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Intellectual Capital and Bank Profitability: Evidence from Serbia

──── **Abstract:** ────

Research Question: This paper examines how investing in Intellectual Capital (IC) influences bank profitability measured by return on average assets and return on average equity. **Motivation**: IC is a source of non-physical (added) value for innovative companies in the knowledge-based economy. In finance and banking, efficient use of IC is critical since a bank's capacity to supply high-quality services is based on its investment in IC. As a result, our goal was to throw light on the components of IC and examine how they relate to the commercial bank's financial performance in Serbia. **Idea**: The main idea behind this paper is to assess the relationship between components of IC and bank profitability. We used the three most common components: Human Capital Efficiency (HCE), Capital Employed Efficiency (CEE), and Structural Capital Efficiency (SCE), as well as control variables such as banks' size and leverage. **Data**: We used a Bankscope data set that included 27 Serbian commercial banks from 2011 to 2019, with 212 observations. **Tools**: We used Breusch–Pagan Lagrange multiplier and the Pesaran test to examine cross-section dependence. Based on the test results, we used the system generalized method of moments (GMM) to assess the relationship between IC components and bank profitability. **Findings**: In Serbian banking industry, both HCE and CEE considerably impact bank profitability. However, we couldn't find evidence that SCE contributes to bank profitability. **Contribution**: This paper adds to the existing literature on the relationship between IC and bank profitability. However, it also includes a policy recommendation for bank executives as we discovered that investing in IC can positively influence bank profitability.

Keywords: Intellectual capital, banks, profitability, GMM, Serbia

JEL Classification: G21, O34

1. Introduction

We live in a knowledge-based economy, where a successful use of intangible assets determines a most value creation (Chowdhury et al., 2019). Knowledge becomes a new source of financial performance and competitive advantage (Soewarno & Tjahjadi, 2020). The resource-based theory acknowledges that the assets owned by an organization are unique and drive its performance as an essential source of competitive advantage. According to the resource-based view, a firm's performance is determined by its unique resources, both tangible and intangible (Soewarno & Tjahjadi, 2020). Human capital is an essential component of intellectual capital (Milosevic et al., 2021), along with capital employed efficiency and structural capital efficiency (Janosevic & Dzenopoljac, 2012; Janosevic et al., 2013; Mrazkova et al., 2016; Nawaz, 2019; Haris et al., 2019; Kweh et al., 2019; Oppong & Pattanayak, 2019; Soewarno & Tjahjadi, 2020; Le & Nguyen, 2020; Anwar et al., 2020; Xu & Liu, 2020). As a strategic resource, accumulated intellectual capital can account for a large portion of a bank's or firm's market worth.

Intellectual capital refers to the sources of non-physical (added) value for a company or organization: human capital, relational capital, and structural capital (Stahle et al., 2011), that can be transformed into organizational performance (Mahmood & Mubarik, 2020). It is challenging to capture IC's structure, functions, and benefits in terms of operationalization. Researchers developed several IC models and methodologies for analysing and monitoring IC to improve total business performance, especially financial performance.

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Modern companies, particularly financial institutions, focus on optimizing intellectual capital efficiency to improve their financial performance. Due to continuous technological advancements, globalization, increasing international competition, and economic downturns, the global financial environment has changed, putting additional pressure on bank performance. Banks can increase their returns by improving service culture and customer satisfaction, utilizing new technologies, implementing effective marketing strategies, or increasing the riskiness of their assets. Nonetheless, boosting intellectual capital efficiency has recently gained popularity and has become one of the most important determinants of bank performance (Hamdan, 2018). As the banking sector is classified under knowledge concentrated/intensive companies, investigating IC in the banking sector is vital (Oppong & Pattanayak, 2019; Rehman et al., 2021). An efficient use of intellectual capital is essential in finance and banking, as a bank's ability to deliver high-quality services is dependent on its investment in intellectual capital-related items (Ahuja & Ahuja, 2012).

Serbia's banking system is characterized by significant changes in the number and relative importance of banking institutions and an increase in the relative proportion of foreign banks. After 2000, Serbia's banking sector experienced significant changes due to strategic commitments to minimize public forms of ownership and the need to reform and modernize the banking system. With the advent of innovation and new technologies, foreign bank entry contributed to creating a competitive banking environment, as foreign banks are already technologically advanced and thus contribute to enhanced industry competition (Oppong & Pattanayak, 2019).

This research aims to highlight the components of Intellectual Capital and examine how they relate to commercial bank financial performance in Serbia. Hence, the study includes five sections, an introduction, a review of the existing literature, methodology, findings, discussion, and a conclusion. The final section provides concluding remarks and wraps up with the debate on the policy implications.

2. Literature Review

The relationship between intellectual capital and business success is analysed in depth across countries for different types of companies, including financial institutions. The literature on the relationship between intellectual capital and bank performance is growing and includes evidence from the Indonesian banking industry (Sidharta & Affandi, 2016; Soewarno & Tjahjadi, 2020; Anwar et al., 2020), the banking system in Vietnam (Le & Nguyen, 2020), Pakistani financial institutions (Haris et al., 2019), Gulf nations (Buallay et al., 2020), Islamic banks (Nawaz, 2017; Nawaz, 2019; Rehman et al., 2021), Indian commercial banks' (Oppong & Pattanayak, 2019) and other. The relationship between IC and bank performance has been thoroughly investigated in Serbia (Bontis et al., 2013; Radic, 2018; Milosevic et al., 2018; Ognjanovic & Pesterac, 2019; Pekovic et al., 2020). There is also a substantial body of research on the link between human capital and bank success (Milosevic et al., 2021).

The value-added intellectual coefficient (VAIC) is the most common proxy to measure the impact of intellectual capital on specified performance metrics. The VAIC model was developed in 1998, as described in Pulic (2004). Because it has proven to be trustworthy, many academics still use it to analyze intellectual capital efficiency (Janosevic et al., 2013; Sidharta & Affandi, 2016; Mrazkova et al., 2016; Nawaz, 2019; Haris et al., 2019; Kweh et al., 2019; Oppong & Pattanayak, 2019; Soewarno & Tjahjadi, 2020; Le & Nguyen, 2020; Anwar et al., 2020).

Even though the three components listed above are the most widely employed, researchers use a variety of approaches to assess intellectual capital. Particular academics include R&D investment and copyrights as a measure of structural capital and call it innovation capital. Others prefer the modified and extended VAIC, which uses human capital efficiency, capital employed efficiency, and innovation capital efficiency as the main components of A-VAIC (Nadeem et al., 2018) or capital employed efficiency, human capital efficiency, structural capital efficiency, innovation capital efficiency and relational capital efficiency (Xu & Liu, 2020). Similarly, Soewarno and Tjahjadi (2020) use both the traditional VAIC methodology and the adjusted Value-Added Intellectual Coefficient (A-VAIC) model in their research. More recently, Rehman et al. (2021) examined human capital efficiency, structural capital efficiency, and relation capital efficiency as factors representing intellectual capital.

In today's literature, there is a variety of indicators for assessing financial performance. While some authors analyse the impact of intellectual capital on financial performances using individual measures such as return on assets (ROA) (Anwar et al., 2020), others use a combination of ROA and return on equity (ROE) (Bontis et al., 2013; Radic, 2018; Nawaz, 2017; Nawaz, 2019; Nadeem et al., 2018, Pekovic et al., 2020) or risk-

adjusted returns on equity and risk-adjusted returns on assets (Le & Nguyen, 2020). In some cases, ROA is combined with the operating cash flow ratio to determine a company's performance (Kweh et al., 2019). ROA and ROE are occasionally combined with additional indicators: net profit, operating revenues, and operating profit (Janosevic et al., 2013); operational cost, non-performing loan, capital adequacy ratio, and loan to deposit ratio (Sidharta & Affandi, 2016). Xu and Liu (2020) and Soewarno and Tjahjadi (2020) assess firm performance using ROA and ROE for profitability, asset turnover ratio as a proxy for productivity, and market-to-book ratio as a market value measure.

The following indicators of profitability also appear in the literature: return on capital, Tobin's Q, revenue growth opportunities and employee productivity (Sherif & Elsayed, 2016); market-to-book ratio and employee productivity (Mrazkova et al., 2016); net interest margin and profit margin (Haris et al., 2019); asset turnover and employee productivity (Oppong & Pattanayak, 2019) and more recently Tobin's Q (Rehman et al., 2021). In certain cases, authors use a mix of indicators: ROA, Market value, and Tobin's Q (Castro et al., 2021).

The positive relation between IC and its components on bank performance is well documented in several studies. IC as the sum of human capital, capital employed and structural capital efficiency positively influence the banks' profitability measured by ROA and ROE (Radic, 2018; Nawaz, 2019; Le & Nguyen, 2020). Anwar et al. (2020) only used ROA to confirm this connection. Capital Employed Efficiency (CEE) and Human Capital Efficiency (HCE) have a positive effect on the financial performance of banks when VAIC is broken down into its component elements (Ozkan et al., 2017). The system generalized method of moments - GMM showed an inverted U-shaped relationship between VAIC and profitability measured by ROA, ROE, net interest margin, and profit margin (Haris et al., 2019). The same methodology was used to assess the relationship between VAIC and risk-adjusted returns on equity and assets (Le & Nguyen, 2020). Using fixed and random effects methods and GMM estimator to check for robustness, Yao et al. (2019) discovered a U-shaped relationship between IC and performance, arguing that profitability and productivity rise with an increase in IC performance up to a point, after which a further increase in IC performance causes a decline in profitability and productivity. IC also impacts banks' productivity measured by asset turnover and employee productivity (Oppong & Pattanayak, 2019). Even though the majority of literature indicates the positive relationship between profitability and intellectual capital, Castro et al. (2021) found inconsistent patterns and a variety of relationships between VAIC, financial performance, and corporate value.

Although some studies have discovered that the IC impacts bank profitability, each IC component can have a different effect. Human capital efficiency (HCE) has been proven to have a beneficial influence on bank profitability as assessed by ROA and ROE (Nawaz, 2019; Haris et al., 2019; Pekovic et al., 2020; Le & Nguyen, 2020; Xu & Liu, 2020; Soewarno & Tjahjadi, 2020; Adesina, 2021), or on banks' productivity measured by assets turnover (Oppong & Pattanayak, 2019). This is the most important component of IC and outperforms other components (Ousama et al., 2019; Yao et al., 2019). In addition, human capital can be critical to the bank's performance and innovation speed (Milosevic et al., 2021). Nonetheless, certain studies confirmed that HCE can negatively affect banks' performance (Rehman et al., 2021). As the connection between HCE and bank performance is established, employee expenses should be considered investments because they provide long-term benefits to the firm and contribute to its financial performance (Pulic, 2004).

SCE (structural capital efficiency) positively impacts bank profitability as measured by ROA and ROE (Le & Nguyen, 2020; Pekovic et al., 2020; Soewarno & Tjahjadi, 2020; Xu & Liu, 2020; Rehman et al., 2021) and on banks' productivity (Oppong & Pattanayak, 2019). On the contrary, there is evidence that SCE can have a negative impact on the banks' performance measured by net interest margin and profit margin (Haris et al., 2019). SCE provides for the working conditions and the efficiency of the employees (Nawaz, 2019), contributing to banks' added value.

Finally, it is evidenced that Capital employed efficiency (CEE) can positively influence banks' profitability measured by ROA and ROE (Sidharta & Affandi, 2016; Radic, 2018; Nawaz, 2019; Haris et al., 2019; Le & Nguyen, 2020; Pekovic et al., 2020; Soewarno & Tjahjadi, 2020; Xu & Liu, 2020), and bank productivity indicated by assets turnover and employee performance (Oppong & Pattanayak, 2019).

Following the aforementioned literature on the intellectual capital and bank performances, we formed the following hypotheses:

H1. The impact of HCE on bank profitability assessed by ROAA and ROAE is positive.
H2. The impact of CEE on bank profitability assessed by ROAA and ROAE is positive.
H3. The impact of SCE on bank profitability assessed by ROAA and ROAE is positive.

3. Research Methodology

3.1. Data

This study uses a dataset from Bankscope (BS) financial reports (balance sheet and income statement). The sample spans the years 2011 to 2019 and includes all banks operating in Serbia as of the end of 2019, including 26 commercial banks (excluding the Bank of China). One bank from the sample was established in 2015 and the data are from then on. Four banks had experienced organizational changes in 2011-2013, and we used data from 2013. We did not have data for three banks for 2019, and their interval runs from 2011 to 2018. We randomly verified data using the authorized individual financial reports. After careful examination, we eliminated all missing firm-year observations and outlier data. Finally, our dataset comprises unbalanced panel data with 212 observations.

3.2. Variables

For the data set of Serbian commercial banks, we used return on average assets (ROAA=Net profit/Average of Total Assets) and return on average equity (ROAE=Net profit/Average of Equity), as our dependent variables, in keeping with previous research on the impact of intellectual capital on profitability (Bontis et al., 2013; Sidharta & Affandi, 2016; Radic, 2018; Nawaz, 2017; Nawaz, 2019; Nadeem et al., 2018, Pekovic et al., 2020; Aslam & Haron, 2020a). We used HCE, SCE and CEE as our independent variables, amended with a set of bank-specific control variables (HCE=(Operating profit + Staff expenses + Depreciation & Amortisation expenses)/Staff expenses; CEE=(Operating profit + Staff expenses + Depreciation & Amortisation expenses)/Total equity, and SCE=(Operating profit + Depreciation & Amortisation expenses)/(Operating profit + Staff expenses + Depreciation & Amortisation expenses). As in Rehman et al. (2021), we employed control values to isolate the influence of other variables that may have an anticipated impact on Serbian bank performance. We measure bank size as the natural logarithm of total assets (TA) and bank leverage (LEV) as the sum of total liabilities relative to total assets.

3.3. Model

Researchers often use multiple linear regression, panel data regression analysis, or system generalized method of moments – GMM to assess the relationship between IC and bank performance analysis. Previous studies use multiple linear regression analyses (Janosevic et al., 2013, Sidharta & Affandi, 2016; Soewarno & Tjahjadi, 2020), while more recent studies employ panel regression (Radic, 2018; Nawaz, 2019; Haris et al., 2019; Oppong & Pattanayak, 2019; Le & Nguyen, 2020; Xu & Liu, 2020; Pekovic et al., 2020; Rehman et al., 2021). The latest trend in analyzing the relationship between intellectual capital and bank financial performances is GMM, applying a two-step system generalized method of moments (2SYS-GMM) estimator on panel data (Haris et al., 2019; Le & Nguyen, 2020; Rehman et al., 2021). Endogeneity issues may arise due to unobserved heterogeneity and the presence of a lagged dependent variable, according to Oppong et al. (2019). As a result, using OLS estimators to assess parameters and fixed-effect models can be inconsistent and ineffective. The problem of endogeneity can be addressed using a more reliable dynamic panel estimator (GMM system) (Oppong et al., 2019). Oppong et al. (2019) state that "The GMM estimator uses the combination of a system with regression taking in all first differences (instrumented with the lags of their levels) and at all levels (are instrumented with the lags of their differences). This helps control endogeneity by using internal instruments and tackles the autoregressive properties in the dependent variables. "

This study used the dynamic panel model estimation provided by Arellano and Bover (1995), also known as the GMM technique, to examine a dynamic link between intellectual capital and bank profitability in Serbia, as described in Oppong et al. (2019). The estimated equations are as follows:

$$X_{it} = C_0 + \alpha X_{it-1} + \beta_i Y_{it} + \delta D_{it} + \varepsilon_{it} \qquad (1)$$

where X_{it} denotes a vector of dependent variables (ROAA and ROAE) of bank i at time t, X_{it-1} entails the lagged value of dependent variables for bank i at time t-1, Y_{it} is the vector of independent variables (HCE, SCE, and CEE), D_{it} is a vector of control variables (TA and LEV), ε_{it} is an error term.

Precisely, we tested the following models:

Model 1:

$$ROAA_{i,t} = C_{01} + \alpha_1 ROAA_{i,t-1} + \beta_1 HCE_{i,t} + \beta_2 CEE_{i,t} + \beta_3 SCE_{i,t} + \beta_4 TA_{i,t} + \beta_5 LEV_{i,t} + \varepsilon_{i,t} \quad (2)$$

Model 2:

$$ROAE_{i,t} = C_{02} + \alpha_2 ROAE_{i,t-1} + \lambda_1 HCE_{i,t} + \lambda_2 CEE_{i,t} + \lambda_3 SCE_{i,t} + \lambda_4 TA_{i,t} + \lambda_5 LEV_{i,t} + \varepsilon_{i,t} \quad (3)$$

where the terms α_1 and α_2 indicate the persistent bank profitability, whereas β and λ are the coefficients.

4. Results and Discussion

Table 1 shows the descriptive statistics of the sample consisting of 212 observations. The average ROAA, according to the findings, is -0.001; however, the median is 0.844. The standard deviation for ROAA is 4.024. ROAE has a mean of 0.625 and a median of 4.189, with a slightly higher standard deviation (19.387). Values of ROAA and ROAE can significantly vary among countries, depending on the economic conditions in the country, type of the banking system, regulatory standards, etc. HCE has a mean of 1.792 and a standard deviation of 2.068, CEE has a mean of 0.127 (SD=0.166), and SCE 0.664 (SD=3.842). Concerning the control variables mean log of total assets is 17.962 (SD=1.329), and the average value of leverage is 0.795 (SD=0.084). The standard deviation is much larger than the average value for most independent variables (excluding TA and LEV), indicating that these indicators are highly variable. This is primarily due to different organizational changes within individual banks in Serbia. The mean and median values for ROAA and ROAE deviate significantly, indicating that the variables are not normally distributed.

Table 1: Descriptive statistics

	Mean	**Median**	**Std. Dev. (SD)**
ROAA	-0.001	0.844	4.024
ROAE	0.625	4.189	19.387
HCE	1.792	1.687	2.068
CEE	0.127	0.141	0.166
SCE	0.664	0.544	3.842
TA	17.992	18.337	1.329
LEV	0.795	0.816	0.084

Notes: ROAA-Return of average assets, ROAE-Return on average equity, HCE-Human Capital Efficiency, CEE- Capital Employed Efficiency, SCE-Structural Capital Efficiency, TA-Total assets, LEV-Leverage
Source: Authors' estimation based on Bankscope data.

We examined heteroscedasticity before evaluating our model when one or more regressors are endogenous, as Le and Nguyen (2020) did. Breusch and Pagan (1980) test is used to test the null hypothesis of homoscedasticity. We used pooled OLS with robust standard errors to estimate the equations when ROAA and ROAE are dependent variables and HCE, CEE, SCE, TA, and LEV are independent variables. Then, we run the Breusch-Pagan Lagrange multiplier tests. Table 2 shows the heteroscedasticity test by Breusch and Pagan (1980) for ROAA and ROAE, respectively. Similar to Vo and Tran (2021), the Breusch – Pagan Lagrange multiplier test results demonstrate that the p-value for both models is lower than 1%, indicating that the problem of heteroskedasticity is present. This finding is comparable to Le and Nguyen's (2020), who claim that "the GMM method is preferred to cope with this issue."

Table 2: Heteroscedasticity test

Breusch–Pagan Lagrange multiplier test	**ROAA**	**ROAE**
χ^2	443.606	333.134
p-value	<0.001	<0.001
Presence of heteroskedasticity	Yes	Yes

Source: Authors' estimation based on Bankscope data.

As suggested by Le and Nguyen (2020) and Oppong et al. (2019), we presented a correlation matrix in Table 3 to test multicollinearity problems between independent variables. Results from Table 3 show a high degree of statistically significant correlation between individual independent variables. As a result, it is reasonable to conclude that there is a problem with multicollinearity among variables (similar to that in Oppong et al., 2019). Oppong et al. (2019) state that "the problem of endogeneity is inherent in a model where correlation among independent variables is above 30 percent". In our case, the correlation coefficient is above 0.6 in some cases, indicating that endogeneity is present. As a result, we used a GMM estimator to control endogeneity and heteroscedasticity. The GMM dynamic estimator system, according to Baum et al. (2003) and Roodman (2009), minimizes endogeneity and overcomes heteroskedasticity concerns (Oppong et al., 2019; Haris et al., 2019). Vo and Tran (2021) emphasize that "even in the context of endogeneity assumptions, GMM produces robust, unbiased and efficient estimates."

Table 3: Correlation matrix

	ROAA	ROAE	HCE	SCE	CEE	TA	LEV
ROAA	1						
ROAE	0.925***	1					
	(33.694)						
HCE	0.780***	0.777***	1				
	(17.344)	(17.161)					
SCE	-0.126*	-0.080	-0.050	1			
	(-1.758)	(-1.121)	(-0.701)				
CEE	0.838***	0.890***	0.675***	-0.098	1		
	(21.349)	(27.154)	(12.701)	(-1.373)			
TA	0.440***	0.388***	0.457***	-0.066	0.228***	1	
	(6.804)	(5.841)	(7.141)	(-0.921)	(3.246)		
LEV	0.153**	0.026	-0.055	-0.147**	0.226***	0.217***	1
	(2.147)	(0.364)	(-0.759)	(-2.069)	(3.221)	(3.084)	

Notes: ***, ** denotes significance at 1%, and 5% levels, respectively; In parentheses are presented the values of t-statistics. ROAA-Return of average assets, ROAE-Return on average equity, HCE-Human Capital Efficiency, CEE- Capital Employed Efficiency, SCE-Structural Capital Efficiency, TA-Total assets, LEV-Leverage
Source: Authors' estimation based on Bankscope data.

We proceed to test cross-section dependence. Table 4 shows Cross-Section Dependence Test by Pesaran (2004) because, in our case, the cross-sectional dimension (N) is greater than the time dimension (T); N>T. For this, the null test hypothesis is that there is no cross-section dependence (correlation) in the residuals of the models when ROAA and ROAE are dependent variables, respectively. As p-values in both cases are insignificant, we cannot reject the null hypothesis of no cross-sectional dependence. This suggests that the disturbances have no cross-sectional dependence. De Hoyos and Sarafidis (2006) provide more information on cross-sectional dependence tests. Under the null hypothesis of cross-sectional independence, the GMM estimator is consistent.

Table 4: Cross-Section Dependence Test

Pesaran CSD	ROAA	ROAE
Statistic	0.743	-0.910
p-value	0.458	0.363

Source: Authors' estimation based on Bankscope data.

Table 5 shows panel regression analysis with Return on Average Assets (ROAA) as the dependent variable. We used Hansen's (1982) test to evaluate the dynamic model's validity and instruments. As a result, we conclude that the Hansen (1982) overidentification test does not provide evidence for misclassification (as shown in Kripfganz & Schwarz, 2019). In other words, if J-statistic is small enough, we can judge that the specified model is correct. We used the Arellano and Bond (1991) specification test for the absence of autocorrelation in the first-differenced residuals. We found that the statistics were insignificant, indicating no

serial correlation in the residuals of the estimated model. Apart from SCE, Table 5 reveals that the influence of the other two IC components is positive and statistically significant at the 1% level in explaining bank profitability as assessed by ROAA.

Table 5: Panel Regression Results with GMM for Model 1: Dependent variable is ROAA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROAA(-1)	0.089***	0.009	10.459	0.000
HCE	0.512***	0.043	11.878	0.000
SCE	0.006	0.004	1.473	0.143
CEE	16.451***	0.401	41.053	0.000
TA	1.396***	0.088	15.934	0.000
LEV	2.699**	1.094	2.468	0.015
Hansen's test	J-statistic			Prob(J-statistic)
	18.867			0.400
Arellano-Bond	m-Statistic			Prob.
AR(1)	-1.430			0.153

Notes: ***, **, * denotes significance at 1%, 5%, and 10% levels, respectively; ROAA-Return of average assets, HCE-Human Capital Efficiency, CEE- Capital Employed Efficiency, SCE-Structural Capital Efficiency, TA-Total assets, LEV-Leverage. The AR (1) tests the null hypothesis of the absence of first-order autocorrelation.
Source: Authors' estimation based on Bankscope data.

As we already mentioned, research is mainly grouped between two approaches: regression analysis (Meles et al., 2016; Radic, 2018; Nawaz, 2019; Pekovic et al., 2020; Soewarno & Tjahjadi, 2020) and GMM model (Le & Nguyen, 2020; Haris et al., 2019; Rehman et al., 2021). Our GMM model results are somewhat consistent with Le and Nguyen (2020) for Vietnamese banks. They did, however, use slightly modified variables, that is, risk-adjusted returns. On the other hand, our findings are only partially consistent with Haris et al. (2019) for HCE (other variables were not tested) for Pakistani banks and Rehman et al. (2021), who found a statistically significant positive correlation on a sample of Islamic banks between HCE and ROA when tested only for HCE. Still, on the other hand, he found a statistically significant negative correlation when he included all IC variables. The authors did not test for the CEE, while contrary to our results, they found a statistically significant relation between SCE and ROA (Rehman et al., 2021). When comparing results with the regression analysis approach, the results are statistically more similar. Our findings are in line with Meles et al. (2016) for US commercial banks (HCE has the biggest impact, SCE is not significant), Ousama et al., (2019) (CEE and the HCE have a positive and significant relationship with the ROE and the ROA); and partially with the results from Radic (2018), who found a statistically significant relation between CEE and ROA on a sample of Serbian banks. Results from our research are entirely consistent with Nawaz (2019) for Islamic banks operating in the UK, Pekovic et al. (2020) for Serbia, Buallay et al. (2020) for Gulf nations and Vo and Tran (2021) for Vietnamese banks. Finally, while Soewarno and Tjahjadi (2020) found a statistically significant relation between CEE and SCE and ROA, they could not confirm the positive impact of HCE on ROA in a sample of Indonesian banks.

The results confirm that the bank size plays a vital role in profitability (Alhassan & Asare, 2016; Nawaz, 2019; Haris et al., 2019; Buallay et al., 2020; Rehman et al., 2021). Regarding size, our results are contrary to the conclusions of Radic (2018), who did not find statistical significance between size and profitability. In addition, as reported by Radic (2018), Soewarno and Tjahjadi (2020), and Rehman et al. (2021), we also found statistical significance concerning leverage.

Next, we tested for HCE, SCE, and CEE results on Return on Average Equity (ROAE) (Table 6). According to Hansen's (1982) results, the J-statistic test is insignificant, and we can conclude that the specified model is correct. Also, following values for the Arellano and Bond (1991) specification tests for first-order autocorrelation, we see that the statistics are insignificant, so there is no serial correlation in the residuals of the estimated model. All independent variables in the model have statistically significant coefficients at the 1% level, except for Structural Capital Efficiency (SCE), as in model 1. To be more specific, Capital Employed Efficiency (CEE) has the highest importance in model 2, with ROAE as a dependent variable.

Table 6: Panel Regression Results with GMM for Model 2: Dependent variable is ROAE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROAE(-1)	-0.027**	0.011	-2.349	0.020
HCE	3.3638***	0.376	8.939	0.000
SCE	0.129	0.119	1.082	0.281
CEE	71.910***	2.516	28.585	0.000
TA	14.029***	0.586	23.921	0.000
LEV	-135.064***	6.248	-21.617	0.000
Hansen's test	J-statistic			Prob(J-statistic)
	19.841			0.342
Arellano-Bond	m-Statistic			Prob.
AR(1)	-0.023			0.982

Notes: ***, **, * denotes significance at 1%, 5%, and 10% levels, respectively; ROAE-Return on average equity, HCE-Human Capital Efficiency, CEE- Capital Employed Efficiency, SCE-Structural Capital Efficiency, TA-Total assets, LEV-Leverage. The AR (1) tests the null hypothesis of the absence of first-order autocorrelation.
Source: Authors' estimation based on Bankscope data.

As in the case of ROAA, the results of our research related to ROAE are, to a large extent, consistent with the majority of literature using the GMM model. They partially corroborate findings from Le and Nguyen (2020) for risk-adjusted returns in Vietnamese banks and are in line with Haris et al. (2019) for Pakistani banks. Rehman et al. (2021) found a statistically significant positive relationship between HCE and ROE, but contrary to our results also discovered a statistically significant relationship between SCE and ROE. Research using regression analysis shows similar results. Meles et al. (2016) confirm the relationship between HCE (as in our case) and SCE (opposite to our results), and ROE. They did not test CEE. The findings of our study related to ROAE are entirely consistent with Pekovic et al. (2020) for Serbia and with Buallay et al. (2020) for Gulf nations but opposite to Nawaz (2019) for Islamic banks operating in the UK. He did not find statistically significant relations among any of the IC components. Soewarno and Tjahjadi (2020) discovered the exact influence of selected variables on ROE as in ROA and a statistically significant relationship between CEE and SCE and ROE but were unable to corroborate the favourable impact of HCE on ROE in a sample of Indonesian banks.

Regarding our control variables, we found confirmation of the influence of bank size on ROAE as in Alhassan and Asare (2016) and Rehman et al. (2021), but contrary to Radic (2018). Also, our results indicate a statistically significant negative relationship between leverage and ROAE. We borrowed interpretation from Aslam and Haron (2020a), who argue that increasing debt levels may negatively impact bank profits.

We interpret the results of the sample of Serbian banks as the fact that good capital management contributes to bank profitability measured by ROAA and ROAE. The capital employed (physical and financial) generates value-added for Serbian banks. Nonetheless, banks have acknowledged the value of human capital and proven that bank staff possess the essential skills and capacities to accomplish their tasks to maximize earnings. We interpret the results obtained for ROAE as similar to those for ROAA. Banks find it helpful to utilize equity and invest in people to achieve higher profitability.

Conclusion

In this study, we provided an empirical analysis of the IC components on the performance of Serbian banks measured by ROAA and ROAE. We analysed Human Capital Efficiency, Capital Employed Efficiency, Structural Capital Efficiency, and the control variables: bank size and leverage. In conclusion, the study finds that both HCE and CEE have a significant impact on the profitability of Serbian banks. However, when it comes to SCE, we couldn't find any evidence to back up such claims. SCE is the knowledge that stays with a company even after an employee leaves it (Poh et al., 2018) and results from past human capital performance (Aslam & Haron, 2020b). The highest score among IC components has CEE, showing that banks' physical and financial capital impact income creation more than the other IC components (Oppong & Pattanayak, 2019). Parallel to this, HCE proved to be statistically significant, demonstrating that investing in knowledge, experience, education, and staff skills pays off, as these are the foundations of HCE (Alamanda, 2019). Employees take these assets when they leave a company, so they are not permanent assets. Overall, our results give a clear policy

recommendation for bank managers: investing in IC can positively impact bank profitability. Tables 5 and 6 show that HCE and CEE demonstrate the effect on ROAA and ROAE; thus, we found evidence to support our first (the impact of HCE on bank profitability assessed by ROAA and ROAE is positive) and second hypotheses (the impact of CEE on bank profitability assessed by ROAA and ROAE is positive). However, we could not find proof to support our third hypothesis (the impact of SCE on bank profitability assessed by ROAA and ROAE is positive).

Based on the findings of other studies, we may conclude that the IC components have a different and sometimes even opposing impact on the bank's profitability. It is mainly determined by the country's overall economic status and the type, structure, and level of financial system development. Given this, the study is limited in scope because it only focuses on commercial banks in a single country. Therefore, it would be helpful to include banks from other countries with similar banking systems. In this study, we used only two proxies for profitability. We can overcome this limitation by having more profitability indicators and including more independent variables that we can test.

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