Original Scientific Article

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ANALYSIS OF ECONOMIC PERFORMANCE OF TRADE COMPANIES IN SERBIA

ABASTRACT: The issue of analysis of economic performance in commercial enterprises in this paper is investigated from the angle of the impact of labor process factors (fixed, working capital and human capital) on profitability and efficiency, on the example of trade enterprises in Serbia. performance. The economic performance of trade companies in Serbia is significantly affected by fixed and working capital. The impact of human capital is moderate. In the future, in order to improve the economic performance of trade companies in Serbia, it is necessary to more efficiently manage human capital through training, salary, improvement of managerial position, compensation.

Key words : fixed assets, current assets, earnings per employee, ratio analysis, statistical analysis, DEA models, Serbian trade

INTRODUCTION

In order to improve the economic performance of commercial enterprises, it is generally necessary to manage fixed, working and human capital as efficiently as possible. With this in mind, the subject of research in this paper is the impact of labor process factors (fixed assets, working capital

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and human labor) on the economic performance of trade enterprises in Serbia. The purpose and goal of the given research is to deal with the treated issues as complex as possible, and to propose adequate measures for improving the economic performance of trade companies in Serbia in the future. This, among other things, reflects the scientific and professional contribution of this paper.

In recent times, as is well known, there is a very rich literature dedicated to the analysis of economic and financial performance in trade from different research angles - factors and measurement (Berman, 2018; Frei, 2022). Also, a very rich world literature is devoted to evaluating the efficiency and productivity of all enterprises, including trade, based on DEA (Data Envelopment Analysis) models, application of AHP (Analytical Hierarchical Process) and TOPSIS methods, econometrics, regression analysis (Malmquist, 1953; Asmild, 2004; Andersen, 1993; Donthu, 1998; Tone, 2001; Tone, 2002; Tone, 2009; Tone, 2010; Asmild, 2004; Fare, 1994; Fare, 1995; Moreno, 2010; Vaz, 2010; Wang, 2011; Moreno, 2011; Vaz, 2012; Lau, 2013; Lee, 2013; Gandhi, 2014; Al-Refaae, 2015; Anand, 2015; Majumdar, 2017; Barros, 2004; Barros, 2006; Bambe, 2017; Qiu, 2017; Sarmento, 2017; Ko, 2017; Hsu, 2018; Haidar, 2018; Camanho, 2009; Caves, 1982; Jorge, 2009; Melo, 2018; Yu, 2009; Busu, 2020; Cheng, 2020; Ali, 2018; Bhargava, 1998; Cheng, 2020; JCTrejo García et al. 2017; Karan, 2008; Keener, 2013; Kingyens, 2012; Laitinen, 1999; Manini, 2018; Mihalovič, 2016; Rogova, 2018; Sami Mestiri, 2012; Simbolon, 2017). However, when it comes to literature in Serbia, it is still not at an enviable level, i.e. there are few extensive papers dedicated to the analysis of economic and financial performance of trade companies in Serbia using modern mathematical models and methods (Analytical Hierarchical Process - AHP, Data Envelopment Analysis - DEA, TOPSIS and others), econometric and statistical analysis (Lukic, 2011; Lukic, 2015 ; Lukic, 2018; Lukic, 2019; Lukic et al., 2019; Lukic et al., 2020). This gap should be filled to some extent by this paper, and this , among other things, reflects his scientific and professional contribution.

A complex analysis of the economic performance of trade in Romania was carried out (Busu et al., 2020). Almost the same analysis is applied in this paper on the example of trade in Serbia.

The basic research hypothesis in this paper is that continuous monitoring of the economic situation of all companies, which means trade, provides a basis for improvement in the future and taking appropriate measures. This is especially true in the case of trading companies in Serbia.

The research methodology of the treated issues in this paper is based on ratio analysis, comparative analysis, statistical analysis and DEA (Data Envelopment Analysis) approach. The comparative results obtained by applying the given methodology enable a better understanding of the situation

regarding the economic performance of trade in Serbia as a function of strengthening it in the future by applying relevant measures.

Necessary empirical data for the research of the treated issues in this paper were collected from the Agency for Business Registers of the Republic of Serbia for the period 2013 – 2021. They are "manufactured" in accordance with relevant international standards and there are no restrictions on international comparison.

INFLUENCE OF WORK PROCESS ON ECONOMIC PERFORMANACE OF TRADE COMPANIES IN SERBIA

Three important factors of the work process in all companies, which means in trade, are fixed assets, working capital and human labor (Lukic, 2020a,b,c, 2021a,b,c,d,e,f, 2022a,b,c,d,e,f,g). Their effective control can significantly affect the achievement of targeted economic performance. We will analyze the impact of work process factors on the economic performance of trade companies in Serbia by applying ratio analysis and statistical analysis. In the context of ratio analysis, in this paper we will pay special attention to the return on fixed and working capital and earnings per employee in trade companies in Serbia.

Table 1 shows the initial input / output data for the analysis of economic performance of trade enterprises in Serbia. Table 2 shows the input / output data statistics.

Table 1. – Initial input / output data for the analysis of economic performance of trade enterprises in Serbia

Year	(I) Fixed assets	(I) Current assets	(I) Number of employees	(O) Earnings before interest and taxes (EBIT)	(O) Net profit
2013	790448	1361155	193210	124241	89730
2014	750729	1318032	191621	112922	79234
2015	802193	1424135	159621	135916	102303
2016	800659	1503476	206092	133277	102002
2017	817685	1568615	208020	159613	126734
2018	856181	1638588	219373	148905	116386
2019	932421	1744078	222049	171642	139409
2020	962951	1861105	230139	198377	162184

2021	1099726	2057718	234727	245546	208075

Note: Data are expressed in millions of dinars. Number of employees in the whole number

Source: Agency for Business Registers of the Republic of Serbia

Table 2. – Data input / output statistics

		Minimum	**Maximum**	**Mean**	**Std. Deviation**
Fixed assets		750729.00	1099726.00	868110.3333	110773.44380
Current assets		1318032.00	2057718.00	1608544.6670	244196.45690
Number of employees		159621.00	234727.00	207205.7778	23336.38395
Earnings before interest and taxes (EBIT)		112922.00	245546.00	158937.6667	41576.34872
Net profit		79234.00	208075.00	125117.4444	40235.82024
N Valid N (listwise)		9	9	9	9
N Missing		0	0	0	0
Correlations					
		1	2	3	4	
1 Fixed assets	Pearson Correlation	1	.975**	.747*	.978**	.978**
	Sig. (2-tailed)		.000	.021	.000	.000
	N	9	9	9	9	9
2 Current assets	Pearson Correlation	.975**	1	.820**	.974**	.979**
	Sig. (2-tailed)	.000		.007	.000	.000
	N	9	9	9	9	9
3 Number of employees	Pearson Correlation	.747*	.820**	1	.732*	.740*
	Sig. (2-tailed)	.021	.007		.025	.023
	N	9	9	9	9	9
4 Earnings before interest and taxes (EBIT)	Pearson Correlation	.978**	.974**	.732*	1	.999**
	Sig. (2-tailed)	.000	.000	.025		.000
	N	9	9	9	9	9
5 Net profit	Pearson Correlation	.978**	.979**	.740*	.999**	1
	Sig. (2-tailed)	.000	.000	.023	.000	
	N	9	9	9	9	9
**. Correlation is significant at the 0.01 level (2-tailed).						

Note: Author's calculation using the SPSS software program

There is a strong correlation between the analyzed variables at the level of statistical significance.

Return on fixed and working capital is a significant indicator of profitability. In this paper, it is expressed as: earnings before interest and taxes (EBIT) / fixed assets, net profit / fixed assets, earnings before interest and taxes

(EBIT) / current assets and net profit / current assets. Earnings before interest and taxes (EBIT) are determined as the sum of net profit, interest and taxes. Table 3 shows the return on fixed and working capital of trade companies in Serbia for the period 2013 - 2021.

Table 3. – Return on fixed and working capital of trade companies in Serbia, 2013 - 2021

Year	Earnings before interest and taxes (EBIT) / Fixed assets	Net profit / Fixed assets	Earnings before interest and taxes (EBIT) / Current assets	Net profit / Current assets
2013	15.72%	11.35%	9.13%	6.59%
2014	15.04%	10.55%	8.57%	6.01%
2015	16.94%	12.75%	9.54%	7.18%
2016	16.65%	12.74%	8.86%	6.78%
2017	19.52%	15.50%	10.18%	8.08%
2018	17.39%	13.59%	9.09%	7.10%
2019	18.41%	14.95%	9.84%	7.99%
2020	20.60%	16.84%	10.65%	8.71%
2021	22.32%	18.03%	11.93%	10.11%

Note: Author's calculation

The data in the given table show the tendency to increase the return on fixed and working capital (as indicators of profitability) in Serbian trade companies. This means, in other words, that the efficiency of managing all assets (fixed and current assets) has increased.

Recently, as it is known, the **earnings per employee** is one of the most important indicators of the performance of all companies, which means trade. It shows, among others, the influence of "invisible" characteristics of employees (for example, skill, creativity) on performance. Table 4 shows the earnings per employee in Serbian trade companies for the period 2013 - 2021.

Table 4. – Earnings per employee in trade companies of Serbia, 2013 -2021

Year	Fixed assets per employee	Current assets per employee	Earnings before interest and taxes (EBIT) per employee	Net profit per employee	Coefficient of ratio of current and fixed assets
2013	4091.134	7044.951	643.0361	464.417	1.722004
2014	3917.78	6878,328	589.2987	413.4933	1.755669
2015	5025.611	8921.978	851,492	640.9119	1.775302

2016	3884.959	7295.169	646.6869	494.9343	1.877798
2017	3930.8	7540.693	767.2964	609.2395	1.918361
2018	3902.855	7469.415	678.7754	530.5393	1.913834
2019	4199.168	7854.474	772.9915	627.8299	1.870483
2020	4184.214	80086.873	861.987	704.721	1.932709
2021	4685.247	8766.430	1046.118	886.455	1.871118

Note: Data are expressed in millions of dinars. Author's calculation

The data in the given table show the tendency to increase earnings per employee (as performance indicators) in Serbian trade companies. This was influenced, in addition to external ones, by the significant improvement of internal business conditions of a material and technical nature, as well as the increased efficiency of human resources management.

Using the **linear regression model,** we will look at the impact of fixed, working capital and human capital on the performance of trading companies in Serbia. The linear regression equation is:

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + e \qquad (1)$$

where: Y - net profit, X_1 - fixed assets, X_2 - current assets, X_3 - number of employees, a and b - coefficients, and e - random error.

In Table 5 shows the results of linear regression.

Table 5. – Results of the application of linear regression in the analysis of the influence of work process factors on the economic performance of trade enterprises in Serbia

Model Summary[b]										
Mo del	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Chang e	df1	df2	Sig. F Change	
1	.987[a]	.975	.960	8070.111 61	.975	64.621	3	5	.000	2.329
a. Predictors: (Constant), Number of Employees , Fixed Assets , Current Assets										
b. Dependent Variable: Net profit										

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12625736340.000	3	4208578779.000	64.621	.000[b]
	Residual	325633507.100	5	65126701.410		

	Total	12951369840.000		8

a. Dependent Variable: Net profit

b. Predictors: (Constant), Number of Employees , Fixed Assets , Current Assets

Coefficientsᵃ

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	Upper Bound	Correlations Zero-order	Partial	Part	Collinearity Statistics Tolerance	VIF
1	(Constant)	-133952.104	37672.133		-3.556	.016	-230791.404	-37112.804					
	Fixed Assets	.120	.126	.330	.951	.385	-.204	.444	.978	.391	.067	.042	23.961
	Current Assets	.127	.066	.770	1.909	.114	-.044	.298	.979	.649	.135	.031	32.332
	Number of Employees	-.237	.234	-.137	-1.013	.358	-.838	.365	.740	-.413	-.072	.273	3.661

a. Dependent Variable: Net profit

Collinearity Diagnosticsᵃ

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Fixed assets	Current assets	Number of employees
1	1	3.985	1.000	.00	.00	.00	.00
	2	.012	18.587	.28	.00	.01	.00
	3	.003	35.021	.12	.03	.00	.67
	4	.000	116.738	.60	.96	.98	.33

a. Dependent Variable: Net profit

Residuals Statisticsᵃ

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	77880.5000	203352.5781	125117.4444	39726.77991	9
Residual	-8229.65723	12921.76367	.00000	6379.98342	9
Std. Predicted Value	-1.189	1.969	.000	1.000	9
Std. Residual	-1.020	1.601	.000	.791	9

a. Dependent Variable: Net profit

Note: Author's calculation using the SPSS software program

There is a strong correlation between net profit and fixed and working capital (at the level of statistical significance). There is a moderate correlation between net profit and employment. This means, in other words, that even more work should be done to motivate employees to achieve the target profit in Serbian trade companies (through training, salary increases, better managerial positions, and compensation - bonuses). All three factors of the work process (fixed, working capital) are significantly integrated and determine the economic performance (net profit) of trade companies in Serbia (Adjusted R Square .844, Sig. .036).

The linear regression equation for trading companies in Serbia can therefore be formulated as:

$Y = -133952.104 + .120X_1 + .127X_2 - .237X_3$

Based on it, a projection of net profit for future observed time can be made period.

Using the **binary logistics model**, we will also investigate the impact of labor process factors (fixed, working capital and human capital) on the economic performance (net profit) of trade companies in Serbia.

Log analysis is a form of regression analysis in which the dependent variable is dichotomous, of the binary type known as the *dummy* variable. The binary logistics model is used to estimate the probability of an event occurring. It is formulated as:

$$Prob(event) = \frac{1}{1 + e^{-z}} \qquad (2)$$

For one independent variable

$$z = b_0 + b_1 x_1$$

For multiple independent variables

$$z = b_0 + b_1 x_1 + b_2 x_2 + b_n x_n$$

where: b_0 and b_1, b_2 - coefficients (estimated from data), x_1, x_2 - independent variables, n - number of independent variables, and e - basis of natural logarithm (2,781).

Due to the nonlinearity of the model, the maximum probability method is used to calculate the coefficients, instead of the most commonly used least squares method. If the independent variable is equal to 0, the probability of

the event is determined by the segment (b_0) . If the regression coefficient is positive (negative), the risk factor increases (decreases) the probability of the event.

Table 6 shows the initial data for the application of the binary logistics model in the analysis of the impact of labor process factors on the economic performance (net profit) of trade enterprises in Serbia.

Table 6. – Initial data for the application of the binary logistics model in the analysis of the impact of labor process factors on economic performance (net profit) of trade enterprises in Serbia, 2013 - 2021

Year	(I) Fixed assets (in millions of dinars)	(I) Current assets (in millions of dinars)	(I) Number of employees	Economic performance, good 1, bad 0 *
2013	790448	1361155	193210	1
2014	750729	1318032	191621	1
2015	802193	1424135	159621	1
2016	800659	1503476	206092	0
2017	817685	1568615	208020	1
2018	856181	1638588	219373	0
2019	932421	1744078	222049	1
2020	962951	1861105	230139	1
2021	1099726	2057718	234727	1

Note: * Author's calculation

Table 7 shows the results of the application of the binary logistics model in the analysis of the impact of labor process factors on the economic performance (net profit) of trade enterprises in Serbia.

Table 7. – The results of the application of the binary logistics model in the analysis of the impact of labor process factors on the economic performance (net profit) of trade enterprises in Serbia.

Omnibus Tests of Model Coefficients				
		Chi-square	df	Sig.
Step 1	Step	9.535	3	.023
	Block	9.535	3	.023
	Model	9.535	3	.023
Model Summary				
Step	-2 Log likelihood		Cox & Snell R Square	Nagelkerke R Square
1	.000[a]		.653	1.000

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	5	1.000

Contingency Table for Hosmer and Lemeshow Test

		Economic performance = .00		Economic performance = 1.00		
		Observed	Expected	Observed	Expected	Total
Step 1	1	1	1.000	0	.000	1
	2	1	1.000	0	.000	1
	3	0	.000	1	1.000	1
	4	0	.000	1	1.000	1
	5	0	.000	1	1.000	1
	6	0	.000	1	1.000	1
	7	0	.000	3	3.000	3

Classification Table[a,b]

			Predicted		
			VAR00004		
	Observed		.00	1.00	Percentage Correct
Step 0	VAR00004	.00	0	2	.0
		1.00	0	7	100.0
	Overall Percentage				77.8

a. Constant is included in the model.

b. The cut value is .500

Classification Table[a]

			Predicted		
			Economic performance		
	Observed		.00	1.00	Percentage Correct
Step 1	Economic performance	.00	2	0	100.0
		1.00	0	7	100.0
	Overall Percentage				100.0

a. The cut value is .500

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Fixed assets	.001	.298	.000	1	.998	1.001
	Current assets	.001	.182	.000	1	.997	1.001
	Number of employees	-.014	2.336	.000	1	.995	.986
	Constant	1272.488	248875.231	.000	1	.996	.
a. Variable(s) entered on step 1: Fixed assets, Current assets , Number of employees .							

Correlation Matrix					
		Constant	Fixed assets	Current assets	Number of employees
Step 1	Constant	1.000	-.285	.943	-.916
	Fixed assets	-.285	1.000	-.452	-.093
	Current assets	.943	-.452	1.000	-.836
	Number of employees	-.916	-.093	-.836	1.000

Note: Author's calculation using the SPSS software program

The data in the given table show that the factors of the labor process (fixed, working capital and human capital) affect the economic performance of trade companies in Serbia with about 70% (Cox & Snell R Square .653), or 100% (Nagelkerke R Square 1.000). The binary regression model agrees well with the data (Hosmer and Lemeshow Test **-** Sig. 1.000> .05), the observed and expected frequencies do not differ significantly (Contingency Table for Hosmer and Lemeshow Test). The method is correct (Overall Percentage 100.0) and it is therefore significantly improved compared to the initial (zero) (Overall Percentage 77.8%).

The binary logistics model for trade companies in Serbia can, therefore, be expressed as:

$$Prob(event) = \frac{1}{[1 + \ e^{-(1272.488 + \ .001x_1 + .001x_2 - .014x_3)}]}$$

$$Z = 1272.488 + \ .001x_1 + .001x_2 - .014x_3$$

Based on it, we can calculate the probability of the occurrence of a certain event, in our case the good or bad economic performance of trade companies in Serbia.

ANALYSIS OF THE EFFICIENCY OF TRADE COMPANIES IN SERBIA BASED ON THE DEA MODEL

We will perform the analysis of the efficiency of trade companies in Serbia only on the basis of the DEA model of entry orientation, with a constant and variable returns. This is because the focus of this paper is on the analysis of the impact of labor process factors (fixed, working capital and human capital) on the performance / efficiency of trade companies in Serbia.

The two basic DEA models are: CCR (Constant Returns) and BCC (Variable Returns).

The **CCR model** is based on a fixed or constant scale returns. This means that a proportional increase in all inputs results in the same proportional increase in all outputs. The dual of CCR efficiency is expressed as:

$$Min\ \theta$$

under restriction

$$\sum_{j=1}^{n} \lambda_j x_{ij} \leq \theta x_{io} \qquad i = 1 \dots m$$

$$\sum_{j=1}^{n} \lambda_j y_{kj} \geq y_{ko} \qquad k = 1 \dots s$$

$$\lambda \geq 0 \qquad j = 1 \dots n \qquad (3)$$

where θ technical efficiency of DMU units is 0, λ is a dual variable for identifying comparable inefficient units. If θ * is equal to the value of one, the observed DMU unit is technically efficient.

A firm is efficient (financially non-risky) if the value of the coefficient is equal to one. However, it is inefficient (financially risky) if the value of the coefficient is less than one. The closer it is to zero, the more "disturbing" it is.

The concept of the CCR model has been modified with the introduction of the **BCC model** (by *Banker-Charnes-Cooper*) by changing the constant returns from scale (CRS) with variable returns from scale (VRS). A DMU unit operates under a variable returns from the scale if an increase in input does not result in a proportional change in output. The BCC model is shown as follows:

$$Min\ \theta$$

under restriction

$$\sum_{j=1}^{n} \lambda_j x_{ij} \leq \theta x_{io} \qquad i = 1 \ldots m$$

$$\sum_{j=1}^{n} \lambda_j y_{kj} \geq y_{ko} \qquad k = 1 \ldots s$$

$$\sum_{j=1}^{n} \lambda_{j=1} = 1 \qquad j = 1 \ldots n$$

$$\lambda_j \geq 0 \qquad\qquad (2)$$

The BCC model divides the technical efficiency (*TE*) obtained by the CCR model into two parts: 1) pure technical efficiency (PTE), which ignores the influence of scale size by comparing DMU units with similar scale units and measures how DMU units use sources under exogenous conditions; and 2) scale efficiency (*SE*), which shows how scale size affects efficiency, and is expressed as: *SE = TE / PTE.*

In this cancer, the input elements are: fixed assets, current assets and the number of employees, and as output: earnings before interest and taxes (EBIT) and net profit.

Table 8 and Figures 1 and 2 show the results of the analysis of the efficiency of trade enterprises in Serbia based on the DEA model of entry orientation, with constant and variable returns.

Table 8. – Efficiency of trade enterprises in Serbia, DEA models (CCR-I; BCC-I)

No.	DMU	Model = CCR-I		Model = BCC-I		RTS of Projected DMU
		Score	Rank	Score	Rank	
1	2013	0.7649	7	1	1	Increasing
2	2014	0.718	9	1	1	Increasing
3	2015	0.814	5	1	1	Increasing
4	2016	0.7455	8	0.9777	7	Increasing
5	2017	0.8742	3	1	1	Increasing

6	2018	0.7789	6	0.938	9	Increasing
7	2019	0.8247	4	0.9432	8	Increasing
8	2020	0.9227	2	0.9813	6	Increasing
9	2021	1	1	1	1	Constant
	Average	0.827	No. of Efficient DMUs = 1	0.9822	No. of Efficient DMUs = 5	
	Max	1	No. of Inefficient DMUs = 8	1	No. of Inefficient DMUs = 4	
	Min	0.718		0.938		
	St Dev	0.091		0.0252		

Note: Author's calculation using DEA-Solver

Figure 1. – Efficiency of trade enterprises in Serbia, Model = CCR-I
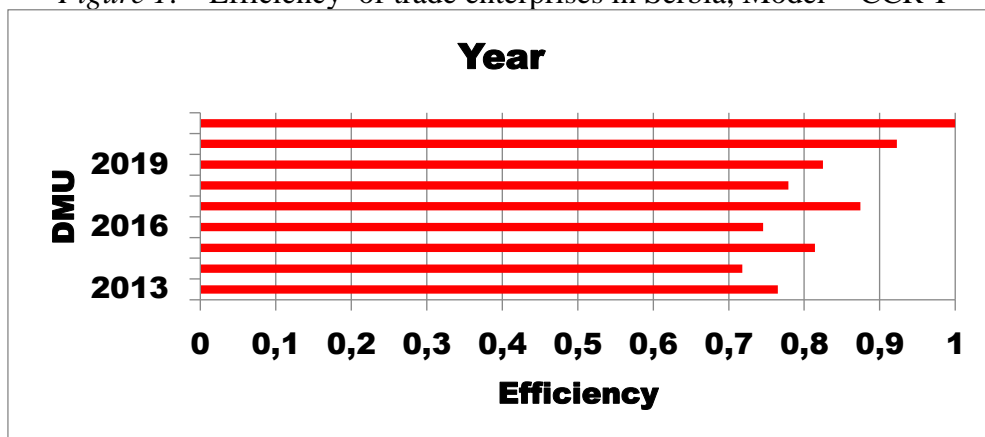
Source: Authors

Figure 2. – Efficiency of trade enterprises in Serbia, Model = BCC-I
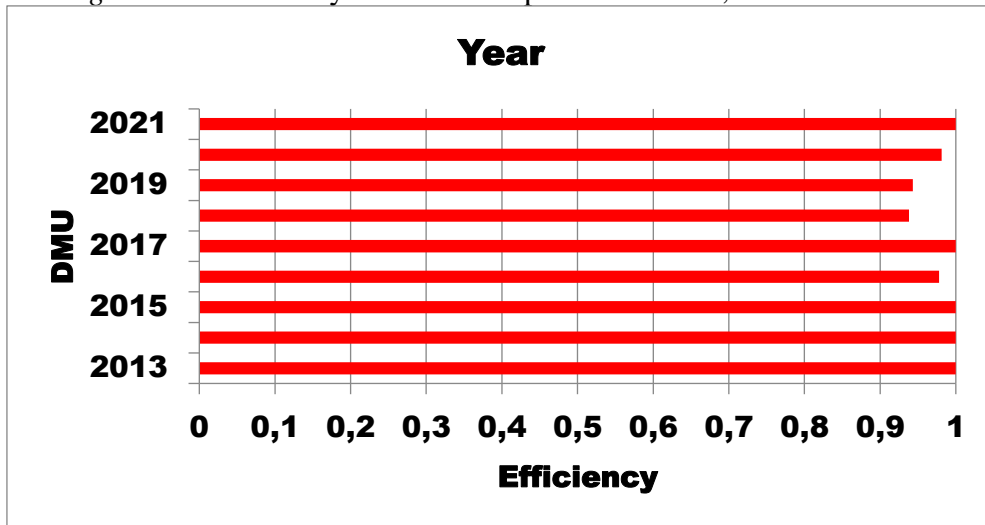
Source: Authors

In the period 2013-2021 according to the CCR-I model, trade companies in Serbia were efficient in 2021 and inefficient in other years. According to the BCC-I model, trade companies in Serbia were efficient in 2013, 2014, 2015, 2017 and 2021, and inefficient in 2016 and 2018. According to both models, trade companies in Serbia were inefficient in 2018. They are also efficient according to both models were efficient in 2021. In order to further improve the efficiency of trade companies in Serbia, it is therefore necessary to manage assets, human capital and profits even more efficiently.

CONCLUSION

The conducted empirical analysis in this paper shows the tendency to increase the return on fixed and working capital in Serbian trade companies. This means, in other words, that the efficiency of management of all assets (fixed and current assets) has increased.

In the observed period of time, earnings per employee, as an indicator of profitability, also tended to increase in Serbian trade companies. This was influenced, in addition to external ones, by significantly improved internal business conditions of a material and technical nature (for example, digitalization of the entire business), as well as the efficiency of human capital management.

There is a strong correlation between net profit and fixed and working capital (at the level of statistical significance). There is a moderate correlation between net profit and employment. This means, in other words, that even

more work should be done to motivate employees to achieve the target profit in trade companies in Serbia (through training, salary increases, better managerial positions, and compensation - bonuses). Significantly integrated, all three factors of the work process (fixed, working capital and human capital) determine the net profit of trade companies in Serbia (Adjusted R Square .960, Sig. .000).

The paper formulates a linear regression equation that can be used to predict the economic performance of trade enterprises with Serbia for the future observed time period. Also, a binary logistics model was formulated to assess the probability of occurrence of the event, ie the character of economic performance (good or bad) of trade companies in Serbia.

In the observed time period (2013 - 2021) according to the CCR-I model trade companies in Serbia were efficient in 2021 and inefficient in other years. According to the BCC-I model, trade companies in Serbia were efficient in 2013, 2014, 2015, 2017 and 2021, and inefficient in 2016 and 2018. According to both models, trade companies in Serbia were inefficient in 2018. They are also efficient according to both models were efficient in 2021. In order to further improve the efficiency of trade companies in Serbia, it is therefore necessary to manage assets, human capital and profits even more efficiently.

REZIME
ANALIZA EKONOMSKIH PERFORMANSI TRGOVINSKIH PREDUZEĆA U SRBIJI

Problematika analiza ekonomskih performansi u trgovinskim preduzećima u ovom radu se istražuje iz ugla uticaja faktora procesa rada (fiksnog, obrtnog i ljudskog kapitala) na profitabilnost i efikasnost, na primeru trgovinskih preduzeća u Srbiji. Što je efikasnija kontrola faktora procesa rada, utoliko su bolje ekonomske performanse. Na ekonomske performanse trgovinskih preduzeća u Srbiji značajno utiče fiksni i obrtni kapital. Umeren je uticaj ljudskog kapitala. U budućnosti u cilju poboljšanja ekonomskih performansi trgovinskih preduzeća u Srbiji neophodno je što efikasnije upravljati ljudskim kapitalom putem treninga, visine plate, unapređenja menadžerske pozicije, kompenzacija i socijalnog i zdrastvenog osiguranja .

Ključne reči: fiksna imovina, obrtna imoviina, zarada po zaposlenom, raco analiza, statistička analiza, DEA modeli, trgovina Srbije

REFERENCES

1. Al-Refaie, A., Najdawi,R., Al-Tahat, M.D., Bata. N. (2015). Window Analysis and Malmquist Index for Accessing Efficiency in a Pharmaceutical Industry. Proceedings of the World Congress on Engineering 2015 Vol 1 WCE 2015, Jul 1-3, 2015, London, U.K.
2. ALI, IFTIKHAR. and ÖZARI, ÇIĞDEM, (June 2018). Estimating the Probability of Bankruptcy Using Z-score and Distance to Default Model: An Application on Istanbul Stock Exchange. *International Review of Management and Business Research*, 7(2), 491-503.
3. Andersen, P., & Petersen, N. C. (1993). A procedure for ranking efficient units in data envelopment analysis. *Management Science*, 39(10), 1261–1264.
4. Anand, N. and Grover, N. (2015). Measuring retail supply chain performance: Theoretical model using key performance indicators (KPIs). *Benchmarking: An International Journal*, 22(1), 135-166.
5. Asmild, M., Paradi, J.C., Aggarwall, V. and Schaffnit, C. (2004). Combinining DEA Window Analysis with the Malmquist Index Approach in a Study of the Canadian Banking Industry. *Journal of Productivity Analysis*, 21, 67-89.
6. Barros, C.P. and Alves, C. (2004). An empirical analzsis of productivity growth in a Portuguese retail chain using Malmquist Productivity index. *Journal of Retailing and Consumer Services*,11, 269-278.
7. Barros, C.P. (2006). Efficiency measurement among hypermarkets and supermarkets and the indentification of the efficiency drivers. *Internationa Journal of retail & Distribution Management*, 34(2), 135-154.
8. Bambe, D. (2017). The Productivity Impact of New Technology: Evidence from the US Retailers Industry. *Advances in Social Sciences Research Journal*, (422), 88-96.
9. Bhargava, M., Dubelaar, C. and Scott, T. (1998). Predicting bankruptcy in the retail sector: an examination of the validity of key measures of performance. *Journal of Retailing and Services*, 5(6), 105-117.
10. Berman, B., Evans, J.R. and Chatterjee, P. (2018). *Retail Management*. Pearson.
11. Busu, M., Vargas, M.V.and Gherasim, I.A. (2020). An analzsis of the economic performance of the retail companies in Romania. *Management & Marketing. Challenges for the Knowledge Society*,15(1), 125-135.
12. Camanho,A.S., Portela, M.C. and Vaz, C.B. (2009). Efficiency analysis accounting for internal and external non-discretionary factors. *Computers & Operations Research*, 36, 1591-1601.

13. Caves,W., Christensen, L.R., & Diewert,W.E.(1982). The economic theory of index numbersandthe measurement of input, output and productivity. *Econometrica*, 50, 1393–1414.

14. Cheng, C.S.A., Chu, K.C.K. & Ohlson, J. (2020). Analyst forecasts: sales and profit margins. *Rev Account Stud* **25,** 54–83. https://doi.org/10.1007/s11142-019-09521-z.

15. Cheng Few Lee (Editor), John C. Lee (Editor), (2020). Handbook of Financial Econometrics, Mathematics, Statistics, and Machine Learning, World Scientific Publishing Co. Ltd. ISBN: 978-981-12-0238-4, Available at SSRN: https://ssrn.com/abstract=3573241.

16. Donthu, N. and Yoo, B. (1998). Retail Productivity Assessment Using Data Envelopment Analysis. *Journal of Retailing*, 74(1), 89-105.

17. Gandhi, A. and Shankar, R.(2014). Efficiency measurement of Indian retailers using Data Envelopment Analysis. *International Journal of Retail & Distribution Management*, 42(6), 500-520.

18. Fare, R., Grosskopf, S., Norris, M., & Zhang, Z.(1994). Productivity growth, technical progress, and efficiency change in industrialized countries. *American Economic Review*, 84, 66–83.

19. Fare, R., Grosskopf, S. & Roos, P.(1995). Productivity and quality changesin Swedish pharmacies. *International Journal of ProductionEconomics*, 39(1/2), 137–147.

20. Frei, Regina, Lisa Jack, and Sally-Ann Krzyzaniak. (2022). Mapping Product Returns Processes in Multichannel Retailing: Challenges and Opportunities. *Sustainability* ,14(3), 1382. https://doi.org/10.3390/su14031382

21. Hsu, S.C. (2018). Performance Analysis for Major Chain Convenience Stores in Taiwan. *Journal of Social Science Studies*, 5(1), 2014-222.

22. Haidar, A. (2018). Mixture Models with Grouping Structure: Retail Analytics Applications. Wayne State University Dissertations. 1911.https://digitalcommon s.wayne.edu/oa_dissertations/1911.

23. Hsu, S.C. (2018). Performance Analysis for Major Chain Convenience Stores in Taiwan. *Journal of Social Science Studies*, 5(1), 2014-222.

24. J.C.Trejo García et al. (2017), Credit risk management at retail in Mexico: An econometric improvement in the selection of variables and changes in their characteristics. *Contaduría y Administración*, 62, 399–418.

25. Jorge, J. and Suárez, C. (2009). Assessing productivity growth and technical efficiency in Spain's retail sector: An aggregate sectoral perspective. *Journal of Business and retail Management Research*, 3(2), 1-19.

26. Karan, M.B., Ulucan, A. and Kaya, M. (2008). Estimation of credit risk of retail stores by using their payment history: A combined logistic

regression and multi-dea. 5th Internation Scientific Conference Business and Management 2008, 16-17 May 2008, Vilniua, Lithuania, 222- 227.

27. Keener, M.H. (August 2013). Predicting the Financial Failure of Retail Companies In The United States. *Journal of Business & Economics Research*, 11(8), 373-380.

28. Kingyens, Angela Tsui-Yin Tran (2012). Bankruptcy prediction of companies in the retail – apparel industry using data envelopment analysis. Degree of Doctor of Philosophy Graduate Department of Chemical Engineering and Applied Chemistry University of Toronto.

29. Laitinen, T., Kankaanpää, M. (1999). Comparative analysis of failure prediction methods: the Finnish case. *The European Accounting Review*, 8 (1), 67–92.

30. Ko, K., Chang, M., Bae, E-S., and Kim, D. (2017). Efficiency Analysis of Retail Chain Stores in Korea. *Sustainability*, 9, 1-14.

31. Lau, K.H. (2013). Measuring distribution efficiency of a retail network through data envelopment analysis. *International Journal of Production Economics*, 146(2), 598-611.

32. Lee, B.L. (2013). Productivity Performance of Singapore's Retail Sector: A Two-Stage Non-Parametric Approach. *Economic Analysis & Policy*, 43(1), 67- .

33. Lukić, R. (2011). *Evaluacija poslovnih performansi u maloprodaji*. Beograd: Ekonomski fakultet. (In Serbian: *Evaluation of business performance in retail*. Belgrade: Faculty of Economics)

34. Lukic, R. (2015). The impact of firm size on the performance of trade in Serbia. *Economic and Environmental Studies*, 15(4), 379-395.

35. Lukic, R. (2018). The Analysis of the Operative Profit Margin of Trade Companies in Serbia. *Review of International Comparative Management*, 19(9), 458-478.

36. Lukić, R. (2019). Analiza efikasnosti trgovinskih preduzeća u Srbiji. *Zbornik radova Ekonomskog fakulteta Brčko*, 13(1), 2019, 15-27.

37. Lukic, R. and Hadrovic Zekic, B. (2019). Evaluation of efficiency of trade companies in Serbia using the DEA approach. Proceedings of the 19 th International Scientific Conference Business logistics in modern management October 10-11, Osijek, Croatia, Josip Juraj Strossmayer University of Osijek, Faculty of Economics in Osijek, 145-165.

38. Lukic, R, Hadrovic Zekic, B. and Crnjac Milic, D. (2020a). Financial performance evaluation of trading companies in Serbia using the integrated Fuzzy AHP - TOPSIS Approach. 9th International scientific symposium region, entrepreneurship, development, under the auspices of: Republic of Croatia ministry of science and education, Osijek, June, 690-703.

39. Lukic, R., Vojteski Kljenak, D. and Anđelić, S. (2020b). Analyzing financial performances and efficiency of the retail food in Serbia by using the AHP – TOPSIS method. *Economics of Agriculture*, Year 67, No. 1, 2020, (pp. 55-68), Belgrade.

40. Lukic, R. (2020c). Analysis of the efficiency of trade in oil derivatives in Serbia by applying the fuzzy AHP-TOPSIS method. *Business Excellence and Management*, 10 (3): 80-98.

41. Lukic, R. (2021a). Application of MABAC Method in Evaluation of Sector Efficiency in Serbia. *Review of International Comparative Management*, 22(3), 400-417. DOI: 10.24818/RMCI.2021.3.400

42. Lukic, R. (2021b). Application of electre method in performance analysis of food retailers in Serbia. *Business Excellence and Managemen*, 1(3): 84-102. DOI: https://doi.org/10.24818/beman/2021.11.3-05

43. Lukic, R. (2021c). Analysis of trade efficiency in Serbia based on the MABAC method. *Economic Outlook*, 23(2): 1-18.

44. Лукић, Р. (2021d). Анализа ефикасности трговинских предузећа у Србији на бази SAW методе. *Економски погледи*, 23(1):1-16.

45. Lukic, R. and Hadrovic Zekic, B. (2021e). Evaluation of transportation and storage efficiency in Serbia based on ratio analysis and the ocra method. Proceedings of the 21 th International Scientific Conference Business logistics in modern management October 7-8, Osijek, Croatia, Josip Juraj Strossmayer University of Osijek, Faculty of Economics in Osijek, 189-200.

46. Lukic, R. and Kozarevic, E. (2021f). Application of ARAS method in assessment of trade efficiency in Serbia. December 2021, Conference: 7th Scientific Conference with International Participation "Economy of Integration" I C E I 2021 – Economic Response and Crisis Recovery Caused by the Covid-19 Pandemic. At: Tuzla, Bosnia and Herzegovina, 21-30.

47. Lukic, R.(2022a). Application of MARCOS method in evaluation of efficiency of trade companies in Serbia. *Ekonomski pogledi – Economic Outlook*, 24(1):1-14. DOI:
10.5937/ep24-38921

48. Lukic, R. (2022b). Application of the MARCOS Method in Analysis of the Positioning of Electronic Trade of the European Union and Serbia. *Informatica Economică*, vol. 26, no. 3/2022, 50-63. DOI: 10.24818/issn14531305/26.3.2022.05

49. Lukic, R. (2022c). Employee costs of distribution trade of the European Union and Serbia. *Businesse excellence and management*, 12(3), 60-76. DOI: https://doi.org/10.24818/beman/2022.12.3-05

50. Lukic, R.(2022d). Operating costs of trade in serbia. *Southeast European Review of Business and Economics*, 3(1), 26-43. DOI: 10.20544/SERBE.05.01.22. P02

51. Lukić, R. (2022e). Performansna analiza distribucione trgovine Evropske unije i Srbije. Performance Analysis of the Distribution Trade of the European Union and Serbia. Izzivi Globalizacije In Družbenoekonomsko Okolje Eu – Globalisation Challenges and The Socialeconomic Environment Of The Eu, Zbornik Prispevkov – Conference Proceedings 11. Mednarodna znanstvena konferenca - 11th International Scientific Conference Novo mesto, 19. maj 2022, University of Novo mesto Faculty of Economics and Informatics – Univerza v Novem mestu Fakulteta za ekonomijo in informatiko. Kataložni zapis o publikaciji (CIP) pripravili v Narodni in univerzitetni knjižnici v Ljubljani COBISS.SI-ID 130333443 ISBN 978-961-6770-56-9 (PDF), 327-335.

52. Lukic, R. (2022f). Analysis of Kosovo and Metohija Trade Performance. *Management and Economics Review*, 7(3), 379-391. DOI: 10.24818/mer/2022.10-08

53. Lukić, R. and Hadrović Zekić, B. (2022). Efficiency analysis of trade companies in serbia using the aras method. 22 nd international scientific conference Business Logistics in Modern Management, Josip Juraj Strossmayer University of Osijek Faculty Of Economics In Osijek, October 6-7, 2022, Osijek, Croatia, 105-119.

54. Majumdar, S. and Asgari, B. (2017). Performance Analysis of Listed Companies in the UAE-Using DEA Malmquist Indeks Approach. *American Journal of Operations research*, 7, 133-151.

55. Malmquist, S.(1953).Index numbers and indifferen cesurfaces. *Trabajos de Estadistica*, 4, 209–242.

56. Melo, F.L., Sampaio, R.M.B. (2018). Effeciency, productivity gains, and the size of Brazilian supermarkets. *International Journal of Production Economics*, 197, 99-111.

57. Manini, R. and Amat, O. (2018). Credit scoring for the supermarket and retailing industry: Analysis and application proposal. Economics Working Paper Series, *Working Paper* No. 1614, Universitat Pompeu Fabra, Barcelona, Department of Economics and Business, 1-14.

58. Mihalovič, M. (2016), Performance Comparison of Multiple Discriminant Analysis and Logit Models in Bankruptcy Prediction, *Economics and Sociology*, Vol. 9, No 4, pp. 101-118. DOI: 10.14254/2071-789X.2016/9-4/6.

59. Moreno, J.J. (2010). Productivity growth of European Retailers: a benchmarking approach. *Journal of Economic Studies*, 37(3), 288-313.

60. Moreno, J.J. and Maria, S-T. (2011). Estimating technical efficiency and bootstrapping Malmwuist indices: Analysis of Spanish retail sector.

International Journal of Retal & Distribution Management, 39(4), 272-288.

61. Rogova, E. and Blinova, A. (2018). The Technical Efficiency of Russian Retail Companies: An Empirical Analysis. *Zesz. Nauk*. UEK, 5 (977), 171–185.

62. Sami Mestiri & Manel Hamdi (2012). Credit Risk Prediction: A comparative study between logistic regression and logistic regression with random effects. *International Journal of Management Science and Engineering Management*, 7:3, 200-204, DOI: 10.1080/17509653.2012.10671224.

63. Sarmento, J., Renneboog, L. and Matos, P.V. (2017). Measuring highway efficiency by a DEA approach and Malmquist index. *European Journal of Transport and Infrastructure Research EJTIR*, 17(4), 530-551.

64. Tone, K. (2001). A slacks-based measure of e• ciency in data envelopment analysis. *European Journal of Operational Research*, 130, 498-509.

65. Tone, K. (2002). A slacks-based measure of super-efficiency in data envelopment analysis. *European Journal of Operational Research*, 143, 32-41.

66. Tone K, Tsutsui M. (2009). Network DEA: a slacks-based measure approach. *European*

Journal of Operational Research, 197, 243–252.

67. Tone K, Tsutsui M. (2010). Dynamic DEA: a slacks-based measure approach. *Omega*,

38, 145-156.

68. Qiu, C. and Meng, L. (2017). Study on total factor productivity of retail industry in east China. *Advances in Economics, Business and Management Research*, 33, 756-763.

69. Vaz, C,B., A.S. Camanho, A.S. and Guimarães, R.C. (2010). The assessment of retailing efficiency using Network Data Envelopment Analysis. *Annals of Operations Research*, 173(1), 5-24.

70. Vaz. C.B. and Camnho, A.S. (2012). Performance comparision of retailing stores using a nalmguist-tyupe index. *The Journal of Operational Research Society*, 63(5), 631-645.

71. Wang, Z-M. and Lan, Z-X. (2011). Measuring Malmquist productivity index: A new approach based on douple frontiers data envelopment analysis. *Mathematical and Computer Modelling*, 54, 2760-2771.

72. Yu, W. and Ramanathan, R. (2009). An assessment of operational efficiency of retail firms in China. *Journal of Retailing and Consumer Services*, 16, 109-122.