ECONOMIC EFFICIENCY OF SMALL AND MEDIUM-SIZED ENTERPRISES IN THE FOOD INDUSTRY

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Abstract

The objective of this paper is to examine economic efficiency of small and medium-sized enterprises in the food industry. The analysis focuses on the Czech Republic. The source of data for the conducted analysis of the enterprises was a database containing accounting data of companies with at least one employee. The observed data were from the 6-year period (2007-2012). The analysis comprised of the data envelopment analysis (DEA) and financial analysis. Based on the analysis results, the enterprises were divided into several groups according to their level of efficiency. In these groups with different efficiency, common economic characteristics of the enterprises were searched for. It was found that the enterprises with high levels of economic efficiency in the food industry evince high levels of profitability, low leverage and high liquidity. The further analysis revealed that the enterprises with the low level of economic efficiency have achieved a substantial improvement in the observed economic indicators of the business performance in a longer term horizon.

Introduction

Small and medium-sized enterprises play a very important economic and social role in the economy. Economic efficiency is the basis for the further development of medium-sized enterprises (SME). The main aim of this paper is to examine economic efficiency of small and medium-sized enterprises in the food industry.

The basis for measuring economics efficiency is production function. The neoclassical production function takes the form $Y(t) = F[K(t), L(t), T(t)]$ where $Y(t)$ is the flow of output produced at time t. Capital, $K(t)$ represents the durable physical inputs. The second input to the production function is labour, $L(t)$ and it represents the inputs associated with the human body. The third input is the level of knowledge or technology, $T(t)$ (Barro& Sala-i-Martin, 2004). The ratio of output to input is called efficiency or productivity (Coelli et al. 2005).

The economics productivity of enterprises we can measure by indicators of productivity. The most frequently measured indicator is labour productivity. Indicator of labour productivity shows the efficiency of utilization factors of production and the production possibility of all economy. Labour productivity we can write value added per labour (Broersma&Oosterhaven, 2007). There are two sources of labour productivity growth: technical progress and increases in the average capital–labour (K–L) ratio (Guest, 2011). Labour productivity is influenced by many shocks. There are two types of structural shocks: (1) technological shocks, that is changes in the technological progress which affects labour productivity in the long-run, and (2) non technological shocks, that is all the other shocks that affect labour productivity temporarily through its effects on capital accumulation and aggregate demand (Travagliny, 2012). We have other types of productivity as capital productivity or total factor productivity. The capital productivity shows how productively capital is used to generate value added. Total factor productivity measure technological change. Total factor productivity determines labour productivity, not only directly, but also indirectly by determining capital per worker (Prescott&Lawrence, 1997).

Small and medium-sized enterprises (SME)are the engine of economy, generator of development, innovation, growth (Mura&Gasparikova, 2010).The efficiency (productivity) of SME is influenced by many factors: human capital, organization capital (Leitao& Franco, 2011), business process (Hajduova, Andrejkovic&Mura, 2014) or innovation policy (Foreman-Peck, 2013).

1. Material and methodology

This paper deals with the search for common economic characteristics for enterprises with the same economic efficiency. The enterprises were divided into 3 groups according to their level of economic efficiency.

The selected economic indicators were: Return on assets (ROA = earnings before interest and taxes (EBIT) / total net assets), Return on equity (ROE = net profit/ equity), Labour productivity (LP = value added / labour costs), Total debt to total assets (total debt/ total assets), Current ratio (CR = current assets / short-term debt) and ratio value added to revenue.

The source of data for the conducted analysis of the enterprises was a database ALBERTINA containing accounting data of companies with at least one employee. The observed data were from the 6-year period (2007-2012). The starting year of observation

was year 2007. Data of enterprises are surveyed at 383 companies in the Czech Republic, whose principal activity is the food industry. These companies have been throughout the period fixed.

According to EU methodology (European Commission Directive (ES) No. 800/2008) was considered as small and medium-sized enterprise micro, small and medium enterprises. Micro enterprises have fewer than 10 employees and their turnover or balance sheet total does not exceed 2 Million Euros. Small firms have less than 50 employees and their turnover or balance sheet total does not exceed 10 Million Euros. The Commission further regards an enterprise with fewer than 250 employees, a turnover not exceeding 50 Million Euro or a balance sheet total not exceeding 42 Million Euros as a medium-sized enterprise.

The relative efficiency was analysed by using a data envelopment analysis. Data envelopment analysis (DEA) is a data oriented, non-parametric method to evaluate relative efficiency based on pre-selected inputs and outputs. It was used a model with two input-one output. The output was defined by value added. The inputs were labour cost and amortization. Data envelopment analysis (DEA), the most representative method for efficiency evaluation, is a mathematical programming method for evaluating the relative efficiency of decision making units (DMUs) with multiple inputs and multiple outputs. DEA is a data-oriented non-parametric method. A production possibility set is constructed empirically by enveloping the inputs and outputs data set, where a parametric transformation function is not assumed. The efficient frontier of a production possibility set enables the relative efficiency evaluation. The efficiency score distinguishes between efficient and inefficient DMUs by establishing whether a DMU is located on the efficient frontier or inside the production possibility set. Also, the efficiency score indicates how far a DMU is from the efficient frontier (Morita&Avkiran, 2009).

$$\text{Efficiency} e_k = \frac{y_k}{x_k} \qquad (1)$$

Efficiency (e_k - the ratio of weighted sum of outputs of a weighted sum of inputs) is used to measure efficiency units with multiple inputs and multiple inputs.

$$e_k = \frac{\sum_{j=1}^{n} v_j y_{jk}}{\sum_{i=1}^{m} u_i x_{ik}}, \ \mathrm{k} = 1,2,\ldots, \mathrm{p} \qquad (2)$$

Where $u_i, \ v_j$ are uniform weights of the inputs and outputs for all evaluated units, x_{ik} the size of the (i) inputs to the (k) unit and y_{jk} the size output for unit (total valued units - p).

The mathematical model consists of:

Objective function $e_H = \frac{\sum_{j=1}^{n} v_{jH} y_{jH}}{\sum_{i=1}^{m} u_{iH} x_{iH}} \rightarrow \max,$ (3)

Function maximizes the ratio of weighted outputs and weighted inputs,

Restricting conditions

$$e_H = \frac{\sum_{j=1}^{n} v_{jH} y_{jk}}{\sum_{i=1}^{m} u_{iH} x_{ik}} \leq \forall k = 1,2,\dots p$$ (4)

The ratio of inputs and outputs with weights for the k unit was for the other units in the evaluated group less than or equal to one (Leitmanova et al. 2011).

Conditions which ensure the non-negativity:

$$v_{jH} \geq 0, \forall j = 1,2,\dots,n$$
$$v_{iH} \geq 0, \forall i = 1,2,\dots,m$$ (5)

2. Results

The first part of analysis deals with the analysis of economic efficiency in enterprises. The enterprises were divided into 3 groups according to their level of efficiency in year 2007. Group 1 is defined as group of enterprises with values of efficiency lower than 0.5. Group 2 is defined as group of enterprises with values of efficiency between 0.5 and 0.7. Group 3 is defined as group of enterprises with values of efficiency higher than 0.7. Each group was analysed with the help of economic indicators of business performance.

Group 1 is characterized by low labour productivity, negative profitability (ROA, ROE), high debt equity ratio and low level of liquidity. Group 2 is characterized by high labour productivity, high profitability (ROA, ROE), high debt equity ratio and high share of value added in revenues. Group 3 is characterized by high productivity, high profitability (ROA, ROE), low debt equity ratio and high level of liquidity (Table 1).

Tab. 1: Economic indicators in basic year 2007

	Labour productivity	Value added/ revenue	ROA	ROE	Debt equity ratio	Current ratio
Group 1	1.32	0.16	-0.003	-0.049	0.62	0.9
Group 2	1.59	0.33	0.048	0.065	0.56	1.24
Group 3	1.88	0.29	0.162	0.172	0.36	1.59
Total	1.55	0.25	0.044	0.050	0.56	1.13

Source: Own calculations based on database ALBERTINA
Notes: ROA - Return on assets, ROE - Return on equity

What was the impact of financial-economic crisis in 2009 on economic characteristic of individual groups? We can see significant improvement in Group 1 with the lowest economic efficiency (Table 2). We can see the improvement in the all observed economic indicators. From more detailed analysis followed that main reason was better reaction of firms on crisis by improvement efficiency of using costs. On the other hand, we can see worse results in the field labour productivity and profitability in Group 3 - enterprises with the highest economic efficiency. The main reason was higher utilization of labour per unit of production.

Tab. 2: Economic indicators in economic crisis (2009)

|	Labour productivity	Value added/ revenue	ROA	ROE	Debt equity ratio	Current ratio
Group 1	1.53	0.24	0.031	0.213	0.55	1.08
Group 2	1.35	0.26	0.037	0.082	0.49	1.49
Group 3	1.76	0.28	0.120	0.111	0.25	1.94
Total	1.48	0.26	0.045	0.124	0.48	1.36

Source: Own calculations based on database ALBERTINA
Notes: ROA - Return on assets, ROE - Return on equity

Finally, we compare the economic characteristics of enterprises. We compare the beginning and end of the monitored period (2012). The result of Group 1 was as follows:significant improvement of labour productivity, liquidity and   decrease debt and improve liquidity.The main reasons are better utilization human capital and increasing of creation added value of enterprises. The result of Group 2 and Group 3 are not positive. The levels of most indicators have worsened except liquidity and debt equity ratio (Table 3). The main reasons were worse utilization of labour cost and decreasing of labour productivity.

Tab. 3: Economic indicators in year 2012

	Labour productivity	Value added/ revenue	ROA	ROE	Debt equity ratio	Current ratio
Group 1	1.54	0.20	0.031	0.028	0.49	1.17
Group 2	1.43	0.22	-0.018	-0.072	0.53	1.25
Group 3	1.73	0.26	0.078	0.083	0.28	2.47
Total	1.53	0.22	0.013	-0.007	0.48	1.33

Source: Own calculations based on database ALBERTINA

Notes: ROA - Return on assets, ROE - Return on equity

2.1. Development of profitability and indebtedness

The key economic characteristics of enterprises are profitability and indebtedness. At First, attention was focused on the level and evaluation of return on assets (ROA). In Figure 1 is outlined the development of ROA. The highest value of this indicator has for a long time Group 3 - companies with the highest economic efficiency. On the contrary firms in the Group 1 and Group 2 have worse results. The same conclusion we can recognize in the return on equity (ROE).

Fig. 1: Development of Return on assets (ROA)
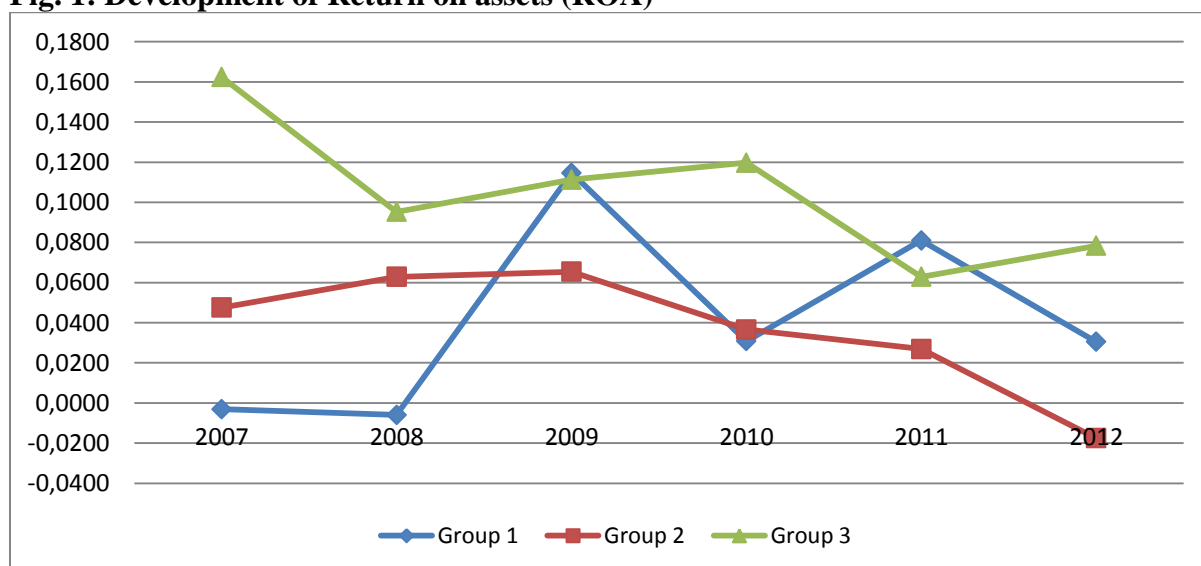
Source: Own calculations based on database ALBERTINA

The following Figure 2 shows us the level of debt equity ratio for individual groups.The lowest debt equity ratio had firms with the highest economic efficiency. The highest debt equity ratio had firms of Group 2. The improvement of debt equity ratio has caused by increasing of profitability in Group 3.

Fig. 2: Development Debt equity ratio

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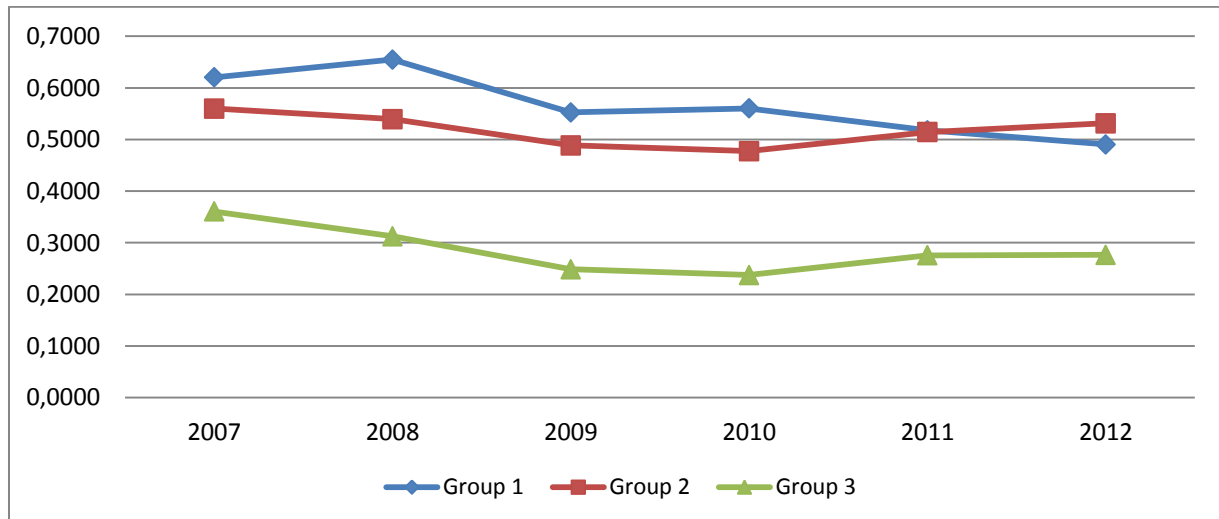
Source: Own calculations based on database ALBERTINA

Conclusion

The paper deals with the search for common economic characteristics for enterprises with the same economic efficiency. It was found that the enterprises with high levels of economic efficiency in the food industry evince high levels of profitability, low leverage and high liquidity. The enterprises with low level of economic efficiency are characteristic by low labour productivity, negative profitability (ROA, ROE), high debt equity ratio and low level of liquidity. On the other hand, enterprises with low level of economic efficiency have achieved a substantial improvement in the observed economic indicators of the business performance in a longer term horizon. The main reasons were better utilization of human capital and increasing of value added.

Acknowledgment

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