THE IMPACT OF PROFITABILITY AND PRODUCTIVITY ON THE RISK OF BANKRUPTCY FOR AGRICULTURAL AND FOOD COMPANIES IN VOJVODINA

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Abstract: The paper deals with agricultural and food companies which operated on the territory of Vojvodina in 2019. The study analyzed the risk of bankruptcy measured by the Altman's Z-score method, as well as the profitability and productivity of the observed companies. The aim of the study was to use a multiple regression model to determine the impact of profitability and productivity on the risk of bankruptcy for agricultural and food companies of different sizes (including micro, small, medium and large companies) as well as to compare the results for these two sectors. The comparison of agricultural and food sectors was made according to the size of the companies. The obtained results indicated that profitability has a statistically significant positive impact on the risk of bankruptcy for micro and large agricultural companies, while for small agricultural companies, the risk of bankruptcy is statistically significant and positively affected by productivity. The risk of bankruptcy for medium-sized agricultural companies is not affected by the examined indicators. In addition, regression analysis indicated that the risk of bankruptcy for micro and small food companies has a statistically significant positive impact on profitability. In contrast, for medium and large food companies, the risk of bankruptcy is not affected by the observed variables.

Key words: profitability, productivity, bankruptcy, agriculture, food industry, Vojvodina.

Introduction

The risk of bankruptcy is one of the major risks in the modern business environment. Bankruptcy occurs when a company is not able to meet its obligations to creditors, i.e. when the value of the debt is higher than the value of the assets. Predicting bankruptcy is an important issue for many users of financial statements, including banks, investors, rating agencies, auditors, insurance

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companies and legislators (Lifschutz and Jacobi, 2010). Most studies dealing with business management include bankruptcy studies (Georgeta and Georgia, 2012). Bankruptcy studies usually aim to determine the impact of different financial ratios on the risk of bankruptcy for companies, which also applies to the studies dealing with the risk of bankruptcy for agricultural and food companies.

A large number of bankruptcy studies dealing with agricultural and food companies have been conducted worldwide.

The bankruptcy risk assessment of companies on the Romanian stock exchange was performed by Burja and Burja (2013). Using the Altman's Z-score model, the authors assessed the risk of bankruptcy for 12 agricultural companies for the period 2007–2012. The results of the study revealed that most of the observed companies were at a certain risk of bankruptcy, i.e. they operated in the gray zone. Aleksanyan and Huiban (2016) examined the impact of productivity and lending costs on the risk of bankruptcy for food companies in France for the period 2001–2012. The results of this study showed that the productivity of the company is an important indicator of bankruptcy and that productivity begins to decline three years before the bankruptcy. In addition, it was found that lending costs have a statistically significant positive impact on the likelihood of bankruptcy for the observed companies. Boratyńska and Grzegorzewska (2018) analyzed the application of the fsQCA method for predicting bankruptcy on a sample of 14 agricultural companies from Poland. In addition, the authors evaluated the application of 35 already known bankruptcy prediction models and compared these methods with the fsQCA method. Apan et al. (2018) investigated the risk of bankruptcy for 18 Turkish food companies by applying two models: The Altman's Z-score model and the VIKOR model. For the period 2008–2014, the findings of this study showed that the VIKOR model is more suitable for assessing the risk of bankruptcy for the observed companies. The risk of bankruptcy for milk processing companies in Belarus was investigated by Kontsevaya et al. (2019). The authors used financial ratios of 11 models to predict the bankruptcy of 6 large processing companies, revealing that the risk of bankruptcy in each year was unstable and that such condition was caused by a number of internal and external factors. Vavrek et al. (2021) analyzed the risk of bankruptcy on a sample of 469 Slovakian agricultural companies in 2016 by applying the Altman's Z-score model, Taffler's model and Bonity Index. It was found that the Altman's Z-score model and Bonity Index accurately predict the risk of bankruptcy for the observed sample of agricultural companies, while the Taffler's model shows certain contradictions.

Studies dealing with the risk of bankruptcy for agricultural and food companies have also been conducted in our country. Rajin et al. (2016) assessed the risk of bankruptcy for five agricultural companies from the Republic of Serbia for the period 2010–2013, by applying three models for predicting the risk of bankruptcy: The Altman's Z-score model, the Kralicek's DF model and the

Kralicek's Quick test. By comparing the obtained results, the authors found that the Kralicek's Quick test is the most suitable model for assessing the risk of bankruptcy for the observed companies. Vukadinović et al. (2018) applied three models for assessing the risk of bankruptcy (Altman's Z-score model, Kralicek's Quick test and balanced growth model) for three agricultural companies for the period 2014–2016. The analysis determined that all three companies were stable and that they were not at risk of bankruptcy. Tekić et al. (2020) carried out an assessment of the bankruptcy risk for milling companies from Vojvodina, for the period 2015–2019. By applying the Altman's Z-score model and the Kralicek's Quick test on a sample of five medium-sized companies, it was determined that both models are adequate for assessing the risk of bankruptcy of the observed companies.

This study deals with agricultural and food companies which operated in Vojvodina in 2019. The companies were grouped according to their size, and the aim was to determine the effect of productivity and profitability on the risk of bankruptcy, measured by the Altman's Z-score for different sizes of companies. The aim of this paper was also to compare the results obtained for companies from the agricultural and food sectors.

Materials and Methods

Sample and data sources

The research data were obtained from the financial statements of agricultural and food companies operating on the territory of Vojvodina, available on the website of Business Registers Agency of the Republic of Serbia. The companies were grouped by their size into micro, small, medium and large companies, according to the Law on Accounting ("Official Gazette of RS", No. 73/2019). Under the provisions of this Law, micro legal entities include legal entities that do not exceed two of the following three criteria: the average number of employees – 10, the operating income of 700,000 EUR and the average value of operating assets – 350,000 EUR. Small legal entities include the legal entities that exceed the above criteria for micro companies but do not exceed two of the following three criteria: the average number of employees – 50, the operating income of 8,800,000 EUR and the average value of operating assets – 4,400,000 EUR. Medium-sized legal entities are the legal entities that exceed two of the three criteria referring to small entities. However, they do not exceed two of the following criteria: the average number of employees – 250, operating income of 35,000,000 EUR and the average value of operating assets – 17,500,000 EUR. Large legal entities include the legal entities that exceed two of the three above criteria referring to medium-sized entities.

On the territory of Vojvodina, there were 1284 agricultural companies actively operating at the end of 2019, including 938 micro companies, 272 small companies, 66 medium-sized companies and 8 large companies (Business Registers Agency of the Republic of Serbia).

At the end of 2019, there were 700 food companies actively operating in Vojvodina, including 532 companies classified in the category of micro companies, 99 in the category of small companies, 51 in the category of medium-sized companies and 18 in the category of large companies (Business Registers Agency of the Republic of Serbia).

Baseline models

In order to determine the impact of productivity and profitability on the assessment of the bankruptcy risk for the observed companies, the research data were first processed using standard statistical tools of descriptive statistics, which was followed by the application of multiple regression.

The risk of bankruptcy

The literature on the risk of bankruptcy mainly refers to the application of different bankruptcy prediction models. The oldest and most commonly used model is the Altman's Z-score model, which was developed in 1968 based on a sample of companies from the US market (Altman, 1968). The sample consisted of 66 manufacturing companies, including 33 companies that went bankrupt and 33 companies which were active. The method of multiple discriminant analysis was used to measure the impact of 22 financial ratios on the bankruptcy of the companies, and it was determined that 5 financial ratios had a significant impact on the risk of bankruptcy for the observed companies. Each of the financial ratios was assigned appropriate weights, providing the function of the following form:

$$Z = 1.2 \cdot X_1 + 1.4 \cdot X_2 + 3.3 \cdot X_3 + 0.6 \cdot X_4 + 1.0 \cdot X_5 \qquad (1)$$

Z – the value of the discriminant function,
X_1 – the ratio of working capital to total assets,
X_2 – the ratio of retained earnings to total assets,
X_3 – the ratio of earnings before interest and tax (EBIT) to total assets,
X_4 – the ratio of the market value of equity to total liabilities and
X_5 – the ratio of sales to total assets.

Indicator X_1 shows the liquidity of the company. Indicator X_2 was obtained as the ratio of retained earnings to total assets, and it indicates cumulative profitability of the company, also providing information on the age of the company (Bryan et al., 2013). Indicator X_3 was calculated as the ratio of gross profit to total assets,

showing the company's profit rate, i.e. profitability. Indicator X_4 is a leverage measure, while indicator X_5 measures the asset turnover, i.e. it shows how efficiently the company uses the assets to generate sales.

Based on the obtained Z values, the companies were classified into three groups. The companies with a Z-score value above 2.67 were considered financially stable and were classified in the safe zone. If the value of a Z-score is between 1.81 and 2.67, it is considered that the business is financially unstable, but there is a chance of recovery, so these companies were classified in the gray zone. The companies with a Z-score value below 1.81 are the companies that will go bankrupt, and they are in the distress zone (Altman, 1968).

Productivity

Labour productivity measures how efficiently the company uses labour as a vital resource of the company (Krstić and Janković-Milić, 2003). Productivity is the ratio between total output and labor input. For the purposes of analyzing productivity, the following expression was used in this paper:

$$Productivity = \frac{Net\ business\ output}{No.of\ employees} \tag{2}$$

Higher productivity means that companies increase production using less input, which results in costs reduction (Bryan et al., 2013). Productivity is increased by intensifying production, i.e. by applying the most efficient available production technology.

Profitability

Profitability, as an indicator of economic success, reflects the primary function of the business determined as the ratio between profit, as the final business output, and the operating assets. The main goal of every company is to achieve maximum profit with minimum investment. In this study, profitability was calculated using the following expression:

$$Profitability = \frac{Net\ business\ output}{Total\ operating\ assets} \times 100 \tag{3}$$

The profitability of a company is necessary for the formation of financial resources, as well as for the expanded reproduction and improvement of both organizational and technological aspects of production. Stability and increased profitability are achieved by increasing the return on fixed and current assets, their optimal structure and intensification of production.

The assessment of the company position measured by the Altman's Z-score model is a complex measurement obtained by using five indicators that should be positively affected by labor productivity and profitability, as was examined in this study.

Regression analysis

The statistical analysis of the data was performed using the method of multiple regression to determine whether there is an impact of productivity and profitability on the assessment of credit risk of the observed companies. Regression analysis is used to assess the value of a dependent variable based on one or more independent variables (Mutavdžić and Đorić-Nikolić, 2018).

The applied regression model has the following form:

$$\hat{Y} = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_p X_{pi} + \varepsilon_i \qquad (4)$$

where $\hat{Y}$ is the value of a dependent variable, $X_{1i}, X_{2i}, \ldots, X_{pi}$ are the values of independent variables, while $\beta_1, \beta_2, \ldots, \beta_p$ are partial regression coefficients, which indicate the influence of individual independent variables on the dependent variable, provided that other regression parameters are held constant. Parameter α is the average initial level of the dependent variable, while ε_i is a random error of the model (Hadživuković, 1991). The statistical significance of the defined model was determined using the variance analysis for regression (Novaković, 2019).

In our models, Y is the risk of bankruptcy, measured by the Altman's Z-score, X_1 is profitability, determined as the rate of return on total operating assets (%), X_2 is productivity, determined as the net outcome per employee (RSD/employee) and ε_i is a random error.

In addition to regression analysis, the study also included correlation analysis performed by calculating multiple correlation coefficients, coefficients of multiple determination and adjusted coefficients of multiple determination. The software used for statistical data processing was the STATISTICA 14 software package.

Results and Discussion

The main indicators of descriptive statistics were calculated for the observed agricultural companies in Vojvodina (Table 1).

According to the results presented in Table 1, the average Z-score determined by the median value for micro agricultural companies in 2019 was 1.44 with large variations, which indicates high heterogeneity within the observed sample. In addition, the results of the Z-score for micro agricultural companies show that these companies, on average, operated in the distress zone, i.e. the zone of insolvency. The average profitability of micro agricultural companies was

extremely low, amounting to only 0.51% with considerable variations, as a large number of these companies had negative financial results. The productivity of micro agricultural companies ranged from -15,965 to 23,407 (RSD/employee), and it was also subject to large variability. Small agricultural companies had significantly better results compared to micro companies, with an average Z-score of 2.34, an average profitability of 1.41% and an average productivity of 272.01 (RSD/employee). Compared to micro companies, small agricultural companies were significantly less subject to variability for all observed indicators. Medium-sized agricultural companies had a lower Z-score value than small companies, but they achieved higher average profitability (1.92%) and productivity (514.38 RSD/employee). Large companies had the highest values of all three observed indicators, with the lowest variability. The average value of the Z-score for large agricultural companies was 2.67, which means that these companies operated in the safe zone, i.e. they were not at risk of bankruptcy.

Table 1. Descriptive statistics for agricultural companies.

Size of the company	Variable	Median	Minimum	Maximum	Coefficient of variation (%)
Micro companies	Z-score	1.44	-8155.40	611.89	7716.18
	Profitability	0.51	-53100.00	2451.40	1643.93
	Productivity	101.00	-15965.00	23407.00	2452.32
Small companies	Z-score	2.34	-1.10	2299.40	979.47
	Profitability	1.41	-40.00	30.00	307.61
	Productivity	272.01	-11331.60	208783.00	888.91
Medium-sized companies	Z-score	1.84	-0.80	31.91	150.31
	Profitability	1.92	-70.00	42.00	652.72
	Productivity	514.38	-10690.50	27398.39	371.91
Large companies	Z-score	2.67	1.480	8.22	67.96
	Profitability	3.48	-10.00	20.20	139.32
	Productivity	402.25	-278.21	4764.49	134.57

Source: Author's calculation.

The main indicators of descriptive statistics were also calculated for the observed food companies in Vojvodina for 2019 (Table 2).

The results presented in Table 2 show that the average Z-score determined by the median value for micro food companies in 2019 was 0.92. This value of the Z-score for micro food companies indicates that these companies were at risk of bankruptcy. The average profitability of micro food companies was extremely low, amounting to only 0.66% with large variations. The productivity of micro food companies averaged 81.83 (RSD/employee), and it was also subject to great variability. Small food companies achieved significantly better results than micro companies, with an average Z-score of 2.45, an average profitability of 3.04% and

an average productivity of 195.30 (RSD/employee). Compared to micro companies, small food companies showed significantly less variability in all observed indicators. Medium-sized food companies had a Z-score of 2.61, which means that they were close to doing business without the risk of bankruptcy. Compared to small companies, medium-sized companies had slightly lower profitability but higher productivity (265.22 RSD/employee). Large food companies had lower Z-score values compared to small and medium-sized companies, which means that they were more exposed to the risk of bankruptcy. The average value of the Z-score was 2.04, profitability was 4.51%, and productivity averaged 1257.44 (RSD/employee). Table 2 indicates large variations for all observed indicators, also showing that variability declined as the size of the company increased.

Table 2. Descriptive statistics of food companies.

Size of the company	Variable	Median	Minimum	Maximum	Coefficient of variation (%)
Micro companies	Z-score	0.92	-2318.50	2520.22	1898.61
	Profitability	0.66	-277.30	101.00	3235.03
	Productivity	81.83	-16348.00	10914.00	1576.62
Small companies	Z-score	2.45	-0.24	8.06	67.16
	Profitability	3.04	-0.31	0.92	269.49
	Productivity	195.30	-2400.40	9554.00	293.62
Medium-sized companies	Z-score	2.61	-1.64	8.85	75.07
	Profitability	2.58	-0.42	0.19	322.81
	Productivity	265.22	-6248.19	7919.79	457.45
Large companies	Z-score	2.04	0.70	4.67	47.31
	Profitability	4.51	-0.05	0.34	128.81
	Productivity	1257.44	-1988.50	11510.62	171.61

Source: Author's calculation.

The first step in the analysis is testing the formed regression models as a whole by using variance analysis (ANOVA) for regression (Table 3).

According to the results of analysis of variance for regression for micro agricultural companies, the null hypothesis was rejected, so it has been concluded that the formed model was statistically significant. The same conclusion has been reached for small and large agricultural companies. In contrast, in the case of medium-sized agricultural companies, the null hypothesis of analysis of variance for regression was accepted, so it can be concluded that the model was not statistically significant.

The regression model parameters were evaluated for the observed agricultural companies (Table 4).

Table 3. ANOVA for regression for agricultural companies.

Size of the company	Effect	Sum of squares	df	Mean squares	F	p-value
	Regression	15943885	2	7971943	22.25778	0.00000
Micro companies	Residual	334883609	935	358164		
	Total	350827494	937			
	Regression	179305	2	89652.38	4.5905097	0.010907
Small companies	Residual	5248310	269	19510.45		
	Total	5427615	271			
	Regression	45.559	2	22.77927	0.929551	0.0400077
Medium-sized companies	Residual	1543.858	63	24.50568		
	Total	1589.416	65			
	Regression	20.30888	2	10.15444	12.24749	0.011832
Large companies	Residual	4.14552	5	0.82910		
	Total	24.45440	7			

Source: Author's calculation.

Table 4. Main indicators of the regression model for agricultural companies.

Size of the company	Model	b*	Std. err. of b*	b	Std. err. of b	t	p-value
Micro companies	Intercept			15.81950	19.59426	0.807354	0.419668
	Profitability	0.213133	0.031961	5.32002	0.79778	6.668544	0.00001
	Productivity	0.001750	0.031961	0.00062	0.01140	0.054743	0.956355
Small companies	Intercept			8.5860	8.92171	0.962374	0.336726
	Profitability	0.074042	0.060780	166.86131	136.97455	1.218193	0.224218
	Productivity	0.154281	0.060780	0.00171	0.00070	2.538334	0.011703
Medium-sized companies	Intercept			3.142820	0.631361	4.977847	0.000005
	Profitability	0.157370	0.146361	7.166363	6.665005	1.075222	0.286376
	Productivity	0.020799	0.146361	0.000023	0.000164	0.142110	0.887446
Large companies	Intercept			1.93653	0.442782	4.37356	0.007198
	Profitability	1.072431	0.237054	31.13886	6.883044	4.52400	0.006260
	Productivity	-0.305865	0.237054	-0.00029	0.000225	-1.29027	0.253401

Source: Author's calculation.

Based on the results from Table 4 for micro agricultural companies, the following form of a regression model can be obtained:

$$\hat{Y} = 15{,}81950 + 5{,}32002X_1 + 0{,}00062X_2 + \varepsilon \qquad (1)$$

The obtained partial regression coefficients (b) indicate that parameter β_1, which defines the independent variable measuring profitability of the company, was statistically highly significant. This variable had a positive impact, and it can be concluded that when profitability increased by one percent, the value of the Z-score for micro agricultural companies increased by 5.32002. On the other hand, the results of regression analysis indicate that productivity had no statistically significant impact on the risk of bankruptcy for micro agricultural companies.

According to the results of regression analysis for small agricultural companies (Table 4), it is possible to obtain a model of the following form:

$$\hat{Y} = 8,5860 + 166,86131X_1 + 0,00171 + \varepsilon \tag{2}$$

Based on the partial regression coefficients, parameter β_2, which defines the independent variable measuring productivity of the company, was identified as statistically highly significant. This variable had a positive impact, so when productivity increased by one unit of measure (RSD/employee), the value of the Z-score for small agricultural companies increased by 0.00171. The results of regression analysis also indicate that profitability had no statistically significant impact on the risk of bankruptcy for small agricultural companies.

Analysis of variance for regression determined that the model for medium-sized agricultural companies was not statistically significant, as neither productivity nor profitability affected the risk of bankruptcy for medium-sized agricultural companies, as measured by the Altman's Z-score. The indicators of descriptive statistics determined that these companies had lower Z-score values but higher values of productivity and profitability compared to small companies, so the above conclusion is in accordance with the results of descriptive statistics.

Based on the results from Table 4 for large agricultural companies, a model of the following form was obtained:

$$\hat{Y} = 1,93653 + 31,13886X_1 - 0,00029X_2 + \varepsilon \tag{3}$$

The partial regression coefficient (b) indicates that parameter β_1, which defines the independent variable of profitability, was statistically highly significant, which means that the profitability of the company had a statistically significant impact on the risk of bankruptcy for large agricultural companies. Based on the positive sign of this variable, it can be concluded that when profitability increased by one percent, the value of the Z-score of large agricultural companies increased by 31.13886. The results of regression analysis for large agricultural companies also indicate that productivity had no statistically significant impact on the risk of bankruptcy for these companies.

Analysis of variance for regression was also applied to the observed food companies (Table 5).

Table Based on the results of variance analysis for regression, which is used to test models as a whole, it can be concluded that all models formed for food companies were statistically significant, so the null hypothesis was rejected for all companies regardless of the company size category.

The regression model parameters were evaluated for the observed food companies (Table 6).

Based on the results obtained from Table 6 for micro food companies, we can obtain a regression model of the following form:

$$\hat{Y} = 13,92058 + 5,88897X_1 + 0,00976X_2 + \varepsilon \tag{4}$$

The obtained partial regression coefficients (b) indicate high statistical significance of the parameter β_1, which defines the independent variable of the profitability of the company. This variable had a positive sign, so it can be concluded that when profitability increased by one percent, the value of the Z-score for micro agricultural companies increased by 5.888897. On the other hand, the regression analysis results indicate that productivity had no statistically significant impact on the risk of bankruptcy for micro food companies.

5. ANOVA for regression for food companies.

Size of the company	Effect	Sum of squares	df	Mean squares	F	p-value
Micro companies	Regression	4339142	2	2169571	70.35783	0.00000
	Residual	16312371	529	30836		
	Total	20651512	531			
Small companies	Regression	94.5795	2	47.28975	19.57498	0.00000
	Residual	231.9193	96	2.41583		
	Total	326.4988	98			
Medium-sized companies	Regression	34.9771	2	17.48857	3.434149	0.040371
	Residual	244.4423	48	5.09255		
	Total	279.4195	50			
Large companies	Regression	6.45157	2	3.225785	4.203675	0.035526
	Residual	11.51059	15	0.767373		
	Total	17.96216	17			

Source: Author's calculation.

Table 6. Main indicators of the regression model for food companies.

Size of the company	Model	b*	Std. err. of b*	b	Std. err. of b	t	p-value
Micro companies	Intercept			13.92058	7.631999	1.82398	0.068720
	Profitability	0.452934	0.038650	5.88897	0.502517	11.71895	0.00001
	Productivity	0.061752	0.038650	0.00976	0.006111	1.59772	0.110702
Small companies	Intercept			2.366336	0.169123	13.99177	0.00001
	Profitability	0.558260	0.098940	8.095830	1.434819	5.64241	0.00001
	Productivity	-0.043221	0.098940	-0.000048	0.000110	-0.43684	0.663207
Medium-sized companies	Intercept			2.87880	0.332499	8.658084	0.000001
	Profitability	0.475197	0.266229	13.17274	7.380013	1.784921	0.080594
	Productivity	-0.150508	0.266229	-0.00019	0.000339	-0.565334	0.574480
Large companies	Intercept			1.65528	0.278333	5.947113	0.000027
	Profitability	0.890786	0.589135	11.04559	7.305166	1.512024	0.151308
	Productivity	-0.322788	0.589135	-0.00012	0.000225	-0.547902	0.591820

Source: Author's calculation.

Based on the results of the regression analysis for small food companies (Table 4), the model of the following form can be obtained:

$$\hat{Y} = 2,366336 + 8,095830X_1 - 0,000048 + \varepsilon \qquad\qquad (5)$$

The partial regression coefficients identified parameter β_1 as statistically highly significant. This parameter defines the independent variable, which measures the profitability of the company. As this variable had a positive sign, it means that when profitability increased by one unit of measure (%), the value of the Z-score of small food companies increased by 8.095830. The results of regression analysis also indicated that productivity had no statistically significant impact on the risk of bankruptcy for small food companies.

The results of regression analysis for medium-sized and large food companies showed that none of the analyzed variables had a statistically significant impact on the risk of bankruptcy for the observed companies. This result can also be inferred by analyzing the average values of the observed indicators, as the Z-score was higher while profitability and productivity were significantly lower in medium-sized companies compared to large companies.

Conclusion

This study analyzed the impact of profitability and productivity on the risk of bankruptcy for agricultural and food companies in Vojvodina in 2019. The obtained results point to the following conclusions:

By comparing micro companies from the agricultural and food sectors, it can be concluded that agricultural companies had a higher average Z-score value (1.44>0.92) and higher average productivity (101>81.83), while food companies were more profitable (0.51<0.66). Regression models for micro companies from both sectors indicate that profitability had a statistically significant positive impact on the risk of bankruptcy for the observed companies. The positive impact of profitability on the value of the Z-score means that when profitability increased, the risk of bankruptcy for the observed companies declined.

In the case of small agricultural and food companies, it can be observed that agricultural companies had a lower average value of the Z-score (2.34<2.45) compared to companies from the food sector, which means that companies from the agricultural sector were more exposed to the risk of bankruptcy. Small agricultural companies also had lower profitability (1.41<3.04) but higher productivity (272.01>195.30) than small food companies. The results of the regression model for small agricultural companies identified productivity as a significant factor, while for small food companies, it was profitability. In both models, it was found that the observed independent variables had a positive impact on the dependent variable, which means that when productivity and profitability increased, the value of the Z-score also increased.

By comparing the results of descriptive statistics for medium-sized agricultural and medium-sized food companies, it can be concluded that

agricultural companies had a lower average value of the Z-score (1.84<2.61), lower profitability (1.92<2.58), but higher productivity (514.38>265.22) compared to food companies. The results of the regression analysis for medium-sized companies in both sectors showed that the risk of bankruptcy was affected by neither profitability nor productivity. This result can be accounted for by the fact that medium-sized companies achieve good business results, so the used indicators are not crucial for assessing the risk of bankruptcy.

Large companies from both sectors were relatively stable, with a low risk of bankruptcy, as the average Z-score for agricultural companies was 2.67, while the average value of the Z-score for food companies was 2.04. The profitability of large agricultural companies was lower compared to the profitability of food companies of the same size (3.48<4.51). Also, the productivity of large agricultural companies was lower than the productivity of large food companies (402.25<1257.44). The results of the regression analysis indicated that for large agricultural companies, the risk of bankruptcy was statistically significantly and positively affected by profitability. However, for large food companies, the risk of bankruptcy was affected by neither profitability nor productivity.

The results of the performed analysis show that the profitability of the observed agricultural companies increased when the company was larger. Medium-sized agricultural companies had higher productivity compared to large agricultural companies due to the outdated production technology of large agricultural companies. It can be concluded that the profitability of the observed food companies also increased when company size increased, except in the case of medium-sized companies, which had lower profitability compared to small companies. Higher productivity of small companies compared to medium-sized ones can be accounted for by a higher rate of investment in fixed and current assets, as well as the intensification of production. The productivity of food companies increased when the company size was larger, which is certainly the result of investments in more intensive production technology.

Recommendations for further studies based on the results obtained in this paper are to examine other independent variables, i.e. more financial ratios, and to determine their impact on the risk of bankruptcy for agricultural and food companies in Vojvodina.

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UTICAJ RENTABILNOSTI I PRODUKTIVNOSTI NA RIZIK BANKROTSTVA POLJOPRIVREDNH I PREHRAMBENIH PREDUZEĆA U VOJVODINI

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R e z i m e

U radu su analizirana poljoprivredna i prehrambena preduzeća koja su poslovala na području Vojvodine u 2019. godini. Analizom su obuhvaćeni rizik bankrotstva, meren Altmanovim Z-skorom, rentabilnost i produktivnost posmatranih preduzeća. Cilj rada bio je da se na osnovu podele preduzeća po veličini, na mirko, mala, srednja i velika, primenom modela višestruke regresije utvrdi uticaj rentabilnosti i produktivnosti na rizik bankrotstva poljoprivrednih i prehrambenih preduzeća različite veličine, kao i da se uporede rezultati iz ova dva sektora. Na osnovu dobijenih rezultata utvrđeno je da na rizik bankrotstva mikro i velikih poljoprivrednih preduzeća statistički značajan i pozitivan uticaj ima rentabilnost, dok na rizik bankrotstva malih poljoprivrednih preduzeća pozitivan i statistički značajan uticaj ima produktivnost. Na rizik bankrotstva srednjih poljoprivrednih preduzeća ne utiču ispitivani pokazatelji. Regresionom analizom utvrđeno je i da na rizik bankrotstva mikro i malih prehrambenih preduzeća statistički značajan pozitivan uticaj ima rentabilnost, dok na rizik bankrotstva srednjih i velikih prehrambenih preduzeća ne utiču posmatrane promenljive.

Ključne reči: profitabilnost, produktivnost, bankrotstvo, poljoprivreda, prehrambena industrija, Vojvodina.

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