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Should Listed Banks Be Concerned with Intellectual Capital in Emerging Asian Markets? A Comparison between China and Pakistan

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Abstract: The purpose of this study is to determine and compare the relationship between intellectual capital (IC) and banks' performance in China and Pakistan. The data are acquired from listed banks in these two countries during 2010–2018. The Value Added Intellectual Coefficient (VAIC™) method is applied as a measure of IC. The results show that capital employed efficiency (CEE) makes the highest contribution to bank performance in both countries. In addition, the profitability of listed Chinese banks is driven by structural capital efficiency (SCE), while human capital efficiency (HCE) positively affects bank profitability and productivity in Pakistan. In addition, we find that the lagged effect of IC has a positive impact on future bank profitability. This study supports greater investment in IC in order to further improve bank performance in emerging Asian markets.

Keywords: intellectual capital; listed banks; bank profitability; bank productivity; emerging Asian markets

1. Introduction

With the emergence of the age of knowledge-based economy, intellectual capital (IC) has been considering as the driving force that organizations need to gain a sustainable competitive advantage [1–5]. At the corporate level, IC investment is the most important determinant of performance [6].

Finance is considered as an essential component of the modern economy, and banks play a vital role in a nation's financial system. Banks' performance not only directly reflects the overall situation of the banking industry, but also relates to the sustainable development of the national economy [7]. The banking sector, due to its knowledge-intensive nature, is appropriate to conduct IC research [7–21]. Firstly, banks largely depend on their customers to create competitive advantages. Secondly, banks provide clients with services which are intangible in nature and require a developed mechanism of IC [14]. Finally, a bank has to invest in processes and systems, brand name, and most importantly, human resources, in order to ensure smooth operations. In addition, competition among banks is now fiercer, due to globalization, which brings great pressure to bank performance. Therefore, banks have to seek new ways to achieve sustainable development and increase profitability by effectively and efficiently managing their IC.

In 2013, China proposed the Belt and Road Initiative (BRI) to improve connectivity and cooperation with 65 countries. Such cooperation can not only fend off future risks, but also promote regional economic development [22]. China also conducted financial cooperation with these countries [23]. As per the World Bank, Pakistan ranked second on the basis of performance among South Asian countries. In 2017, China's foreign direct investment in Pakistan reached USD 62 billion to improve the

infrastructure, which can bring great facility for companies. Following this, for the ease of channelizing the business transactions, the Bank of China (BOC) commenced its first branch in 2017 in Karachi, the financial capital city of Pakistan. However, before this only the Industrial and Commercial Bank of China (ICBC) operated in Pakistan. Both ICBC and BOC are listed Chinese banks. China and Pakistan are emerging Asian financial markets with good neighborly relations and close cooperation [24]. In emerging markets, the financing and lending role of the banking sector is utmost important for ensuring a sustained economy [17].

According to the World Bank, bank capital to assets ratio in China grows from 6.60% to 8.56%, while Pakistan witnesses a downward trend (see Figure 1). Although the nonperforming loans to total gross loans in Pakistan gradually declines over the period 2014–2017, this ratio in China is much lower than that in Pakistan (See Figure 2). Haneef et al. [25] concluded that nonperforming loans have an adverse effect on the performance of banks in Pakistan. These indicate that the Chinese banking industry is much healthier than the Pakistani banking industry, and Pakistani banks operate with relatively higher risk exposure. However, the Pakistani banking system is more open as many foreign banks operating in Pakistan compared to the Chinese banking system [26]. Recently, China has revised the Regulations on the Administration of Foreign-funded Banks to lower the threshold of establishing foreign branches in China, which can stimulate the vitality of banking sector and improve the competitiveness of Chinese and foreign financial institutions. The opening up of the Chinese banking sector will provide opportunities for Pakistani banks to establish their branches in China. Considering that the competition among banks will become severer with financial liberalization, banks will expand their operation in the international market [27]. It will require that banks fully utilize local resources to improve the competitiveness under different business environment. We choose these two countries for comparison, not only because they are among the emerging Asian economies, but also because the two countries have undergone deep reforms in the banking industry since the 1990s to improve profitability and productivity. Specifically, the banking sector in China and Pakistan both went through from nationalization to internationalization with several great reforms [27,28]. However, the performance of banks is still not up to the standard in the two countries [26]. Under slower economic growth in the world, how to maintain sustainable and healthy development of the banking sector in China and Pakistan by effectively utilizing IC has become an important issue. The China-proposed BRI will build a bridge for the cooperation of the banking sector in the two countries and also will benefit banks' foreign branches to achieve the win-win strategy.

Is there any difference in IC efficiency in the banking sector in China and Pakistan? What factors of IC derive bank profitability and productivity in both countries? What could listed banks do to improve their performance by effectively managing IC resources in the two emerging countries? This study will address the above questions.

To conduct a comparative analysis, this paper uses the Value Added Intellectual Coefficient (VAIC™) method proposed by Pulic [29] to measure the efficiency of IC of listed banks in China and Pakistan during 2010–2018. Then, we investigate the lagged effect of banks' IC in these two emerging countries.

The contributions of the current study are presented as follows. First, this paper firstly analyzes and compares the impact of IC on bank performance in two emerging Asian economies, i.e., China and Pakistan. Most IC research has been carried out only in one country or region, while little has been done with the cross-country comparison. Moreover, it also identifies which IC components contribute most to bank performance in these two countries. Second, bank performance is measured from two aspects: Profitability and productivity. A large body of literature only focuses on profitability indicators, while little has been done from the perspective of bank productivity. Third, this paper examines the lagged effect of IC that is not taken into consideration in most IC studies. Finally, this study not only aids assistance for the management of listed banks in improving their performance, but also suggests important insights for policymakers to attain their financial stability goals.

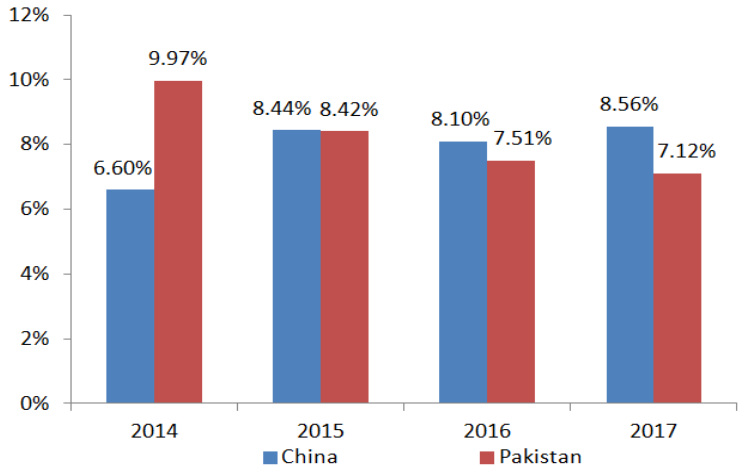

Figure 1. Bank capital to assets ratio in China and Pakistan from 2014 to 2017.

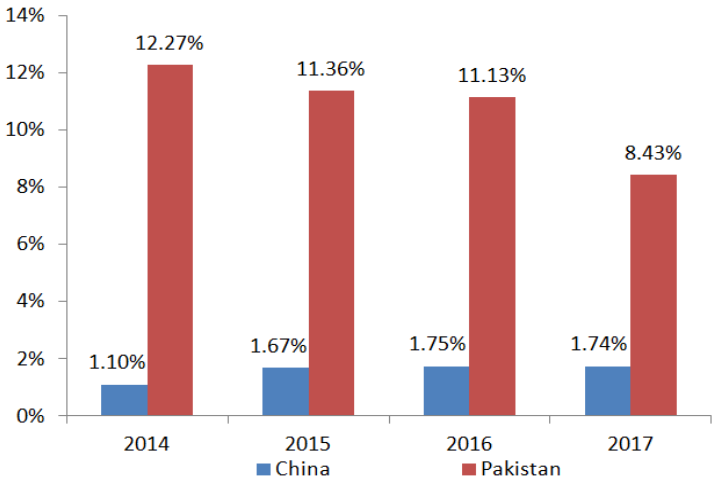

Figure 2. Bank nonperforming loans to total gross loans in China and Pakistan from 2014 to 2017.

The remainder of this paper is arranged as follows. Section 2 describes the situation of the banking system in China and Pakistan. Section 3 offers a review of related literature and hypotheses development. Section 4 describes the methodology of the current paper, followed by Section 5 that presents empirical results. Section 6 offers and summarizes the results. Finally, Section 7 offers conclusions, implications, and limitations.

2. Review of the Chinese and Pakistani Banking Systems

2.1. Review of the Chinese Banking System

With the process of the reform and opening-up, banks' operation mode has transferred from unification to diversification [30,31]. However, the banking industry was still monopolized by the government. Four state-owned banks came into existence, including BOC, ICBC, Agricultural Bank of China (ABC), and China Construction Bank (CCB). When China joined the World Trade Organization (WTO) in 2001, the Chinese government decided to implement joint-stock reforms of state-owned commercial banks in the global competition. The reform of the Chinese banking industry has stepped into a new stage since 2006 [32]. Chinese banks began to list on the Shanghai and Shenzhen stock exchanges. From 2007, foreign players were allowed to work in the banking system, which fostered the efficiency and competition among the domestic banks. China's banking industry was substantially affected by the recent global financial crisis in 2008. Therefore, the Chinese commercial banks were required to supply more financial services and products in order to transform and upgrade their main

businesses [32]. Furthermore, the total assets of Chinese banks increased gradually, but net profit growth rate decreased year by year [33,34]. China has transferred its economic development pattern with better quality, higher efficiency, and an increased total factor of productivity. The five-year plan (2016–2020) also emphasized the efficiency enhancement of finance, the improvement of service quality, and acceleration of the banking reforms by the Chinese government. The purpose of strengthening the banking reforms was to streamline the real economy [35]. According to the industrial classification of listed companies, as of 31 December 2018, there were 29 banks listed on the Chinese A-share stock market, and many of which were newly listed in 2017 or 2018. Table 1 reports the IC performance of the Chinese banking industry during 2010–2018. From 2010 to 2014, the sector saw an increase in VAIC, followed by a slight decrease. Capital employed efficiency (CEE) shows a declining trend (from 0.3034 to 0.1878), while human capital efficiency (HCE) and structural capital efficiency (SCE) remain stable (see Figure 3).

Table 1. The trend in Value Added Intellectual Coefficient (VAIC) and its components of the Chinese banking system.

Year	VAIC	CEE	HCE	SCE
2010	4.9344	0.3034	3.8964	0.7346
2011	5.1918	0.3199	4.1220	0.7499
2012	5.3025	0.3211	4.2244	0.7571
2013	5.1517	0.3165	4.0854	0.7497
2014	5.1272	0.2929	4.0857	0.7486
2015	4.9924	0.2541	3.9949	0.7434
2016	4.5424	0.2153	3.6139	0.7132
2017	4.9647	0.2042	4.0481	0.7124
2018	4.6930	0.1878	3.8016	0.7036

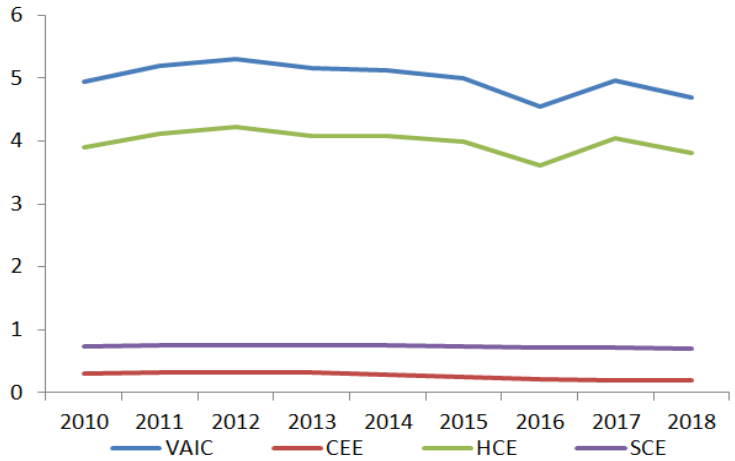

Figure 3. The trend of VAIC and its components of the Chinese banking system from 2010 to 2018.

2.2. Review of the Pakistani Banking System

The Pakistani financial sector inherited a banking system dominated by foreign banks because during the early period of independence, only five domestic banks operated with 97 branches [36]. At that time, uncertainty and unsuitability caused heavy losses in the banking industry. Although the share of the domestic banks started growing gradually, the industry faced snags in 1974 when all domestic banks were nationalized [37]. Later, realizing the adverse effects of nationalization, the government initiated a number of reforms to streamline the banking industry. Since then, the Pakistani banking industry has experienced several regime changes and challenges, such as political interference, political instability, higher financial and service cost, and the lack of financial and human capitals [38]. However, the Pakistani banking industry saw rapid growth and continued its support to the economic

growth. As of today, the domestic banks are dominant with a 98% share of industry in terms of assets [20]. Over the last decade, the performance of tangible resources, such as assets, deposits, equity, investments and finances have grown extensively [20,36]. The significant improvement has also been noted in the IC performance during the period from 2010 to 2018, VAIC increased from 2.9864 to 3.1250, CEE increased from 0.3034 to 0.3280, HCE increased from 2.1485 to 2.2429, and SCE fluctuated around 0.55. Table 2 presents the trend in the IC performance of Pakistani banks during 2010–2018 and Figure 4 is the graphical representation of Table 2.

Table 2. The trend in VAIC and its components of the Pakistani banking system.

Year	VAIC	CEE	HCE	SCE
2010	2.9864	0.3034	2.1485	0.5346
2011	3.5297	0.3617	2.5588	0.6092
2012	3.3863	0.3513	2.4442	0.5909
2013	3.1334	0.3222	2.2547	0.5565
2014	3.5625	0.3217	2.6222	0.6186
2015	3.9332	0.3761	2.9017	0.6554
2016	3.7045	0.3695	2.7047	0.6303
2017	3.2244	0.3241	2.3295	0.5707
2018	3.1250	0.3280	2.2429	0.5541

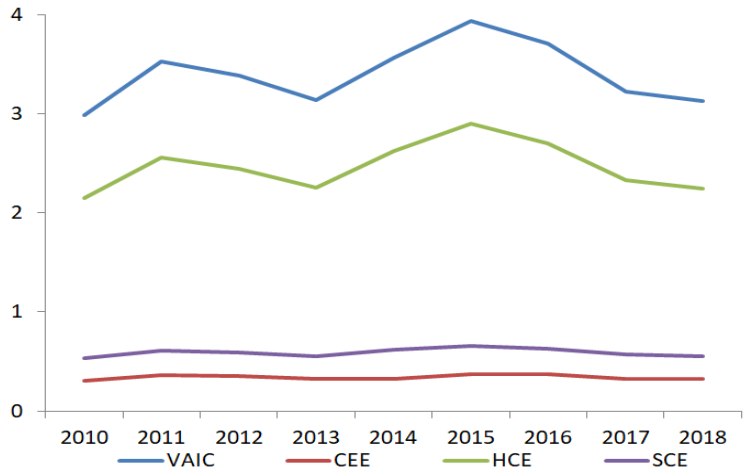

Figure 4. The trend of VAIC and its components of the Pakistani banking system from 2010 to 2018.

3. Literature Review and Hypotheses Development

3.1. Definition of IC

Many scholars define the concept of IC in different ways. For example, Edvinsson and Sullivan [39] and Harrison and Sullivan [40] interpreted IC as the knowledge that can easily be converted into the sustained value of an institution. Stewart [41] explained IC as the intellectual materials, i.e., knowledge, intellectual property, experience, information, which can be used to produce wealth. Sveiby [42] defined IC as the composition of individual competencies, internal and external structure. In addition, many researchers classified IC into different components. For example, Stewart [41], Bassi [43], Sveiby [44], and Bontis [45] classified that IC is comprised of human capital (HC), structural capital (SC) and customer capital. Later, Pulic [29,46] classified IC into HC, SC and physical capital. There have been several methods developed by researchers to measure the IC performance: The Skandia Navigator [47], the Intangible Assets Monitor [44], the balanced scored card approach [48], market capitalization methods, and the VAIC™ [29,46]. However, among these methods, the VAIC™ model is widely accepted and utilized to compute the performance of IC. The VAIC is based on the valued added generated by the tangible and intangible resources. The value of VAIC is obtained from

the sum of three components, i.e., CEE, HCE, and SCE. Among these components, CEE is the efficiency of physical capital. Physical capital refers to the tangibles or the amount of money invested by the shareholders to produce value. Based on the resource-based view (RBV), many researchers emphasized that although the intangibles are the main forces behind the sustainable performance, but the role of physical capital cannot be ignored as it also acts as a source of competitive advantage [8,45,49]. Goh [50] argued that physical capital is very critical for banking institutions. HCE and SCE measure the efficiency of HC and SC. HC includes capacity and motivation to act, skills and capabilities, experience, educations, and innovative capabilities [51,52]. The capital theorists emphasized that a firm may increase its performance by investing in the skills, abilities, and knowledge of its employees [53,54]. SC includes culture and environment, operations, systems and procedures, learning process and capacity, knowledge management process and advancement in information technology [55–58].

3.2. IC and Firm Performance

Kamath [59], using a sample of Indian banks during 2000–2004, discovered that public banks are the top performers in CEE, while foreign banks are the top performers in HCE. The results of Saengchan [60] reported a strong relationship between IC and return on assets (ROA) by examining the impact of IC and its components on the financial performance of Thai commercial banks. The results showed a strong association between IC and return on assets (ROA). Ting and Lean [58] evaluated the impact of IC on the performance of financial institutions in Malaysia over the period 1999–2007. Their study suggested a positive correlation between VAIC and ROA. Gigante [11] used the VAIC™ model and examined the association between IC performance and financial performance of bank in European countries (Czech Republic, Denmark, Finland, Germany, Italy, Norway, Poland, Spain, Sweden) over the period 2004–2007. The results showed that CEE and HCE increase bank profitability, while HCE has a negative impact on return on average equity. Joshi et al. [61], using the VAIC™ method, revealed that the value creation capability of the Australian financial sector is highly influenced by HC. Using a sample of 5749 U.S. banks from 2005 to 2012, Meles et al. [6] found that banking financial performance is positively influenced by IC. Ozkan et al. [15] argued that CEE and HCE are positively related to financial performance (measured by ROA) in the Turkish banking sector. Recently, Poh et al. [62] analyzed the relationship between IC and the financial performance of the Malaysian banking sector. Their findings showed that CEE is significantly related to ROA, while HCE is related to return on equity (ROE). Tiwari and Vidyarthi [16] also found a positive association between IC and Indian banks' performance. Tran and Vo [17] used the data of 16 listed banks in Thailand and proved that the profitability of Thai banks is mainly driven by CEE, and HCE marginally reduces bank profitability. Thus, we come to the following hypothesis:

Hypothesis 1. *IC has a positive impact on the profitability of listed banks in China and Pakistan.*

Gan and Saleh [63] employed the VAIC™ model to measure the impact of IC on the corporate performance of technology-intensive companies (measured by ROA, asset turnover, and market-to-book ratio). The results showed that companies with greater IC are more likely to have more efficient productivity. The findings of Alhassan and Asare [13] and Mondal and Ghosh [57] showed that CEE and HCE are the major determinants of bank productivity. Xu and Wang [5] argued that the productivity of textile firms in China and South Korea is determined by CEE and HCE. Using the data of Chinese agricultural listed companies, Xu and Wang [64] found that CEE has a positive impact on companies' productivity, while HCE has a negative impact. However, a study in Taiwan by Shiu [65] showed a negative relationship between IC and productivity of listed technological firms. Yao et al. [66] found an inverted U-shaped relationship between IC and the productivity of Pakistani financial institutions. In addition, Pal and Soriya [67] confirmed that IC has no significant impact on companies' productivity in Indian pharmaceutical and textile industry. Therefore, we develop the following hypothesis:

Hypothesis 2. *IC has a positive impact on the productivity of listed banks in China and Pakistan.*

Because of achieving remarkable economic growth, China becomes the world's second largest economy. The two countries have different economic, political and social systems, and their banking systems are also different from each other. The Pakistani banking sector is more market-based than Chinese banking sector [37]. Young et al. [9] explored IC performance of commercial banks operating in eight Asian economies, i.e., Hong Kong, Indonesia, Malaysia, Philippines, Singapore, South Korea, Thailand, and Taiwan. They found that banks in Thailand improved the most in IC, while those in Hong Kong, on average had the best IC performance. Wang et al. [12] argued that IC plays an important role in achieving high levels of bank efficiency in East Asia. Nadeem et al. [68] presented an adjusted-VAIC model to test the impact of IC and its components (human, innovation and physical assets) on firm performance in 10 emerging and developed economies. The results showed that the impact of IC varies greatly in different countries. Al-Musali and Ismail [69] explored IC performance of banks in the Gulf Cooperation Council (GCC) countries, and found that the relationships between IC components and bank performance vary greatly. Therefore, we develop the following hypotheses:

Hypothesis 3. *The impact of IC on the profitability of listed banks is different in China and Pakistan.*

Hypothesis 4. *The impact of IC on the productivity of listed banks is different in China and Pakistan.*

4. Methodology

4.1. Research Objectives

The study's purpose is to examine the impact of IC and its components on bank performance using 29 listed Chinese banks and 20 listed Pakistani banks over the period 2010–2018. Listed banks with missing information were excluded from our samples. Chinese data were derived from the CSMAR database. Pakistani data were obtained from the official websites of the respective banks and database maintained by the State Bank of Pakistan [70]. However, the financial statements of one Pakistani bank, i.e., Summit bank, for the year of 2018 were not updated. Finally, our final samples comprise 177 and 179 observations for 29 listed Chinese banks and 20 listed Pakistani banks, respectively. For facilitating comparison, Pakistani Rupee was converted to Chinese Yuan according to the Chinese official intermediate exchange rate by the end of each year. The pooled ordinary least squares (OLS) regression models were used.

4.2. Variables

(1) Dependent variables. Guided by previous studies [4,5,11,16,17,63,64,69,71,72], ROA and ROE are used as the measure of profitability. ROA is measured as the ratio of a bank's net income to average total assets, and ROE is measured as the ratio of a bank's net income to average shareholders' equity. Asset turnover ratio (ATO) is used to measure the productivity of listed banks, calculated by the ratio of bank's revenue to average total assets. This measure of productivity is used in many previous IC studies [5,63–67].

(2) Independent variables. The VAIC™ model is applied to measure the IC efficiency. IC and its components (CEE, HCE, and SCE) are measured as follows:

$$\text{CEE} = \text{VA}/\text{CE}, \quad (1)$$

$$\text{HCE} = \text{VA}/\text{HC}, \quad (2)$$

$$\text{SCE} = (\text{VA} - \text{HC})/\text{VA}, \quad (3)$$

$$\text{VAIC} = \text{CEE} + \text{HCE} + \text{SCE}. \quad (4)$$

In these computations, VA is the amount of value added to the listed banks. Guided by Meles et al. [6], Young et al. [9], Alhassan and Asare [13], Tran and Vo [17], Adesina [18], and Vidyarthi [21], VA is calculated as follows:

$$\text{VA} = \text{Total revenue generated by listed banks} - \text{all related costs} + \text{personnel cost (salaries, wages, and other benefits).} \quad (5)$$

CE is the physical and financial capital of listed banks, measured by total assets minus total liabilities. CEE indicates the banks' ability to utilize their physical and financial capital efficiently. HC is defined as the total amount of capital invested in knowledge workers (including salaries, wages, and other benefits), measured by personnel costs in banks' financial statements, as widely used in previous studies [11,17,62,73]. HCE and SCE indicate the efficiency of HC and SC. Thus, VAIC is the sum of CEE, HCE, and SCE.

(3) Control variables. Guided by the literature [17,18,20,66,74–76], this study also controls for some bank characteristics by deploying three important variables: Bank size (SIZE), measured as the natural logarithm of total assets of listed banks; debt ratio (LEV), calculated by dividing total liabilities by total assets of listed banks; bank type (TYPE), which takes 1 if a bank is private-owned and if it is not; gross domestic product (GDP), measured as the natural logarithm of gross domestic product; and year dummy (YEAR). Table 3 presents a list of the variables used in this study with their description.

Table 3. Variable description.

Variable	Notation	Description
Return on assets	ROA	Net income/Average total assets
Return on equity	ROE	Net income/Average shareholders' equity
Asset turnover ratio	ATO	Total revenue/Average total assets
Value added intellectual coefficient	VAIC	See Equation (4)
Capital employed efficiency	CEE	See Equation (1)
Human capital efficiency	HCE	See Equation (2)
Structural capital efficiency	SCE	See Equation (3)
Bank Size	SIZE	Logarithm of total assets of listed banks
Debt ratio	LEV	Ratio of total liabilities to total assets
Bank type	TYPE	Dummy variable that takes 1 if a bank is private-owned, 0 otherwise
Gross domestic product	GDP	Logarithm of gross domestic product
Year	YEAR	Dummy variable that takes 1 for the test year, 0 otherwise

4.3. Models

We propose six models to test the relationship between IC and its components and bank profitability and productivity. Models (6) and (8) test the relationship between IC and bank profitability. Models (7) and (9) are applied to test the relationship between IC components and bank profitability. Model (10) aims to analyze the impact of IC on bank productivity, and Model (11) is used to examine the impact of IC components on bank productivity.

$$\text{ROA}_{i,t} = \beta_0 + \beta_1\text{VAIC}_{i,t} + \beta_2\text{SIZE}_{i,t} + \beta_3\text{LEV}_{i,t} + \beta_4\text{TYPE}_{i,t} + \beta_5\text{GDP}_{i,t} + \text{YEAR}_t + \varepsilon_{i,t}, \quad (6)$$

$$\text{ROA}_{i,t} = \beta_0 + \beta_1\text{CEE}_{i,t} + \beta_2\text{HCE}_{i,t} + \beta_3\text{SCE}_{i,t} + \beta_4\text{SIZE}_{i,t} + \beta_5\text{LEV}_{i,t} + \beta_6\text{TYPE}_{i,t} + \beta_7\text{GDP}_{i,t} + \text{YEAR}_t + \varepsilon_{i,t}, \quad (7)$$

$$\text{ROE}_{i,t} = \beta_0 + \beta_1\text{VAIC}_{i,t} + \beta_2\text{SIZE}_{i,t} + \beta_3\text{LEV}_{i,t} + \beta_4\text{TYPE}_{i,t} + \beta_5\text{GDP}_{i,t} + \text{YEAR}_t + \varepsilon_{i,t}, \quad (8)$$

$$\text{ROE}_{i,t} = \beta_0 + \beta_1\text{CEE}_{i,t} + \beta_2\text{HCE}_{i,t} + \beta_3\text{SCE}_{i,t} + \beta_4\text{SIZE}_{i,t} + \beta_5\text{LEV}_{i,t} + \beta_6\text{TYPE}_{i,t} + \beta_7\text{GDP}_{i,t} + \text{YEAR}_t + \varepsilon_{i,t}, \quad (9)$$

$$\text{ATO}_{i,t} = \beta_0 + \beta_1\text{VAIC}_{i,t} + \beta_2\text{SIZE}_{i,t} + \beta_3\text{LEV}_{i,t} + \beta_4\text{TYPE}_{i,t} + \beta_5\text{GDP}_{i,t} + \text{YEAR}_t + \varepsilon_{i,t}, \quad (10)$$

$$ATO_{i,t} = \beta_0 + \beta_1 CEE_{i,t} + \beta_2 HCE_{i,t} + \beta_3 SCE_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 LEV_{i,t} + \beta_6 TYPE_{i,t} + \beta_7 GDP_{i,t} + YEAR_t + \varepsilon_{i,t}, \quad (11)$$

where *i* and *t* represent individual bank and year, respectively; β stands for the presumed parameter; and ε signifies the error term.

5. Results

5.1. Descriptive Statistics

The descriptive statistics are summarized in Tables 4 and 5. We find that listed Chinese banks have higher profitability than Pakistani counterparts, but ATO in listed Chinese banks is lower than that in Pakistan. The results further indicate that Chinese banks have higher VAIC than Pakistani banks. The average VAIC in the banking system in China and Pakistan is estimated at 4.9430 and 2.8761, respectively. Among the three components of VAIC, Chinese banks have higher HCE and SCE, while Pakistani banks have higher CEE. Moreover, HCE plays a major role in VAIC, consistent with Meles et al. [6], Gigante [11], Ozkan et al. [15], Tran and Vo [17], Adesina [18], and Haris et al. [20]. In addition, listed Chinese banks have larger size and higher debt ratio. In these two emerging Asian countries, most listed banks are private-owned. We also apply *t*-test and find that there are significant differences in term of all variables except ROA in China and Pakistan. Tables A1 and A2 also present the average value of IC and its components of listed banks in China and Pakistan from 2010 to 2018 (See Appendix A).

Table 4. Descriptive statistics of listed banks in China.

Variable	N	Mean	Max	Min	Standard Deviation
ROA	177	0.0105	0.0230	0.0059	0.0024
ROE	177	0.1631	0.2531	0.0780	0.0414
ATO	177	0.0284	0.0436	0.0143	0.0050
VAIC	177	4.9430	19.4447	2.6828	1.5900
CEE	177	0.2558	0.4085	0.1108	0.0662
HCE	177	3.9573	18.2711	2.0580	1.5424
SCE	177	0.7299	0.9453	0.5141	0.0591
SIZE	177	28.5061	30.9524	24.6287	1.5254
LEV	177	0.9323	0.9659	0.8134	0.0143
TYPE	177	0.75	1	0	0.437
GDP	177	31.8239	32.1312	31.3498	0.2419

Table 5. Descriptive statistics of listed banks in Pakistan.

Variable	N	Mean	Max	Min	Standard Deviation	Difference *t*-Statistics
ROA	179	0.0094	0.0318	−0.0216	0.0089	1.614
ROE	179	0.1037	0.2825	−0.8186	0.1410	5.380 ***
ATO	179	0.0913	0.1288	0.0568	0.0169	−47.443 ***
VAIC	179	2.8761	8.0049	−16.4274	2.4429	9.450 ***
CEE	179	0.3325	3.4474	−1.1687	0.2990	−3.334 ***
HCE	179	2.2661	6.7638	−2.2570	1.2279	11.451 ***
SCE	179	0.2775	2.5650	−16.4939	1.6194	3.715 ***
SIZE	179	16.6713	18.7232	14.1760	1.0344	85.761 ***
LEV	179	0.9143	0.9840	0.7388	0.0415	5.462 ***
TYPE	179	0.8492	1	0	0.3589	−2.442 **
GDP	179	27.6856	28.0454	27.2066	0.2603	4.1383 ***

** $p < 0.05$, *** $p < 0.01$.

5.2. Diagnostic Tests

First, the Augmented Dickey-Fuller (ADF) test is performed to check the unit root. The significant coefficients of the variables in Table 6 rejected the null hypothesis that at least one panel contains a unit root. Second, the results of correlation analysis are presented in Table 7 that display a statistically significant positive correlation between bank performance (ROA, ROE, and ATO) and VAIC. In order to address the multi-collinearity, we compute the variance inflation factors (VIFs) and find that all values of VIFs are less than 10, suggesting the absence of multi-collinearity among explanatory variables.

Table 6. ADF test.

Variable	China		Pakistan		Full Sample	
	Coef.	PV	Coef.	PV	Coef.	PV
ROA	102.005	0.000	162.920	0.000	171.449	0.000
ROE	68.310	0.043	208.484	0.000	215.337	0.000
ATO	71.638	0.000	126.720	0.000	153.941	0.000
VAIC	90.558	0.000	182.291	0.000	202.580	0.000
CEE	90.928	0.000	149.686	0.000	158.866	0.000
HCE	82.481	0.003	77.887	0.000	149.608	0.000
SCE	66.374	0.000	224.981	0.000	263.392	0.000
SIZE	141.298	0.000	70.724	0.002	168.652	0.000
LEV	57.956	0.003	83.124	0.000	141.080	0.000
GDP	357.717	0.000	152.164	0.000	194.198	0.000

Table 7. Correlation matrix.

Variable	ROA	ROE	ATO	VAIC	CEE	HCE	SCE	SIZE	LEV	TYPE	GDP	VIF1	VIF2
Panel A: China													
ROA	1												
ROE	0.670 ***	1											
ATO	0.689 ***	0.522 ***	1										
VAIC	0.673 ***	0.232 ***	0.281 ***	1								1.544	
CEE	0.580 ***	0.938 ***	0.605 ***	0.056	1								3.024
HCE	0.646 ***	0.183 ***	0.258 ***	0.999 ***	0.008	1							5.333
SCE	0.601 ***	0.414 ***	0.152 **	0.780 ***	0.203 ***	0.757 ***	1						4.168
SIZE	0.177 ***	0.264 ***	0.154 **	−0.097	0.340 ***	−0.123 *	0.213 ***	1				2.306	3.135
LEV	−0.271 ***	0.491 ***	−0.108 *	−0.449 ***	0.538 ***	−0.483 ***	−0.094	0.194 ***	1			2.512	3.163
TYPE	−0.275 ***	−0.114 *	−0.128 **	−0.006	−0.165 **	0.006	−0.117 *	−0.674 ***	0.133 **	1		2.430	2.464
GDP	−0.396 ***	−0.751 ***	−0.333 ***	−0.088	−0.722 ***	−0.050	−0.255 ***	−0.101 *	−0.476 **	0.124 *	1	1.738	2.748
Panel B: Pakistan													
Variable	**ROA**	**ROE**	**ATO**	**VAIC**	**CEE**	**HCE**	**SCE**	**SIZE**	**LEV**	**TYPE**	**GDP**	**VIF1**	**VIF2**
ROA	1												
ROE	0.822 ***	1											
ATO	0.176 **	0.025	1										
VAIC	0.770 ***	0.652 ***	0.011	1								1.456	
CEE	0.466 ***	0.616 ***	−0.074	0.442 ***	1								1.302
HCE	0.923 ***	0.745 ***	0.065	0.770 ***	0.442 ***	1							2.286
SCE	0.375 ***	0.305 ***	−0.018	0.843 ***	0.147 **	0.322 ***	1						1.132
SIZE	0.464 ***	0.417 ***	−0.340 ***	0.459 ***	0.281 ***	0.511 ***	0.253 ***	1				1.676	2.083
LEV	−0.318 ***	−0.102	−0.305 ***	−0.153 **	0.041	−0.261 ***	−0.041	0.295 ***	1			1.267	1.533
TYPE	0.049	0.092	0.090	0.069	0.112	0.110	−0.001	−0.068	−0.004	1		1.021	1.054
GDP	0.005	0.141 **	−0.779 ***	0.142 **	0.162 **	0.103 *	0.107 *	0.367 ***	0.233 ***	−0.003	1	1.180	1.195

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

5.3. Regression Results

The empirical results are shown in Tables 8 and 9. Table 8 demonstrates that a positive and significant relationship exists between VAIC and bank profitability indicators (ROA and ROE) in two countries, supporting Hypothesis 1. In terms of the relationship between IC and productivity, VAIC has a positive and significant impact only in Pakistan, which partially supports Hypothesis 2 and Hypothesis 4. Additionally, the coefficients of VAIC on profitability in Pakistan are higher than those in China, which suggests that IC can make more profits for Pakistani banks. Thus, Hypothesis 3 is accepted.

Table 8. Regression results of Models (6), (8), and (10).

Variable	China			Pakistan		
	ROA	ROE	ATO	ROA	ROE	ATO
Constant	0.191 ***	1.912 ***	0.465 ***	0.137 ***	−0.386	1.479 ***
	(7.331)	(4.577)	(5.737)	(3.385)	(−0.445)	(17.694)
VAIC	0.001 ***	0.009 ***	0.0003	0.002 ***	0.032 ***	0.001 ***
	(9.356)	(7.115)	(1.075)	(11.764)	(8.056)	(2.774)
SIZE	0.0003 ***	0.006 ***	0.001 ***	0.003 ***	0.026 **	−0.002 *
	(3.289)	(3.330)	(3.328)	(6.146)	(2.591)	(−1.889)
LEV	−0.050 ***	1.023 ***	−0.142 ***	−0.063 ***	−0.260	−0.031
	(−4.273)	(5.420)	(−3.880)	(−6.308)	(−1.210)	(−1.490)
TYPE	−0.001	0.005	0.002 **	0.001	0.026	0.003
	(−0.345)	(0.742)	(2.079)	(0.701)	(1.174)	(1.517)
GDP	−0.005 ***	−0.092 ***	−0.011 ***	−0.004 ***	0.007	−0.048 ***
	(−7.977)	(−9.843)	(−5.896)	(−2.898)	(0.202)	(−15.106)
YEAR	Included	Included	Included	Included	Included	Included
F	66.772 ***	83.547 ***	12.148 ***	81.369 ***	28.480 ***	63.244 ***
Adj. R^2	0.651	0.701	0.241	0.693	0.436	0.636
D.W.	0.668	0.865	0.599	1.547	1.469	1.525
N	177	177	177	179	179	179

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. t-values are in parentheses.

The adjusted R^2 values of Models (7), (9), and (11) are higher than those of Models (6), (8), and (10). This demonstrates VAIC components are better at explaining the bank performance than VAIC alone.

When decomposing VAIC into CEE, HCE, and SCE, Table 9 illustrates that CEE is positively related to the performance of listed banks in China, which is consistent with Firer and Willians [8]'s argument that physical capital is the most influencing factor of VAIC on business performance in an emerging economy. SCE is positively related to bank profitability in China. However, no significant association is found between HCE and bank performance. This is because listed Chinese banks with large scale may have redundant personnel, which leads to the low efficiency of bank operation.

In the context of Pakistan, we find a significant positive association between HCE and bank performance when measured by ROA, ROE, and ATO. This is similar to the findings of Goh [50] and Mondal and Ghosh [57]. The result indicates that HC investment can generate higher profitability and productivity in the Pakistani banking system. Physical capital has a positive impact on ROA and ROE. However, the impact of SCE on bank performance is not significant except the ROA indicator, which suggests that SCE is not a major driver of bank performance. Mondal and Ghosh [57] also found that the relationship between SCE and profitability is not significant. Therefore, Hypothesis 3 and Hypothesis 4 are further supported.

At the same time, bank size (SIZE) has a negative relationship with the profitability of listed Chinese banks, but this correlation is insignificant for listed Pakistani banks. This indicates that Chinese banks should keep a reasonable scale to achieve sustainable development. Similarly, the high debt ratio (LEV) reduces bank profitability (ROA) in Model 7.

Table 9. Regression results of Models (7), (9), and (11).

Variable	China			Pakistan		
	ROA	ROE	ATO	ROA	ROE	ATO
Constant	0.081 ***	0.147	0.200 ***	0.106 ***	−0.394	1.459 ***
	(6.736)	(0.756)	(3.383)	(4.145)	(−0.571)	(17.389)
CEE	0.034 ***	0.537 ***	0.077 ***	0.003 ***	0.164 ***	−0.0005
	(27.651)	(27.307)	(12.975)	(3.600)	(6.886)	(−0.165)
HCE	0.00007	−0.001	0.0002	0.006 ***	0.068 ***	0.003 ***
	(1.021)	(−0.579)	(0.508)	(20.344)	(8.777)	(3.058)
SCE	0.014 ***	0.190 ***	−0.012	0.001 ***	0.006	0.0004
	(8.843)	(7.349)	(−1.596)	(3.304)	(1.451)	(0.774)
SIZE	−0.0002 ***	−0.003 ***	0.0003	0.001 *	−0.002	−0.003 ***
	(−4.146)	(−3.557)	(1.121)	(1.863)	(−0.254)	(−2.670)
LEV	−0.109 ***	0.125	−0.233 ***	−0.023 ***	0.141	−0.011
	(−18.853)	(1.343)	(−8.289)	(−3.323)	(0.759)	(−0.483)
TYPE	−0.001 ***	−0.002	0.002 **	−0.001 *	−0.005	0.003
	(−3.170)	(−0.576)	(2.346)	(−1.756)	(−0.281)	(1.168)
GDP	0.001 *	−0.009 *	0.001	−0.004 ***	0.007	−0.048 ***
	(1.772)	(−1.742)	(0.507)	(−3.682)	(0.276)	(−14.944)
YEAR	Included	Included	Included	Included	Included	Included
F	355.747 ***	413.197 ***	46.352 ***	187.451 ***	48.233 ***	46.566 ***
Adj. R^2	0.934	0.943	0.643	0.880	0.650	0.642
D.W.	1.121	1.523	0.921	1.464	1.290	1.574
N	177	177	177	179	179	179

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. t-values are in parentheses.

5.4. Robustness Check

In robustness check, Generalized Method of Moments (GMM) is applied to the data of full sample by controlling for the country (COUNTRY) and year (YEAR) variables. Because bank performance is affected, due to the unidentified characteristics that cannot be measured in an equation and bank performance persists over time, which are the basis of possible unobserved heterogeneity. For example, the behavior of managers and their attitude towards internal policies and risks may affect bank performance [36]. Similarly, the current year's performance of banks might be affected by the past year's performance. Further, the presence of endogenous variables in an equation may also create the problem of endogeneity because of simultaneity and thus, may produce biased results [20]. For example, the lower profitable banks might have a higher leverage ratio because of retaining lower equity and vice versa [66]. Thus, the existence of persist profitability, unobserved heterogeneity, and endogeneity makes the results of OLS methods inconsistent and biased. Therefore, for the robustness of our results, we followed Haris et al. [20] and Yao et al. [66] and applied two-step GMM system estimator, which is efficient and deals with performance persistence, unobserved heterogeneity, serial correlation, and endogeneity, thus, produces robust and unbiased results.

Our study used the ratio of total liabilities to total assets (used as a proxy to measure leverage) as an endogenous variable and treated it with different lag-length (3–5), along with the lag of dependent variables. Since GMM allows the use of instruments, therefore, it is necessary to make use of valid instruments to ensure the consistency in the results of GMM. Therefore, the GMM, by default, calculates Hansen-J statistics of the over-identifying restrictions under the null of joint validity of the used instruments. The results of Hansen-J represent that residuals and instruments are not correlated. Further, GMM also calculates the difference-in-Hansen test (also called C-statistics) under the null of exogeneity of the instrument subset, for the validity of instrument subsets. In addition, GMM, by default, addresses the problems of Arellano-Bond first-order autocorrelation (AR1) and second-order autocorrelation (AR2) under the null of no serial correlations. However, the absence of

AR(2) is important than AR(1), in order to get the unbiased and consistent results of GMM [20,36,66]. The following are the new econometric models based on GMM.

$$PER_{i,t} = \beta_0 + \delta PER_{i,t-1} + \beta_1 VAIC_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 TYPE_{i,t} + \beta_5 GDP_{i,t} + \beta_6 COUNTRY_i + \beta_7 YEAR_t + \nu_{i,t} + \mu_{i,t}, \quad (12)$$

$$PER_{i,t} = \beta_0 + \delta PER_{i,t-1} + \beta_1 CEEi,t + \beta_2 HCE_{i,t} + \beta_3 SCE_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 LEV_{i,t} + \beta_6 TYPE_{i,t} + \beta_7 GDP_{i,t} + \beta_8 COUNTRY_i + \beta_9 YEAR_t + \nu_{i,t} + \mu_{i,t}. \quad (13)$$

In Models (12) and (13), $PER_{i,t}$ refers to performance, i.e., ROA, ROE, and ATO, of each bank at time t. $PER_{i,t-1}$ is the one-period lag of performance. δ refers to the persist performance and its coefficients range between 0 and 1, value closer to 0 shows a higher adjustment speed and competitive market. $COUNTRY_i$ is the country dummy that measures the country effect. $YEAR_t$ refers to the year dummy that measures the time effect; $\nu_{i,t}$ is the unobserved individual effect, and $\mu_{i,t}$ is the residual.

The results of Models (12) and (13) are shown in Table 10. The positive significant coefficients of the lag dependent variables (DEP_{t-1}) indicating the positive impact of past year performance on the current performance, and thus, proving the dynamic nature of GMM models. The significant F-statistics ($p < 1\%$) shows the joint significance of GMM models. The results report the significant *p*-values of AR(1) some models; however, the insignificant *p*-values of AR(2) indicates the absence of serial correlation and make our estimation valid. Since the GMM allows the use of instruments to deal with endogeneity, therefore, the insignificant values of Hansen-J ($p > 10\%$) refer to the over-identifying restrictions, leading to the acceptance of joint validity of the used instruments. Further, the insignificant values of C-statistics ($p > 10\%$) also prove the validity of instruments subsets used to deal with the endogeneity.

Turning to our main findings, we find almost consistent results of GMM with our previous estimations. Table 10 shows a positive and significant impact of VAIC on bank profitability (ROA and ROE) and productivity (ATO) in two countries. As for as the VAIC components are concerned, Table 10 reports a positive and significant relationship between CEE and ROE of Chinese and Pakistani banks. It also shows that CEE has a positive, but insignificant impact on ROA. HCE is found to have a positive and significant impact on the performance indicators (ROA, ROE, and ATO). Similarly, SCE is also found to have a positive and significant relationship with each performance indicator in China and Pakistan.

Table 10. Regression results of Generalized Method of Moments (GMM).

Variable	Model (12)			Model (13)		
	ROA	ROE	ATO	ROA	ROE	ATO
Constant	−1.096	−4.933	3.187 ***	−0.120	−8.052	0.938
	(0.735)	(3.949)	(0.678)	(0.121)	(9.173)	(0.931)
DEP_{t-1}	0.334 ***	0.461 ***	0.252 ***	0.310 ***	0.380 ***	0.300 ***
	(0.077)	(0.086)	(0.096)	(0.119)	(0.040)	(0.101)
VAIC	0.002 ***	0.021 ***	0.009 ***			
	(0.001)	(0.002)	(0.003)			
CEE				0.003	0.104 ***	−0.014 **
				(0.003)	(0.040)	(0.006)
HCE				0.002 ***	0.019 **	0.017 **
				(0.001)	(0.010)	(0.009)
SCE				0.001 ***	0.020 ***	0.009 *
				(0.0001)	(0.004)	(0.005)
SIZE	0.002 *	0.011 **	0.007 **	0.001 **	0.008 *	0.004
	(0.001)	(0.005)	(0.003)	(0.0004)	(0.005)	(0.003)

Table 10. *Cont.*

Variable	Model (12)			Model (13)		
	ROA	ROE	ATO	ROA	ROE	ATO
LEV	−0.145 ***	−0.496 **	−1.008 ***	−0.073 ***	−0.410 *	−0.871 ***
	(0.049)	(0.252)	(0.141)	(0.018)	(0.232)	(0.145)
TYPE	0.005	0.013	0.065 ***	0.001	0.012	0.054 ***
	(0.003)	(0.012)	(0.023)	(0.002)	(0.011)	(0.020)
GDP	0.043	0.188	−0.087 ***	0.006	0.299	−0.119 **
	(0.027)	(0.137)	(0.023)	(0.004)	(0.332)	(0.049)
COUNTRY	YES	YES	YES	YES	YES	YES
YEAR	YES	YES	YES	YES	YES	YES
F	19.62 ***	362.68 ***	81.70 ***	297.19 ***	651.23 ***	14.10 ***
Bank	47	47	47	47	47	47
Instruments	21	23	23	25	24	24
AR(1)	−1.71(0.087)	−1.56(0.118)	−1.58(0.114)	−1.61(0.108)	−1.88(0.061)	−1.80(0.072)
AR(2)	−0.98(0.328)	−0.87(0.383)	−0.85(0.397)	−1.44(0.150)	−0.68(0.498)	−0.35(0.729)
Hansen-J	1.96(0.744)	2.50(0.869)	7.04(0.317)	5.71(0.457)	2.66(0.752)	7.91(0.161)
C-statistics	0.17(0.921)	0.12(0.939)	1.43(0.488)	1.24(0.537)	0.26(0.879)	2.63(0.268)
N	307	307	307	307	307	307

Two-step GMM system estimator is applied for econometric robustness. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are in parentheses. The significant *p*-values of F-statistics indicate the joint significance of the models. AR(1) is the results of Arellano-Bond first-order autocorrelation, while AR(2) is the second-order autocorrelation. The insignificant *p*-values of AR(2) led to the acceptance of the null of no autocorrelation. The insignificant *p*-values of Hansen-J statistics and Difference-in-Hansen test as the C-statistics, led to the acceptance of null of exogeneity of the full instruments and instruments subset. DEP_{t-1} refers to one-year lag of dependent variables.

5.5. Additional Analysis on the Lagged Effect of IC

The previous literature [3,17,64,77] has proved that the lagged value of IC benefits current profitability. We use one-time and two-time lagged independent variables to examine the lagged effect of IC on bank performance.

As shown in Table 11, the one-year lagged VAIC only has a positive impact on bank profitability in China and Pakistan.

Table 11. Regression results of one-year lagged effect of IC.

Variable	China			Pakistan		
	ROA	ROE	ATO	ROA	ROE	ATO
Constant	0.296 ***	3.168 ***	0.773 ***	0.255 ***	1.181	1.890 ***
	(8.864)	(5.949)	(7.490)	(4.419)	(1.095)	(20.171)
$VAIC_{t-1}$	0.001 ***	0.008 ***	−0.001	0.001 ***	0.015 ***	−0.0001
	(4.864)	(4.749)	(−1.613)	(6.000)	(4.044)	(−0.439)
SIZE	0.0003 ***	0.005 **	0.001 ***	0.003 ***	0.040 ***	−0.0002
	(2.722)	(2.474)	(3.562)	(6.411)	(3.950)	(−0.242)
LEV	−0.062 ***	0.893 ***	−0.212 ***	−0.082 ***	−0.311	−0.065 ***
	(−0.373)	(3.929)	(−4.804)	(−6.684)	(−1.351)	(−3.237)
TYPE	−0.00005	0.005	0.004 ***	0.001	0.006	0.002
	(−0.132)	(0.727)	(3.013)	(0.745)	(0.261)	(1.231)
GDP	−0.007 ***	−0.126 ***	−0.018 ***	−0.008 ***	−0.054	−0.063 ***
	(−10.104)	(−10.647)	(−7.992)	(−3.844)	(−1.331)	(−17.712)
YEAR	Included	Included	Included	Included	Included	Included
F	58.385 ***	79.690 ***	15.874 ***	41.518 ***	13.114 ***	82.863 ***
Adj. R^2	0.661	0.728	0.336	0.562	0.277	0.721
D.W.	0.728	0.734	0.747	1.515	1.363	1.245
N	148	148	148	159	159	159

** $p < 0.05$, *** $p < 0.01$. *t*-values are in parentheses.

Table 12 illustrates that one-year lagged CEE is positively associated with Chinese bank performance. One-year lagged SCE has a positive impact on bank profitability in China. For listed Pakistani banks, only lagged HCE positively influences bank profitability, and the impact of the lagged CEE and SCE is not significant at the 5% level.

Tables 13 and 14 show the regression results of two-year lagged effect of IC and its components on bank performance. Table 13 shows that two-year lagged VAIC has a positive impact on bank profitability in the Pakistani banking sector, while it negatively influences bank productivity in China.

Table 12. Regression results of one-year lagged effect of IC components.

Variable	China			Pakistan		
	ROA	ROE	ATO	ROA	ROE	ATO
Constant	0.183 ***	0.987 ***	0.387 ***	0.244 ***	1.414	1.889 ***
	(7.190)	(2.739)	(4.434)	(4.616)	(1.358)	(20.143)
CEE_{t-1}	0.026 ***	0.438 ***	0.062 ***	0.0001	0.073 **	0.0003
	(13.031)	(15.626)	(9.133)	(0.067)	(2.573)	(0.130)
HCE_{t-1}	−0.00005	0.003	−0.0001	0.004 ***	0.034 ***	0.001
	(−0.352)	(1.303)	(−0.198)	(7.713)	(3.646)	(1.546)
SCE_{t-1}	0.012 ***	0.106 **	−0.015	0.0003	0.003	−0.001 *
	(4.040)	(2.421)	(−1.411)	(1.188)	(0.704)	(−1.776)
SIZE	−0.0003 ***	−0.004 ***	0.0002	0.002 ***	0.024 **	−0.001
	(−2.829)	(−3.389)	(0.531)	(3.441)	(2.206)	(−1.209)
LEV	−0.095 ***	0.565 ***	−0.199 ***	−0.054 ***	−0.080	−0.048 **
	(−8.017)	(3.369)	(−4.906)	(−4.386)	(−0.333)	(−2.192)
TYPE	−0.001 **	−0.007 *	0.002 *	−0.0002	−0.011	0.002
	(−2.497)	(−1.832)	(1.826)	(−0.176)	(−0.471)	(0.826)
GDP	−0.003 ***	−0.045 ***	−0.006 ***	−0.008 ***	−0.062	−0.063 ***
	(−4.599)	(−5.037)	(−2.693)	(−4.084)	(−1.589)	(−17.766)
YEAR	Included	Included	Included	Included	Included	Included
F	112.442 ***	188.891 ***	34.858 ***	41.047 ***	12.559 ***	60.942 ***
Adj. R^2	0.841	0.899	0.617	0.640	0.339	0.726
D.W.	1.408	1.127	1.094	1.769	1.446	1.318
N	148	148	148	159	159	159

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *t*-values are in parentheses.

Table 13. Regression results of two-year lagged effect of IC.

Variable	China			Pakistan		
	ROA	ROE	ATO	ROA	ROE	ATO
Constant	0.347 ***	3.762 ***	0.846 ***	0.231 ***	1.291	1.792 ***
	(7.933)	(5.304)	(6.978)	(3.177)	(0.993)	(14.709)
$VAIC_{t-2}$	0.0001	0.001	−0.002 ***	0.001 ***	0.028 ***	−0.0002
	(0.954)	(0.317)	(−4.826)	(6.698)	(6.979)	(−0.451)
SIZE	0.0003 **	0.005 **	0.001 ***	0.001 ***	0.010 **	−0.00005
	(2.561)	(2.267)	(4.004)	(5.015)	(2.071)	(−0.112)
LEV	−0.061 ***	0.983 ***	−0.171 ***	−0.047 ***	0.192	−0.076 ***
	(−3.108)	(3.071)	(−3.127)	(−3.558)	(0.817)	(−3.466)
TYPE	3.310E-06	0.004	0.004 ***	−0.0002	−0.008	0.002
	(0.008)	(0.622)	(3.509)	(−0.127)	(−0.336)	(0.882)
GDP	−0.009 ***	−0.146 ***	−0.022 ***	−0.007 **	−0.053	−0.059 ***
	(−9.835)	(−9.764)	(−8.479)	(−2.494)	(−1.089)	(−13.026)
YEAR	Included	Included	Included	Included	Included	Included
F	35.082 ***	61.155 ***	20.432 ***	37.608 ***	18.527 ***	47.705 ***
Adj. R^2	0.587	0.715	0.4447	0.570	0.388	0.629
D.W.	0.916	0.874	0.890	1.888	1.703	1.424
N	121	121	121	139	139	139

** $p < 0.05$, *** $p < 0.01$. *t*-values are in parentheses.

Table 14. Regression results of two-year lagged effect of IC components.

Variable	China			Pakistan		
	ROA	ROE	ATO	ROA	ROE	ATO
Constant	0.261 ***	2.466 ***	0.619 ***	0.248 ***	1.164	1.798 ***
	(6.448)	(3.680)	(5.551)	(3.394)	(0.878)	(14.436)
CEE_{t-2}	0.017 ***	0.266 ***	0.048 ***	0.001	0.037	0.002
	(5.958)	(5.628)	(6.121)	(0.715)	(1.342)	(0.605)
HCE_{t-2}	−0.001	−0.005	−0.001	0.002 ***	0.018 *	−0.001
	(−1.193)	(−0.514)	(−0.542)	(4.585)	(1.882)	(−0.678)
SCE_{t-2}	0.017 *	0.148	−0.011	0.001 ***	0.031 ***	−0.0001
	(1.952)	(1.032)	(−0.458)	(3.922)	(6.001)	(−0.245)
SIZE	−0.0002 *	−0.004	0.00002	0.001 ***	0.013 **	0.00006
	(−1.677)	(−1.537)	(0.043)	(3.316)	(2.347)	(0.107)
LEV	−0.075 ***	0.768 ***	−0.210 ***	−0.042 ***	0.144	−0.079 ***
	(−4.346)	(2.678)	(−4.410)	(−3.189)	(0.599)	(−3.506)
TYPE	−0.001 *	−0.007	0.002 **	−0.0003	−0.006	0.002
	(−1.982)	(−1.130)	(1.991)	(−0.279)	(−0.277)	(0.822)
GDP	−0.006 ***	−0.096 ***	−0.012 ***	−0.008 ***	−0.046	−0.059 ***
	(−6.109)	(−6.054)	(−4.714)	(−2.770)	(−0.937)	(−12.758)
YEAR	Included	Included	Included	Included	Included	Included
F	38.675 ***	60.029 ***	25.373 ***	27.959 ***	13.341 ***	33.772 ***
Adj. R^2	0.687	0.775	0.587	0.578	0.385	0.624
D.W.	1.115	1.061	0.915	1.802	1.804	1.417
N	121	121	121	139	139	139

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *t*-values are in parentheses.

In terms of IC components, as shown in Table 14, we find that only two-year lagged CEE has a positive and significant impact on bank profitability and productivity in China. In the Pakistani context, two-year lagged HCE and SCE are positively associated with the profitability of listed banks.

6. Discussion

As China and Pakistan are emerging Asian economies, their banking systems have not fully advanced. The findings of this study are in line with previous studies [11,15,17,20,78] and suggest that bank profitability in two countries is primarily driven by CEE. However, Mohapatra et al. [79] documented a negative relationship between CEE and operational efficiency in the Indian banking sector, which suggests that Indian banks do not reach the minimum capital requirements with the exposure to many outside risks. Also, bank profitability in China is determined by SCE, consistent with Zhang [7], Chen [71], Zhang [74], and Feng [75]. One possible explanation is that investment in SC (e.g., bank culture, systems, procedures, database, and networks) will promote the expansion of banking business in the reform of banking systems when facing fierce competition. Contrary to some studies [6,10,11,13,15–18,57], SCE is observed to be not correlated with the financial performance of listed banks.

HCE contributes to financial performance in the Pakistani banking sector, while HCE is confirmed to be statistically insignificant with ROA, ROE, and ATO in China. Meles et al. [6], Gigante [11], Ozkan et al. [15], Tiwari and Vidyarthi [16], Irawanto et al. [78], and Buallay [80] also found that HC has a positive effect on financial performance of banks (measured by ROA and ROE). This is consistent with Zou and Huan [10] who argued that HCE has a non-significant impact on Chinese banks' performance (measured through technical efficiency), and Tran and Vo [17] who confirmed a negative relation between HCE and banks' financial performance because of the mergers and acquisitions in Thailand. In the Chinese context, this insignificant impact of HC on bank performance can be explained in two aspects. First, banks are too large to make full use of employee talents. Second, the functioning mode of listed Chinese banks is complicated. State-owned banks often neglect customer satisfaction because of their reputation, and they do not sufficiently invest in employee training in this field. Overall, listed Chinese banks do not pay much attention to the role of HC. In addition, there are some biases in the allocation and utilization of bank resources.

Additionally, bank productivity in China and Pakistan is driven by CEE and HCE, respectively. This is consistent with the findings of Alhassan and Asare [13] who believed that CEE and HCE drive productivity growth in the banking industry in Ghana, a developing country, and Yao et al. [66] who found that HCE is a key component that enhances the productivity of financial institutions in Pakistan.

We also obtained that CEE and SCE are positively related to Chinese bank profitability in the one-year and two-year lagged period. However, in the Pakistani banking sector, the lagged effect of HC can bring future benefit, consistent with Tran and Vo [17]. This can be due to the process or management style within listed Pakistani banks. Therefore, HCE seems to take longer to have an impact on the performance of listed banks in Pakistan.

7. Conclusions

IC is generally acknowledged as the source of competitive advantage and future value creation in today's knowledge-based economy. This current study empirically examines the impact of IC on bank performance, i.e., profitability and productivity, in emerging Asian countries from 2010 to 2018, using the VAIC™ method. Then, this current paper examines the lagged effect of IC and its components on bank performance at these banks. The main conclusions are as follows:

(1) IC has a positive impact on bank profitability and productivity in China and Pakistan.
(2) Among VAIC components, CEE is the most influencing factor that explains higher profits for banks in China and Pakistan. In the Chinese context, CEE and SCE are found to be the main drivers of profit in the Chinese banking system. In the case of Pakistan, CEE and HCE mainly affect bank performance.
(3) The lagged CEE and SCE positively affect Chinese banks' performance. In Pakistan, only lagged HCE yields a positive effect on future profitability.

In a dynamic business environment, bank managers should continuously focus on the operating performance of the banks. Though there are many studies on the impact of IC on bank performance, little has specifically investigated how bank profitability and productivity could be improved using IC resources. This study also extends the IC research by conducting a comparative analysis in the context of China and Pakistan, emerging Asian economies.

This study suggests several practical implications. First, the current study suggests that the Chinese and Pakistani banks can improve their profitability and productivity, investing more in IC resources. Because the banks provide financial services that require developed systems, environment, procedures and well-trained human resources. Therefore, managers of listed banks in these two countries should keep aware of the importance of IC and effectively manage IC to create more value. Meanwhile, IC should be taken into consideration when bank managers make future strategic plans.

Second, the empirical results show that listed banks in these two countries largely depend on physical and financial capital to make profits, so bank managers should effectively utilize physical and financial resources to achieve a better bank performance.

Third, although HC has no significant impact on bank performance in China, bank managers should also recognize the important role of HC and invest in HC, such as continuous training to improve their HCE. Considering the idiosyncratic and knowledge-intensive nature of banks, it requires skills in human resources and well-trained experts to cater the financial complexities and build strong relationships with stakeholders to alleviate the agency problems. Therefore, investment in HC has great potential to improve the profitability and productivity of banks in these two countries.

Finally, SCE has a favorable effect on the profitability in the Chinese banking sector, and banks in Pakistan should focus on using SC to create value added by maintaining good relationships with customers and building good bank reputation. They should develop a positive organizational culture, strong IT and the management control systems to support internal business operations. Thus, this study suggests that the listed Pakistani banks should advance their mechanism of producing value from SC.

This study has some limitations. First, foreign banks are not included in the samples of this study that are likely to utilize IC from developed and emerging countries. Second, more IC components, such as relational capital and innovative capital should be taken into account. These will be done in the future.

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Abbreviations

IC	Intellectual capital
VAIC	Value added Intellectual Coefficient
CEE	Capital employed efficiency
HCE	Human capital efficiency
SCE	Structural capital efficiency
ROA	Return on assets
ROE	Return on equity
ATO	Asset turnover ratio

Appendix A

Table A1. Descriptive statistics of listed Chinese banks.

Bank's Name	CEE	HCE	SCE	VAIC
Ping An Bank	0.2584	3.2025	0.6870	4.1479
Bank of Ningbo	0.2736	3.5387	0.7131	4.5254
Jiangyin Rural Commercial Bank	0.1330	2.3931	0.5759	3.1021
Rural Commercial bank of Zhangjiagang	0.1460	2.5637	0.6092	3.3189
Bank of Zhengzhou	0.1442	3.3089	0.6978	4.1509
SPD Bank	0.2770	4.1232	0.7560	5.1562
Hua Xia Bank	0.2895	3.1872	0.6837	4.1604
China Minsheng Bank	0.3015	3.6494	0.7246	4.6755
China Merchants Bank	0.3275	3.5378	0.7161	4.5815
Jiangsu Financial Leasing	0.1954	16.4203	0.9383	17.5539
Wuxi Rural Commercial Bank	0.1691	3.7792	0.7353	4.6836
Bank of Jiangsu	0.1886	3.3467	0.7008	4.2361
Bank of Hangzhou	0.1660	2.8011	0.6428	3.6100
Bank of Nanjing	0.2369	4.2686	0.7645	5.2700
Changshu Rural Commercial Bank	0.2302	2.5700	0.6103	3.4104
Industrial Bank	0.2858	4.4571	0.7730	5.5160
Bank of Beijing	0.2215	5.6196	0.8201	6.66122
Bank of Shanghai	0.1550	4.8239	0.7924	5.7713
Agricultural Bank of China	0.3099	3.0552	0.6725	4.0377
Bank of Communications	0.2254	4.4016	0.7722	5.3992
Industrial and Commercial Bank of China	0.2964	4.2129	0.7625	5.2718
Bank of Changsha	0.2576	3.1703	0.6846	4.1126
China Everbright Bank	0.2621	3.9924	0.7483	5.0028
Bank of Chengdu	0.2357	3.8317	0.7390	4.8063
China Construction Bank	0.2913	4.1847	0.7609	5.2369
Bank of China	0.2491	3.8575	0.7406	4.8473
Bank of Guiyang	0.2452	3.9141	0.7440	4.9033
China Citic Bank	0.2519	3.7222	0.7263	4.7004
Suzhou Rural Commercial Bank	0.1615	2.5935	0.6130	3.3680

Table A2. Descriptive statistics of listed Pakistani banks.

Bank's Name	CEE	HCE	SCE	VAIC
Allied Bank	0.4013	3.0168	0.6661	4.0841
Askari Bank	0.3682	1.5202	0.6197	2.5081
Bank Alfalah	0.4007	2.0621	0.4918	2.9546
Bank Al Habib	0.5093	2.7537	0.6338	3.8968
Bankislami Pakistan	0.2334	1.2696	0.1792	1.6823
Bank of Khyber	0.2434	2.3342	0.5485	3.1261
Bank of Punjab	0.1872	1.5219	−0.1908	1.5183
Faysal Bank	0.3237	1.8848	0.4199	2.6284
Habib Bank	0.3958	2.8865	0.6366	3.9189
Habib Metropolitn Bank	0.3461	2.9387	0.6559	3.9407
JS Bank	0.2611	1.5594	−0.1096	1.7110
MCB Bank	0.3574	5.0547	0.7895	6.2015
Meezan Bank	0.5238	2.3257	0.5679	3.4174
National Bank of Pakistan	0.3289	1.9813	0.4792	2.7894
Samba Bank	0.1215	1.5168	0.2822	1.9206
Standard Chartered Bank Pak	0.6531	3.3884	0.6939	4.7354
Silk Bank	0.3200	1.1465	−0.4330	1.0335
Summit Bank	0.0004	0.1941	−2.9299	−2.7354
Soneri Bank	0.2712	1.9330	0.4621	2.6662
United Bank	0.3661	3.8044	0.7304	4.9008

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