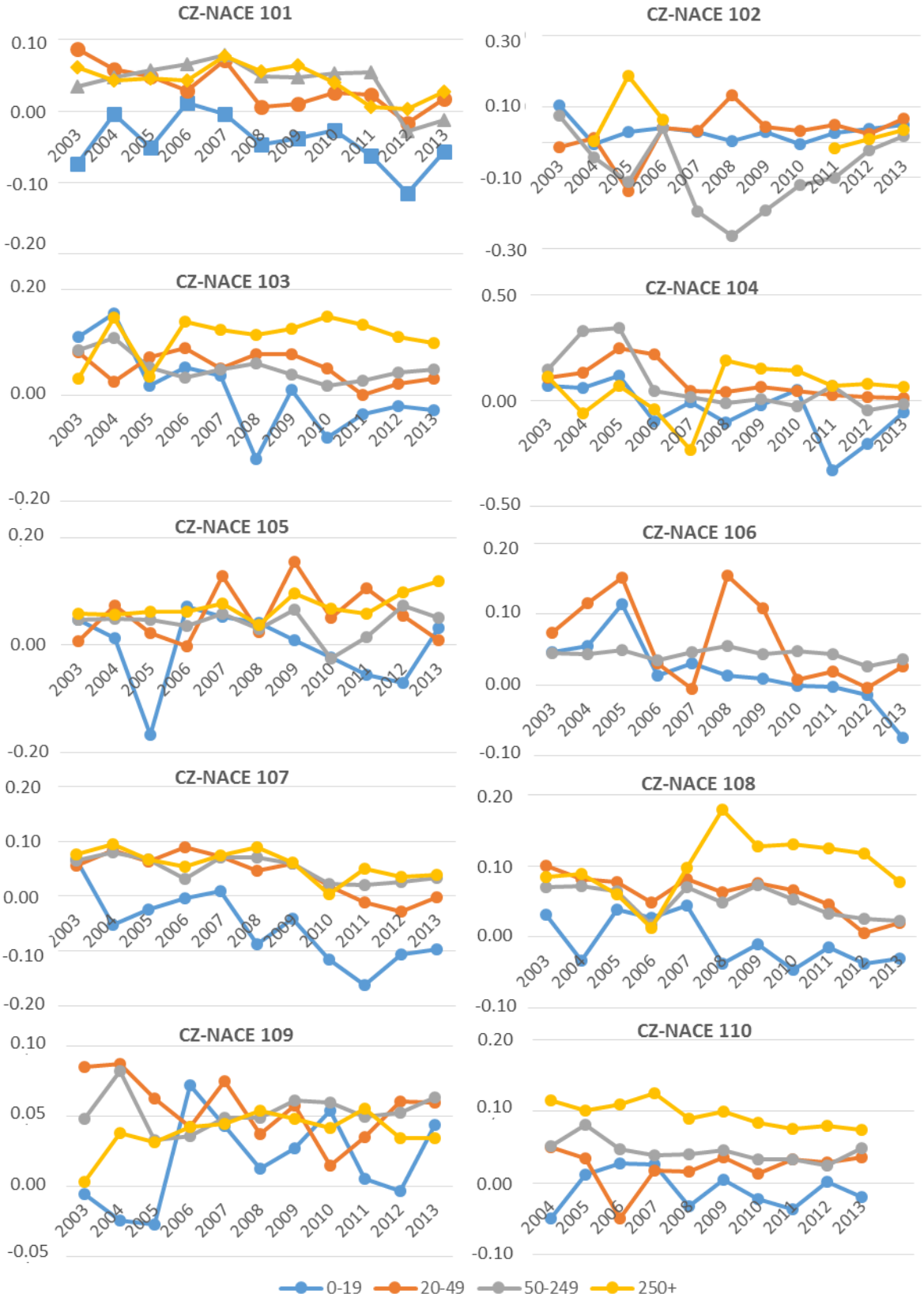
The largest companies in the sector of manufacture of vegetable and animal oils and fats (CZ-NACE 104) reached low values of *ROA* till 2007, which was caused by the results of the largest company (whose market share was around 40 % in 2007). The company was in liquidation and in 2007-2008 it was transformed into several new enterprises, which nowadays represent the group of the largest enterprises and whose market share is significant – the market share of four largest companies in this sector, i.e. the concentration ratio CR_4, was 96.24 % in 2013 (Blažková and Chmelíková, 2015). From 2008 the *ROA* values of the largest enterprises are significantly better in comparison with smaller enterprises.

Large companies in the sector of manufacture of grain mill products, starches and starch products (CZ-NACE 106) have stable values of *ROA* indicator during the whole observed period, but there are significant fluctuations in the group of smaller enterprises. This sector, with the absence of the largest enterprises with more than 250 employees, belong among less concentrated sectors of the Czech food industry – the concentration ratio for four largest companies was 28.30 % in 2013 (Blažková and Chmelíková, 2015).

In the sector of manufacture of prepared animal feeds (CZ-NACE 109) there are no evident tendencies in the development of *ROA* within the particular size groups of enterprises, the values are fluctuating in all size groups.

Despite some above mentioned exceptions it can be stated, that larger enterprises reach in average higher profitability in the Czech food and beverages industry.

Figure 2 *ROA* of particular sectors of the Czech food and beverages industry by size groups in 2003-2013



Source: own processing

Subsequently, it was statistically verified whether there are differences between different size groups of enterprises within the *ROA* indicator during the analysed period. For the analysis of comparison of various size groups in terms of *ROA* the parametric analysis of variance (one-way ANOVA) was used. The *ROA* ratio was used as the dependent variable, four different size groups of enterprises was used as the factor. The results of ANOVA are presented in the Table 1.

Table 1 The results of the analysis of variance (ANOVA)

		n	Mean	Standard Deviation
Food and beverages industry – total	0-19	5967	-0.02562	0.30819
	20-49	2526	0.03885	0.16214
	50-249	3065	0.04385	0.13149
	250+	785	0.06568	0.09118
F(3, 12339) = 5.20464 / 0.056124 = 92.7347 [p-value 2,4e-059]				
CZ-NACE 101	0-19	912	-0.04550	0.28037
	20-49	430	0.02776	0.12867
	50-249	420	0.04063	0.11705
	250+	165	0.04091	0.06127
F(3, 1923) = 1,05735 / 0,0442372 = 23,9018 [p-value 3,47e-015]				
CZ-NACE 102	0-19	51	0.02594	0.07476
	20-49	28	0.01929	0.10929
	50-249	30	-0.10189	0.25559
	250+	6	0.04634	0.07381
F(3, 111) = 0,120604 / 0,0227355 = 5,30465 [p-value 0,0019]				
CZ-NACE 103	0-19	170	0.00161	0.24690
	20-49	74	0.04918	0.09279
	50-249	120	0.04779	0.06121
	250+	20	0.11733	0.08833
F(3, 380) = 0,11805 / 0,0303288 = 3,89233 [p-value 0,0092]				
CZ-NACE 104	0-19	51	-0.03103	0.29707
	20-49	29	0.07288	0.08514
	50-249	32	0.02608	0.14195
	250+	19	0.03758	0.22110
F(3, 127) = 0,0729163 / 0,0481888 = 1,51314 [p-value 0,2143]				
CZ-NACE 105	0-19	197	0.00057	0.26439
	20-49	79	0.06362	0.14418
	50-249	310	0.03995	0.13573
	250+	92	0.07169	0.08927
F(3, 674) = 0,143157 / 0,032255 = 4,4383 [p-value 0,0042]				
CZ-NACE 106	0-19	277	0.00983	0.22903
	20-49	105	0.05718	0.09540
	50-249	190	0.04306	0.05696
F(2, 569) = 0,111292 / 0,028186 = 3,94848 [p-value 0,0198]				
CZ-NACE 107	0-19	1396	-0.06866	0.37904
	20-49	722	0.03280	0.19884
	50-249	741	0.04722	0.13591
	250+	222	0.05663	0.08184
F(3, 3077) = 3,1752 / 0,0793239 = 40,0283 [p-value 2,27e-025]				
CZ-NACE 108	0-19	1093	-0.01474	0.33152
	20-49	509	0.05610	0.13789
	50-249	576	0.04812	0.15235
	250+	109	0.10000	0.12372
F(3, 2283) = 1,04108 / 0,0633693 = 16,4287 [p-value 1,46e-010]				
CZ-NACE 109	0-19	441	0.02172	0.26623
	20-49	219	0.05415	0.08506

	50-249	220	0.05255	0.08337
	250+	56	0.03923	0.03259
F(3, 932) = 0,0735175 / 0,0368487 = 1,99512 [p-value 0,1131]				
CZ-NACE 110	0-19	1379	-0.00859	0.26260
	20-49	331	0.01441	0.21460
	50-249	426	0.04459	0.14332
	250+	96	0.09587	0.07120
F(3, 2228) = 0,566629 / 0,0536064 = 10,5702 [p-value 6,69e-007]				

Source: Own processing

Based on the results of ANOVA within the whole Czech food and beverages industry, the p-value was lower than the significance level ($\alpha = 0.01$), which allows to reject the null hypothesis and to accept the alternative hypothesis. It is therefore possible to conclude that there have been statistically confirmed significant differences between *ROA* by size groups of enterprises.

This result is also valid in the case of most sectors – the differences among values of *ROA* depicted in graphs in Figure 2 are confirmed statistically. The different results were founded in the sectors CZ-NACE 104 and CZ-NACE 109, which correspondents with the graphical illustration in Figure 2 and can be explained as follows.

The explanation of the different result in sector CZ-NACE 104, i.e. manufacture of vegetable and animal oils and fats, can be found in the fact, that during the analysed period significant structural change took place, which caused sharp fluctuations of profitability of the largest enterprises – till 2008 there was only one large company in this sector with the high market share (almost half of the output of this sector was produced by this company), whose financial results were worsening during 2003-2008. The bad financial situation of this company resulted in the liquidation of the company and its transformation into new enterprises. Due to this fact there were bad financial results (i.e. low profitability) observed in large enterprises in 2008-2009. Since 2008, the development in this sector has not been influenced by any abrupt change and the profitability of particular size categories of enterprises in this sector has been developing comparably with other sectors (as seen in Figure 2).

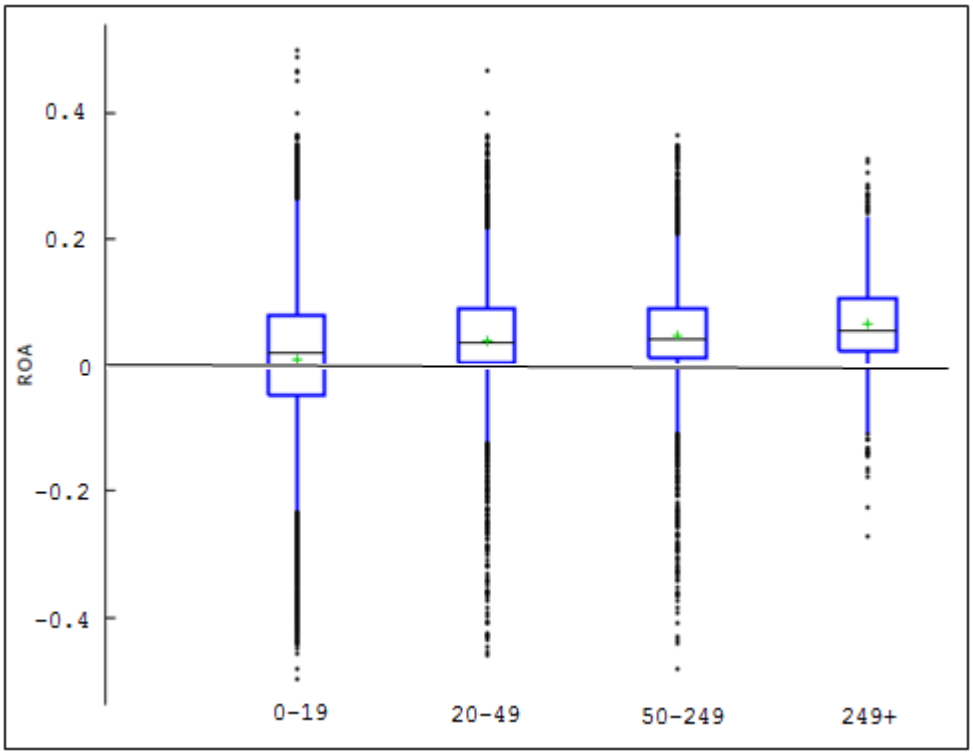
The enterprises of the sector CZ-NACE 109, i.e. manufacture of prepared animal feeds, have a slightly different position than enterprises in other manufacturing sectors – this sector manufactures products that are largely intended for sale to farms dealing with livestock and only part of the production (pet food) is intended for sale in retail to final consumers. Therefore, there are a lot of small or medium-size enterprises, that do not face strong market position of large retail chains when negotiating prices of their production and as suppliers to farmers they are in most cases in stronger bargaining position. This fact probably causes better profitability of smaller enterprises in this sector in comparison with other manufacturing sectors, where the company size and the related market position of processors seem to be an important factor of profitability (due to the heavily concentrated retail sector with great market power).

In the sector CZ-NACE 106 the null hypothesis can be rejected on the significance level $\alpha = 0.05$, which enables to conclude the significant differences between *ROA* by size groups of enterprises in this sector as well.

The standard deviation, which indicates the statistical dispersion, is lower in the case of larger enterprises (with 250 or more persons employed) – i.e. firm profitability is of a similar level among large firms – in contrast to the smallest enterprises (with 0-19 persons employed), where high standard deviation indicates more significant mutual differences. This indicates the fact that large enterprises have lower dispersion of *ROA* values around the arithmetic average and their *ROA* indicators are similar, in contrast to the small enterprises, whose *ROA* values are more diverse (which can be seen in Figure 3 as well).

The variability of *ROA* among particular size groups of enterprises within the whole food and beverages industry of the Czech Republic is illustrated also by the box-whisker plot in Figure 3, which shows graphically five values: minimum, first quartile, median, third quartile and maximum. The extreme values called “outliers” are depicted as separate dots – there are more outliers in the group of the smallest enterprises. Due to the high dispersion of *ROA* values in the data set the graph in Figure 3 is limited by the values -0.4 to 0.4.

Figure 3 The variability of *ROA* within the size groups of Czech food enterprises



Source: own processing

4 Conclusions

Based on the graphical analysis of the *ROA* indicator in terms of size structure of enterprises in the Czech food and beverages industry in period 2003-2013, it was found that the size of *ROA* is determined by the firm size (expressed by number of employees) – these results were confirmed within most sub-sectors. It should be noted that profitability is influenced also by other factors, but the size of the business appears to be a significant prerequisite for achieving higher firm profitability. Significant differences in the size of *ROA* in different size groups were also statistically verified with the use of ANOVA.

The profitability in the food and beverages industry of the Czech Republic is at a low level, food companies are exposed to competitive pressures from subsequent stages of commodity vertical, i.e. retail, where the market structure is more concentrated (while the market share of five largest companies in the Czech food industry in 2013 reached the value of 14.45%, concentration in the retail sector was much higher – 45.5% in 2013) and can exercise greater market power. Due to the concentrated retail market and related market power it can be concluded, that large food enterprises have better position to compete with the retail, as evidenced by the analysis in this paper.

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