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HUMAN CAPITAL AND PROFITABILITY: CASE of TURKISH BANKING SECTOR[1]

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Abstract

This study aims to examine the effect of human capital on profitability of Turkish banking sector by a panel data covering 2009.q1-2022.q4. Throughout this aim, a research model based on a dependent variable as return on equity is set up. The independent variable to be focused is the Human Capital Efficiency Coefficient -mostly considered as the most significant sub-coefficient of the Value-Added Intellectual Coefficient Methodology developed by Ante Pulic (2004)- to measure intellectual capital efficiency. Besides, three control variables are included in the model to proxy balance sheet structure, assets quality and liquidity.

Levin-Lin-Chu (LLC), Im-Pesaran-Shin (IPS) and Augmented Dickey Fuller (ADF) Fisher panel unit root tests, and Pedroni (1999) panel co-integration test are conducted in the econometric analyses to test the stationarity and co-integration among the series. Long term co-integration coefficients are estimated by Fully Modified Ordinary Least Squares (FMOLS) methodology proposed by Pedroni (2000). The empirical findings indicate the existence of a statistically significant and positive relationship between human capital and profitability; and statistically significant and negative relationships among human capital and assets quality, and human capital and liquidity. Another finding is that there exists no statistically significant relationship between human capital and balance sheet structure.

Keywords: *Human Capital, Profitability, Balance Sheet Structure, Asset Quality, Liquidity,*

JEL Classification: *G2, G32, J24.*

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İNSAN SERMAYESİ ve KÂRLILIK: TÜRK BANKACILIK SEKTÖRÜ ÜZERİNE BİR UYGULAMA

Öz

Bu çalışmanın amacı; 2009.q1-2022.q4 dönemini kapsayan panel veri seti kullanılarak, insan sermayesinin Türk bankacılık sektörünün kârlılığı üzerindeki olası etkisinin irdelenmesidir. Bu amaç doğrultusunda, kârlılığın bağımlı değişken olarak özsermaye getirisi ile test edildiği bir araştırma modeli oluşturulmuştur. Modelin temel bağımsız değişkeni Ante Pulic (2004) tarafından geliştirilen ve entelektüel sermaye etkinliğini ölçmede kullanılan Entelektüel Katma Değer Katsayısı (Intellectual Value Added Coefficient-VAIC) Yöntemi'nin en önemli alt bileşeni olan İnsan Sermayesi Etkinliği (Human Capital Efficiency-HCE) Katsayısı'dır. Ayrıca, araştırma modeline kontrol değişkenleri olarak ilgili bankanın bilanço yapısı, aktif kalitesi ve likidite değişkenleri dâhil edilmiştir.

Çalışmanın ekonometrik metodolojisi kapsamında, modele dâhil edilen değişkenlerin durağanlık ve eş-bütünleşme düzeylerinin tespit edilmesinde Levin-Lin-Chu (LLC), Im-Pesaran-Shin (IPS) ve Augmented Dickey Fuller (ADF) Fisher panel birim kök testleri ile Pedroni (1999) panel eş-bütünleşme testi kullanılmaktadır. Uzun dönem eş-bütünleşme katsayıları ise Pedroni (2000) tarafından önerilen (tam Modifiye Edilmiş En Küçük Kareler (Fully Modified Ordinary Least Squares-FMOLS) yöntemi ile tespit edilmektedir. Elde edilen ampirik bulgular, insan sermayesi etkinliğinin kârlılık üzerindeki etkisinin pozitif; buna karşın aktif kalitesinin ve likiditenin finansal performans üzerindeki etkilerinin negatif yönlü olduğunu göstermektedir. Elde edilen bir diğer ampirik bulgu ise kontrol değişkenlerinden olan bilanço yapısı değişkeninin, kârlılık üzerinde istatistiksel olarak anlamlı bir etkisinin bulunmadığıdır.

Anahtar Kelimeler: *İnsan Sermayesi, Kârlılık, Bilanço Yapısı, Varlık Kalitesi, Likidite.*

JEL Sınıflandırması: *G2, G32, J24.*

INTRODUCTION

With the emergence of the knowledge economy (k-economy) in the late 1900s-2000s, the traditional patterns in the evolution of firms have shifted from capital-driven to knowledge-driven (Xu & Li, 2019), and the dominance in value creation has shifted from mass production to intellectual capital (IC) and its components (Dean & Kretschmer, 2007; Murthy & Mouritsen, 2011). In this k-economy, new business models such as Airbnb and Uber operating with almost no physical capital or physical assets; and the technologically and fast-shifting advanced firms such as Apple that are organized around areas of expertise rather than individual products, that have only a few manufacturing facilities and create value using intellectual capital and its mostly intangible assets related components such as skills, employees' talents, design, innovation and comprehensive knowledge have risen to prominence. These firms have been perceived as paragons of increasing role of IC as a catalyst and a primary value-driver to increase the overall performance (Nimtrakoon, 2015; Sardo, Serrasquero & Alves, 2018; Smriti & Das, 2018). This perception has also been confirmed by the Organization for Economic Co-operation and Development (OECD, 2006) as stated that economic value of the firm does not depend only on tangible assets, but also intangible assets such as human capital and knowledge.

The term intellectual capital was firstly referred by the well-known Canadian-American economist John Kenneth Galbraith in his 1967 book, *The New Industrial State*. He considered intellectual capital as a result of an "intellectual action" rather than *just* knowledge as a new and unique value-driver in the traditional economy (Galbraith, 1967). Thereafter, Eric Flamholtz suggested an intellectual capital related term "human asset" in his 1971 article on human resource valuation to describe workers collaborating in organizations (Flamholtz, 1971). After mid-1990s, studies on intellectual capital gained popularity mostly regarding about the its basic definitions and components such as human, structural, relational capital (Edvinsson & Malone, 1997; Roos & Roos, 1997; Stewart, 1997; Bontis, Keow & Richardson, 2000; Vishnu & Kumar Gupta, 2014; Bontis, Ciambotti, Palazzi & Sgro, 2018; Ge & Xu, 2021; Tiwari, Vidyarthi & Kumar, 2023), and contributions of these components to managerial and financial performance (Bollen, Vergauwen & Schnieders, 2005; Chen, Cheng &

Hwang, 2005; Barney, Ketchen & Wright, 2011; Nimtrakoon, 2015; Amin & Aslan, 2017; Soetanto & Liem, 2019). In brief, most definitions have commonly defined intellectual capital as a non-physical set of intangible resources and capabilities owned and/or controlled by the firm (Albertini & Berger-Remy, 2019), having crucial importance to create value and achieve sustainable competitive advantage (Crook, Ketchen, Combs & Todd, 2008); also, by expressing the very difficulty of putting forth a universally agreed-upon definition about it. Kianto, Sáenz & Aramburu (2017) and Pedro, Leitão & Alves (2018) relate this difficulty to the variety of intellectual capital components and complex interactions among them. Besides, the empirical findings on the correlation between intellectual capital and firm performance (mostly proxied by profitability) have yielded mixed results (see, for instance, Joshi, Cahill, Sidhu & Kansal, 2013; Nimtrakoon, 2015; Nadeem, Gan & Nyugen, 2017; Xu & Wang, 2018; Weqar, Khan & Haque, 2020).

Another branch of intellectual capital related studies have attempted to develop contemporary methodologies to value it. The rationale for these attempts is that the traditional accounting-based intellectual capital valuation methodologies remain insufficient to capture the value especially generated by intellectual capital and its components. Some well-known metrics to value intellectual capital are Economic Value Added (EVA) developed by the consulting firm Stern Stewart and its derivations such as Market Value Added (MVA), Shareholder Value Added (SVA) and Cash Value Added (CVA); the Balanced Scorecard of Kaplan & Norton (1996); Skandia's Intellectual Capital Navigator of Edvinsson & Malone (1997); the Intangible Assets Monitor of Sveiby (1997) and Value Added Intellectual Coefficient (VAIC) of Pulic (2000). The most commonly referred metric to proxy intellectual capital - in especially empirical studies- is VAIC (Chu, Chan & Wu, 2011; Mondal & Gosh, 2012; Ulum, Ghozali, & Purwanto, 2014; Bontis, Janosevic & Dzenopoljac, 2015; Sohel Rana & Hossain, 2023; Xu & Wang, 2018; Lee & Lin, 2019; Castro, Ramirez & Escobar, 2021; Ahmed & Hussin, 2024). It deals with intellectual capital comprehensively around its three key components as (i) human capital efficiency (HCE), structural capital efficiency (SCE) and capital employed efficiency (CEE). Here, HCE can be attributed as the most crucial component of VAIC, as many researchers including Prahalad & Hamel (1990), Pfeffer (1994), Huselid (1995), Guenther, Beyer & Menninger (2003), Ahmed & Hussin (2023) perceive human capital which comprises employees' skills, experience, expertise and capabilities, as a very vital resource and necessity to gain competitive advantage.

This study aims to examine especially the effect of human capital proxied by human capital efficiency on profitability of Turkish banking sector by a panel data covering 2009.q1-2022.q4. The contribution of this study to intellectual capital literature is threefold. Firstly, this study analyzes the effect of human capital on profitability of only one specific service sub-sector in Türkiye as an emerging market. As known, the banking as a sub-sector of financial services sector is a highly knowledge-intensive sector and undeniably the backbone of especially emerging economies. In such economies, as banks have relatively opaque and complicated skill-intensive corporate structures that derive value mostly from intangible assets and intellectual capital (Nawaz, Haniffa & Hudaib, 2020), human capital can be considered as the most important and unique asset for them (Richard, 2000). Secondly, the study deeply focuses on the most crucial and human related component of VAIC, HCE, and ignore the effects of other components, SCE and CEE. This is because SCE and CEE deal specifically with the effectiveness of physical and financial capital, respectively; and are quite far away from the interactions among firm performance and human capital related assets. Finally, the research model is tested on a data set employing advanced econometric methodologies.

The study is structured to discuss the T*heoretical Background* and *Literature Review* in Section I and Section II, respectively. Section III is on the *Methodology* covering with the data, variable definitions, the research model and empirical findings. The study concludes with Section IV, that the theoretical and managerial implications derived from empirical findings, limitations of the study and recommendations for future research are discussed.

I. THEORETICAL BACKGROUND

I.I. Intellectual Capital: Definitions and Classifications

Since Galbraith (1969)'s pioneering reference the term "intellectual capital", there have been many attempts to define intellectual capital by several researchers in various ways. Edvinsson & Sullivan (1996) define it as knowledge to be converted to value. According to Stewart (1997), intellectual capital is a combined set of knowledge, information, employees' experience and consequently intellectual property as an outcome of this set. Sardo et al. (2018) relate intellectual capital to operating activities that contribute to creativity, build competitive advantages, provide benefits and eventually create value. Similarly, Bontis et al. (2018) describe it as an intangible resource and a value-driver that plays a very vital role in organizational success. Brooking (1996) considers the firm as total sum of physical assets and intellectual capital, expressing that the latter term is a combination of intangible assets that the firm owns. Here, it can be obviously observed that there is a general lack of consensus across intellectual capital definitions. However, the common issue on which almost all definitions agree is that it has an intangible nature in essence and can be used as a synonym for intangible or knowledge related assets. This intangible nature does not only make it a challenge to define intellectual capital, but also to classify different components of it for its effective management.

Most of the common proposals on intellectual capital classification (Kaplan & Norton, 1992; Edvinsson & Sullivan, 1997; Ross, Ross, Edvinsson & Dragonetti, 1997; Sveiby, 1997; Brennan & Connell, 2000; Petty & Guthrie, 2000; Marr & Ross, 2005; Martin de Castro, Delgado-Verde, Lopez-Saez & Navas-Lopez, 2011; Tiwari et al., 2023) divide intellectual capital into three main components as (*i*) human capital (HC), (*ii*) structural capital (SC) and (*iii*) relational capital (RC) or customer capital. Following Brooking (1996)'s detailed explanations on the differences among intellectual property assets, infrastructure assets and market assets, CIC (2003) has made a more detailed classification to better understand the interactions among intellectual capital related assets. CIC (2003)'s classification includes five components as (*i*) human capital, (*ii*) technological capital, (*iii*) organizational capital, (*iv*) business capital and (*v*) social capital (for an adopted combination of these classifications, *see*, Figure 1).

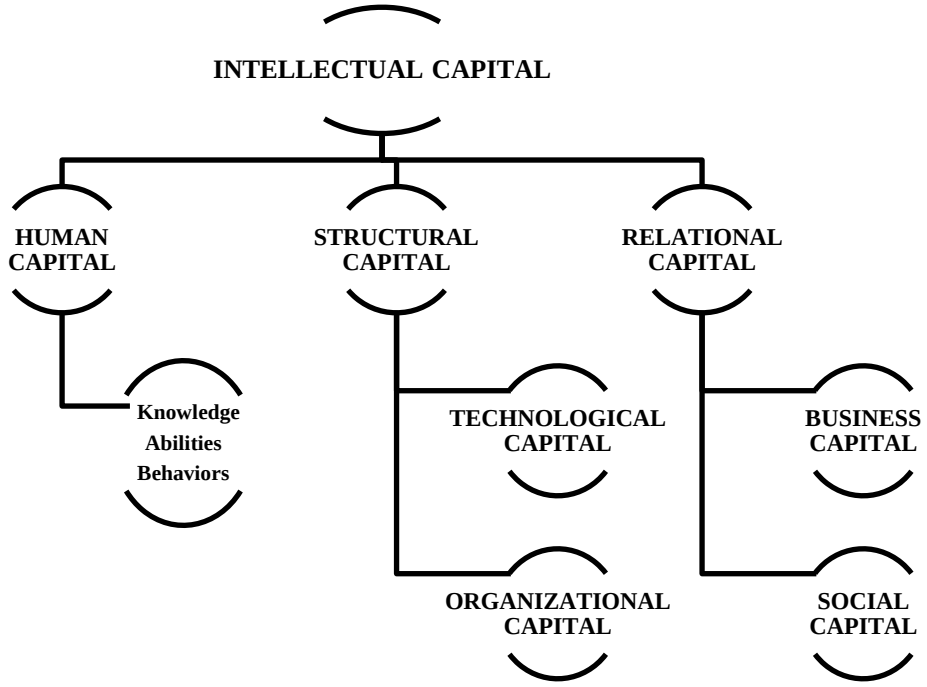

Figure 1. Components of Intellectual Capital

Human capital is the individual stock of knowledge, abilities such as creativity, know-how and loyalty, behaviors, ideas, values, attitudes, and innovation accumulated by the firm's employees (Ross et al., 1997; Bontis, Crossan & Hulland, 2002). As, these features of human capital are unique for each employee, there is potentially a direct or indirect threat for every organization due to the possibility that employees may leave the firm, and this may cause loss in corporate memory. Therefore, many researchers (Sveiby, 1997; Soetanto & Liem, 2019; Sultan, Ameen, Murtaza, Jafar & Jamal, 2021) refer human capital as the most crucial intangible source that makes the most valuable contribution to the firm's intellectual capital accumulation.

Structural capital is a crucial and strategic asset closely linked to human capital in intellectual capital taxonomy. However, unlike human capital, it is inseparable from the firm (Joshi, Cahill, Sidhu & Kansal, 2013), and consists of the firm's non-human assets such as organizational systems, information systems, databases, supportive infrastructures, procedures and routines (Sofian, Tayles and Pike, 2006; Cabrita & Bontis, 2008). Additionally, structural capital involves intellectual property such as trademarks, copyrights and patents as a reflection of firm's innovation capacity. Various classifications on structural capital also exist in literature. For instance, CIC (2003)'s intellectual capital classification analyzes structural capital in two sub-components as technological capital and organizational capital. While, technological capital is defined as the organizational knowledge directly linked to the technical system of the firm; organizational capital is the combination of explicit and implicit intangible assets including organizational culture, values, information technology capabilities and organizational structure.

Relational capital can be defined as the value generated from the interaction of the firm's employees with the parties outside the firm such as customers, suppliers or allies, distributers, government, and -in the broadest sense- society in general (Martin de Castro et al., 2011). Hence, this externally oriented characteristic of relational capital differs it from human capital and structural capital. Strong relationships established with the parties outside have potential to trigger new product development and research&development (R&D) activities through knowledge sharing (Yarbrough, Morgan & Vorhies, 2011); build customer loyalty to guarantee long-term sales (Hsu & Wang, 2010); improve firm's reputation (Davies, Chun & Kamin, 2010) and credibility (Erdem & Swait, 1998).

I.II. Intellectual Capital: Valuation Methodologies

It is more challenging to propose a reliable and fair intellectual capital valuation methodology as compared to its definition and classification. Due to substantial differences between the market and book values of firms, accounting has been severely criticized to fail to reflect these differences mostly caused by the effect of intellectual capital related assets and has proven to be insufficient for intellectual capital valuation. However, the main problem here is beyond accounting recognition on intellectual capital. It is -as mentioned before- because of the very intangibility nature of intellectual capital and its components. Intangibles valuation -in essence- attempts to relate value to "hidden" assets with unique and distinct characteristics and embedded not only in the structure of tangible assets, but also in the organizational culture or corporate strategies (Castro et al., 2021). So, there is a need to value these assets and reveal their effects on firm's financial and managerial performance.

Concerning these criteria, some valuation methodologies of intellectual capital have been proposed by both academicians and practitioners including Technology Broker (Brooking, 1996) Intellectual Capital Navigator (Edvinsson & Malone, 1997), Intangible Assets Monitor (Sveiby, 1997), Financial Method of Intangible Assets Measurement (Rodov and Leliaert, 2002), Value Added Intellectual Coefficient (Pulic, 2000) and Value Explorer (Andriesson, 2005). A similar problem encountered while defining intellectual capital and classifying its components also arises here that there is a contentious debate on the classification of intellectual capital valuation methodologies (see, for a detailed review Ramanauskaite & Rudzioniene, 2013). Lev, Abernethy, Wyatt, Bianchi & Labory (2003), Tan, Plowman & Hancock (2010), and Sveiby (2001)'s classifications are based on the general principles of valuation and/or use of a monetary unit in the process of valuation. Another classification is on the valued objects as holistic and atomistic (Bouteiller and Karyotis, 2010). Additionally, a broader classification is made according to the expression of valuation results (Andriessen, 2005; King, 2006;

Vaskeliene, 2007). In a less detailed but a clear classification, Sveiby (2001) classifies valuation methodologies as quantitative and qualitative. While the quantitative methodologies are proposed to calculate a monetary valuation with intent to measure the direct effect of intellectual capital on value creation and eventually on financial performance; the qualitative ones consider value creation processes indirectly to set managerial criteria such as business strategies and evaluation metrics; and focus mainly on interaction among business environment (and behavior) and intangible assets.

Among the methodologies mentioned above, Pulic (2000)'s VAIC is a widely accepted and reliable methodology referred in most academic and practical studies. It is basically a measure of return on firm's intellectual capital investments. The proponents of VAIC emphasize its simplicity, practicability, and ability to make cross-firm, cross-sector and cross-country comparisons. Besides, the data required for VAIC calculation can easily be derived from publicly available financial statements (Nazari & Herremans, 2007; Aybars & Öner, 2022). Moreover, the efficient use of both tangible and intangible assets and both the financial (monetary and physical) capital and intellectual capital (human capital and structural capital) of the firm are considered in the calculation process. VAIC calculates the intellectual capital efficiency of the firm as the sum of its human capital efficiency and structural capital efficiency (Stahle, Stahle & Aho, 2011).

Despite these advantages, VAIC is not free of criticism. The main critic related to the historical data derived from financial statements used in calculation is that VAIC focuses on only operating performance, and has a critical deficiency to reflect future value creation (Dzenopoljac, Yaacoub, Elkanj & Bontis, 2017). Another common critic is its lack of measuring relational capital (Sardo et al., 2018) and innovation capital (Chu et el. 2011). Most of other critics are especially related to the human capital efficiency component of VAIC. Lazzolina & Laise (2013) criticize HCE stressing that human capital is proxied by only wages, salaries and bonus payments, ignoring other human related expenses such as employee training.

The initial step in VAIC calculation is the value added (VA) estimation. Pulic (2000; 2004) refers value added as a crucial indicator of firm performance generated by firm's entire resources. In general, value added is the difference between output (OUT) and input (IN), and is calculated as:

$$VA = OUT - IN$$

where, VA is the value added generated by the firm; OUT is the total income generated from products/services sold by the firm. IN is the sum of all expenses undergone by the firm. The most remarkable point of VAIC is that it considers staff (labor) expenses (total wages and salaries to employees) not as a component of cost because of their vital role in value creation process (Pulic, 2003). Monetary total after deducting input from output is the total VA generated by the firm.

However, Pulic (2000;2004), and Yao, Haris, Tariq, Javaid, & Khan (2019) calculate an adjusted VA as:

$$VA = OP + HC + D + A$$

where, OP is the operating profit; HC is the total sum of wages and salaries; D is the depreciation expenses and A is the amortization expenses.

Following VA calculation, the following step is to calculate HCE, SCE and CEE as:

$$HCE = VA/HC$$

$$SCE = SC/VA$$

$$CEE = VA/CE$$

where, HC is human capital proxied by total sum wages and salaries; SC is the structural capital as calculated by subtracting total wages and salaries from value added; and CE is capital employed (financial capital) proxied by the total sum of long-term liabilities and equity. Finally, VAIC can mathematically be computed as:

$$VAIC = HCE + SCE + CEE$$

II. LITERATURE REVIEW

The interest on the importance of intellectual capital and direct and/or indirect effects on profitability, especially in the k-economy, has enormously grown for the last two decades. According to the data collection, the literature can be diversified along (*i*) studies using primary data based on case studies (Viyaja & Jan, 2011; Santos-Rodriguez, Cranfield, Faria & Morais, 2013; Almutirat, 2022) surveys (Alain, Edige & Zhan, 2014; Yeganeh, Sharahi, Mohammadi & Beigi, 2014; Zhining, Nianxin & Huigang, 2014) and (iii) and descriptive reviews and bibliometric analyses (Lutz & Yvonne, 2004; Quintero-Quintero, Blanco-Ariza & Garzon-Castrillon, 2021); and (*ii*) studies using secondary data to obtain and support empirical findings (Allam, 2018; Sardo & Serrasqueiro, 2017). Another diversification involves sector-specific studies in k-economy such as banking (Ercan, Öztürk & Demirgüneş, 2003; Yalama, 2013; Sardo et al., 2018; Rouf & Hossan, 2020; Mollah & Rauf, 2022); information technologies (Wang & Chang, 2005) and telecommunication (Sharabati, Shamari, Nour, Durra & Moghrabi, 2016; Muftiasa, Wibowo & Rahayu, 2023); and country-specific and cross-country analyses (see, for a detailed review, Andriessen & Stam, 2005; Kapyla, Kujansivu, & Lonnqvist, 2012 and Vo & Tran, 2023).

Majority of the empirical studies -that focus on the relationship between intellectual capital and traditional measures of firm performance such as return on assets (ROA), return on equity ROE), market-to-book (MB) and Tobin's q ratios, etc. using secondary data- refer VAIC and its components methodology in their research models. These models attempt to analyze the validity of VAIC's components as value-drivers and yield mixed, but positive empirical findings (Castro et al., 2021; Aybars & Öner, 2022). Besides, rather than focusing on human capital, these models generally include each component of VAIC, and sometimes additional components of its extensions (see, for detailed Modified VAIC models, Marzo, 2024).

Chu et al. (2011)'s study, on the Hang Seng Index of the Hong Kong Stock Exchange covering the period 2001-2009 with 333 observations company-year, concludes the significant and positive effects of all components of VAIC, including human capital on ROA, but no significant effect of human capital on ROE. Besides, in the case of ROE, the fundamental value driver is structural capital. Mondal & Ghosh (2012), and Ulum et al. (2014) analyze different banking sectors pointing out similar findings, that VAIC components, including human capital have strong positive effects on profitability. Gonzales, Calzada & Hernandez, (2017) refer a possible VAIC-profitability relationship in manufacturing sector based on a research model with ROA, ROE and MB ratios as dependent variables. They imply the existence of a positive relationship between increase in VAIC and the dependent variables. Other studies with empirical findings that support the positive relationship directly between human capital and profitability are to be summarized as Janosevic & Dzenopoljac (2012), Xu & Wang (2018), Aslam & Horon (2020), Nyugen (2023) and Randa, Budiarso & Rondonuwu (2023). On the contrary, some fewer empirical studies (Bontis et al., 2015) provide no evidence on the relationship between human capital and profitability.

Despite extensive theoretical and empirical studies, the theoretical background, empirical findings, and implications remail still so questionable. The underlying reasons for this inconclusiveness may be the lack of a commonly agreed definitions and classifications on intellectual capital and its components; unavailability of standardized data; and the existence of different and inconsistent intellectual capital valuation methodologies (Subhash & James, 2010).

III. METHODOLOGY

III.I. Sample, Data, Variables, and the Research Model

The primary aim of the study is to analyze the effect of human capital on the profitability of Turkish banking sector. By the end of 2022, the total number of banks operating in the Sector is 51, as a total of 35 deposit and 16 development and investment banks. The number of state-owned, privately-

owned, and foreign deposit banks in the sector are 3, 8 and 21, respectively. Besides, there are 3 deposit banks under management of the Depository Insurance Fund. However, the sector is very significantly dominated by 15 deposit banks (see, Table 1). Therefore, after excluding banks under the Depository Insurance Fund and development and investment banks, the data of the study consists of a balanced panel data of 10 of these 15 deposit banks due to data availability, covering quarterly data for the period 2009.q1-2022.q4 with 640 observations in total.

Table 1. Banks Operating in Türkiye (by the end of 2022)

	Number of Domestic Branches	%	Number of Branches Abroad	%	Number of ATMs	%	Number of Employees	%
TURKISH BANKING SYSTEM	**9,589**	**100.00**	**72**	**100.00**	**46,419**	**100.00**	**188,687**	**100.00**
DEPOSIT BANKS	**9,518**	**99.26**	**72**	**100.00**	**46,419**	**100.00**	**182,987**	**96.98**
State-owned Banks	***3,710***	***38.69***	**35**	**48.61**	**15,499**	**33.39**	**62,226**	**32.98**
T.C. Ziraat Bankası A.Ş.	1,733	18.07	25	34.72	7,276	15.67	24,484	12.98
Türkiye Halk Bankası A.Ş.	1,032	10.76	6	8.33	4,075	8.78	20,781	11.01
Türkiye Vakıflar Bankası T.A.O.	945	9.86	4	5.56	4,148	8.94	16,961	8.99
Privately-owned Banks	***3,468***	***36.17***	***27***	**37.50**	**18,499**	**39.85**	**67,377**	**35.71**
Akbank T.A.Ş.	710	7.40	1	1.39	5,553	11.96	12,717	6.74
Anadolubank A.Ş.	116	1.21			127	0.27	1,671	0.89
~~Fibabanka A.Ş.~~	~~44~~	~~0.46~~			~~47~~	~~0.10~~	~~1,979~~	~~1.05~~
~~Şekerbank T.A.Ş.~~	~~238~~	~~2.48~~			~~280~~	~~0.60~~	~~3,427~~	~~1.82~~
Turkish Bank A.Ş.	6	0.06			9	0.02	120	0.06
~~Türk Ekonomi Bankası A.Ş.~~	~~444~~	~~4.63~~	~~4~~	~~5.56~~	~~1,599~~	~~3.44~~	~~6,723~~	~~3.56~~
Türkiye İş Bankası A.Ş.	1,110	11.58	21	29.17	6,169	13.29	23,309	12.35
Yapı ve Kredi Bankası A.Ş.	800	8.34	1	1.39	4,715	10.16	15,431	8.18
Foreign Banks	***2,337***	***24.37***			**12,421**	**26.76**	**53,084**	**28.13**
Denizbank A.Ş.	670	6.99			3,080	6.64	13,140	6.96
ING Bank A.Ş.	148	1.54			478	1.03	2,989	1.58
~~QNB Finansbank A.Ş.~~	~~435~~	~~4.54~~			~~3,113~~	~~6.71~~	~~11,426~~	~~6.06~~
~~Türkiye Garanti Bankası A.Ş.~~	~~829~~	~~8.65~~			~~5,450~~	~~11.74~~	~~18,453~~	~~9.78~~
~~**Banks under the Depository Insurance Fund**~~	~~***3***~~	~~***0.03***~~				~~0.00~~	~~**300**~~	~~**0.16**~~
~~**Development and Investment Banks**~~	~~**71**~~	~~**0.007**~~				~~0.00~~	~~5,700~~	~~3.02~~

The dependent variable included in the research model of the study is return on equity (ROE) to proxy profitability of the banks, in line with the previous studies of Amin & Aslam (2017) and Scafarto, Ricci & della Corte (2023). Besides, Moussu & Petit-Romec (2017) point out that there is a great deal of empirical evidence that ROE was and still is a central measure of financial performance of banks.

The independent variable to be focused on is human capital proxied by "HCE" component of VAIC. Additionally, there are three other independent variables included in the model as control variables. "TC Assets to Total Assets", "Financial Assets (Net) to Total Assets" and "Liquid Assets to Total Assets" are utilized to control the effects of balance sheet structure, assets quality and liquidity, respectively, in the research model. The entire data to calculate dependent, independent and control variables can be derived from "Banks in Türkiye" yearbooks regularly published by the Banks Association of Turkey.

The research model is as:

$$ROE_{it} = \alpha_{it} + \beta_{it} HCE_{it} + \beta_{it} BSS_{it} + \beta_{it} ASQ_{it} + \beta_{it} LIQ_{it} + \varepsilon_{it}$$

where HCE_{it}, BSS_{it}, ASQ_{it} and LIQ_{it} represent human capital, balance sheet structure, assets quality and liquidity for firm *i* in year *t*, respectively. α and ε are the constant, and the error term.

III.II. Empirical Findings

The research model is analyzed referring panel data analysis to analyze the possible effect of human capital on profitability. Panel data analysis has several advantages that it contains more degrees of freedom and more sample variability than cross-sectional data. Besides, it has a greater capacity to capture the complexity of human behavior than a single cross-section or time series data and simplify computation and statistical inference (Hsiao, 2007).

The first step to panel data analysis is to employ panel unit root tests to test the stationarity of the series for the reliability of the analysis. Here, the stationarity levels of the series are tested by Levin-Lin-Chu (LLC) (Levin et al., 2002); Im-Pesaran-Shin (IPS) (Im et al., 2003), and Augmented Dickey Fuller (ADF) panel unit root tests (Maddala and Wu, 1999). Table 2 presents the results of these tests, pointing out that the series are stationary in their first differences.

Table 2. Results of Panel Unit Root Tests of LLC, IPS and ADF

Variables	LLC		IPS		ADF Fisher	
	Intercept	Trend-Intercept	Intercept	Trend-Intercept	Intercept	Trend-Intercept
ROE	-1.102 (0.069)	0.234 (0.597)	-1.912 (0.041)	-0.882 (0.204)	24.102 (0.114)	17.999 (0.512)
Δ*ROE*	-9.925 (0.000)*	-8.267 (0.000)*	-9.987 (0.000)*	-10.111 (0.000)*	128.427 (0.000)*	109.879 (0.000)*
HCE	0.892 (0.842)	-0.314 (0.426)	0.862 (0.664)	0.611 (0.693)	2.342 (0.801)	2.103 (0.902)
Δ*HCE*	-0.815 (0.000)*	-3.414 (0.000)*	-5.356 (0.000)*	-3.586 (0.000)*	32.125 (0.000)*	23.789 (0.000)*
BSS	0.381 (0.614)	2.612 (0.888)	1.112 (0.716)	1.212 (0.836)	14.236 (0.911)	10.526 (0.826)
Δ*BSS*	-7.826 (0.000)*	-7.111 (0.000)*	-6.002 (0.000)*	-6.314 (0.000)*	73.256 (0.000)*	75.946 (0.000)*
ASQ	2.198 (0.864)	3.105 (0.879)	1.253 (0.894)	1.412 (0.859)	9.253 (0.869)	14.999 (0.562)
Δ*ASQ*	-10.001 (0.000)*	-7.125 (0.000)*	-9.356 (0.000)*	-7.968 (0.000)*	109.364 (0.000)*	96.345 (0.000)*
LIQ	-1.136 (0.635)	1.112 (0.852)	-2.985 (0.007)	-2.425 (0.014)	40.236 (0.001)	35.126 (0.017)
Δ*LIQ*	-2.124 (0.004)	-2.635 (0.007)*	-7.021 (0.000)*	-7.025 (0.000)*	110.235 (0.000)*	62.986 (0.000)*

Note: * denotes significance at 1% level. Δ ,s the difference operator.

Following the panel unit root tests, Pedroni (1999) panel co-integration test is employed to test the existence of long-run relationship among the series. Pedroni (2004) has introduced seven test statistics to test the null hypothesis of no cointegration in non-stationary panels. These test statistics allow heterogeneity in the panel, both in the short-run dynamics as well as in the long-run slope and intercept coefficients. The within-dimension test statistics are panel v-statistics, panel rho-statistics, panel PP-statistics and panel augmented Dickey-Fuller (ADF)-statistics; while the between-dimension test statistics are group rho-statistics, group PP-statistics and group ADF-statistics. Results of Pedroni (1999) panel co-integration test are as in Table 3. The 4 of 7 tests (panel PP, panel ADF, group PP and group ADF) refer the existence of co-integration relationship among the series.

Table 3. Results of Panel Co-integration Test

Test statistics	Intercept	Trend-Intercept
Panel v	-0,408 (0,658)	-1,124 (0,869)
Panel rho	-0,227 (0,410)	0,190 (0,575)
Panel PP	-6,036* (0,000)	-6,678* (0,000)
Panel ADF	-4,401* (0,000)	-4,303* (0,000)
Group rho	1,623 (0,947)	1,664 (0,951)
Group PP	-7,103* (0,000)	-6,229* (0,000)
Group ADF	-4,332* (0,000)	-4,207* (0,000)

Note: Probability values are given in parentheses. * denotes significance at 1%.

Finally, long-run coefficients are to be estimated by panel Fully Modified Ordinary Least Squares (FMOLS) test of Pedroni (2000). FMOLS corrects deviations in standard fixed effect estimators such as autocorrelation and varying variance. Besides, it allows a significant degree of heterogeneity between individual cross-sections and accounts for the existence of a possible correlation between the constant term, the error term and the differences between the independent variables. FMOLS test results in Table 4 indicate that HCE has statistically significant and positive effect on profitability proxied by ROE. However, the control variables included in the research model as assets quality, and liquidity affect profitability negatively. Another empirical finding is that the other control variable as balance sheet structure has no statistically significant effect on profitability in terms of return on equity.

Table 4. Long-run Coefficients

Banks	Panel FMOLS Results			
	HCE	*BSS*	*ASQ*	*LIQ*
T. C. Ziraat Bankası A.Ş.	0.079 (0.904)	0.215 (0.695)	0.014 (0.269)	-0.025* (0.168)
Türkiye Halk Bankası A.Ş.	0.045 (1.209)	-0.235 (-6.429)	-0.079* (-3.111)	-0.015 (-3.100)
Türkiye Vakıflar Bankası T.A.O.	-0.061 (-0.644)	-0.415 (-1.850)	-0.036 (-0.754)	-0.098 (-0.601)
Akbank T.A.Ş.	0.059 (-0.063)	-0.125 (-7.013)	-0.176* (-3.124)	-0.144 (-3.879)
Anadolubank A.Ş.	0.440* (2.894)	-0.239 (-3.956)	0.125 (1.161)	0.102 (1.168)
Turkish Bank A.Ş.	0.361 (1.041)	0.216 (1.769)	0.121 (0.529)	-0.099** (0.415)
Türkiye İş Bankası A.Ş.	0.296 (1.145)	-0.223 (-2.409)	0.345** (2.069)	0.295 (2.111)
Yapı ve Kredi Bankası A.Ş.	-0.488 (-0.945)	-0.067 (-0.923)	-0.452*** (-1.905)	-0.455 (-1.905)
Denizbank A.Ş.	-0.319 (-1.612)	0.078 (1.435)	-0.601* (-3.695)	-0.578 (-3.305)
Türkiye Garanti Bankası A.Ş.	0.264 (1.399)	0.067 (1.569)	-0.008 (-0.041)	-0.015 (-0.033)
PANEL RESULTS	*0,068* *(1,601)*	*-0,524* *(-5,398)*	*-0,081*** *(-2,879)*	*-0,065** *(-2,752)*

Note: Figures in parentheses are t-statistics. *, ** and *** denote significance at 1%, 5% and 10%, respectively.

CONCLUSION

This study analyses especially the effect of human capital proxied by human capital efficiency on profitability of Turkish banking sector by a panel data covering 2009.q1-2022.q4. Empirical findings of the study posit that human capital has statistically a positive effect on Turkish banks' profitability. This finding is consistent with Mondal & Ghosh (2012), Ulum et al. (2014), Gonzales, Calzada & Hernandez, (2017), Xu & Wang (2018), Aslam & Horon (2020), Nyugen (2023) and Randa, Budiarso &

Rondonuwu (2023)' findings. However, assets quality and liquidity position of Turkish banks affect their profitability negatively. Another empirical finding is that balance sheet structure has no statistically significant effect on profitability in terms of return on equity.

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