Multiple regression approach to modelling determinants of business success based on financial statements: Evidence from food processing companies in the Republic of Serbia

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Abstract

In this paper, the profitability determinants of food processing industry in the Republic of Serbia was analyzed at the level of meat, fruit and vegetable, and milk processing industry. The profitability determinants was estimated by panel data technique for the period 2007-2015 based on the sample of 657 observations of companies. Profitability was measured by return on assets, while as the independent determinants were defined size, debt ratio, quick ratio, inventory, sale growth and capital turnover ratio. The results show that among all three types of food processing industry sale growth has positive significant influence on profitability. Beside these, profitability of meat processing industry is positive related to the quick ratio and negative related to size, debt ratio and capital turnover ratio. Profitability of fruit and vegetable processing industry is negative related to size and capital turnover ratio. Profitability of milk processing companies is positive related to quick ratio and negative related to debt ratio. The results show the profile of specific companies from food processing industry which can be useful information for the various stakeholders such as managers of companies and owners, potential investor, creditors, suppliers and other users of financial statements for the purpose of business decision making.

Keywords: Panel analysis. Profitability. Food processing industry.

1. Introduction

The food processing industry has one of the most important role among all economic sectors. The importance the food processing sector is reflected by ensuring food safety production and reducing dependence on imports of main foodstuffs. One of the main prerequisites of the development of agricultural and therefor for food processing industry are natural resources such as the high quality of arable land and good climatic condition. The territory of the Republic of Serbia is situated on territory with good prerequisites for agricultural and food processing industry. Therefore, a large number of food processing companies have a major role in development of whole Serbian economy.

According to the data of Chamber of Commerce and Industry of Serbia (2017) the largest contribution to the growth of industrial production in May 2017 was registered in the production of activities of the chemical industry, food products, machinery and equipment, metal products, except machinery and coal exploitation. In the first five months of 2017 compared to the same period last year, food production increased 3.8 percent, while beverage production increased by 4.0 percent.

Compared to May 2016 production was even higher in food and beverage production by 5.7 and 7.8 percent, respectively. Furthermore, the food processing sector in the Republic of Serbia have significant number of employees. In 2017 in food processing industry 83,653 employees was engaged which represents 4.3 percent of the whole employment (Chamber of Commerce and Industry of Serbia, 2017).

The main sectors of food processing industry in the Republic of Serbia are meat processing industry, fruit and vegetable processing industry and milk processing industry. The market competition of companies of meat, fruit and vegetable, and milk processing industry is similar in the way of position between large and small companies. A small number of large companies have dominant position on market, while very large number of small processors have significant small market share. On the milk processing industry market a few milk processing companies participate at about 90% in total milk processing. These means that they dominate the market (Jaksic et al, 2015).

For the sustainable development of the food processing industry, business success of companies as processors are very important. The management of companies have continuously provide monitoring and analyzing of business success indicators in order to

prevent business failure, improve development of companies, as well as the whole food processing industry. In order to achieve business success and long term business, management of food processing industry have to investigate which factors have significant impact on business success. The aim of these paper is to investigate the significant factors that affect the food processing industry, separately at the level of meat processing industry, fruit and vegetable processing industry and milk processing industry.

2. Literature Review

Business success can be measured by several proxies such as profitability, growing customer, customer satisfaction, employee satisfaction and owner satisfaction (Gartner, 2008). According to Kuratko and Hodgetts (2011) profitability is the most important variable for measuring business success. One of the main goal of business is long-term operating and profitability is one of the main precondition for achiving it. Profitability represent the business`s ability to gain a return on an investment. Profitability can be measured as returno on assets, return on equity, gross profit ratio, net profit ratio etc. Return on assets is the most relevant accounting business performance measure (Aliabadi, Dorestani, Balsara, 2013; Muminovic et al., 2012).

Many researchers have used different approaches to examnine which variables have significant impact on profitability of comanies. The results of investigation which factors have influence on profitability are different based on the difference in characteristics of companies, industry and economy.

Chowdhury and Amin (2007) used multiple regression models based on cross sectional pooled data to investige determinants of profitability of pharmaceutical companies listed in Dhaka stock exchange. The results show that working capital have significant impact on profitability. Profitability was measured as return on equity.

Stierwald used random and fixed effect regression and corrects for dynamic panel bias for investigation which variables have signifacnt influence on 961 large Australian firms in period 1995-2005. The results show that lagged profit, productivity level and company size have a positive impact on firm profitability (Stierwald, 2010).

Sivathaasan et al. (2013) investigated factors of profitability of selected manufacturing companies listed on Colombo Stock Exchange in Sri Lanka for the period 2008-2012 by using multiple regression model. The results show that capital structure and non-debt shield have

statistically significant impact on profitability, while working capital, growth rate and company size have no significant effect on the profitablity.

Profitability of food industry in India base on size-wise analysis was conducted by Ramachandran and Raju (2012). The results show that vlatility and growth are significant determinants of profitability of small size firms. Furhtermore, growth is significant determinant of profitability of medium size firm.

Impact of firm specific factors on profitability of firms in food sector in Pakistan was examined by multivariate regression analysis (Nousheen, Arshad, 2013). The research is based on companies listed in food sector of Karachi stock market in the period 2002-2006. They point on significant negative relationship between size and profitability. On the other hand, tangibility, growth of the firm and food inflation are insignificantly positively related to profitability. Furthermore, negative insignificant relation is between debt to equity ration and profitability.

The profitability of the agricultural industry of countries of CEE region for the period 2011-2014 were analyzed by using a panel data estimation technique (Mijic, Jaksic, 2017). The results show that profitability of agricultural industry in Hungary and Romania is positively affected by leverage, quick ratio, growth and lagged profitability. On the other hand, size and fixed assets to total assets ratio are negatively related to the profitablity. Profitability of agricultural industry in Serbia and Bosnia and Herzegovina are positively related to the quick ratio, lagged profitability and growth, while in Bosnia and Herzegovina leverage is also significant.

3. Data and Methodology

3.1. The subject of research

The subject of the research in this paper is the search for the answer to the question of whether the panel models can identify the internal factors of business success and determine how these factors influence on the profitability of selected food processing companies in Serbia.

3.2. The aim of research

The aim of this paper is to analyse profitability and explain the dependence of the performance of the food processing industries in Serbia of the various internal factors (size, debt ratio, quick ratio, inventory, sale growth, capital turnover ratio), so potential investors will enable to better understand the factors that influence the success of the company's business, based on which they will be able to analyse the advantages and disadvantages of investments in food processing enterprises in Serbia. Also, more information about the impact of some internal factors on profitability will enable investors easier choice of the company they need to invest in and which will allow them to return invested funds with greater certainty.

3.3. Research hypotheses

In accordance with the subject and the aim of the research, the following hypothesis was set up:

H_1: Internal factors, such as size of company, debt ratio, quick ratio, inventory, sale growth and capital turnover ratio, have a significant impact on profitability (measured by return on assets) of selected food processing companies in Serbia.

3.4. Sample and sample selection

The study covers the period from 2007 to 2015 (9 years) and includes three groups (samples) of food processing companies - 29 meat processing companies, 22 fruit and vegetable processing companies and 22 milk processing companies.

The data were collected from the databases of Serbian Business Registers Agency and Scoring.

3.5. Measuring instruments

In this survey, the business success of selected food processing companies was measured by theirs profitability.

Return on Assets (ROA) and Return on Equity (ROE) are profitability indicators which are the most represented and often used in the analysis (Walsh, 2003).

In this paper, ROA has a function of the dependent variable. ROA is a better choice than ROE because "the return on equity wouldn't provide a good comparison because the small and the negative equity levels of some companies would generate distorted indicators of profitability" (Vieira, 2010).

The ROA ratio shows how good the company's total assets is employing by management in order to make a profit. It means that higher the ROA indicates that company earns more money on less investment. Also, ROA is a very useful indicator of comparison profitability within an industry.

3.6. Explanatory and dependent variables

Financial ratios generated from financial statements of selected companies are recognized as firm-specific factors which have impact on firm's productivity measured by ROA (Return on Assets). List of variables used in panel models is given in Table 1.

Table 1: List of variables

Variables	Type of variables	Indicator	Explanation	Expected Impact
Return on assets (ROA)	Dependent	Indicates company's ability to generate earnings from its assets.	ROA = Net Income / Total Assets	-
Size	Explanatory	Indicates the size of company	Size = Natural log of Total Assets	Positive
Debt ratio	Explanatory	Measures the extent of a company's leverage.	Debt ratio = Total debts / Total Assets	Negative
Quick ratio	Explanatory	Company's short-term liquidity indicator	Quick ratio = (current assets – inventories) / current liabilities	Positive
Inventory	Explanatory	Shows the portion of assets tied up in inventory	Inventory = Inventory / Total Assets	Negative
Sale growth	Explanatory	Shows increase (decrease) in sales between two time periods.	Sales Growth = (Current Period Sales – Previous Period Sales) / Previous Period Sales	Positive
Capital turnover ratio	Explanatory	Measures capital intensity of firm	Capital turnover ratio = Net Fixed Assets / Sale	Negative

Source: Authors illustration (based on Chandrapala and Knapkova, 2013; Bhutta and Hassan, 2013; Nuševa, Mijić, Jakšić, 2017).

3.7. Methodology

The research is based on a panel analysis which implies the necessary use of methodology in the field of analysis of panel data series.

The panel analysis takes into account the time and space component. The biggest advantage of the panel data set in comparison to comparative data is the fact that panel data allow the researcher great flexibility in modelling differences in behaviour of different subjects.

In order to analyze the impact of internal factors on profitability, as a measure of the success of the food processing companies in Serbia, the following general model (Pooled OLS model) was used:

$$y_{it} = \alpha + \beta_{it} x_{it} + u_{it} \quad (1)$$

where i is a subscript for observation (i = 1, …, N) and t for time (t = 1, …, T), y_{it} represents the dependent variable, the α tag for the cut, β is k x 1 parameter vector which needs to be evaluated on independent variables, x_{it} represents 1 x k vector observations on independent variables and u_{it} represents the mark for a random error (Brooks, 2008).

The Pooled OLS model has the most limitations, so the mostly used regression models in panel analysis are the model of fixed effects or the model of random effects.

The model of fixed effects involves taking into account the internal dimensions of the data, while the model of random effects takes into account both internal differences and differences between individual entities (Verbeek, 2008).

By incorporating internal variables into the equation (1), we obtain a model which assesses the impact of internal factors on the profitability of the selected companies:

$$ROA_{it} = \alpha_{it} + \beta_1 size_{it} + \beta_2 debt\_ratio_{it} + \beta_3 quick\_ratio_{it} + \beta_4 inventory_{it} + \beta_5 sale\_growth_{it} + \beta_6 capital\_turnover\_ratio_{it} + u_{it} \quad (2)$$

where *i* is a subscript for each enterprise (i = 1, …, n) and *t* for each year (t = 1, … 9).

4. Empirical Results and Discussions

4.1. Descriptive statistics

In order to investigate the nature and validity of the data used in analysis, the descriptive statistics of the variables used in analysis in all three samples is presented in Table 2.

Table 2: Descriptive statistics

	ROA	Size	Debt ratio	Quick ratio	Inventory	Sale growth	Capital turn over ratio
MEAT PROCESSING COMPANIES							
Mean	0.072329	5.477826	0.673674	0.961188	0.168956	0.191530	0.318306
Median	0.046400	5.441900	0.712930	0.810000	0.149400	0.138410	0.230480
Maximum	0.569700	7.164950	1.000000	5.160000	0.579540	2.531980	1.295530
Minimum	-0.330100	3.411620	0.164710	0.130000	0.001290	-0.628070	0.016210
Std. Dev.	0.100811	0.741732	0.206926	0.647834	0.110682	0.347182	0.251328
Observations	261	261	261	261	261	261	261
MILK PROCESSING COMPANIES							
Mean	0.058945	5.403680	0.617671	1.451414	0.121338	0.177337	0.297034
Median	0.049050	5.186932	0.616656	1.235000	0.108137	0.158567	0.271437
Maximum	0.358200	7.477299	1.000000	7.430000	0.443574	1.430929	1.038498
Minimum	-0.344700	3.923658	0.098870	0.230000	0.003326	-0.770839	0.005085
Std. Dev.	0.104412	0.885065	0.221975	0.914738	0.071714	0.243974	0.210961
Observations	198	198	198	198	198	198	198
FRUIT AND VEGETABLE PROCESSING COMPANIES							
Mean	0.042093	5.857547	0.624252	1.475455	0.297990	0.215152	0.681499
Median	0.041350	5.800345	0.665968	0.770000	0.289840	0.100868	0.423970
Maximum	0.262500	7.143248	1.000000	11.92000	0.702298	6.872516	6.579362
Minimum	-0.640300	4.674236	0.097736	0.010000	0.000000	-0.750331	0.000000
Std. Dev.	0.102950	0.484988	0.243278	2.154358	0.164701	0.717064	0.840148
Observations	198	198	198	198	198	198	198

Source: Author's calculation.

As we can see in Table 2, the average value of the ROA in the observed companies indicates a very low level of profitability (Meat processing companies 7,23%, Fruit and vegetable processing companies 4,21%, Milk processing companies 5,89%), because very good level of profitability is usually considered when the ROA indicator is above 10%. The same conclusion can be made considering the ROA trend in the observed period (Figure 1).

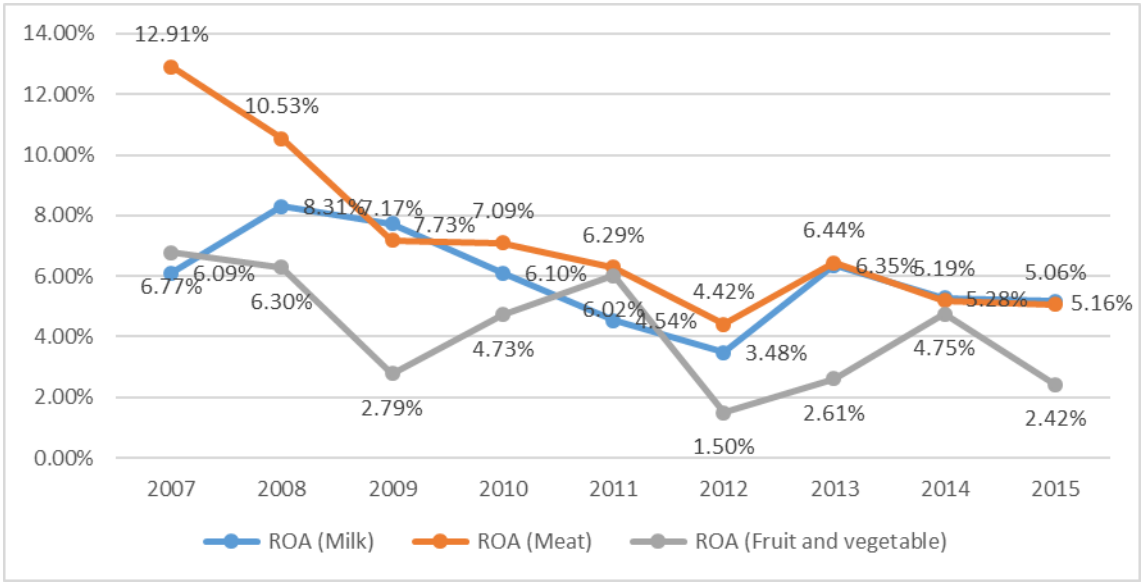

Figure 1: ROA trends in the period 2007-2015 in selected food processing companies in Serbia
Source: Authors.

On the other hand, the profitability of selected food processing enterprises is characterized by a very high standard deviation which shows the distance of the value from the average. This data points to the wide diversity of ROA in food processing companies in Serbia during the analysed period.

4.2. Choosing a model

An important question for researchers is choosing the right panel model (Table 3).

The joint significance of differing group means was base for the selection of appropriate model between the pooled OLS and the fixed effect. A p-value higher than 5% means that the pooled OLS model is more adequate than the fixed effects model and vice versa.

Testing the null hypothesis: Variance of the unit-specific error = 0 ($\sigma_u^2 = 0$) against the alternative: Variance of the unit-specific error > 0 ($\sigma_u^2 > 0$) is based on the Breusch-Pagan test. The p-value less than 5% means that the Breusch-Pagan test rejects the null hypothesis that the effects are not random and that the pooled OLS model is adequate, so accept the alternative that the effects are random.

The Hausman test is used for the selection of appropriate model between the random effect and the fixed effect.The Hausman test indicates in null hypothesis that the random

effects model is adequate. A low p-vaule (less than 5%) count against the null hypothesis. The Hausman test is based on the difference between the estimated values by the model of the fixed and model of stochastic effects (Baltagi, 2005).

Table 3: Panel model diagnostic

Diagnostics	Null hypothesis	Decision
Joint significance of differing group means:	The pooled OLS model is adequate	A p-value less than 5% (0.05) counts against the null hypothesis that the pooled OLS model is adequate, in favour of the fixed effects alternative.
Breusch-Pagan test statistic	The pooled OLS model is adequate	A p-value less than 5% (0.05) counts against the null hypothesis that the pooled OLS model is adequate, in favour of the random effects alternative.
Hausman test statistic	The random effects model is adequate	A p-value less than 5% (0.05) counts against the null hypothesis that the random effects model is adequate, in favour of the fixed effects alternative.

Source: Authors.

Table 4 gives an overview of model selection for each sample particular.

Model 1 refers to meat processing companies, model 2 to fruit and vegetable processing companies and model 3 to milk processing companies.

As we can see in Table 4 (section „Decision“) for Model 1 the fixed effects is adequate and for the Model 2 and Model 3 the random effects is more appropriate.

Table 4: Panel model diagnostic

Diagnostics	Model	p-value	Null hypothesis	Decision
Joint significance of differing group means	Model 1	0.000	The pooled OLS model is adequate.	The fixed effects is adequate.
	Model 2	0.000		The fixed effects is adequate.
	Model 3	0.000		The fixed effects is adequate.
Breusch-Pagan test statistic	Model 1	0.000	The pooled OLS model is adequate.	The random effects is adequate.
	Model 2	0.000		The random effects is adequate.
	Model 3	0.000		The random effects is adequate.
Hausman test statistic	Model 1	0.003	The random effects model is adequate.	The fixed effects is adequate.
	Model 2	0.542		The random effects is adequate.
	Model 3	0.328		The random effects is adequate.

Source: Authors.

4.3. Regression models and discussion

Variance impact factors (VIF) and tolerance of variables are calculated in order to detect multicollinearity in constructed regression models for all three samples (Table 5).

Table 5: Variance impact factors of variables

	Collinearity Statistics					
	Meat processing companies		Fruit and vegetable processing companies		Milk processing companies	
	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF
Size	0.637	1.570	0.946	1.057	0.578	1.731
Debt ratio	0.633	1.581	0.476	2.100	0.684	1.462
Quick ratio	0.632	1.583	0.522	1.917	0.626	1.597
Inventory	0.881	1.135	0.587	1.703	0.934	1.071
Sale growth	0.915	1.093	0.969	1.032	0.960	1.042
Capital turnover ratio	0.616	1.622	0.678	1.475	0.612	1.633

Source: Author's calculation.

Acceptable level of tolerance value is 0.10 and it is recommended as the minimum level of tolerance (e.g., Tabachnick & Fidell, 2001). The VIF recommendation of 10 corresponds to the tolerance recommendation of 0.10. Since all VIF values are less than 10 and all tolerance values are higher than 0.10 (Table 5), it is concluded that there is no multicollinearity between the variables.

For the selected meat processing companies, the fixed effect model is performed. The coefficients estimations are given in Table 6

Table 6: The fixed effect model – Meat processing companies

Dependent variable	**ROA**			
Variable	**Coefficient**	**Std. Error**	**t-ratio**	**p-value**
const	0.6205	0.1116	5.5584	**<0.00001*****
Size	**-0.0868**	0.0189	-4.5925	**<0.00001*****
Debt_ratio	**-0.1316**	0.0520	-2.5387	**0.01180****
Quick_ratio	**0.0326**	0.0107	3.0342	**0.00269*****
Inventory	-0.0076	0.0649	-0.1164	0.90741
Sale_growth	**0.0345**	0.0144	2.4024	**0.01709****
Capital_turn_over_ratio	**-0.0657**	0.0309	-2.1233	**0.03482****

Source: Author's calculation.
Note: *** - level of significance 1%; ** - level of significance 5% ; * - level of significance 10 %;

Based on the results presented in Table 6, we can see that the variables size of company and quick ratio are statistically significant at the level of significance of 1%, while the variable debt ratio, sale growth and capital turnover ratio are statistically significant at the level of significance of 5%. Variables size, debt ratio and capital turnover ratio have negative influence on the ROA, while the quick ratio and sale growth have positive influence on dependent variable. Only inventory variable have not statistically significant impact on ROA, so we can conclude that, in this case, the alternative hypothesis H_1 is accepted.

After providing all assumptions, for the fruit and vegetable processing companies, the random model is performed. The coefficients estimations is given in Table 7.

Table 7: Random effects model – Fruit and vegetable processing companies

Dependent variable	**ROA**			
Variable	**Coefficient**	**Std. Error**	**t-ratio**	**p-value**
const	0.3162	0.1452	2.1779	0.0306
Size	**-0.0406**	0.0232	-1.7472	**0.08222***
Debt ratio	-0.0749	0.0515	-1.4519	0.14816
Quick ratio	0.0063	0.0046	1.3814	0.16877
Inventory	0.0382	0.0631	0.6048	0.54602
Sale growth	**0.0360**	0.0084	4.3099	**0.00003*** **
Capital turnover ratio	**-0.0266**	0.0102	-2.6057	**0.00989*** **

Source: Author's calculation.
Note: *** - level of significance 1%; ** - level of significance 5%; * - level of significance 10 %;

In this case the panel analysis shows that variables sale growth (0.0036 – positive impact) and capital turnover ratio (-0.0266 – negative impact) are statistically significant at the level of significance of 1%, but only size of company (-0.0406 – negative impact) is statistically significant variable at the level of significance of 10%. Other variables didn't show statistically significant impact on dependent variable Return on assets (ROA) so we can conclude that alternative hypothesis H_1 is partly accepted.

As in the previous case, random effect model is performed for the sample which includes selected milk processing companies. The coefficients estimations are given in Table 8.

Table 8: Random effects model – Milk processing companies

Dependent variable	**ROA**			
Variable	**Coefficient**	**Std. Error**	**t-ratio**	**p-value**
const	0.2474	0.18027	1.3727	0.17166
Size	-0.01555	0.03253	-0.4781	0.63321
Debt_ratio	**-0.2210**	0.05866	-3.7674	**0.00023*****
Quick_ratio	**0.0183**	0.00902	2.0272	**0.04421****
Inventory	0.0386	0.10198	0.3787	0.70541
Sale_growth	**0.0601**	0.02441	2.4629	**0.01478****
Capital_turn_over_ratio	-0.0332	0.05153	-0.6446	0.52008

Source: Author's calculation.
Note: *** - level of significance 1%; ** - level of significance 5% ;

Based on the results in Table 8, we can see that there are three of six independent variables included in panel analysis that show statistically significance impact on ROA as dependent variable: a) debt ratio (-0.2210) shows negative impact on ROA at the level of significance of 1% b) quick ratio (0.0183) shows positive impact on ROA at the level of significance of 5% and c) sale growth (0.0601) also shows positive impact on ROA, but at the level of significance of 5%. In this case, also, set alternative hypothesis is partly accepted.

5. Conclusions

The profitability of food processing industry in the Republic of Serbia for the period 2007-2015 was examined. The food processing industry was diveded into three main segments: meat processing industry, fruit and vegetable processing industry, and milk processing industry. The food processing industry has main role in providing food safety production and supply.

The profitability of the food processing industry in the Republic of Serbia in the period od 2007-2015 is positive in average but has fluctuacting trend. In 2015 the average profitability is on the lower level than in 2007. The profitability of meat processing industry in 2015 was 5.06 percent, while in 2007 was 12.91 percent. The profitability of fruit and vegetable processing industry in 2015 was 2.42 percent, while in 2007 was 6.77 percent. The profitability of meat processing industry in 2015 was 5.16 percent, while in 2007 was 6.09 percent.

In order to investigate which determinants have significant influence on profitability among food processing companies a panel data analysis was realized. The results show that the profitability of meat processing companies is positive related to quick ratio and sale

growts, while is negative related to size, debt ratio and capital turnover ratio. The profitabililty of fruit and vegetable processing industry is significant related to the smaller number of factors such as sales growth which has positive influence and size and capital turnover ratio which have negative influence. Furthermore, the results of profitaiblity determinants among milk processing companies indicate that quick ratio and sales growth have positive impact on profitability, while on the other hand debt ratio has negative influence.

The research results provide information about companies profile of business success in the food processing industry. These results can be of interest for a wide range of stakeholders such as potential investors, creditors, suppliers, companies owners and managers in order to realize an adequate business decision making. Furhtermore, these results indicate on the significant factors that have influence on profitability which can be used as a part of creating strategy for future development of food processing industry.

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