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INTELLECTUAL CAPITAL AND CORPORATE PERFORMANCE OF SERBIAN BANKS

Interest in research on measuring and analyzing intellectual capital (IC) and determining its impact on corporate performance is growing. This paper explores the impact of IC, measured using the value added intellectual coefficient (VAIC), on the corporate performance of Serbian banks during the period of 2008-2011. Performance measures used include profitability, total assets, return on assets, return on equity (ROE), and employee productivity (EP). The data were drawn from published financial statements of all Serbian commercial banks and analyzed using statistical methods of correlation and multiple regression. In the case of Serbian banks our results show that human capital significantly affects EP only, structural capital determines the size of total assets and ROE, and physical capital influences profitability and ROE.

Keywords: *intellectual capital (IC), intangible assets, financial performance, value added intellectual coefficient (VAIC), banks.*

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ІНТЕЛЕКТУАЛЬНИЙ КАПІТАЛ І ЙОГО РОЛЬ У КОРПОРАТИВНОМУ УПРАВЛІННІ СЕРБСЬКИМИ БАНКАМИ

У статті показано, як зростає інтерес до вимірювання і аналізу інтелектуального капіталу і визначення його впливу на корпоративні показники банків. Розглянуто вплив ІК, виміряного за допомогою доданої вартості інтелектуального коефіцієнту, на корпоративні показники сербських банків у 2008-2011 роках. Використано такі показники діяльності, як рентабельність, сукупні активи, рентабельність активів, рентабельність власного капіталу і продуктивність персоналу. Дані було взято з опублікованої фінансової звітності всіх сербських комерційних банків і проаналізовано за допомогою статистичних методів кореляції і множинної регресії. У випадку із сербськими банками результати показали, що людський капітал істотно впливає лише на продуктивність персоналу, структурний капітал визначає розмір сукупних активів і власного капіталу, а фізичний капітал впливає на загальну рентабельність і рентабельність власного капіталу.

Ключові слова: *інтелектуальний капітал, нематеріальні активи, фінансові показники, додана вартість інтелектуального коефіцієнту, банки.*

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ИНТЕЛЛЕКТУАЛЬНЫЙ КАПИТАЛ И ЕГО РОЛЬ В КОРПОРАТИВНОМ УПРАВЛЕНИИ СЕРБСКИМИ БАНКАМИ

В статье показано, как растет интерес к измерению и анализу интеллектуального капитала и определению его влияния на корпоративные показатели банков. Рассмотрено влияние ИК, измеренного с помощью добавленной стоимости интеллектуального коэффициента, на корпоративные показатели сербских банков в 2008-2011 годах. Использованы такие показатели деятельности, как рентабельность, совокупные активы, рентабельность активов, рентабельность собственного капитала и производительность персонала. Данные были взяты из опубликованной финансовой отчетности всех сербских коммерческих банков и проанализированы с помощью

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статистических методов корреляции и множественной регрессии. В случае с сербскими банками результаты показали, что человеческий капитал существенно влияет только на производительность персонала, структурный капитал определяет размер совокупных активов и собственного капитала, а физический капитал влияет на общую рентабельность и рентабельность собственного капитала.

Ключевые слова: *интеллектуальный капитал, нематериальные активы, финансовые показатели, добавленная стоимость интеллектуального коэффициента, банки.*

1. Introduction. Business models within the context of the information age are exposed to conditions in which intangible resources create more value than tangible resources (Janosevic, 2009). In analyzing intangible assets, or intellectual capital (IC) and its impact on corporate and market performance of the information-age companies, it is essential to understand IC and its constituents, IC measurement, and its relation to the value-creation process (Bontis, 2001).

Stewart (1997) defines IC as collective brainpower which includes knowledge, information, intellectual property, and expertise used in the process of value creation. Lev (2001) emphasizes future benefits from IC when defining its essence and nature. He describes IC as the existing knowledge in an organization that is used to create differential advantage. Sullivan (2000), on the other hand, sees IC as knowledge that is convertible into profit. In addition, to fully understand the nature of IC, it is important to review the elements that make up the IC of a company (Bontis, 1999). The most widely used classification of IC divides it into 3 categories (Sveiby, 1997; MERITUM, 2002; Bontis, 2002): human, structural, and relational capital.

Many attempts have been made to find a useful model for measuring the size and the impact of IC on overall company performance. One early effort in this area can be seen in the work of Edvinsson (1997), who developed a model for measuring IC, known as the Skandia Navigator. Methods for measuring IC can be categorized into 4 large groups, according to Sveiby (2007): 1) market capitalization methods (Andriessen, 2004; Bontis, 2001; Caddy, 2000; Guthrie, 2001; Sveiby, 2007); 2) direct IC measurement methods (Bontis, 2001; Caddy, 2000; Sveiby, 2007); 3) scorecard approaches (Edvinsson and Malone, 1997; Kaplan and Norton, 1992; Sveiby, 2007); and 4) economic value-added approaches (Stewart, 1997). The value added intellectual coefficient (VAIC) method does not fit into any of the above groups, so Chan (2009) has labeled it as a fifth approach to IC measurement (Javornik, S., Tekavcic, M., and Marc, M., 2012).

2. Review of recent research. Many researchers have investigated IC performance within banking sector. The research undertaken in Pakistan (Kamath, 2010) analyzed the IC performance of private-sector banks compared to nationalized commercial, privatized, and foreign banks, and concluded that private banks use IC more efficiently. It also found that the most influential element of IC was human capital. Another study within Pakistani banking sector (Shaari et al., 2011) concluded that the overwhelming majority of Pakistani banks are satisfactory performers when it comes to using and exploiting IC.

One study on 8 Asian economies (Hong Kong, Indonesia, Malaysia, the Philippines, Singapore, South Korea, Thailand, and Taiwan) over the 6-year period (1996-2001) (Young et al., 2009) aimed to establish the main drivers of commercial

banks' performance. The study found that human capital and physical capital were the main driving forces of value creation in the observed period. An interesting conclusion of their study is that, during the financial crisis, the value-creation potential of human capital was diminished while physical capital continued to create value without a loss of significance.

The analysis of Italian banking, by Puntillo (2009) was aimed to determine the relationship between modified VAIC (where training costs are added to the original value of VAIC) and corporate and market performance between 2005 and 2007. The research found a positive relationship only between capital-employed efficiency (CEE) and return on assets (ROA) and return on equity (ROE), while CEE demonstrated a negative relationship with market-to-book value.

Another interesting study investigated 11 Australian banks for the period 2005-2007 using VAIC methodology (Joshi et al., 2010), in order to determine IC performance in Australian banking sector. It found that VAIC had a significant relation to human costs and VA, and that the majority of the VAIC index in Australian banks comprises human capital efficiency (HCE). An interesting conclusion in the paper is that the best-performing bank in terms of IC is small in size as measured by total assets, shareholder equity, and employees number. The results indicate that the value-creation capability of banks in Australia is directly attributable to their HCE. The performance of banks in terms of CEE and structural capital efficiency (SCE) has little or no impact on overall efficiency of banks and the process of value creation. These findings are consistent with the studies on Malaysian banks (Goh, 2005), Indian banks (Kamath, 2007), and Japanese banks (Mavridis, 2004) where the best-performing banks are those who mainly have very good results in terms of usage of their IC or human capital as opposed to their use of CEE. Banks with large numbers of employees have high human costs, which have significant impact on their HCE (Joshi, M. et. al, 2010).

The analysis of the 17 largest Greek banks over 1996-1999 (Mavridis and Kyrmizoglou, 2005) showed that corporate performance of these banks is significantly affected by IC (mainly human capital). A separate study by Mavridis (2004) examined the relationship between IC and corporate performance of Japanese banks. The sample consisted of 141 Japanese banks for the period 2001-2003. The paper concludes that the best performing banks, in terms of corporate performance, are those who mainly have very good results in their use of IC and less so in their use of physical capital.

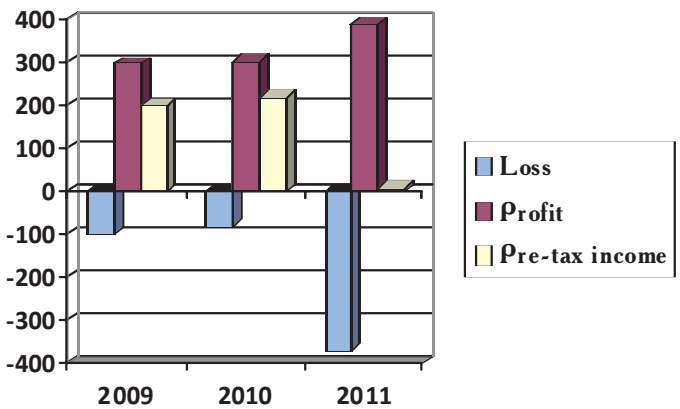
During a 10-year period (1996-2006), Kuwaiti banks were analyzed regarding IC performance (measured by VAIC) (Abdulsalam et al., 2011). The study compared commercial and non-commercial banks in Kuwait. In terms of IC performance, it was found that commercial banks outperformed non-commercial ones over 3 years (2004-2006). In addition, Kuwaiti commercial banks showed better exploitation of IC and physical capital.

3. Research methodology.

a. Survey description. The data collected for this research were from the official financial statements of commercial banks operating in Serbia. The sample consists of 33 commercial banks, which is the total number of banks at this market. The data used in the analysis cover the period of 2008-2011, and the main source of informa-

tion was the database owned by Serbian Business Registry Agency, to which all business entities in Serbia are required to submit their official financial statements. The Agency subsequently makes this data available through its website (www.apr.gov.rs). Top 6 banks on the list account for more than half (53%) of the total assets owned by 33 commercial banks in Serbia.

During the last trimester of 2011, Serbian banking sector employed 29,228 people in total, while the total net assets of commercial banks were around 25 bln euros and total equity was 5.2 bln euros. The majority of banks in Serbia are owned by foreign entities (21 out of 33), while only 12 banks are under domestic ownership. Among these 12 banks, 8 are state-owned (where the majority of shares are either owned by the state or the state is the largest individual shareholder) and 4 banks are owned by domestic private entities. Commercial banks owned by foreign entities hold 74% of the total assets, 75% of equity, and 70% of all employees across the entire Serbian banking sector (source: National Bank of Serbia (2011): Banking Supervision, Third Quarter Report 2011, p.3).



Source: National Bank of Serbia (2011): Banking Supervision, Third Quarter Report 2011 (version in Serbian), p. 26

Figure 1. **Corporate performance in the last 3 years**

Figure 1 illustrates the corporate performance of Serbian banking system in 2009-2011. The performance dropped significantly in the last quarter of 2011, mostly thanks to poor performance of one bank (Agrobanka), which had a loss of 290 million euros. The bank was placed under receivership at the end of 2011.

b. VAIC as a measure of IC. The chosen method used in the analysis of effective use of IC in Serbian banking sector was introduced and implemented by Ante Pulic from Austrian IC Research Center (Pulic, 1998; 2004) and uses VAIC as a measure of a company's efficiency in using IC. In the context of Pulic's model, the starting point is the assessment of VA achieved by a company, as a difference between total revenues (OUT) and total expenses (IN), except for those related to human resources, which are viewed as an investment, not a cost. The ultimate goal is to determine individual contribution of all IC elements to the creation of VA. Calculation of VAIC therefore involves the following steps:

(1) VA = OUT - IN

(2) HCE = VA/HC
(3) SCE = SC/VA
(4) ICE = HCE + SCE
(5) CEE = VA/CE
(6) VAIC = ICE + CEE

A company's IC comprises human and structural capital. Calculation of HCE starts with employee salaries and wages. HCE is calculated according to equation (2), where human capital, denoted HC, includes total salaries and wages during one fiscal year. In this way, the model highlights the relative contribution of human resources in VA. The next component of IC, structural capital, comprises hardware, software, organizational structure, patents, trademarks, and all other factors that support or increase employee productivity (EP). SCE is calculated as in equation (3), where SC stands for structural capital. This equation indicates that SCE is inversely related to HCE. IC efficiency (ICE) is obtained by summing partial efficiencies of human and structural capital, as described by equation (4). Finally, the physical capital component, or CEE, is derived from the ratio of VA to a company's net assets (equation (5)). Here, capital employed (CE) is the capital already invested in a company. In order to enable a comparison of overall value-creation efficiency, the two indicators need to be summed (equation (6)). This aggregated indicator allows us understand a company's overall efficiency and indicates its intellectual ability.

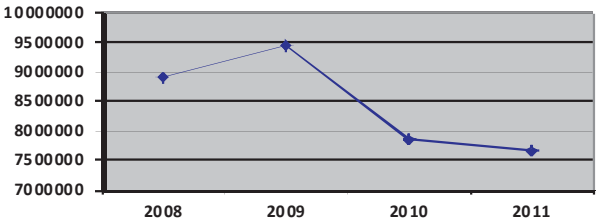


Figure 2. **Mean values during the period 2008-2011**

The most significant disadvantage of the VAIC model is that it is calculated using companies' financial statements, which implies that the coefficient is a measure of value created in the past and not that of value-creation potential. Another criticism is the inability of the model to incorporate possible synergistic effects of various components of IC. The VAIC approach highlights the contribution of each component of IC to value creation. However, in practice, elements of IC interact, and therefore it is not possible to calculate accurately the contribution of each component to the creation of VA. In addition, the model fails to offer an adequate analysis of the creation of VA for those companies that have negative values for equity and operating profit. In these cases, VA and all the elements of VAIC (HCE, SCE, and CEE) would be negative as well, which would result in ineffective analysis (Chu et al., 2011).

Although the majority of the VAIC index comprises the human-capital component in 2011, the trend of investing in human resources falls from 2009 to 2011 (Figure 2). A possible reason for this negative trend is lack of orientation on the carrier of intangible assets: human resources.

c. Research objectives and hypotheses. There are 2 main groups of studies in the field and they must be treated separately. The first group focuses on the so-called real sector of the economy and analyzes the relationship between IC and corporate performance among process- and cost-oriented companies (i.e., within the manufacturing sector). The second group aims to examine these relationships within the services sector. The ultimate objective of the present paper is to determine whether IC has impact on corporate performance in Serbian banking sector, and if so, the nature of its impact. The research hypotheses were developed to achieving the defined objective:

Hypotheses regarding profitability:
H1. Banks with higher values for HCE tend to be more profitable.
H2. Banks with higher values for SCE tend to be more profitable.
H3. Banks with higher values for CEE tend to be more profitable.
Hypotheses regarding total assets:
H4. Banks with higher values for HCE tend to have higher total assets.
H5. Banks with higher values for SCE tend to have higher total assets.
H6. Banks with higher values for CEE tend to have higher total assets.
Hypotheses regarding ROA:
H7. Banks with higher values for HCE tend to have higher ROA.
H8. Banks with higher values for SCE tend to have higher ROA.
H9. Banks with higher values for CEE tend to have higher ROA.
Hypotheses regarding ROE:
H10. Banks with higher values for HCE tend to have higher ROE.
H11. Banks with higher values for SCE tend to have higher ROE.
H12. Banks with higher values for CEE tend to have higher ROE.
Hypotheses regarding EP:
H13. Banks with higher values for HCE tend to have higher EP.
H14. Banks with higher values for SCE tend to have higher EP.
H15. Banks with higher values for CEE tend to have higher EP.

The proposed model includes dependent and independent variables. Dependent variables are the traditional measures of corporate performance: profitability, total assets, ROA, ROE, and EP. Independent variables used are components of VAIC. The dependent variables selected for the purposes of this research are defined as follows:

- Profitability: the ratio between operating profit and operating revenues;
- Total assets: the sum of current and long-term assets owned by the firm;
- ROA: the ratio of pre-tax income to the company's total assets;
- ROE: net profit divided by the book value of average stockholders' equity;
- EP: the ratio of pre-tax income to total number of employees.

The gathered data are analyzed using a number of statistical methods. First, tests of normality are undertaken to test the nature of the sample. The next step involves descriptive statistical analysis, followed by correlation and multiple-regression analysis.

4. Empirical results.

a. Descriptive statistics. The initial statistical test performed on the defined sample (or the population, since all Serbian banks are examined in the research) assesses the normal distribution of the data within the sample. The objective here is to deter-

mine the nature of the data and to select an appropriate type of correlation analysis (described in section 4b).

Table 2. **Tests of normal distribution of data**

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Profitability	.114	132	.000	.937	132	.000
Assets	.178	132	.000	.797	132	.000
ROA	.211	132	.000	.587	132	.000
ROE	.224	132	.000	.629	132	.000
EP	.201	132	.000	.623	132	.000
HCE	.152	132	.000	.751	132	.000
SCE	.064	132	.200*	.984	132	.135
CEE	.085	132	.020	.941	132	.000
VAIC	.123	132	.000	.805	132	.000

*. This is a lower bound of the true significance.
[a] Lilliefors Significance Correction.

Kolmogorov-Smirnov and Shapiro-Wilk tests of normality (Table 2) clearly suggest that the only variable with a normal distribution is that concerning the efficiency of structural capital in Serbian banks. This indicates that the analysis requires non-parametric statistical tests. Since there is only one variable with a normal distribution of data, it is necessary to apply Spearman's correlation analysis as the next step.

Table 3. **Descriptive statistics**

	Minimum	Maximum	Mean	Std. Deviation
Profitability	.2800	.9671	.642070	.1203015
Assets	5893838.67	3749228924.83	695121735.7996	742965190.44456
ROA	-.4831	.2095	-.003177	.0594402
ROE	-1.8429	.3120	-.026913	.2169580
EP	-326282.9864	161874.9792	4774.428756	42558.7556035
HCE	1.7488	16.2460	4.398252	2.2027201
SCE	.4282	.9384	.733313	.0953968
CEE	.0000	1.2859	.457964	.2128174
VAIC	.0000	17.4384	5.541089	2.2769539

Table 3 presents the descriptive statistics for the research.

b. Correlation analysis. Table 4 presents the results of correlation analysis using Spearman's coefficient of correlation, for data without a normal distribution. The results indicate a significant correlation between CEE and profitability. Other components of VAIC - HCE and SCE - which make up IC, do not correlate with profitability in Serbian banking sector. On the other hand, the remaining dependent variables (ROA, ROE, EP, and total assets) correlate significantly with all of the components of VAIC. The strongest correlation is observed in the case of EP and VAIC.

For example, the component of VAIC with the highest correlation coefficient to a given dependent measure is HCE in correlation with EP (Spearman's coefficient = 0.716). In order to examine the nature of relationships between the dependent and independent variables, the next section of the paper presents the results of multiple-regression analysis.

c. Multiple-regression analysis. The multiple-regression model used in this study has as dependent variables — profitability, ROA, ROE, EP, and total assets, while the independent variables are the components of VAIC, which are HCE, SCE and CEE.

The first regression analysis concerns profitability as the dependent variable. The results of this analysis are given in Table 5. Regression model no. 1 describes only 7.2% of all profitability changes caused by predictors HCE, SCE, and CEE (R^2 = 0.072). Since the Durbin-Watson coefficient value is close to 2, we can conclude that the model has no autocorrelation issue.

Table 4. **Correlation analysis**

		HCE	SCE	CEE
Profitability	Correlation Coefficient	.053	.053	-.179*
	Sig. (2-tailed)	.549	.549	.040
Assets	Correlation Coefficient	.693**	.693**	-.193*
	Sig. (2-tailed)	.000	.000	.026
ROA	Correlation Coefficient	.630**	.630**	-.276**
	Sig. (2-tailed)	.000	.000	.001
ROE	Correlation Coefficient	.657**	.657**	-.247**
	Sig. (2-tailed)	.000	.000	.004
EP	Correlation Coefficient	.716**	.715**	-.373**
	Sig. (2-tailed)	.000	.000	.000

Table 5. **Regression model no. 1 (profitability as dependent variable)**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.268[a]	.072	.050	.1172669	1.878

a. Predictors: (Constant), CEE, SCE, HCE.
Dependent Variable: Profitability.

Table 6. **Coefficients for regression model no. 1**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.771	.115		6.725	.000		
	HCE	-.004	.009	-.073	-.461	.646	.292	3.425
	SCE	-.054	.193	-.043	-.278	.782	.309	3.231
	CEE	-.157	.051	-.277	-3.079	.003	.894	1.118

Dependent Variable: Profitability.

From Table 6 it is clear that, of the VAIC components, only CEE has a statistically significant impact on profitability. As a test for multicollinearity, the variance inflation factor (VIF) is used. According to Myers (1990), the VIF value must be below 10 for the statistical model to be relevant.

Table 7. **Regression model no. 2 (Total assets as dependent variable)**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.584[a]	.341	.326	610153313.91471	2.435

a. Predictors: (Constant), CEE, SCE, HCE
Dependent Variable: Assets

Tables 7 and 8 present the second regression model, where the total assets of a bank are the dependent variable. This variable is taken into consideration since the relative market power of commercial banks in Serbia is often presented through this particular measure of corporate performance. Model no. 2 suggests that 34.1% of all changes in the size of total assets can be explained by VAIC components. This model does not display weakness through multicollinearity (Durbin-Watson value close to 2).

Table 8. **Coefficients for regression model no. 2**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-2322355811.432	596281028.671		-3.895	.000		
	HCE	4624357.413	44787462.249	.014	.103	.918	.292	3.425
	SCE	4272309723.797	1004509941.589	.549	4.253	.000	.309	3.231
	CEE	-296532893.907	264897251.079	-.085	-1.119	.265	.894	1.118

Dependent Variable: Assets.

Table 8 presents the coefficients for the second regression model, where it is clear that structural capital is a major factor influencing total assets in Serbian banking sector. The other two components of VAIC (HCE and CEE) display no significance regarding total-asset size over the observed period.

The next regression model involves ROA as the dependent variable, and the results of this analysis are presented in Tables 9 and 10.

Table 9. **Regression model no. 3 (ROA as dependent variable)**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.262[a]	.069	.047	.0580300	1.331

a. Predictors: (Constant), CEE, SCE, HCE.
Dependent Variable: ROA.

Table 10. **Coefficients for regression model no. 3**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.091	.057		-1.612	.109		
	HCE	.002	.004	.091	.580	.563	.292	3.425
	SCE	.109	.096	.175	1.142	.256	.309	3.231
	CEE	-.006	.025	-.021	-.228	.820	.894	1.118

Dependent Variable: ROA.

Regression model no. 3 shows that changes in values of ROA for Serbian commercial banks can be described by VAIC components in only 6.9% of cases (R^2 = 0.069), and the value of the Durbin-Watson coefficient suggests there is a possibility of autocorrelation, which makes this model less reliable for analysis. However, values for regression coefficients given in Table 10 indicate that none of the independent variables affects ROA over time, since none of the coefficients has a significance value of below 0.05.

The next regression model examines the effect of IC and capital employed on the returns achieved compared to equity (ROE). Tables 11 and 12 highlight the findings.

Table 11. **Regression model no. 4 (ROE as dependent variable)**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.514[a]	.264	.247	.1883278	2.081

a. Predictors: (Constant), CEE, SCE, HCE,
Dependent Variable: ROE.

The statistical quality of the fourth regression model is an improvement on that of the first two models. Variations in ROE can be explained in 26.4% of the cases by changes in the values of independent variables. Table 11 presents results of the Durbin-Watson test, which suggest that the model does not suffer from autocorrelation.

Table 12. **Coefficients for regression model no. 4**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.560	.184		-3.042	.003		
	HCE	-.015	.014	-.151	-1.078	.283	.292	3.425
	SCE	1.033	.310	.454	3.332	.001	.309	3.231
	CEE	-.347	.082	-.341	-4.247	.000	.894	1.118

Dependent Variable: ROE.

When we analyze the impact of VAIC elements on ROE (Table 12), the obvious conclusion is that structural capital and capital employed have significant impact on ROE, while the human-capital component does not. This regression model has no multicollinearity issue.

Table 13. **Regression model no. 5 (EP as dependent variable)**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.541[a]	.293	.276	36213.2316120	1.091

a. Predictors: (Constant), CEE, SCE, HCE.
Dependent Variable: EP.

EP varies significantly when VAIC changes. In fact, 29.3% of the variations in EP are caused by variations in values for HCE, SCE and CEE. To further examine the individual impact of VAIC components, we must analyze the coefficients for regression model no. 5 (Table 14).

Table 14. **Coefficients for regression model no. 5**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	14529.151	35389.897		.411	.682		
	HCE	14339.660	2658.182	.742	5.395	.000	.292	3.425
	SCE	-107557.220	59618.706	-.241	-1.804	.074	.309	3.231
	CEE	13208.339	15721.926	.066	.840	.402	.894	1.118

Dependent Variable: EP.

a. Dependent Variable: EP. Although HCE, SCE, and CEE together explain almost one third of all EP variations, the coefficients for this model indicate that only the human-capital component has significant impact on the productivity of bank employees. Structural capital is close to statistical significance (Sig. = 0.074), while capital employed does not influence EP.

5. Discussion and conclusion. Recent empirical studies undertaken in Pakistan, Hong Kong, Indonesia, Malaysia, the Philippines, Singapore, South Korea, Thailand, Taiwan, Italy, Australia, India, Japan, Greece, and Kuwait almost all indicate a significant correlation between banks' corporate performance and their IC. Only within Italian banking sector does physical capital displays a significant correlation to measures of corporate performance (ROA and ROE). Other studies reveal the dominant impact of human capital on overall performance.

The findings of our research on Serbian commercial banks differ from those described in the recent literature. Our study investigated the relationships between components of VAIC (HCE, SCE, and CEE) and measures of corporate perform-

ance most commonly used for measuring commercial banks' success (profitability, total assets, ROA, ROE, and EP). The research hypotheses were identified accordingly. The study presented normality tests, correlation analysis, and 5 multiple-regression models. Correlation analysis shows a significant correlation between total assets, ROA, ROE, and EP, and all components of VAIC. In the case of profitability, a significant correlation is identified only with CEE.

Multiple-regression analysis involved 5 regression models. The first model aimed to analyze the impact of HCE, SCE, and CEE on profitability. The model shows that profitability is only affected by physical capital. The second regression model, with total assets as the dependent variable, validated only the hypothesis that structural capital significantly affects total assets. When analyzing the impact of VAIC components on ROA, the model did not confirm any of the relevant hypotheses. In other words, ROA in Serbian banks is not influenced by any component of VAIC. Regarding ROE (regression model no. 4), human capital is the only component of VAIC with no significant impact on this measure. Unlike HCE, SCE and CEE significantly determine the size of ROE. The final regression model validated the hypothesis that banks with higher value for HCE have higher values of EP. Structural and physical capital do not determine the productivity of employees.

All of the above point to the fact that a shift in perspective is particularly important for Serbia that entered the 2008 global economic crisis with impotent economy, low competitiveness, and high system risk (Duricin and Vuksanovic, 2012). This is why the overall conclusion of our IC analysis on Serbian commercial banks is somewhat different to the conclusions drawn from other economies. It is also important to mention the limitation of this study, which is the ongoing economic crisis. The crisis means that conclusions are relative, and this must be borne in mind, particularly when examining the findings presented in Figure 1. Figure 2, on the other hand, indicates a possible reason why IC is being neglected, that is, the cutting of investments in human capital. Although in Serbian banks HCE makes up the majority of the VAIC index, human capital influences only EP. Structural capital plays an important role in value creation that results in higher values of total assets and ROE. Finally, physical capital dominates profitability and ROE. The presented results form a basis for further research in the field of IC in Serbian banking sector. Human capital is undervalued and not exploited properly. Structural capital, resulting from the external relations of banks (mostly owned by foreign entities), has an inadequate effect on corporate performance. Physical capital still plays a significant role in achieving exceptional levels of profitability and ROE, but its role must be replaced by impacts of HCE and SCE if banks are to sustain competitive advantage in the long run.

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