EXPLORING THE CAUSALITY BETWEEN HUMAN CAPITAL EFFICIENCY AND PROFITABILITY OF BANKS BASED IN SLOVAKIA

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Abstract

Human capital represents a combination of various attributes, abilities, and professional competencies that employees bring to an organization. Recently, Slovak banks have experienced a significant decline in the number of employees, which may impact the future functioning of the financial system in Slovakia. Human capital can directly influence the financial performance of institutions. This paper specifically focuses on highlighting the importance of human capital in banks based in Slovakia in a causal relationship with bank profitability, measured by selected indicators. Measuring human capital within institutions is relatively complex, and in this case, it is conducted using the calculation of the Human Capital Efficiency (HCE) indicator from data reported by Slovak banks in their financial statements. In contrast, measuring profitability is relatively common and can be expressed through various indicators, also derived from banks' financial reports. Causality between the variables is determined using the Granger causality method. The paper confirms the causality between HCE and various bank profitability indicators, emphasizing the importance of further and deeper exploration of human capital in the banking sector.

Key words: banking, human capital efficiency, profitability, Granger causality, Slovakia

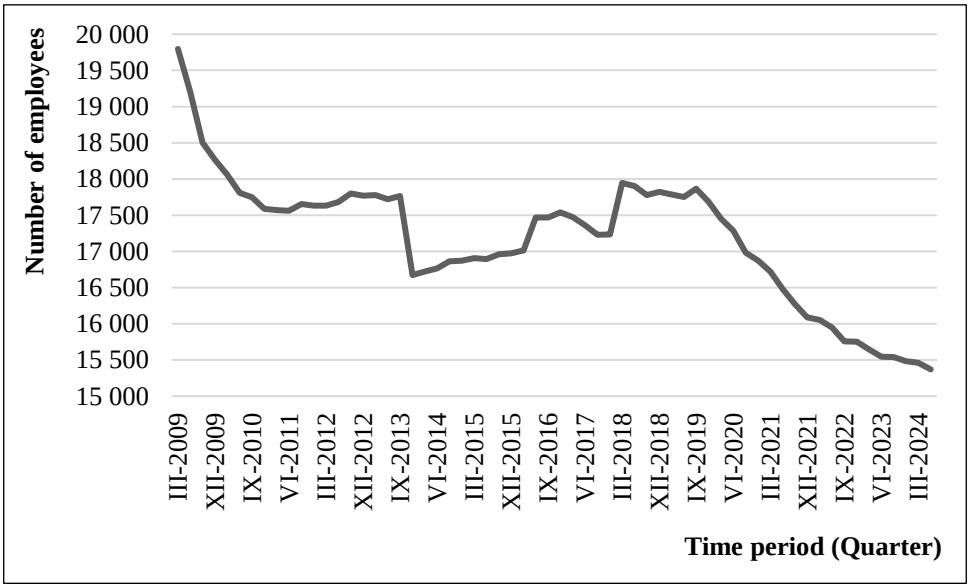
JEL Code: G21, J24

Introduction

Human capital, as one of the factors of production, has been addressed in the works of Adam Smith, Milton Friedman, and Karl Marx. They recognized the necessity of understanding individuals, along with their knowledge and skills, as valuable assets that contribute positively to the organization. This perspective allows businesses to leverage human capital to enhance their competitiveness, generate higher profits, and ultimately increase the overall value of the enterprise. Therefore, investing in employees and their development is essential for fostering long-term organizational success. In this study, the focus will be on the Slovak banking

sector, which has recently experienced a significant reduction in employee numbers. Over the past few years, major Slovak banks have substantially reduced their workforce. According to data published by the National Bank of Slovakia (NBS), there has been a notable decline in the number of employees in the banking sector in recent times (NBS, 2024). Since 2009, the second quarter of 2024 has recorded the lowest employee count, with a reduction of 91 employees compared to the previous year. This decreasing trend has been particularly evident since the onset of the COVID-19 pandemic. A significant change was also observed between the third and fourth quarters of 2013, which the National Bank of Slovakia attributed to the transformation of UniCredit Bank Slovakia, a.s. into a branch of a foreign bank (UniCredit Bank Czech Republic and Slovakia, a.s., branch of foreign bank). The trend of the decline in the number of employees can be observed in Fig. 1.

Fig. 1: Number of employees in the banks based in Slovakia



Source: National Bank of Slovakia (2024)

Maxa (2023) presents several statements from experts currently holding various positions within banks, indicating that the reduction in the number of branches is driven by cost-cutting measures in banks and, as well, by digitalization, which favours alternative channels for client communication. Several specific banking institutions have cited various reasons for their decrease in employee numbers. This suggests that while banks address human resource issues individually, they publicly present a common challenge: an overall decline in workforce size. This study seeks to analyse the significance of human capital, highlighting its critical role in the banking sector. Reducing employee numbers may not necessarily be the most beneficial approach for banks, particularly when considering the

importance of human capital in enhancing bank profitability and overall performance. Understanding how human capital directly contributes to these areas is essential, especially in a time when operational efficiency and adaptability are crucial for maintaining competitive advantage.

In this study, human capital will be measured using the Human Capital Efficiency (HCE) indicator, while profitability and bank performance will be assessed using nine different indicators. Several studies (e.g. Adesina, 2021 or Bawono et al., 2023) have examined the HCE in relation to profitability using the regression estimation analysis. The aim of the analytical section of this paper is to assess the importance of human capital in banks based in Slovakia using Granger causality. By using Granger causality, banks can answer following question: Does an increase in the human capital efficiency indicator lead to better bank profitability and overall performance? This comprehensive approach aims to provide a deeper understanding of how human capital impacts the overall performance and profitability of banks. Granger causality can help detect these time-dependent relationships, allowing for more effective and forward-looking decisions, such as anticipating when investments in employees will start to pay off. By leveraging Granger causality, banks can better understand the dynamic interplay between their workforce and their performance, leading to more sustainable growth and improved overall outcomes.

1 Literature review

The significance of human capital for enhancing productivity, firm performance, and maintaining competitive advantage has been a well-established concept in economic theory, emphasized in an early paper by Becker (1962). Human capital, which includes the skills, knowledge, and abilities of employees, is increasingly recognized as a key intangible asset that can drive organizational success. In more recent study by Sulisnaningrum et al. (2022), the efficient use of human resources is still constantly at the centre of attention of the management of any organization. Human capital can focus on employee education, development, and how companies engage with their workforce to understand and meet their needs. Studies often emphasize the importance of organizational efforts to support employee well-being and recognize individual requirements. While adequate compensation remains a primary motivator for job performance, factors such as professional growth opportunities and company engagement are equally crucial. Rahmar and Akhter (2021) conduct an empirical analysis examining the significance of human capital investment on bank performance through a structured questionnaire survey. Another method involves measuring human capital

using data from banks' financial statements. Absar et al. (2014) reveal that all banks in Bangladesh banking industry include human capital disclosures as the most frequently reported theme in their annual reports. The process of collecting data through survey-based research is time-consuming, and from a practical standpoint, it is simpler to measure indicators describing human capital using publicly available reports, such as annual reports within a company's financial statements. Moreover, it cannot be definitively stated that commercial banks in other countries significantly focus on human capital analysis in their annual reports. For this reason, human capital is typically measured using the VAIC (Value Added Intellectual Coefficient) methodology. Within it is also possible to measure the HCE indicator, which specifically evaluates the efficiency of human capital in generating value for the organization.

In recent years, there has been a growing amount of research investigating the specific relationship between HCE and bank performance, reflecting its importance in knowledge-driven sectors like banking. A study by Meles et al. (2016), utilizing a comprehensive panel dataset of 5,749 commercial banks in the U.S. between 2005 and 2012, provides strong evidence that higher levels of intellectual capital positively influence bank performance. Their findings suggest that among the different components of intellectual capital, human capital stands out as the most significant driver of profitability in the banking sector. The study highlights that investing in the development of employees, through training, education, and knowledge enhancement, results in tangible performance gains, with human capital playing a more critical role than other forms of intellectual assets. The importance of human capital in banking is not only confined to the U.S. market. A study conducted by Mention and Bontis (2013), based on a dedicated survey administered to over 200 banks in Belgium and Luxembourg, reinforces these findings. This research emphasizes the direct and indirect contributions of human capital to bank performance. Another study by Adesina (2021) find that effects of human capital efficiency have a positive impact on bank performance measures in 34 African countries over the period from 2005 to 2015 and highlight the importance of the development of human capital. Ikapel (2016) argue that productivity of banks in Kenya can be enhanced by investment in human capital efficiency. Research by Bawono et al. (2023) illustrates the significant impact of human capital on both the performance and diversification of banks in Asian markets.

While numerous studies have examined human capital efficiency in relation to bank performance in various global economies, it is important to consider these findings in the context of Slovakia. Given the evolving dynamics of the Slovak banking sector, particularly

with recent workforce reductions and a growing emphasis on operational efficiency, understanding the role of human capital could be essential for maintaining competitiveness, ensuring sustainable profitability, and optimizing performance.

2 Data and methodology

The Slovak banking sector plays a crucial role in the country's financial system, serving as a backbone for economic stability and growth. It is characterized by a mix of domestic and foreign banks, regulatory oversight from the National Bank of Slovakia. This study analyses 11 banks based in Slovakia from 2009 (the year when the euro was adopted in Slovakia) to 2023. The study primarily focusses on banks based in Slovakia, not branches of foreign commercial banks, because domestic banks are governed and licensed by the NBS and must comply with local regulations and standards. The study aims to address specific challenges and opportunities faced by the Slovak banking sector, which may not be as pronounced in the branches of foreign banks that operate under different corporate strategies and market dynamics.

In line with previous studies (e.g. Meles et al, 2016 or Van Nguyen and Lu, 2024), we measure banks' human capital efficiency indicator using the human capital component of the VAIC model developed by Pulic (1998). In this study, we will not focus on the VAIC method as a whole, but instead will concentrate on its component, human capital efficiency. The HCE indicator refers to the efficiency of human capital in utilizing intellectual resources to create value. Specifically, the VAIC model captures HCE by showing the ability of human assets held by a bank to create value for the bank. To calculate HCE, we first need to estimate the total value added (VA).

$$VA_{it} = OP_{it} + PC_{it} + A_{it} \tag{1}$$

where OP_{it} is the operating profit (the money left after paying all business costs, but before paying tax), PC_{it} it is the personnel costs of bank, and A_{it} represents the amortisation and depreciation of bank i at time t. Mathematically, it measures HCE by calculating the marginal contribution per unit of money invested in employees. The following equation shows how the HCE is calculated:

$$HCE_{it} = \frac{VA_{it}}{HC_{it}} \tag{2}$$

where human capital (HC) refers to personnel expenses of bank i at time t. In this way, the relation between VA and HC (i.e. Equation (2)) describes the ability of HC to create

value in a bank. In other words, a higher value of the HCE indicates higher capability in value creation by HC (Adesina, 2021).

Measuring profitability of banks is crucial to assessing their financial performance. Several key metrics and ratios are commonly used to evaluate a bank's profitability. These metrics focus on different aspects of the bank's income generation, cost control, and operational efficiency. Tab. 1 shows the list of indicators used in the analysis of this study.

Tab. 1: Profitability indicators and their optimal values

Variable (abbreviation)	Formula		Interpretation
Return on Assets (ROA)	$\frac{net\ profit_{it}}{total\ assets_{it}}$	(3)	ROA measures how efficiently a bank uses its assets to generate profits. 1-2% is typically seen as a strong performance in the banking sector.
Return on Equity (ROE)	$\frac{net\ profit_{it}}{total\ equity_{it}}$	(4)	ROE measures the return generated on shareholders' equity and shows how well a bank is using investors' money to generate profits. It generally falls within the range of 10-15%.
ROA before taxation (EBITROA)	$\frac{profit\ before\ taxe}{total\ assets_{it}}$	(5)	EBITROA provides insight into operational efficiency and asset utilization irrespective of their tax burdens.
ROE before taxation (EBITROE)	$\frac{profit\ before\ taxes}{total\ equity_{it}}$	(6)	EBITROE assesses how efficiently a company is using its shareholders' equity to generate operating earnings before tax considerations.
Net Interest Margin (NIM)	$\frac{net\ interest\ incom}{total\ earning\ asset}$	(7)	NIM reflects the bank's core profitability from its lending and investment activities. It typically falls between 2-4%.
Cost-to-Income Ratio (CIR)	$\frac{operating\ expenses}{operating\ income_i}$	(8)	CIR measures the proportion of a bank's costs relative to its income. Generally, the lower the CIR, the more efficiently the bank is managing its available resources. CIR of around 50-60% is considered a good value.
Loan-to-Deposit Ratio (LDR)	$\frac{total\ loans_{it}}{total\ deposits_{it}}$	(9)	LDR measures a bank's ability to fund loans with deposits. Generally, the value between 80-90% is considered optimal for commercial banks. A very high LDR may indicate liquidity risks, while a very low LDR suggests the bank isn't lending enough, limiting its profitability.
Net Profit Margin (NPM)	$\frac{net\ profit_{it}}{total\ revenue_{it}}$	(10)	A ratio of NPM within the 20-30% range suggests that the bank is efficiently converting its revenue into profit. A higher NPM indicates that the bank is converting a larger portion of its revenue into profit or operating with higher margins, which could be unsustainable in the long run.
Non-Interest Income Ratio (NONIN)	$\frac{non-interest\ inco}{total\ revenue_{it}}$	(11)	NONIN between 30-50% is often considered healthy for most commercial banks. A higher ratio can indicate strong diversification, or the bank is more focused on non-lending activities.

Note: For the calculations, the following indicators were utilized: **NIM** is derived from total earning assets, along with a comprehensive set of six indicators including loans to banks, loans to customers, finance lease receivables, debt securities, financial assets held for trading, and non-trading financial assets at fair value. **The operating expenses for the CIR indicator** were calculated by considering interest costs, fees and commission costs, personnel expenses, depreciation and amortization, as well as other administrative expenses. **Operating income** was determined by aggregating interest income, income from fees and commissions, dividend income, net trading results, exchange differences, and other administrative income. Lastly, **total revenue** encompasses income from interest (interest income) and income from fees and commissions (non-interest income).
Source: The optimal values presented in this table are derived from general recommendations found in academic literature related to banking performance. Specific references can be provided upon request.

In the results section, we will focus on evaluating these indicators using Granger causality, the outcome of which will determine the verification of a unidirectional dependence. This model was proposed by Granger (1969), who examined the dynamics of relationships using time lags, specifically deviations from the autoregressive distributed lag. The Granger model takes the form of:

$$y_t = \alpha_0 + \sum_{i}^{m} \alpha_i y_{t-1} + \sum_{i=1}^{m} \beta_i x_{t-i} + u_t \tag{12}$$

To demonstrate the relationship, we test two auxiliary regressions:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \cdots + \alpha_m y_{t-m} + \beta_1 x_{t-1} + \cdots + \beta_m x_{t-m} + u_t \tag{13}$$

$$x_t = \gamma_0 + \gamma_1 x_{t-1} + \cdots + \gamma_m y_{t-m} + \delta_1 y_{t-1} + \cdots + \delta_m y_{t-m} + u'_t \tag{14}$$

where $x, y \in R$. The regression parameters $\alpha_0, \gamma_0, \alpha_i, \beta_i, \gamma_i, \delta_i$ are denoted differently because we change the functional form, resulting in different parameter estimates and different random errors u_t, u'_t. The index $i = 0,1,2,K,\dots,m; i \in N$ serves to express the lag from time t. The null hypothesis for a Granger causality test is that the variable 1 does not Granger-cause the variable 2 (i.e., past values of variable 1 do not provide additional information about future values of variable 2). In the first case, it indicates that x does not influence y in the Granger sense, and in the second equation, it is analogous, meaning y does not influence x. The p-value tells us whether we can reject this hypothesis. If the p-value is lower than the chosen significance level ($\alpha = 0.05$), we reject H0, which indicates that there is Granger causality between the variables.

3 Results

The analysis of the banking performance indicators reveals critical insights into the overall performance of the observed banks. By examining these key metrics, stakeholders can better understand the banks' operational efficiency, profitability, and risk management strategies. The results are presented in Tab. 2.

Tab. 2: Descriptive statistics

Variable	*HCE*	*ROA*	*ROE*	*EBITROA*	*EBITROE*	*NIM*	*CIR*	*LDR*	*NPM*	*NONIN*
Mean	2.03	0.69	6.53	0.93	8.75	2.88	61.94	90.08	21.61	22.73
Median	2.12	0.79	7.41	1.02	9.57	2.62	61.31	84.47	24.94	23.20
Std. deviation	1.25	1.05	10.11	1.05	10.13	1.04	14.94	33.52	21.36	9.67
Minimum	-9.95	-10.14	-96.58	-8.53	-81.29	0.87	30.85	38.44	-131.07	0.00
Maximum	3.97	2.37	27.78	2.85	36.40	6.32	106.39	223.30	63.22	55.52

Count	165	165	165	165	165	165	165	165	165	165

Source: own calculation processed in MS Excel

In the Slovak banking sector, the mean value of the ROA suggests a moderate ability to convert assets into profit, falling slightly below the optimal range. Similarly, the ROE remains below the preferred benchmark of 10% to 15%, signalling a need for improved capital management and profitability strategies. The NIM indicator reflects effective interest income management, showcasing the banks' ability to maintain profitability on their lending activities. Conversely, mean value of the CIR indicates points to significant operational costs relative to income generated, suggesting that banks may need to implement strategies to streamline operations and reduce expenses to achieve a more favourable cost structure. The mean value of the LDR indicates a healthy utilization of deposits for lending purposes, NPM reflects a robust ability to convert revenues into profits, and NONIN suggest that banks based in Slovakia focus more on traditional interest income. The extreme values (minimum and maximum) were typically observed in banks that hold a distinctive position within the Slovak banking sector. For instance, the maximum LDR was recorded at the Slovak Guarantee and Development Bank in 2013, which is state-owned and provide funding to support small and medium-sized enterprises. Additionally, several values outside the optimal range were noted as a result of various crises faced by the banking sector since 2009.

The first step in using Granger causality is to verify the assumptions by testing variables for stationarity. The stationarity of each time series is tested using the unit root test, specifically the Augmented Dickey-Fuller (ADF) test, and further confirmed by the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test. Both tests show that the data are stationary, except for the LDR and CIR indicators. This needs to be considered when interpreting the results.

Following this, a correlation analysis is conducted. This analysis generates Tab. 3 to examine the correlation between the HCE indicator and various profitability measures, as well as the correlations among indicators themselves. By analysing these correlations, the main goal is to determine whether HCE has a significant relationship with key financial metrics

Tab. 3: Correlation analysis

	HCE	*ROA*	*ROE*	*EBITROA*	*EBITROE*	*NIM*	*CIR*	*LDR*	*NPM*	*NONIN*
HCE	1									
ROA	0.9571	1								
ROE	0.9368	0.9492	1							
EBITROA	0.9542	0.9813	0.9190	1						
EBITROE	0.9315	0.9205	0.9821	0.9217	1					

NIM	0.0074	0.0222	-0.0436	0.1024	0.0173	1				
CIR	-0.2144	-0.1615	-0.2008	-0.2225	-0.2569	-0.6271	1			
LDR	-0.1547	-0.1256	-0.1251	-0.1754	-0.1987	0.0472	-0.3576	1		
NPM	0.8840	0.8985	0.8664	0.9087	0.8701	-0.0552	-0.1997	-0.1855	1	
NONIN	0.1636	0.2043	0.2051	0.1938	0.2064	-0.5600	0.5553	-0.3404	0.3163	1

Source: own calculation processed in MS Excel

Based on the correlation analysis, there appears to be a strong positive relationship between HCE and certain profitability indicators (such as ROA, ROE, etc.). The correlation analysis also does not provide information about causal relationships. Our aim is to verify whether the examined indicators demonstrate not only a correlation but also a causal link between HCE and other indicators. In the Tab. 4, the quantified output of the entire model is not presented; instead, the p-value calculated based on the Wald F-statistic is provided.

Tab. 4: Results of Granger causality test

H0			p-value			
Variable 1		Variable 2	lag 1	lag 2	lag 3	lag 4
HCE	≠>	ROA	**<0.0001**	**0.0011**	**0.0042**	**0.0035**
HCE	≠>	ROE	**0.0123**	0.0891	0.2197	0.1680
HCE	≠>	EBITROA	0.5017	0.7508	0.6880	0.8679
HCE	≠>	EBITROE	0.0628	0.1201	0.1380	0.3052
HCE	≠>	NIM	0.7616	0.8793	**<0.0001**	**<0.0001**
HCE	≠>	CIR	**0.0349**	0.1205	**0.0390**	**0.0097**
HCE	≠>	LDR	0.6468	0.1377	**<0.0001**	**<0.0001**
HCE	≠>	NPM	**0.0199**	0.1245	0.2405	0.2999
HCE	≠>	NONIN	0.7931	**0.0367**	**0.0091**	**0.0146**

Source: own calculation processed in RStudio

The results presented in Tab. 4 lead to the following conclusions. A causal relationship at a significance level of 0.05 (5%) is confirmed for seven variables out of nine variables. The HCE is not statistically significant in relation to the profitability measured by the EBITROA and EBITROE. It is assumed that the application of tax burden could play an important role as these indicators do not reflect tax costs. In the other cases, causality is observed, although it is not significant across all lags. The results do not indicate a reverse causal effect of the indicators on human capital. Therefore, these results are not presented; however, they can be included upon request.

HCE influences ROA across all time lags, indicating that human capital affects financial performance both immediately and in subsequent periods. Investments in employee efficiency enhance immediate firm performance and provide long-term benefits in return on assets. Conversely, HCE affects ROE only in the short term, contributing to improved return

on equity immediately after a specific period. It reflects how improvements in human capital can lead to short-term financial gains and immediate positive reactions from capital markets. However, factors like financing structure or external economic conditions may diminish this effect over time. The positive relationship between HCE and ROA and ROE align with findings from Van Nguyen and Lu (2024) and Meles et al. (2016), who also assert that HCE is a key driver of financial performance relative to other the VAIC components. Furthermore, the analysis shows that HCE influences three indicators at a longer-term level. Specifically, it affects NIM and LDR at lags 3 and 4, and the NONIN indicator at lags 2 to 4. Based on the results, it can be inferred that investments in the development and effective utilization of human capital manifest in net interest income reflected in the NIM indicator only after a certain period. This relationship is confirmed as statistically significant by Ikapel (2016) using linear regression, although the temporal aspect is not examined. The lagged effect observed in the LDR indicator may suggest that an increase in employee efficiency can lead to changes of the ratio in the long run. Additionally, HCE also has a delayed and long-term impact on the bank's non-interest income. The significance of this relationship is supported by Githaiga (2021), who argues that a focus on non-traditional banking activities might diminish the economic value of human capital and ultimately lower performance. HCE influences CIR at various time levels. This indicates that investments in human capital could lead to more efficient resource utilization in the bank. Bawono et al. (2023) also confirm this relationship as significant. According to the results, HCE affects NPM only in the short term, suggesting that immediate improvements in the HCE quickly impact the firm's ability to generate higher net profit, but its long-term effects are less pronounced.

Conclusion

The key conclusion of this study is that human capital efficiency, as calculated through the VAIC method, significantly influences various aspects of bank profitability and overall performance, particularly the ROA indicator, and other profitability metrics at certain lags. As human capital directly impacts a bank’s profitability, it is critical for management to focus on enhancing its efficiency. While improvements in financial performance may not be immediate, they are likely to materialize over time. Emphasizing the need for proactive management and investment in employee development ensures long-term sustainability and competitiveness in a dynamic economic environment. For future research, confirming the significance of this relationship in other studies and identifying further relevant indicators for

similar research would be beneficial. Additionally, it is recommended to analyse the relationship across multiple countries and incorporate a broader set of indicators to validate these findings.

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