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Intellectual Capital, Profitability, and Productivity: Evidence from Pakistani Financial Institutions

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Abstract: The idiosyncratic and knowledge-intensive nature of the financial institutions requires them to rely more on intangible than on tangible resources. Over the past two decades, researchers have been motivated to embark on the relationship between intellectual capital (IC) and performance of financial institutions. Considering the knowledge-based intellect as a critical skill of this era, the current study examines the impact of IC on the performance of 111 Pakistani financial institutions (PFIs) over the period 2007–2018. Two IC measures, i.e., value-added intellectual coefficient (VAIC) and modified value-added intellectual coefficient (MVAIC), were applied to examine the impact of IC on profitability and productivity. Robust results from the fixed effect regression and generalized method of momentum affirm the inverted U-shaped relationship between IC and performance, suggesting that the increase in IC performance of PFIs increases their profitability and productivity up to a certain level, and after that, a further increase in IC performance decreases profitability and productivity. The results further suggest that human capital is the most influencing intellectual resource which produces higher intellectual efficiencies and increases the performance significantly. The results of this study are likely to be helpful for management, regulators, policy makers, and academics and provide insights into the importance of IC and suggest that the investment in the IC improves the sustainable performance to a certain extent.

Keywords: intellectual capital; profitability; productivity; financial institutions; Pakistan

JEL Classification: G21; O34

1. Introduction

Institutions operate with a combination of both tangible and intangible resources. However, due to the knowledge-intensive and intellectually intense nature of financial institutions (FIs) [1–3], they rely more on intangible resources rather on physical ones. Since FIs are not involved in the production of any physical products, they do not require excessive physical assets to operate and grow. As it is service-oriented, the financial industry requires nonbalance-sheet items, e.g., information, knowledge, human resources, learning environment, relationship, system, information technology, and a supportive culture, which have significant relevance in producing and sustaining value [4]. As per the resource-based view, the intangible resources of an institution are more likely to contribute to attaining sustainable performance [5]. In this modern era, knowledge-based resources are replacing the traditional factors of production [6]. Intangible assets, i.e., intellectual capital (IC), have been considered more and more significant in a knowledge economy [7]. The term intellectual capital

(IC) was first published in 1969 by John Kenneth Galbraith [8]; since then, the development and the existence of IC have been considered significant to the performance and sustainability of FIs [9].

Modern FIs operate in a more challenging and dynamic environment due to technological advancement, continuous innovation in systems and processes, fast-changing customer preferences, and intense competition [10]. Unlike the nonfinancial sector, the operational success, growth, and sustainability of the financial sector do not rely more on tangible assets. As the financial sector provides a range of diversified financial services, therefore, it relies more on IC elements which are intangible in nature, like advanced systems, processes, skills, expertise, supportive culture, environment, knowledge, and information [4]. IC is believed to be a key force to value creation, hidden behind the book value of institutions [11,12]. In order to understand the concept of IC, it can be explained as the combination of structure capital and human capital [11,13]. Structure capital is based on customer and organization capital. Customer capital refers to potential intangibles such as knowledge embedded in suppliers, customers, related industry associations or the government [13]. Organization capital refers to intangibles such as knowledge embedded within the routines of an institution, systems and processes, supportive culture, information systems, transaction times, and procedural innovativeness [11,14]. Human capital can be defined as the knowledge embedded in employees and their skills, experience, expertise, ideas, and creativity [11,14–18]. Drucker [19] claimed that knowledge is the only meaningful resource, because it is connected to the institution's history and experiences and can easily be shared to achieve sustainable growth. Knowledge is possessed by human capital and delivered through a supportive culture, learning environment, and information technologies. The pivotal role of human capital in technological advancement helps to boost the sustainable competitive advantages of FIs [20]. Broadly defined, IC is the ability to convert intangible assets, e.g., knowledge, experience, innovative systems, and supporting culture, into resources that create sustainable wealth for both institutions and nations [21]. IC has been classified into different components and measured by different methodologies [11,13,14,16,22–25]. However, the advanced one, i.e., value-added intellectual coefficient (VAIC), developed by Pulic [24], is used in this study as a measurement of IC.

Many studies have provided evidence regarding the relationship between IC and performance in different countries [4,18,26–44]. However, evidence from financial institutions is still scarce. Moreover, IC studies regarding Pakistani financial institutions are very limited in breadth and depth. The few available IC studies regarding Pakistan focused on the banking sector only, with a limited sample size [4,30], except Ahmad and Ahmed [45]. Therefore, this study fills the literature gap by contributing in several ways to the ongoing research regarding the impact of IC on the performance of financial institutions. The financial sector is considered as a key pillar of an economy to operate and grow. There has always been a requirement for a sound, stable, and healthy financial system to ensure a functioning economy [46]. Consequently, the sustainable positive performance of the financial sector affects economic growth positively [47]. The Pakistani financial sector (PFS) comprises commercial banks, specialized banks, microfinance banks, investment banks, insurance companies, leasing companies, modaraba companies, investment companies, and development financial institutions. Since the country, i.e., Pakistan, got its independence, the PFS has experienced several regimes and daunting challenges. The lack of financial capital and intellectual resources, i.e., human capital and information technologies, have squeezed sustainable industry growth [4]. Over the past two decades, the dynamic and unstable environment demanded the sustainable performance of the Pakistani financial institutions (PFIs) to support the economic wheel. With the development of knowledge-based economies, researchers have agreed that IC is the only meaningful resource that any financial institution has in order to boost sustainable performance. The sustainable performance of FIs as the ultimate objective of doing business is of utmost importance to continuing their support to the economic development of an emerging economy [29] like Pakistan. Therefore, the current study is the first that measures the impact of IC performance on the profitability and productivity of the Pakistani financial sector (PFS). This is the first study using the data set of 111 PFIs, covering seven financial

industries, over the latest and large twelve-year period of 2007–2018. For the robustness of the study, two accounting measures of profitability, i.e., return on assets (ROA) and net operating margin (NOM), and one accounting measure of productivity, i.e., assets turnover (ATO), were used as the performance indicators. An extensive body of literature focused only on profitability, while the use of productivity was limited. To offer the robust impact of IC, this is the first study that uses both VAIC and modified VAIC (MVAIC) as IC indicators. The results are based on fixed effect regression, i.e., base line methodology; however, the generalized method of momentum (GMM) was also applied to offer the robust findings. The use of GMM in IC studies that offers consistent and unbiased findings by catering the problems of endogeneity and unobserved heterogeneity is still limited. In order to offer better insights and implications, several indicators were also applied to account for the impact of institution-specific factors, economic growth, and recent financial crisis. This study also supports the resource-based view that the use of intangible resources is more likely to contribute to attaining sustainable performance than tangible ones. Finally, this study provides insights into the importance of IC for financial institutions in emerging economies.

The rest of this paper is structured as follows. Section 2 reviews the Pakistani financial sector. Section 3 provides a review of existing IC studies and the hypothesis development of the current study; Section 4 discusses the sample, data, and methodology; Section 5 discusses the findings of the paper; Section 6 summarizes and discusses the findings; finally, Section 7 concludes and provides policy implications.

2. Review of the Pakistani Financial Sector (PFS)

There has always been a requirement for a healthy, sound, and stable financial system to ensure a functioning economy [46]. However, the PFS has been facing several regimes and daunting challenges mainly because of an unstable political system. Since its independence in 1947 until today, Pakistan's economy experienced almost twenty-five governments, including elected, interim, and military governments. If we exclude the military and interim governments, the average life span of a politically elected government is around 2.5 years. Therefore, the PFS have suffered due to the different economic policies and higher political interference as a response of authoritarian and democratic regimes. At the time of independence, the Pakistan inherited a financial system dominated by foreign banks [4]. However, The State Bank of Pakistan (SBP), i.e., Central Bank, was incorporated by the political government in July 1948 to establish a financial system and to regulate the monetary and credit system of the country. As a result, five banks were operating with 97 branches until 1951 [46]. However, in February 1953, the first martial law was imposed, and the first military government assumed full control of the country in 1958. Consequently, during this period, reforms were implemented vigorously with impressive results in the financial system and economic growth until 1970 [48]. Later, in 1971, the military government transitioned into a civil government, and the PFS suffered a setback in 1974, when the elected government introduced another set of reforms to nationalize all the banks [46]. In the aftermath of the nationalization, the supervisory role of the SBP was distorted due to the incorporation of the Pakistan Banking Council (PBC). The purpose of PBC was to monitor and inspect the banks and to oversee the objectives of nationalization. However, the second military government again assumed command of the state in 1977, and once again, the democratic regime transitioned into an authoritarian one [48]. Because of reforms, realizing the adverse effect of nationalization, in 1980, licenses were issued to private banks to operate side by side [46]. However, after the end of the authoritarian regime, as part of the federal government policy of privatization and deregulation of the financial sector, the PFS was opened to the private sector in 1989. The broader macroeconomic structural adjustment programs initiated the financial sector deregulation and liberalization during the 1990s. The SBP was awarded partial autonomy in 1994 and declared a completely autonomous body in May 1997, when PBC was dissolved during the same year. Since the 1980s, there have been a series of reforms initiated to counter the adverse effects of nationalization and to streamline the financial sector on modern lines with the intention to make it conducive to economic growth and stability. A number of

studies were conducted to study the aftermaths of reforms, and most of them converged to the same conclusion that sector performance remains a question mark [46]. The lack of human and financial resources, political interference, and political instability have hindered industry growth in the past. However, significant improvement has been noted over the recent years. The financial sector and stock market development are likely to continue given growth in the gross domestic product (GDP) of Pakistan, which has hit an average growth of 5.2% over the past decade. The tremendous performance of the Pakistani financial sector contributed to bringing Pakistan into one of the most renowned stock markets around the globe [49]. The contribution of the financial sector in the GDP of Pakistan was raised to 3.39% by the end of year 2018 from 3% (2011), and the sector itself achieved a growth of 6.13% in 2018, which was negative (−4.22%) by the end of year 2011 [50].

3. Literature Review and Hypothesis Development

3.1. IC Definition

The literature provides the different definitions of IC in order to understand the concept. For instance, Edvinsson and Malone [11] defined IC as the ownership of knowledge, institutional technology, customer relations, professional skills, and applied experiences that provide the sources of competitive advantage for an institution. During the same period, Stewart [14] defined IC as intellectual capital and materials, experiences, information, and knowledge that can be deployed by an institution in the processes of value creation. Later, Harrison and Sullivan [51] argued that IC is knowledge that can easily be transformed into organizational profits. Chen, et al. [52] defined IC as the intellectual property, resources, and competencies, which are intangible in nature and embedded in institutions. In addition, some other researchers such as Bontis [53] and Vishnu and Kumar Gupta [44] defined IC as related to intangibility, i.e., knowledge, which is used in wealth creation. Mondal and Ghosh [12] described IC as the hidden value (usually nonbalance-sheet items) that helps to create and sustain the competitive advantage for institutions if managed well. Recently, Soetanto and Liem [38] defined IC as all knowledge that provides added value as a source of competitive advantage in the process of wealth creation.

3.2. IC Measurement

Many researchers classified and measured IC in terms of different components [54–57], e.g., the balanced scored card approach, market capitalization method, the intangible asset monitor, and the Skandia Navigator [58]. However, the IC was first classified into customer, structural, and human capital by Sveiby [23]. Stewart [14] and Bontis [13] also classified IC into customer, structural, and human capital. Later, Pulic [24] classified IC into human capital, structural capital, and physical capital. Pulic developed a new methodology, i.e., value-added intellectual coefficient VAICTM, to measure IC performance. The VAIC is based on the concept of value added [59], which is consistent with stakeholder view [38,60], emphasizing that in addition to shareholders, there are stakeholders (e.g., employees, shareholders, lenders, customers, government, environment) for whom an institution is responsible because the stakeholders are the main force behind achieving the firm's objectives. Therefore, the value added is actually a measure of evaluating the total wealth created by stakeholders that is distributed among the same stakeholders [61]. The value-added statements containing the value-added measures are being reported by the Pakistani financial institutions in their annual reports, e.g., see Allied Bank Limited (ABL) [62], among others. Therefore, the value-added intellectual coefficient (VAIC) developed by Pulic [24] is an appropriate measure to analyze the impact of IC on the performance of an institution. Pulic's [24] VAIC is a sum of three components, i.e., capital-employed efficiency (CEE), human capital efficiency (HCE), and structural capital efficiency (SCE). This is the most widely accepted methodology of IC, and the evidence in support of VAIC has grown in existing literature (see Section 3.3).

The VAIC methodology has many advantages, such as that it is easy and standardized to determine the IC and uses a more accurate and reliable data set based on audited financial statements [1,6,63,64], which make VAIC a more objective and verifiable measure of IC [57,64]; it allows evaluating the efficiency of all resources involved in value creation; it is easy to make an IC comparison across cross-sections [38,65]; and it can also be used by institutions to measure their own IC performance irrespective of industry standards [63]. However, it has some limitations. Among these, the common limitation is that VAIC does not include the relational capital (RC), which is very significant in the creation of sustainable value [44,66]. To account for this limitation, many researchers have added relational capital efficiency (RCE) and replaced the original VAIC model with the modified value-added intellectual coefficient (MVAIC), which is the sum of three VAIC components, i.e., CEE, HCE, SCE, and an additional component, i.e., RCE [38,40,41,44,63,65,67], because the success of an institution is significantly related to the relationship with external stakeholders, i.e., government, regulators, suppliers, customers, trade associations, and competitors. Thus, RC is the only meaningful resource that an institution has which can help to build and sustain such long-term relationships, which leads toward sustainable performance [13,18,40]. Therefore, the researchers have agreed that RC should be included in the VAIC to increase its efficiency, so the addition of RC transforms VAIC into MVAIC. Hence, our study also intends to use both IC measures, i.e., VAIC and MVAIC, to offer robust results and better insights and implications by doing comparative analysis between VAIC and MVAIC.

3.3. IC and Performance of Financial Institutions

Previously, many researchers measured the IC performance of both the financial and nonfinancial sectors. However, the literature about examining the impact of IC on the performance of financial institutions is limited to an extent. Many researchers used VAIC and reported the positive impact of IC on the performance of the financial sector in different countries [4,6,10,12,28,30,31,33,35,39,40,45,52,68–74]. For instance, using a sample of 38 Indian banks over the period 2005–2016, Vidyarthi [40] applied Tobit regression and found a positive impact of both IC measures, i.e., VAIC, MVAIC, and their component, i.e., HCE, on efficiency. However, among other VAIC and MVAIC components, i.e., CEE, SCE, and RCE, they found different results. Using a sample of 10 local Malaysian banks over the period 2007–2016, Poh, Kilicman and Ibrahim [35] applied linear regression and found a positive impact of VAIC on ROA. However, among VAIC components, they reported different relationships during the periods 2007–2016 and 2011–2016. Using a sample of 20 Pakistani banks over the period 2007–2016, Haris, Yao, Tariq, Javaid and Malik [30] applied multiple regression and found a positive impact of VAIC and its component, i.e., HCE, on ROA. Using a sample of 78 Pakistani financial institutions over the period 2008–2013, Ahmad and Ahmed [45] applied linear regression and found a positive impact of VAIC and its component, i.e., CEE, on ROA. Using a sample of almost 73 banks located in the Gulf Cooperation Council (GCC) region over the period 2008–2010, Al-Musali and Ismail [6] applied linear regression and found a positive impact of VAIC on profitability. However, among VAIC components, they found different results. Using a sample of 64 Islamic financial institutions over the period 2007–2011, Nawaz and Haniffa [39] applied cross-sectional regression and found a positive impact of VAIC and its components, i.e., HCE and CEE, on ROA. Using a sample of 5749 US banks over the period 2005–2012, Meles, Porzio, Sampagnaro and Verdoliva [69] applied pooled ordinary least square (OLS) and found a positive impact of VAIC and its component, i.e., HCE, but an insignificant impact of SCE on ROA. Using a sample of 11 Saudi banks over the period 2008–2010, Al-Musali and Ismail [68] applied linear regression and found a positive impact of VAIC and its components, i.e., HCE and CEE, but an insignificant impact of SCE on ROA. Using a sample of 15 banks in the UAE over the period 2004–2010, El-Bannany [28] applied multiple regression and found a positive relationship between ROA and VAIC. Using a sample of 11 Australian banks over the period 2005–2007, Joshi, Cahill and Sidhu [10] applied linear regression and found a positive relationship between profitability and VAIC. Using a sample of 20 Malaysian financial institutions over the period 1999–2007, Ting and Lean [71] applied Spearman's correlations and found a positive relationship between VAIC and ROA.

They also applied linear regression and found a positive impact of HCE and CEE but an insignificant impact of SCE on ROA. Using a sample of 9 UK banks over the period 1999–2005, El-Bannany [70] applied multiple regression and found a positive relationship between profitability and VAIC.

Further, using the data of 73 Indian commercial banks over the period 2006–2017, Oppong and Pattanayak [33] applied fixed effect (FE) regression and found a positive impact of VAIC and its components, i.e., CEE, HCE, and SCE, on productivity, i.e., ATO. Using a sample of 18 Ghanaian banks over the period 2003–2011, Alhassan and Asare [72] found a positive impact of VAIC on productivity. However, among VAIC components, they only found a positive impact of HCE on productivity. Further, Chen, Liu and Kweh [52] used a sample of 16 Malaysian general insurance companies over the period 2008–2001 and applied OLS and Tobit regressions. Their study found a positive impact of VAIC and its components, i.e., CEE, HCE, and SCE, on productivity. Using a sample of 17 Turkish banks over the period 1995–2006, Yalama [73] applied OLS regression and found a positive impact of IC on ROA and ATO. Using a sample of 65 Indian banks over the period 1999–2008, Mondal and Ghosh [12] applied multiple regression and found a positive impact of VAIC and its component, i.e., HCE, on ROA and ATO. Their study also reported both significant and insignificant impacts of CEE and SCE on ATO and ROA in different years.

In addition to a positive relationship, some studies found no relationship between VAIC and the performance of financial institutions in different countries [18,34,75]. For instance, using a sample of 40 Australian financial companies over the period 2006–2008, Joshi, Cahill, Sidhu and Kansal [18] applied linear regression and found no relationship between VAIC and its components, i.e., HCE, SCE, and ROA. However, their study reported a positive impact of CEE on ROA. Using a sample of 44 Turkish banks over the period 2005–2014, Ozkan, Cakan and Kayacan [34] applied OLS regression and found an insignificant impact of VAIC and its component, i.e., SCE, but a positive impact of CEE and HCE on ROA.

Further, some other studies applied VAIC just to measure and compare the IC performance of financial institutions in different countries, e.g., Asian economies [42], Turkey [76], India [54], Malaysia [29], Greece [2], Japan [3], Austria, and Croatia [15].

3.4. IC and Performance of Nonfinancial Institutions

In addition, many other researchers also provided evidence from the nonfinancial sector of different countries using VAIC as a measure of IC performance and reported a positive relationship between IC and performance [32,41,44,58,63,65,77,78]. Using a sample of 390 Korean manufacturing firms over the period 2012–2016, Xu and Wang [58] applied multiple regression and found a positive impact of VAIC and its components, i.e., CEE, HCE, and RCE, on profitability. Using a sample of 100 Indian firms over the period from 2000–2013, Maji and Goswami [32] applied OLS regression and found a positive impact of VAIC and its components, i.e., CEE and HCE, on ROA. Further, Nimtrakoon [63] applied multiple regression on a sample of 213 technology firms listed on ASEAN Stock Exchange and found a positive impact of MVAIC and its components, i.e., CEE and HCE, on ROA and profit margin. However, they found an insignificant impact of SCE and RCE on profitability. Using a sample of 34 Serbian hotels over the period 2009–2012, Bontis, Janošević and Dženopoljac [77] applied multiple regression and found that the performance of hotels was positively influenced by physical capital, i.e., CEE. Using a sample of 22 Indian pharmaceutical firms over the period 2005–2011, Vishnu and Kumar Gupta [44] applied pooled OLS and found a positive impact of VAIC on profitability. Sumedrea [78] applied linear regression and found a positive impact of VAIC on the profitability of 62 firms listed on the Bucharest Stock Exchange. Using a sample of firms listed in the Taiwan Stock Exchange over the period 1992–2002, Chen, Cheng and Hwang [65] applied linear regression and found a positive impact of VAIC on profitability and revenue growth. Among VAIC components, i.e., CEE, HCE, SCE, and RCE, they found different results. However, they reported a negative relationship between RCE and profitability. Using a sample of 66 Chinese and Korean textile firms over the period 2012–2017, Xu and Wang [41] applied pooled OLS regression and found a positive impact of VAIC and MVAIC and

their component, i.e., CEE, on profitability and productivity. However, among other IC components, i.e., HCE, SCE, and RCE, they reported different results.

Further, some studies reported the different results between IC and performance, i.e., profitability and productivity, of non-financial firms. For example, Pal and Soriya [79] applied OLS regression on a sample of 207 Indian textile and pharmaceuticals firms over the period 2001–2010 and found a positive impact of VAIC on profitability but an insignificant impact of VAIC on productivity. Using a sample of listed companies in the Hong Kong Stock Exchange over the period 2001–2005, Chan [57,80] found a positive impact of VAIC on ROA while an insignificant impact on ATO. Among VAIC components, both studies reported a positive impact of SCE and CEE on profitability and a positive impact of HCE on productivity. Using a sample of 73 South African firms, Firer and Williams [1] applied linear regression and found a positive impact SCE on ROA, but a negative impact of HCE on ATO. Using a sample of 100 Arab companies over the period 2011–2015, Dzenopoljac, Yaacoub, Elkanj and Bontis [27] applied linear regression and found different results, but specifically, their study reported a positive impact of SCE and CEE on earnings and profitability. They also found that only CEE influenced ATO significantly. Using a sample of 31 Brazilian firms over the period 2007–2011, Britto, et al. [81] applied OLS regression and found a positive impact of VAIC and its components, i.e., CEE, HCE, and SCE, on financial performance. Their study further argued that IC plays a negative role in explaining the value creation.

Finally, Nuryaman [82] applied multiple regression on a sample of Indonesian listed firms and found no relationship between VAIC and its components, i.e., CEE, HCE, SCE, and ROA and NPM.

3.5. GMM Application in IC Studies

The above discussed studies applied linear regressions, i.e., OLS, pooled OLS, and multiple regression, which produce biased and inconsistent results if the effects of unobserved heterogeneity and endogenous variables are not taken into consideration [4,49]. However, some studies applied dynamic regression, i.e., GMM, in both the financial and nonfinancial sectors to offer reliable results by controlling for endogeneity and unobserved heterogeneity [4,31,37,38,43,67,74,75]. Using a sample of 127 Indonesian firms over the period 2010–2017, Soetanto and Liem [38] applied pooled OLS, FE, and GMM regressions and found a positive impact of MVAIC and its components, i.e., SCE and CEE, on ROA. Using a sample of 710 Indian listed firms over the period 2001–2016, Smriti and Das [37] applied GMM and found a positive impact of VAIC on ROA and ATO. Among VAIC components, their study reported different results. Using a sample of 6045 firms listed in BRICS economies, Nadeem, Gan and Nguyen [43] applied GMM and found a positive impact of VAIC and its component, i.e., CEE, on the profitability and productivity of different countries. Among other VAIC components, i.e., HCE and SCE, they reported different results for different countries. Using a large sample of 2090 nonfinancial firms over the period 2004–2015, Sardo and Serrasqueiro [67] applied GMM and found a positive impact of VAIC and its components, i.e., CEE and HCE, on ROA. Further, they reported a negative impact of SCE on ROA. Using a sample of 339 African banks over the period 2005–2015, Adesina [74] applied Tobit and GMM regressions and found a positive impact of VAIC and its components, i.e., CEE, HCE, and SCE, on efficiency. Using a sample of 191 banks listed in the New York Stock Exchange over the period 2000–2011, Kehelwalatenna and Premaratne [31] applied GMM and found a positive impact of IC on profitability and productivity. Using a sample of 26 Pakistani domestic banks over the period 2007–2016, Haris, Yao, Tariq, Malik and Javaid [4] applied GMM and found a positive impact of VAIC and its components, i.e., CEE and HCE, on profitability. However, their study was the first which also reported an inverted U-shaped relationship between VAIC and profitability. Using a sample of 16 Thai banks over the period 1997–2016, Tran and Vo [75] applied OLS and GMM regressions and found no relationship between VAIC and ROA. Among VAIC components, their study reported a positive relationship between CEE and ROA while a negative relationship between HCE and ROA. Therefore, our study also intends to apply GMM in order to offer robust findings.

3.6. Hypothesis Development

3.6.1. IC and Performance

There are different theories emphasizing the importance of IC for the performance of institutions, which is significant for business sustainability. For example, the resource-based view and knowledge-based view state that along with tangible resources, intangible resources are the essential factors behind the sustainable competitive advantage and improved performance of an institution [4,13,83]. Previously, Bontis [13] emphasized that once managers realize the significance of IC, they will want to increase IC, since it positively affects performance. Nadeem, Gan and Nguyen [43] argued that irrespective of location and size, IC increases the performance of an institution, and their study supported a resource-based view by finding a positive relationship between IC and performance. Curado, et al. [84] also stated that IC is a good predictor of future banking performance. Previously, a large body of literature provided a positive relationship between IC and performance [12,30,31,33,35,39–41,45,52,63,67,69,73,74]. However, Haris, Yao, Tariq, Malik and Javaid [4] argued that the positive relationship between IC and performance depends upon the efficient use of intangible resources, which are difficult to control, and therefore, the relationship between IC and performance could be nonlinear. They further argued that the failure of management in generating higher efficiencies from investment made on human capital and structural capital could undermine profitability. Therefore, their study reported an inverted U-shaped relationship between VAIC and profitability. Their study concluded that the financial institutions in Pakistan are capable, up to a certain level, of generating value and sustaining competitive advantage through their IC and financial capital resources. Previously, Britto, Monetti and Lima Jr [81] used VAIC and also found a nonlinear relationship between IC and performance. In this study, the VAIC and MVAIC are used as the measures of IC performance. Thus, we pose the following hypothesis:

Hypothesis 1. *There is an inverted U-shaped relationship between IC (VAIC and MVAIC) and the performance of Pakistani financial institutions.*

3.6.2. CEE and Performance

CEE is the component of VAIC that measures the efficiency of physical capital (PC). Consistent with the resource-based view, Pulic also emphasized that the inefficient utilization of PC undermines the performance of IC resources. Similarly, Bontis [13] emphasized that although the IC is significant in sustaining competitive advantage, the PC is also essential in achieving a sustainable performance. Firer and Williams [1] also emphasized the importance of PC in improving the sustainable performance of an institution. However, previously, many studies reported the positive impact of CEE on performance [4,6,12,18,32–34,39,41,52,58,63,67,71,75,77], while some reported no relationship between CEE and performance [1,10,35,37,38,43]. We thus, pose the following hypothesis:

Hypothesis 2. *There is a positive impact of CEE on the performance of Pakistani financial institutions.*

3.6.3. HCE and Performance

HCE as a component of VAIC measures the efficiency of human capital (HC). HC consists of knowledge, skills, experience, expertise, education, ideas, creativity, and the business attitude of employees, as well as efficacy of management, which improve the performance of an organization [18, 23,85,86]. Bontis [13] highlighted the importance of HC in a knowledge-based economy and stated HC as a source of innovation and strategic renewal enhances the performance. The capital theorists emphasized that an institution may increase its performance by investing in the skills, abilities, and knowledge of its employees [17,87]. Financial institutions as a knowledge-intensive sector require competitive HC, and therefore, HC is more essential for them than PC [2]. Similarly, the World Bank [20] also emphasized that HC as a significant component of IC is far more essential for financial institutions

than PC. However, the stakeholder view and resource-dependence view state that an institution works with a network of several stakeholders to generate value, classified into internal sources, i.e., employees, learning environment, and shareholders, and external sources, i.e., suppliers, customers, external environment, government, etc. [60,88]. Consistent with these theories, the efficient utilization of internal sources, i.e., HC, is very essential because employees are the center-point to interact with all other stakeholders by building a strong relationship and acting as the agents of shareholders in minimizing agency problems to improve sustainable performance [37,43]. Previously, Guo, et al. [89] used a sample of 279 US biotech companies over the period 1994–2005 and argued that HC plays an important role in enhancing financial performance. In addition, there is abundant literature available that extended the significant positive relationship between HCE and performance [4,30,32–34,39–41,58,63,67,69,71,72,74]. We thus, pose the following hypothesis:

Hypothesis 3. *There is a positive impact of HCE on the performance of Pakistani financial institutions.*

3.6.4. SCE and Performance

SCE as a component of VAIC measures the efficiency of structural capital (SC). This study takes a holistic view of IC and acknowledges Sveiby's distinction between internal and external structure [23]. Thus, the SC refers to intangibles owned and retained by firms that facilitate development of a business structure which promotes efficiency and sustainable growth [22]. SC may include culture and environment [12,90], operations, systems and procedures [21], information technologies capital, i.e., process of knowledge management, and learning capacity and process [71]. IC is based on HC and SC [64]. Therefore, Bontis [13] stated that without SC, IC would just be HC. He further stated that overall IC will not reach its fullest potential if an institution has a poor supportive culture, system, and procedure, and consequently, IC would not play a significance role in achieving sustainable performance. Similarly, consistent with the organization learning theory, Njuguna [91] stated that a continuous learning process allows institutions to sustain competitive advantage in the process of value creation. However, literature has provided mixed evidence about the impact of SCE on performance. Previously, some researchers reported a positive relationship [6,12,33,52,74,81,92,93] and some reported an insignificant relationship between SCE and performance [32,34,39,58,68,69,71,72,75]. Thus, based on the theories and literature, we pose our hypothesis:

Hypothesis 4. *There is a positive impact of SCE on the performance of Pakistani financial institutions.*

3.6.5. RCE and Performance

RCE as a component of VAIC measures the efficiency of relational capital (RC). RC is composed of advertising, selling, and marketing expenses which are invested to establish a long-term relationship with external stakeholders, i.e., customers, suppliers, creditors, competitors, and regulators [53]. Previously, Sveiby [23] classified RC as customer capital and Bontis [13] also used the same term, i.e., customer capital, for RC. As a knowledge-intense sector, financial institutions are more likely based on relationship marketing to enhance the customer base. Therefore, the efficient utilization of RC with the ultimate objective of profit maximization has a significant importance for sustainable performance. However, the literature does not provide conclusive evidence regarding the relationship between RCE and performance—e.g., Vidyarthi [40] found a negative impact of RCE on the efficiency of Indian banks, Chen, Cheng and Hwang [65] reported a negative relationship between RC and the profitability of Taiwanese listed companies, Nimtrakoon [63] found no relationship between RCE and the performance of ASEAN firms, and Soetanto and Liem [38] reported no relationship between RCE and the performance of Indonesian firms. However, some other studies found a positive relationship between RCE and performance [41,58,67]. We thus, pose our hypothesis:

Hypothesis 5. *There is a positive impact of RCE on the performance of Pakistani financial institutions.*

4. Data and Methodology

4.1. Sample and Data

The sample of this study was based on 111 Pakistani financial institutions (PFIs) covering the 7 industries of Pakistani financial sector (PFS). As stated by Firer and Williams [1], the VAIC has merit over other IC measures because it is based on audited financial data, which make it verifiable and objective [64]. Therefore, the data of these PFIs were obtained from the audited financial statements and audited notes to the financial statements, which were accessed from the databases maintained by each respective institution. We also accessed the regulatory data banks from State Bank of Pakistan (<http://www.sbp.org.pk>), Insurance Association of Pakistan (<http://www.iap.net.pk>), Pakistan Banks Association (<http://pakistanbanks.org>), NBFIs and Modarabah Association of Pakistan (<http://www.nbfi-modaraba.com.pk>), and Security and Exchange Commission of Pakistan (<http://www.secp.gov.pk>) to collect and verify our data. Initially, we collected the data of 124 PFIs; however, after deleting some institutions with missing and less than five years of data, our final sample was composed of an unbalanced panel of 111 PFIs over the last 12-year period from 2007 through 2018, with 1105 institution–year observations. The details of the industry-wise sample are given in Table 1.

Table 1. List of samples.

Type of FIs	Total FIs	Sample FIs	Observations
Commercial Banks	33	28	318
Microfinance Banks	11	10	88
Investment Banks	6	6	68
Leasing Companies	9	9	85
Modaraba Companies	25	19	170
Insurance Companies	33	31	296
Other DFIs	8	8	80
Total	124	111	1105

Notes: The sample does not include any financial institution with less than five years of data and missing values.

4.2. Variable Selection

4.2.1. Performance Indicators

This study utilized the two main performance indicators of PFIs, i.e., profitability and productivity. Profitability was measured by two indicators obtained from Xu and Wang [41], Haris, HongXing, Tariq and Malik [46], Haris, Yao, Tariq, Malik and Javaid [4], Yao, Haris and Tariq [49], AKBL [94], SBP [95], Dzenopoljac, Yaacoub, Elkanj and Bontis [27], Tan [96], and Nimtrakoon [63]. These are return on assets (ROA) and net operating margin (NOM). ROA is measured as net profit divided by average assets, which reflects the income generating capacity of an institution from its assets. NOM is the ratio of net profits to gross revenues, which determines the ability to generate profits after compensating for all expenses and taxes. Productivity was measured by assets turnover ratio, which was obtained from Xu and Wang [41], Smriti and Das [37], Nadeem, Gan and Nguyen [43], Kehelwalatenna and Premaratne [31], Mondal and Ghosh [12], and Pal and Soriya [79]. ATO was calculated as gross revenues divided by total assets, and it determines how efficiently an institution generates revenues from assets.

4.2.2. Explanatory Variables

IC Indicators

The current study followed the previous literature [4,24,30,34,64,77,97] to measure the VAICTM developed by Pulic [24]. As stated earlier, the VAIC [24,64,98] is based on value added (VA) created by

all resources, i.e., human, structural, financial, and physical, of an institution. Thus, the VA can be calculated as:

$$VA_{it} = OUT_{it} - IN_{it}, \quad (1)$$

where VA is the difference between output (OUT_{it}), i.e., total revenues, and input (IN_{it}), i.e., total expenses, including direct and operating. However, as guided by the literature [4,32,37,43,64,77,98], the VA can be calculated from the financial statements using Equation (2). Now, the VAIC can be calculated as:

$$VA_{it} = OP_{it} + PC_{it} + D_{it} + A_{it}, \quad (2)$$

$$CEE_{it} = VA_{it} / CE_{it}, \quad (3)$$

$$HCE_{it} = VA_{it} / HC_{it}, \quad (4)$$

$$SCE_{it} = SC_{it} / VA_{it}, \quad (5)$$

$$SC_{it} = VA_{it} - HC_{it}, \quad (6)$$

$$VAIC_{it} = CEE_{it} + HCE_{it} + SCE_{it}, \quad (7)$$

where OP_{it} represents operating profit. PC_{it} means personnel cost (salaries, wages, and other benefits). D_{it} is the depreciation and A_{it} is the amount amortization. CE_{it} refers to capital employed, measures as equity value or book value of assets. HC_{it} represents human capital and measures personnel expenses, including salaries, wages, and all other expenses incurred on employees. SC_{it} represents structure capital.

As guided by the previous literature [38,40,41,44,63,65,67], the MVAIC is a sum of four components, i.e., CEE, HCE, SCE, and RCE. Thus, MVAIC can be calculated as:

$$RCE_{it} = RC_{it} / VA_{it}, \quad (8)$$

$$MVAIC_{it} = CEE_{it} + HCE_{it} + SCE_{it} + RCE_{it}, \quad (9)$$

where RC_{it} refers to relational capital, measures as sum of selling, marketing, and advertising expenses.

Other Variables

Based on the literature, in this study, along with the IC performance, the impact of some other variables related to institutions, industry, and country was also analyzed. The natural logarithm of total assets was used as a proxy to control for the size (INSSIZE) of the PFIs [1,4,12,30,31,38,46,49,75]. The total liabilities to total assets ratio was used as a proxy to control for the leverage (LEV) of the PFIs [1,12,31,33,39,41,58]. The natural logarithm of total years from incorporation was used as a proxy to control for the age (AGE) of the PFIs [28,63,67]. The ratio between revenues other than core operations and gross revenues was used as a proxy to control for the revenue diversification (RDIV) of the PFIs [49,96]. The operating expenses to average assets ratio was used as a proxy to control for the operational efficiency (OE) of PFIs [49,96]. The natural logarithm of gross domestic product of the country was used to control for the impact of economic growth (EGR) on the performance of PFIs [4,49,69,74]. Further, our study period (2007–2018) contained the effect of the recent 2008 global financial crisis. Therefore, it is worth controlling for this event to offer better insights and implications. For that, we generated a dummy variable of crisis (CRISIS) and assigned value 1 to the recent financial crisis period (2008–2009) and 0 otherwise [6,28,33,42,68]. The detailed list of variables is also given in Table 2.

Table 2. List of variables.

Variables	Notation	Description	Expected Results	Literature
DEPENDENT				
Return on Assets	ROA	Profit after tax to average assets		Xu and Wang [41], Haris, Yao, Tariq, Malik and Javaid [4], Yao, Haris and Tariq [49]
Net Operating Margin	NOM	Profit after tax to gross revenues		Haris, HongXing, Tariq and Malik [46], SBP [95], Dzenopoljac, Yaacoub, Elkanj and Bontis [27], Nimtrakoon [63]
Assets turnover	ATO	Gross revenues to total assets		Xu and Wang [41], Smriti and Das [37], Kehelwalatenna and Premaratne [31], Mondal and Ghosh [12], Pal and Soriya [79]
INDEPENDENT				
Intellectual Capital				
Value-Added Intellectual Coefficient	VAIC	See Equation (7)	+/-	Haris, Yao, Tariq, Malik and Javaid [4], Xu and Wang [58], Tran and Vo [75], Goh [29], Pulic [24], Pulic [64]
Modified Value-Added Intellectual Coefficient	MVAIC	See Equation (9)	+/-	Vidyarthi [40], Xu and Wang [41], Sardo and Serrasqueiro [67], Chen, Cheng and Hwang [65]
Capital Employed Efficiency	CEE	See Equation (3)	+	Haris, Yao, Tariq, Malik and Javaid [4], Xu and Wang [58], Tran and Vo [75], Bontis, Janošević and Dženopoljac [77], Ting and Lean [71], Pulic [64]
Human Capital Efficiency	HCE	See Equation (4)	+	Haris, Yao, Tariq, Malik and Javaid [4], Xu and Wang [58], Tran and Vo [75], Bontis, Janošević and Dženopoljac [77], Ting and Lean [71], Pulic [64]
Structural Capital Efficiency	SCE	See Equation (5)	+	Haris, Yao, Tariq, Malik and Javaid [4], Xu and Wang [58], Tran and Vo [75], Bontis, Janošević and Dženopoljac [77], Ting and Lean [71], Pulic [64]
Rational Capital Efficiency	RCE	See Equation (8)	+	Vidyarthi [40], Xu and Wang [41], Sardo and Serrasqueiro [67], Chen, Cheng and Hwang [65]
Institutions-Specific				
Institution Size	INSSIZE	Natural logarithm of total assets	+/-	Xu and Wang [41], Vidyarthi [40], Firer and Williams [1]
Leverage	LEV	Total liabilities to total assets	+/-	Xu and Wang [41], Vidyarthi [40], Firer and Williams [1], SBP [95]
Institution Age	AGE	Natural logarithm of total years from incorporation	+	Sardo and Serrasqueiro [67], Nimtrakoon [63]
Revenue Diversifications	RDIV	revenues other than core operations to gross revenues	+	Yao, Haris and Tariq [49], Tan [96]
Operational Efficiency	OE	Operating expenses to average assets	-	Yao, Haris and Tariq [49], Tan [96]
Industry-Specific				
Economic Growth	EGR	Natural logarithm of gross domestic product of the country	+/-	Haris, Yao, Tariq, Malik and Javaid [4], Yao, Haris and Tariq [49], Tan [96]
Financial Crisis	CRISIS	Equal to 1 to the period of recent financial crisis (2008–2009) and 0 otherwise	-	Oppong and Pattanayak [33], Al-Musali and Ismail [6], El-Bannany [28]

4.3. Methodology and Econometric Specification

The hypotheses of our study were tested initially by pooled OLS; however, based on the F-test and Breusch and Pagan [99] Lagrange multiplier (LM) test, we found that pooled OLS is not a suitable model due to the existence of unobserved individual effects (firm specific effects). Therefore, we applied fixed and random effects methods, based on the Hausman [100] specification, and we found that FE is an appropriate methodology for our study. Moreover, we detected the problems of heteroskedasticity and autocorrelation by applying modified Wald statistic and Wooldridge [101] test. Hence, in order to offer the corrected inference, we used robust standard errors to enhance the efficiency of the FE method. Thus, the regression equations based on our baseline methodology, i.e., FE method, are given below:

$$P_{it} = \alpha_0 + \beta_j VAIC_{it} + \beta_k VAIC_{it}^2 + \beta_l INSSIZE_{it} + \beta_m LEV_{it} + \beta_n AGE_{it} + \beta_o RDIV_{it} + \beta_p OE_{it} + \beta_q EGR_t + \beta_r CRISIS_t + \varphi_s IND_s + \varepsilon_{it}, \quad (10)$$

$$P_{it} = \alpha_0 + \beta_i CEE_{it} + \beta_j HCE_{it} + \beta_k SCE_{it} + \beta_l INSSIZE_{it} + \beta_m LEV_{it} + \beta_n AGE_{it} + \beta_o RDIV_{it} + \beta_p OE_{it} + \beta_q EGR_t + \beta_r CRISIS_t + \varphi_s IND_s + \varepsilon_{it}, \quad (11)$$

$$P_{it} = \alpha_0 + \beta_j MVAIC_{it} + \beta_k MVAIC_{it}^2 + \beta_l INSSIZE_{it} + \beta_m LEV_{it} + \beta_n AGE_{it} + \beta_o RDIV_{it} + \beta_p OE_{it} + \beta_q EGR_t + \beta_r CRISIS_t + \varphi_s IND_s + \varepsilon_{it}, \quad (12)$$

$$P_{it} = \alpha_0 + \beta_h CEE_{it} + \beta_i HCE_{it} + \beta_j SCE_{it} + \beta_k RCE + \beta_l INSSIZE_{it} + \beta_m LEV_{it} + \beta_n AGE_{it} + \beta_o RDIV_{it} + \beta_p OE_{it} + \beta_q EGR_t + \beta_r CRISIS_t + \varphi_s IND_s + \varepsilon_{it}, \quad (13)$$

In the above Equations (10)–(13), P_{it} is the dependent variable, measured as ROA, NOM, and ATO. α_0 is the constant term, β is the coefficient, ε_{it} is the error term, and $\varphi_s IND_s$ is used to account for the effect of different types of financial institutions, i.e., industry effects. Further, the squared term ($VAIC_{it}^2$) of $VAIC_{it}$ and the squared term $MVAIC_{it}^2$ of $MVAIC_{it}$ were added into the Equations (10) and (12) to determine the nonlinear relationship between IC and performance, as hypothesized.

Although FE regression with robust standard errors deals with possible heteroskedasticity and autocorrelation, the problem of endogeneity still exists for an empirical researcher due to the reverse causality, time-invariant endogenous variables, and measurement errors [102]. For example, more profitable institutions might have a lower leverage because of retaining higher equity and vice versa [4,49]. Similarly, the performance of the institutions persists over time, meaning that the past year's performance affects the current year's performance, indicating the dynamic relationship of dependent variables [31,37,43]. Consequently, in the presence of endogeneity, the use of FE sometimes offers biased and inconsistent results [103]. Therefore, for the robustness of our study, we also used the two-step system GMM estimator developed by Arellano and Bover [104] and Blundell and Bond [105], which is efficient due to the orthogonality conditions and deals with three major problems, i.e., endogeneity, unobserved heterogeneity, and serial correlations, and offers consistent and unbiased inference [106]. Previously, Adesina [74], Haris, Yao, Tariq, Malik and Javaid [4], Soetanto and Liem [38], Smriti and Das [37], Tran and Vo [75], Nadeem, Gan and Nguyen [43], Sardo and Serrasqueiro [67], and Kehelwalatenna and Premaratne [31] also applied GMM to examine the relationship between IC and performance.

5. Findings

5.1. Descriptive Statistics

The comparative analysis of summary statistics of all variables is presented in Table A1 (see Appendix A), over the period 2007–2018. The results show that PFs report, on average, 1.3% ROA, −3.6% NOM, and 19.8% ATO, 3.929 VAIC, 3.941 MVAIC, 0.335 CEE, 2.880 HCE, 0.715 SCE, and 0.012 RCE. Pakistani banking financial institutions (BFIs) report, on average, −0.1% ROA, −9.6% NOM, 10.9% ATO, 2.456 VAIC, 2.475 MVAIC, 0.344 CEE, 1.70 HCE, 0.411 SCE, and 0.020 RCE. The Pakistani nonbanking financial institutions (NBFIs) report, on average, 2.4% ROA, 0.8% NOM, 26.4% ATO, 5.035

VAIC, 5.042 MVAIC, 0.327 CEE, 3.765 HCE, 0.944 SCE, and 0.007 RCE. Pakistani insurance companies (ICs) report, on average, 3.7% ROA, 6.6% NOM, 33.4% ATO, 3.926 VAIC, 3.934 MVAIC, 0.397 CEE, 2.444 HCE, 1.085 SCE, and 0.008 RCE. In terms of performance, overall, we found that, on average, Pakistani banking financial institutions (BFIs) are less profitable and less productive than nonbanking financial institutions (NBFIs), while Pakistani insurance companies (ICs) are more profitable and more productive than all NBFIs. In terms of IC performance, overall, the results report that, on average, Pakistani BFIs generate lower VAIC and MVAIC scores than NBFIs, while the VAIC and MVAIC scores of ICs are also less than the average VAIC and MVAIC scores of NBFIs. Moreover, in terms of IC measures, we did not find any significant difference between VAIC and MVAIC of PFS, BFIs, NBFIs, and ICs, indicating that RCE has a very low impact on IC performance. This indicates that PFIs rely more on HC and SC than on RC to generate their IC performance. This is also consistent with Chinese and Korean firms [41], Indian banks [40], and Taiwanese firms [65].

5.2. Diagnostic Tests

Before going for further analysis, we performed two important diagnostic tests in order to ensure the validity of our results. Firstly, we performed an augmented Dickey Fuller (ADF) fisher type to check the unit root. The significant coefficients of each variable obtained from the ADF test rejected the null hypothesis that at least one panel contains a unit root. The ADF values are reported in Table A2 (see Appendix A). Secondly, we applied Pearson correlation to examine multicollinearity among all independent variables. The correlation coefficients of all independent variables are presented in Table A3 (see Appendix A). We did not find any multicollinearity among explanatory variables, as the correlation coefficients are not very high, except VAIC and MVAIC. This is because the VAIC and MVAIC are almost equal, as we find in Table A1 (see Appendix A). However, this is not a problem for our analysis, as both were tested in different econometric equations. In addition, we also performed a variance inflationary (VIF) test to cross-examine multicollinearity. The VIF values reported in Table A3 (see Appendix A) also rejected the existence of multicollinearity among independent variables at a cut-off value of 4.

5.3. IC Findings

Our empirical results are reported in Tables 3–5. Table 3 provides the relationship between IC performance and ROA. Table 4 provides the relationship between IC performance and NOM. Table 5 provides the relationship between IC performance and ATO. Each table comprises four models, and each model tests the four econometric equations. Model 1 provides the relationship between IC and the performance of the Pakistani financial sector (PFS). Further, our sample was segregated into different subsectors to provide the cluster analysis for the robustness of our study. Therefore, Model 2 provides the relationship between IC and the performance of banking financial institutions (BFIs). Model 3 examines the impact of IC on the performance of nonbanking financial institutions (NBFIs). Model 4 provides the relationship between IC and performance of insurance companies (ICs). The significant values of F-statistics ($p < 1\%$) indicate the joint significance of our all econometric equations tested in Tables 3–5.

Table 3. IC performance and return on assets (ROA).

	(Model 1) PFS				(Model 2) BFIs				(Model 3) NBFIs				(Model 4) ICs			
	Equation (10)	Equation (11)	Equation (12)	Equation (13)	Equation (10)	Equation (11)	Equation (12)	Equation (13)	Equation (10)	Equation (11)	Equation (12)	Equation (13)	Equation (10)	Equation (11)	Equation (12)	Equation (13)
VAIC	0.005 ^a (0.001)				0.005 ^a (0.001)				0.006 ^a (0.001)				0.006 ^c (0.004)			
VAIC-SQ	-0.001 ^a (0.000)				-0.000 ^a (0.000)				-0.000 ^a (0.000)				-0.001 ^c (0.000)			
MVAIC			0.005 ^a (0.001)				0.005 ^a (0.001)				0.006 ^a (0.001)				0.007 ^c (0.004)	
MVAIC-SQ			-0.000 ^a (0.000)				-0.000 ^a (0.000)				-0.001 ^a (0.000)				-0.001 ^c (0.000)	
CEE		0.001 (0.002)		0.001 (0.002)		-0.000 (0.001)		-0.000 (0.002)		0.004 (0.007)		0.004 (0.007)		0.002 (0.011)		0.002 (0.011)
HCE		0.007 ^a (0.002)		0.006 ^a (0.002)		0.006 ^a (0.002)		0.006 ^a (0.002)		0.007 ^a (0.002)		0.007 ^a (0.002)		0.032 ^a (0.005)		0.031 ^a (0.005)
SCE		-0.000 (0.000)		0.001 (0.001)		0.001 ^c (0.001)		0.002 (0.001)		-0.001 (0.000)		0.001 (0.001)		-0.001 (0.000)		-0.000 (0.001)
RCE				0.029 (0.026)				0.023 (0.014)					0.031 (0.042)			0.006 (0.034)
INSSIZE	0.002 (0.003)	0.010 ^b (0.005)	0.009 ^b (0.005)	0.010 ^b (0.005)	0.011 ^c (0.007)	0.012 ^c (0.007)	0.011 ^c (0.007)	0.012 (0.007)	0.007 (0.007)	0.006 (0.008)	0.007 (0.007)	0.005 (0.007)	0.023 (0.016)	-0.016 (0.013)	0.023 (0.016)	-0.016 (0.013)
LEV	-0.018 (0.012)	-0.021 (0.015)	-0.023 (0.016)	-0.021 (0.015)	-0.017 (0.024)	-0.018 (0.024)	-0.017 (0.024)	-0.018 (0.024)	-0.024 (0.021)	-0.022 (0.020)	-0.024 (0.021)	-0.022 (0.019)	-0.016 (0.019)	-0.007 (0.009)	-0.016 (0.019)	-0.007 (0.009)
AGE	0.001 (0.003)	-0.005 (0.006)	-0.004 (0.006)	-0.005 (0.005)	-0.005 (0.003)	-0.008 ^b (0.004)	-0.005 (0.003)	-0.007 (0.004)	-0.002 (0.013)	-0.002 (0.012)	-0.001 (0.013)	-0.001 (0.012)	0.032 (0.069)	-0.016 (0.008)	0.032 (0.069)	-0.015 (0.055)
RDIV	0.050 ^a (0.009)	0.046 ^a (0.008)	0.050 ^a (0.009)	0.046 ^a (0.008)	0.064 ^a (0.016)	0.052 ^a (0.017)	0.064 ^a (0.016)	0.052 (0.017)	0.048 ^a (0.010)	0.045 ^a (0.010)	0.048 ^a (0.010)	0.045 ^a (0.009)	.056 ^a (.018)	0.011 (0.016)	0.056 ^a (0.018)	0.011 (0.016)
OE	-0.035 ^a (0.007)	-0.031 ^a (0.007)	-0.035 ^a (0.007)	-0.032 ^a (0.007)	-0.025 ^a (0.006)	-0.026 ^a (0.006)	-0.025 ^a (0.006)	-0.026 (0.006)	-0.039 ^a (0.012)	-0.034 ^a (0.011)	-0.039 ^a (0.012)	-0.034 ^a (0.011)	-0.037 ^c (.019)	-0.030 ^b (0.013)	-0.037 ^c (0.019)	-0.031 (0.012)
EGR	-0.008 (0.012)	-0.005 (0.012)	-0.008 (0.012)	-0.005 (0.012)	-0.004 (0.010)	0.003 (0.011)	-0.004 (0.010)	0.004 (0.011)	-0.016 (0.019)	-0.013 (0.018)	-0.016 (0.019)	-0.012 (0.019)	-0.075 ^c (.041)	0.003 (0.021)	-0.075 ^c (0.041)	0.003 (0.021)
CRISIS	-0.020 ^a (0.007)	-0.016 ^a (0.006)	-0.020 ^a (0.007)	-0.015 ^a (0.006)	-0.015 ^b (0.007)	-0.011 (0.007)	-0.015 ^b (0.007)	-0.011 (0.007)	-0.026 ^b (0.011)	-0.020 ^b (0.009)	-0.026 ^b (0.011)	-0.020 (0.009)	-0.048 ^a (.015)	-0.016 ^c (0.008)	-0.048 ^a (0.015)	-0.016 ^c (0.008)
Const.	0.082 (0.240)	-0.008 (0.235)	0.083 (0.239)	-0.013 (0.006)	-0.082 (0.143)	-0.269 (0.174)	-0.082 (0.143)	-0.267 (0.175)	0.311 (0.408)	0.256 (0.391)	0.312 (0.408)	0.247 ^b (0.392)	1.381 ^b (0.644)	0.197 (0.333)	1.377 ^b (0.643)	0.195 (0.335)
Ins.	111	111	111	111	44	44	44	44	67	67	67	67	31	31	31	31
Obs.	1105	1105	1105	1105	474	474	474	474	631	631	631	631	296	296	296	296
R-square	0.246	0.251	0.247	0.256	0.314	0.304	0.314	0.305	0.295	0.291	0.297	0.295	0.255	0.453	0.257	0.455
F-statistics	38.16 ^a	24.44 ^a	38.40 ^a	22.46 ^a	53.86 ^a	35.15 ^a	53.86 ^a	38.31 ^a	26.59 ^a	16.22 ^a	26.59 ^a	15.10 ^a	24.61 ^a	37.87 ^a	24.55 ^a	35.32 ^a

Notes: The fixed effect (FE) regression results between intellectual capital and profitability (ROA). Robust standard errors are in parenthesis. ^{a, b, c} represent significance level at 1%, 5%, and 10%, respectively. The significant F-statistics indicate the joint significance of the models. PFS refers to the Pakistani financial sector. BFIs are banking financial institutions. NBFIs are nonbanking financial institutions. ICs are insurance companies. Both VAIC-SQ and MVAIC-SQ refer to squared terms of value-added intellectual coefficient (VAIC) and modified VAIC (MVAIC).

Table 4. IC performance and net operating margin (NOM).

	(Model 1) PFS				(Model 2) BFIs				(Model 3) NBFIs				(Model 4) ICs			
	Equation (10)	Equation (11)	Equation (12)	Equation (13)	Equation (10)	Equation (11)	Equation (12)	Equation (13)	Equation (10)	Equation (11)	Equation (12)	Equation (13)	Equation (10)	Equation (11)	Equation (12)	Equation (13)
VAIC	0.059 ^a (0.018)				0.091 ^a (0.026)				0.045 ^a (0.013)				0.005 (0.004)			
VAIC-SQ	-0.001 ^a (0.000)				-0.002 ^a (0.001)				-0.000 ^a (0.000)				-0.000 (0.000)			
MVAIC			0.060 ^a (0.018)				0.093 ^a (0.026)				0.046 ^a (0.013)				0.005 (0.004)	
MVAIC-SQ			-0.001 ^a (0.000)				-0.002 ^a (0.000)				-0.000 ^a (0.000)				-0.000 (0.000)	
CEE		0.001 (0.014)		0.001 (0.014)		0.015 (0.024)		0.015 (0.025)		0.065 (0.050)		0.066 (0.050)		-0.073 (0.058)		-0.072 (0.058)
HCE		0.071 ^a (0.023)		0.071 ^a (0.023)		0.098 ^c (0.053)		0.098 ^c (0.053)		0.053 ^a (0.019)		0.053 ^a (0.019)		0.030 ^c (0.019)		0.030 ^c (0.019)
SCE		0.001 (0.003)		0.001 (0.007)		0.020 (0.021)		0.020 (0.024)		-0.001 (0.001)		-0.002 (0.004)		-0.002 ^a (0.000)		-0.003 (0.003)
RCE				0.014 (0.176)				-0.009 (0.298)					-0.026 (0.119)			-0.054 (0.114)
INSSIZE	-0.101 (0.103)	-0.094 (0.102)	-0.099 (0.103)	-0.094 (0.102)	0.033 (0.121)	0.040 (0.124)	0.033 (0.121)	0.040 (0.124)	0.049 (0.077)	0.055 (0.077)	0.049 (0.077)	0.056 (0.077)	0.035 (0.092)	-0.046 (0.091)	0.035 (0.092)	-0.045 (0.091)
LEV	-0.289 (0.190)	-0.276 (0.187)	-0.288 (0.189)	-0.276 (0.187)	-0.958 (0.774)	-1.003 (0.807)	-0.956 (0.773)	-1.003 (0.808)	-0.144 (0.145)	-0.140 (0.144)	-0.143 (0.145)	-0.140 (0.144)	-0.061 (0.075)	-0.049 (0.061)	-0.061 (0.075)	-0.049 (0.061)
AGE	-0.108 ^b (0.053)	-0.113 ^b (0.056)	-0.107 ^b (0.053)	-0.112 ^b (0.057)	-0.206 (0.158)	-0.276 (0.177)	-0.205 (0.158)	-0.276 (0.179)	-0.092 ^c (0.050)	-0.099 ^b (0.051)	-0.091 ^c (0.051)	-0.101 ^b (0.051)	-0.084 (0.142)	-0.091 (0.137)	-0.084 (0.142)	-0.097 (0.134)
RDIV	1.123 ^b (0.550)	1.091 ^b (0.545)	1.122 ^b (0.549)	1.091 ^b (0.546)	5.473 ^a (1.884)	5.313 ^a (1.967)	5.468 ^a (1.883)	5.313 ^a (1.971)	0.607 ^a (0.126)	0.589 ^a (0.135)	0.606 ^a (0.126)	0.589 ^a (0.135)	0.779 ^a (0.066)	0.733 ^a (0.084)	0.779 ^a (0.066)	0.733 ^a (0.088)
OE	-1.278 ^a (0.343)	-1.249 ^a (0.346)	-1.276 ^a (0.343)	-1.249 ^a (0.346)	-1.365 ^a (0.224)	-1.364 (0.229)	-1.365 ^a (0.224)	-1.364 (0.229)	-0.851 ^a (0.084)	-0.811 (0.085)	-0.849 ^a (0.084)	-0.811 (0.085)	-0.853 ^a (0.228)	-0.890 ^a (0.288)	-0.852 ^a (0.228)	-0.890 ^a (0.288)
EGR	0.416 ^b (0.210)	0.447 ^b (0.217)	0.415 ^b (0.209)	0.447 ^b (0.217)	0.221 (0.236)	0.410 (0.282)	0.220 (0.236)	0.410 (0.283)	0.239 ^b (0.103)	0.244 ^b (0.103)	0.238 ^b (0.103)	0.244 ^b (0.103)	-0.024 (0.120)	0.084 (0.128)	-0.024 (0.121)	0.083 (0.129)
CRISIS	0.158 (0.120)	0.197 (0.126)	0.159 (0.120)	0.197 (0.126)	0.023 (0.105)	0.095 (0.121)	0.025 (0.106)	0.095 (0.121)	0.116 (0.106)	0.152 (0.108)	0.118 (0.106)	0.151 (0.108)	0.001 (0.036)	0.028 (0.039)	0.001 (0.036)	0.027 (0.040)
Const.	-7.542 ^b (3.376)	-8.391 ^b (3.553)	-7.532 ^b (3.372)	-8.392 ^b (3.556)	-4.893 (4.350)	-9.292 ^c (5.531)	-4.885 (4.354)	-9.293 ^c (5.538)	-5.852 (2.671)	-6.100 (2.700)	-5.851 (2.669)	-6.092 (2.701)	0.646 (1.658)	-0.696 (1.832)	0.646 (1.660)	-0.687 (1.841)
Ins.	111	111	111	111	44	44	44	44	67	67	67	67	31	31	31	31
Obs.	1105	1105	1105	1105	474	474	474	474	631	631	631	631	296	296	296	296
R-square	0.376	0.377	0.377	0.377	0.531	0.514	0.532	0.514	0.502	0.495	0.503	0.494	0.692	0.754	0.692	0.751
F-statistics	9.63 ^a	8.40 ^a	9.59 ^a	7.96 ^a	8.37 ^a	7.57 ^a	8.39 ^a	7.05 ^a	33.97 ^a	49.29 ^a	34.04 ^a	45.54 ^a	298.62 ^a	162.40 ^a	295.74 ^a	154.13 ^a

Notes: The fixed effect (FE) regression results between intellectual capital and profitability (NOM). Robust standard errors are in parenthesis. ^{a, b, c} represent significance level at 1%, 5%, and 10%, respectively. The significant F-statistics indicate the joint significance of the models. PFS refers to the Pakistani financial sector. BFIs are banking financial institutions. NBFIs are nonbanking financial institutions. ICs are insurance companies. Both VAIC-SQ and MVAIC-SQ refer to squared terms of VAIC and MVAIC.

Table 5. IC performance and assets turnover (ATO).

	(Model 1) PFS				(Model 2) BFIs				(Model 3) NBFIs				(Model 4) ICs			
	Equation (10)	Equation (11)	Equation (12)	Equation (13)	Equation (10)	Equation (11)	Equation (12)	Equation (13)	Equation (10)	Equation (11)	Equation (12)	Equation (13)	Equation (10)	Equation (11)	Equation (12)	Equation (13)
VAIC	0.002 ^a (0.001)				0.002 ^a (0.001)				0.003 ^a (0.001)				0.003 (0.003)			
VAIC-SQ	-0.000 ^a (0.000)				-0.001 ^a (0.000)				-0.000 ^a (0.000)				-0.000 (0.000)			
MVAIC			0.002 ^a (0.001)				0.002 ^a (0.001)					0.003 ^a (0.001)			0.004 (0.003)	
MVAIC-SQ			-0.000 ^a (0.000)				-0.000 ^a (0.000)					-0.000 ^a (0.000)			-0.000 (0.000)	
CEE		0.004 (0.003)		0.004 (0.003)		0.001 (0.001)		0.001 (0.001)		0.023 ^b (0.011)		0.024 ^b (0.010)		0.010 (0.024)		0.012 (0.023)
HCE		0.003 ^a (0.001)		0.003 ^a (0.010)		0.001 (0.001)		0.001 (0.001)		0.003 ^a (0.001)		0.003 ^a (0.001)		0.011 (0.008)		0.011 (0.008)
SCE		0.000 (0.000)		0.000 (0.001)		0.002 (0.001)		0.002 (0.001)		0.001 ^c (0.000)		-0.001 (0.001)		0.001 ^b (0.000)		-0.001 (0.002)
RCE				-0.021 (0.033)				0.001 (0.015)					-0.041 (0.054)			-0.051 (0.067)
INSSIZE	-0.019 ^c (0.010)	-0.018 ^b (0.010)	-0.019 ^c (0.011)	-0.018 ^b (0.010)	-0.018 ^c (0.010)	-0.019 ^c (0.010)	-0.019 ^c (0.010)	-0.019 ^c (0.010)	-0.033 ^a (0.013)	-0.026 ^b (0.013)	-0.033 ^a (0.013)	-0.025 ^b (0.013)	-0.058 ^b (0.024)	-0.065 ^c (0.034)	-0.058 ^b (0.024)	-0.063 ^c (0.033)
LEV	0.081 (0.054)	0.081 (0.054)	0.081 (0.054)	0.081 (0.054)	0.178 ^a (0.052)	0.177 ^a (0.053)	0.179 ^a (0.052)	0.177 ^a (0.053)	0.040 (0.040)	0.038 (0.039)	0.040 (0.040)	0.038 (0.039)	0.033 (0.045)	0.035 (0.046)	0.033 (0.045)	0.035 (0.046)
AGE	0.022 ^b (0.011)	0.022 ^b (0.011)	0.022 ^b (0.011)	0.021 ^c (0.011)	0.001 (0.007)	-0.001 (0.007)	0.000 (0.007)	-0.001 (0.008)	0.054 ^c (0.028)	0.050 ^c (0.027)	0.054 ^c (0.028)	0.049 ^c (0.026)	0.191 ^a (0.065)	0.174 ^b (0.068)	0.192 ^a (0.065)	0.168 ^b (0.068)
RDIV	0.009 (0.021)	0.008 (0.021)	0.009 (0.021)	0.008 (0.021)	-0.023 (0.050)	-0.022 (0.051)	-0.023 (0.050)	-0.022 (0.051)	0.014 (0.018)	0.012 (0.018)	0.014 (0.018)	0.012 (0.018)	0.004 (0.014)	-0.009 (0.019)	0.004 (0.014)	-0.009 (0.019)
OE	-0.056 ^a (0.013)	-0.054 ^a (0.013)	-0.056 ^a (0.013)	-0.054 ^a (0.013)	-0.045 ^a (0.014)	-0.045 ^a (0.015)	-0.045 ^a (0.014)	-0.045 ^a (0.015)	-0.065 ^a (0.018)	-0.058 ^a (0.017)	-0.064 ^a (0.018)	-0.058 ^a (0.017)	-0.193 ^a (0.038)	-0.186 ^a (0.046)	-0.193 ^a (0.038)	-0.185 ^a (0.046)
EGR	-0.027 (0.018)	-0.026 (0.018)	-0.027 (0.018)	-0.026 (0.018)	-0.002 (0.014)	0.002 (0.014)	-0.002 (0.014)	0.002 (0.014)	-0.046 (0.029)	-0.051 ^c (0.028)	-0.046 (0.029)	-0.052 ^c (0.028)	-0.082 (0.062)	-0.063 (0.065)	-0.083 (0.062)	-0.064 (0.065)
CRISIS	-0.003 (0.006)	-0.001 (0.006)	-0.003 (0.006)	-0.001 (0.005)	-0.004 (0.004)	0.004 (0.004)	-0.005 (0.004)	0.004 (0.004)	-0.008 (0.012)	-0.005 (0.012)	-0.008 (0.012)	-0.006 (0.013)	-0.006 (0.018)	0.004 (0.017)	-0.006 (0.018)	0.003 (0.018)
Const.	1.044 ^a (0.377)	1.019 ^a (0.375)	1.045 ^a (0.377)	1.022 ^a (0.375)	0.361 ^c (0.214)	0.284 (0.216)	0.361 ^c (0.214)	0.284 (0.216)	1.681 ^a (0.657)	1.698 ^a (0.638)	1.681 ^a (0.657)	1.710 ^a (0.635)	2.574 ^b (1.152)	2.258 ^c (1.178)	2.575 ^b (1.151)	2.226 ^c (1.177)
Ins.	111	111	111	111	44	44	44	44	67	67	67	67	31	31	31	31
Obs.	1105	1105	1105	1105	474	474	474	474	631	631	631	631	296	296	296	296
R-square	0.123	0.123	0.123	0.120	0.107	0.110	0.107	0.110	0.045	0.063	0.045	0.062	0.022	0.014	0.022	0.013
F-statistics	4.82 ^a	4.22 ^a	4.82 ^a	3.91 ^a	7.24 ^a	6.06 ^a	7.20 ^a	5.52 ^a	2.97 ^a	3.30 ^a	2.96 ^a	3.09 ^a	6.70 ^a	9.42 ^a	6.67 ^a	9.54 ^a

Notes: The fixed effect (FE) regression results between intellectual capital and productivity (ATO). Robust standard errors are in parenthesis. ^{a, b, c} represent significance level at 1%, 5%, and 10%, respectively. The significant F-statistics indicate the joint significance of the models. PFS refers to the Pakistani financial sector. BFIs are banking financial institutions. NBFIs are non-banking financial institutions. ICs are insurance companies. Both VAIC-SQ and MVAIC-SQ refer to squared terms of VAIC and MVAIC.

In Table 3, Model 1 shows the significant positive coefficients of VAIC ($\beta = 0.005, p < 1\%$) and MVAIC ($\beta = 0.005, p < 1\%$) while the significant negative coefficients of VAIC-SQ ($\beta = -0.001, p < 1\%$) and MVAIC-SQ ($\beta = -0.000, p < 1\%$). It affirms the inverted U-shaped relation between IC performance and ROA of PFS, which is consistent with Haris, Yao, Tariq, Malik and Javaid [4] and thus leads to acceptance of H₁. The findings suggest that a one-unit increase in VAIC increases the ROA of PFS by 0.005. However, this relationship is positive up to a certain level because of decreasing marginal utility. This indicates that there is a certain point, after which a further unit increase in VAIC decreases the ROA by -0.001 . This can be because of the fact that financial institutions in Pakistan are capable, up to a certain level, of generating higher value and sustaining competitive advantage through their IC and financial capital resources. Regardless of whether we used VAIC and MVAIC, our study reports almost the same impact of both IC measures on ROA. This is consistent with Xu and Wang [41]. Among the VAIC and MVAIC components, we only found the significant positive coefficients of HCE ($\beta = 0.007, p < 1\%$ and $\beta = 0.006, p < 1\%$, respectively). This indicates the positive impact of HCE on ROA of PFS, which is consistent with Xu and Wang [41], Xu and Wang [58], Haris, Yao, Tariq, Malik and Javaid [4], Haris, Yao, Tariq, Javaid and Malik [30], Al-Musali and Ismail [6], Mondal and Ghosh [12], and Ting and Lean [71]. This leads to acceptance of H₃. As far as our cluster analysis is concerned, the results of Models 2–4 are consistent with those of Model 1. Models 2–4 report an inverted U-shaped relationship between the IC performance and ROA of Pakistani BFIs, NBFIs, and ICs. Among the VAIC and MVAIC components, we found that only HCE has a significant positive impact on the ROA of Pakistani BFIs ($\beta = 0.006, p < 1\%$), NBFIs ($\beta = 0.007, p < 1\%$) and ICs ($\beta = 0.032, p < 1\%$). However, the R² values of Models 2–4 are higher than those of Model 1, indicating the higher importance of their IC performance in explaining the variations of ROA.

In Table 4, Model 1 reports the significant positive coefficients of VAIC ($\beta = 0.059, p < 1\%$) and MVAIC ($\beta = 0.060, p < 1\%$) and the significant negative coefficients of VAIC-SQ ($\beta = -0.001, p < 1\%$) and MVAIC-SQ ($\beta = -0.001, p < 1\%$). This again confirms the inverted U-shaped relationship between IC performance and NOM of PFS. However, the results are similar to those in Table 3, but the higher coefficient values of VAIC and MVAIC reported in Table 4 indicate that IC performance has a higher positive impact on NOM than ROA. This also suggests that a one-unit increase in VAIC increases the NOM of PFS by 0.059, and after that, a further unit increase in VAIC decreases the NOM by -0.001 . Among the VAIC and MVAIC components, we found the same significant positive coefficients of HCE ($\beta = 0.071, p < 1\%$), which are higher than the coefficient values of HCE reported in Table 3, indicating that HCE has a higher positive impact on the NOM of PFS than ROA. Further, the results of our cluster analysis also report an inverted U-shaped relationship between IC performance and NOM of Pakistani BFIs, NBFIs, and ICs (see Models 2–4 reported in Table 4). However, Model 2 reports that the VAIC has a higher positive impact ($\beta = 0.091, p < 1\%$) on the NOM of BFIs than PFs, Model 3 indicates that the VAIC ($\beta = 0.045, p < 1\%$) has a higher positive impact on the NOM of NBFIs than BFIs, and Model 4 shows that the VAIC ($\beta = 0.005, p < 1\%$) has a lower positive impact on the NOM of ICs than NBFIs. Among the VAIC and MVAIC components, the Models 2–4 report the positive impact of HCE ($\beta = 0.098, p < 10\%$, $\beta = 0.053, p < 1\%$, and $\beta = 0.030, p < 10\%$, respectively) on the NOM of Pakistani BFIs, NBFIs, and ICs. However, Model 4 also shows the negative impact of SCE ($\beta = -0.002, p < 1\%$) on the NOM of Pakistani ICs only. Moreover, the coefficient values of VAIC and MVAIC and their components reported in Table 4 are almost similar in each model, proving the robustness of results. Furthermore, the R² values of Models 1–4 reported in Table 4 are higher than those in Table 3, indicating that the VAIC and MVAIC and their components have a higher power in explaining the variations of NOM than ROA.

Table 5 is incorporated to examine the impact of VAIC and MVAIC on the productivity (measured as ATO) of PFS. Regardless of whether we used VAIC or MVAIC as a measure of IC performance, our study reports the consistent impact of IC performance on ATO of PFs. In Table 5, Model 1 reports the significant positive coefficients of VAIC ($\beta = 0.002, p < 1\%$) and MVAIC ($\beta = 0.002, p < 1\%$) and the significant negative coefficients of VAIC-SQ ($\beta = -0.000, p < 1\%$) and MVAIC-SQ ($\beta = -0.000, p < 1\%$).

It also indicates an inverted U-shaped relationship between IC performance and ATO of PFS. Similar to profitability, this also suggests that a one-unit increase in IC performance increases the productivity of PFS by 0.002, and after that, a further unit increase in IC performance decreases productivity by -0.000 . Among the VAIC and MVAIC components, our study reports the same significant positive coefficients of HCE ($\beta = 0.003, p < 1\%$), indicating the positive relationship between the HCE and ATO of PFS. In terms of cluster analysis, we found consistent results of Models 2 and 3 with those of Model 1. Both Models 2 and 3 report an inverted U-shaped relationship between IC performance and the ATO of Pakistani BFIs and NBFIs. Though Model 4 also reports an inverted U-shaped relationship between IC performance and the ATO of Pakistani ICs, this relationship is insignificant, as we find insignificant positive coefficients of VAIC ($\beta = 0.003, p > 10\%$) and MVAIC ($\beta = 0.004, p > 10\%$) and insignificant negative coefficients of VAIC-SQ ($\beta = -0.000, p > 10\%$) and MVAIC-SQ ($\beta = -0.000, p > 10\%$). Among the VAIC and MVAIC components, the Model 2 does not report a significant impact of any component on the ATO of Pakistani BFIs. Model (3) reports the significant positive impact of CEE ($\beta = 0.023, p < 5\%$), HCE ($\beta = 0.003, p < 1\%$) and SCE ($\beta = 0.001, p < 10\%$) on the productivity (ATO) of Pakistani NBFIs. Model 4 shows only the positive impact of SCE ($\beta = 0.001, p < 5\%$) on the productivity (ATO) of Pakistani ICs. The R^2 values reported in Table 5 are less than the R^2 values reported in Tables 3 and 4, indicating the lower power of VAIC, MVAIC, and their components to explain variations of productivity than profitability, which is consistent with Xu and Wang [41], Oppong and Pattanayak [33], and Pal and Soriya [79].

5.4. Additional Robust Check

Although our results are robust to three performance indicators, i.e., ROA, NOM, and ATO, and two IC measures, i.e., VAIC and MVAIC, for the econometrical robustness of our study, we applied a two-step generalized method of momentum (GMM) system estimator to offer robust findings. Since we found that both VAIC and MVAIC produced consistent results, we only re-estimated Equation (12) (MVAIC) and Equation (13) (MVAIC components, i.e., CEE, HCE, SCE, and RCE) and tested only Model 1 by developing the following new dynamic econometric equations:

$$P_{it} = \alpha_0 + \delta P_{it-1} + \beta_j MVAIC_{it} + \beta_k MVAIC_{it}^2 + \beta_l INSSIZE_{it} + \beta_m LEV_{it} + \beta_n AGE_{it} + \beta_o RDIV_{it} + \beta_p OE_{it} + \beta_q EGR_t + \beta_r CRISIS_t + \varphi_s IND_s + \varphi_t TD_t + v_{it} + \mu_{it}, \quad (14)$$

$$P_{it} = \alpha_0 + \delta P_{it-1} + \beta_i CEE_{it} + \beta_j HCE_{it} + \beta_k SCE_{it} + \beta_l RCE + \beta_l INSSIZE_{it} + \beta_m LEV_{it} + \beta_n AGE_{it} + \beta_o RDIV_{it} + \beta_p OE_{it} + \beta_q EGR_t + \beta_r CRISIS_t + \varphi_s IND_s + \varphi_t TD_t + v_{it} + \mu_{it}. \quad (15)$$

In Equations (14) and (15), P_{it-1} makes our model dynamic by adding a one-year lag of performance indicators; δ represents the persistent performance, and its value ranges from 0 to 1; values closer to 0 of lagged performance indicators represent a high adjustment speed and a competitive market; IND_s are the industry dummies; TD_t are the time (year) dummies; v_{it} is the unobserved individual effect; and μ_{it} is the residual.

The results of GMM are presented in Table 6. The Windmeijer [107] corrections were applied to avoid any potential bias in the estimation of asymptotic standard errors. The use of 'orthogonal deviation' reduced the gap in our unbalanced panel data by subtracting the average of future available observations of a variable in the transformed data and thus provided the robust and correct inference [104,106]. The dynamic nature of our GMM equations was proven because of getting the significant coefficients of lagged performance indicators. This indicates that the past performance of PFS has a positive impact on current performance. The joint significance of each econometric equation was proven because of getting significant F-statistics ($p < 1\%$). The insignificant Z values of AR-2 in each equation indicate the absence of autocorrelations which make our estimations valid. Since the GMM allows to instrument the exogenous variables to deal with endogeneity, therefore, the insignificant χ^2 of Hansen-J statistics in each equation indicates the validity of used instruments.

Table 6. Impact of IC on the performance of the Pakistani financial sector (generalized method of momentum (GMM) application).

	ROA		NOM		ATO	
	Equation (14)	Equation (15)	Equation (14)	Equation (15)	Equation (14)	Equation (15)
Dep _{t-1}	0.517 ^a (0.182)	0.358 ^b (0.180)	0.203 ^a (0.075)	0.102 ^b (0.050)	0.563 ^b (0.267)	0.621 ^a (0.220)
MVAIC	0.007 ^a (0.003)		0.117 ^a (0.044)		0.019 ^a (0.008)	
MVAIC-SQ	-0.001 ^b (0.000)		-0.004 ^a (0.001)		-0.001 ^a (0.000)	
CEE		0.001 (0.016)		0.720 (0.796)		0.004 (0.030)
HCE		0.010 ^a (0.004)		0.121 ^b (0.060)		0.014 ^a (0.005)
SCE		0.002 (0.009)		-0.247 (0.193)		-0.096 (0.062)
RCE		0.245 (0.386)		-12.461 (8.307)		-2.756 (2.232)
INSSIZE	-0.008 (0.007)	-0.010 (0.007)	0.023 (0.109)	-0.543 (0.228)	-0.012 (0.012)	-0.030 ^c (0.018)
LEV	0.007 (0.022)	0.012 (0.014)	0.155 (0.299)	-0.138 (0.280)	0.101 ^a (0.037)	0.062 (0.073)
AGE	-0.006 (0.012)	-0.006 (0.014)	-0.444 ^c (0.259)	0.187 (0.248)	-0.037 (0.022)	-0.031 (0.039)
RDIV	0.214 ^b (0.093)	0.313 ^b (0.131)	4.158 ^b (1.992)	4.506 ^b (2.08)	0.237 (0.272)	0.575 (0.411)
OE	-0.079 ^b (0.035)	-0.066 ^b (0.027)	-1.646 ^a (0.398)	-3.140 ^a (0.611)	-0.142 ^b (0.067)	-0.346 ^b (0.159)
EGR	0.014 ^b (0.006)	0.007 ^c (0.004)	0.189 ^b (0.097)	0.433 ^a (0.161)	0.038 ^a (0.015)	0.076 ^a (0.026)
CRISIS	-0.187 ^b (0.082)	0.004 (0.025)	-3.049 ^a (1.223)	1.427 (0.860)	-0.884 ^a (0.336)	-1.712 ^b (0.711)
Ins.	111	111	111	111	111	111
Obs.	918	918	918	918	918	918
Instruments	40	40	40	40	40	40
AR-1 (Z)	-1.90 ^c	-1.82 ^c	-1.94 ^b	-1.83*	-2.44 ^b	-2.53 ^a
AR-2 (Z)	-1.03	-0.94	-0.68	1.26	-0.52	1.04
Hansen-J (Chi ²)	9.52	10.34	9.34	6.56	12.55	9.61
F-statistics	8.41 ^a	9.02 ^a	2.44 ^a	2.20 ^a	27.38 ^a	9.45 ^a

Notes: The two-step GMM system estimator results between intellectual capital and performance of financial institutions. Robust standard errors are in parenthesis. ^{a, b, c} represent significance level at 1%, 5%, and 10%, respectively. The significant 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 z-values of AR-2 lead to accepting the null of no autocorrelation. The insignificant Chi² of Hansen-J statistics addresses the over-identifying restrictions under the null of joint validity of exogenous instruments. DEP_{t-1} refers to a one-year lag of dependent variables and MVAIC-SQ refers to the squared term of MVAIC.

The GMM results are consistent with our previous findings, demonstrating the robustness of our results. We found the significant positive coefficients ($p < 1\%$) of MVAIC and significant negative coefficients ($p < 5\%$ and $p < 1\%$) of MVAIC-SQ. This affirms the inverted U-shaped relationship between IC performance and the ROA, NOM, and ATO of PFS. Among the MVAIC components, we also found the same outcomes, the results only reporting the significant positive coefficients of HCE ($p < 5\%$ and $p < 1\%$). This indicates that among all the MVAIC components, only HCE has a positive impact on the ROA, NOM, and ATO of PFS. However, the magnitude of the coefficients of control variables was changed, but all have maintained their significant relationship, consistent with previous findings.

6. Summary and Discussion

The aim of this study was to analyze the impact of IC performance on the profitability and productivity of PFS over the period 2007–2018. This study also offered the comparative impact of VAIC and MVAIC. Empirical findings from FE and GMM regressions shed light on the relationship between IC and performance. We found that regardless of whether we used VAIC or MVAIC, the impact of IC remained the same. The impact of VAIC depends on investment in RC; if the financial institutions of an emerging economy like Pakistan are not preferring to invest more in RC, then the results of VAIC and MVAIC would be almost the same.

Turning to our empirical findings of VAIC and MVAIC, Model 1 reports the significant positive impact of both IC measures, i.e., VAIC and MVAIC, and significant negative impact of the squared values of both IC measures, i.e., VAIC-SQ and MVAIC-SQ, on the profitability, i.e., ROA and NOM, and productivity, i.e., ATO, of PFS. This indicates an inverted U-shaped relationship between IC and sustainable performance, i.e., profitability, and productivity. The positive relationship between IC and profitability is consistent with Xu and Wang [41], Poh, Kilicman and Ibrahim [35], Haris, Yao, Tariq, Javaid and Malik [30], Sardo and Serrasqueiro [67], Nadeem, Gan and Nguyen [43], Al-Musali and Ismail [6], Maji and Goswami [32], Nimtrakoon [63], and Ting and Lean [71], and the positive relationship between IC and productivity is consistent with Oppong and Pattanayak [33], Smriti and Das [37], Nadeem, Gan and Nguyen [43], Kehelwalatenna and Premaratne [31], Mondal and Ghosh [12], and Chen, Liu and Kweh [52]. The findings suggest that the increase in the IC investment increases the sustainable performance of PFS. But this relationship is positive up to a certain level because of decreasing marginal utility, which indicates that there is a certain point at which adding more investment into IC affects the performance negatively. Recently, Haris, Yao, Tariq, Malik and Javaid [4] also reported the same inverted U-shaped relation between IC performance and the profitability of Pakistani banks over the period 2007–2016. This can be because of the fact that financial institutions in Pakistan are capable, up to a certain level, of generating higher value and sustaining competitive advantage through their IC and financial capital resources. Previously, Britto, Monetti and Lima Jr [81] also reported the nonlinear relationship between VAIC and performance. They argued that a higher IC indicates a lower value. Further, Mondal and Ghosh [12] also argued that the positive impact of VAIC on performance depends upon the efficient use of IC. Thus, this confirms that PFIs are capable of using IC efficiently up to a certain extent. Therefore, an increase beyond a certain limit decreases their profitability and productivity. Considering the cluster analysis, Models 2–4 report the same inverted U-shaped relationship between IC and the sustainable performance of Pakistani BFIs, NBFIs, and ICs. Furthermore, the study discloses that the impact of VAIC and MVAIC is almost same because the difference in the impact of both IC measures lies with the investment in RC. Our study suggests that the financial institutions in an emerging market like Pakistan are not advanced in attaining the efficacy from RC. Therefore, the impact of VAIC and MVAIC in emerging economies could be the same. Previously, Xu and Wang [41] also found a similar impact of VAIC and MVAIC on the firm performance of two emerging economies, i.e., China and South Korea. The findings of VAIC and MVAIC are consistent as hypothesized, and thus, H_1 is fully supported.

Regarding the empirical findings of IC components, Models 1, 2, and 4 reported no relationship between CEE and sustainable performance of PFS. However, Model 3 reported a positive relationship

between CEE and the productivity of Pakistani NBFIs. Thus, H₂ is partially supported. This indicates that PFIs are not efficient in generating higher efficiencies from physical or financial capital, and thus, CEE of PFIs is not a fully developed indicator of IC performance. Concerning HCE, Models 1–4 reported a significant positive relationship between HCE and sustainable performance of PFS. Thus, H₃ is fully supported. This indicates that HC is a main influencing force behind the profitability and productivity of PFIs among other IC components, and thus, HCE is a key component that enhances the IC performance of PFS. This implies that human capital is vested in employees rather than institutions [22]; therefore, HC has gained significant attention from PFIs as an important intangible source of value creation. This is consistent with Poh, Kilicman and Ibrahim [35], Nimtrakoon [63], Chen, Liu and Kweh [52], and Mondal and Ghosh [12]. Recently, Haris, Yao, Tariq, Malik and Javaid [4] also stated HCE is the most influential component of IC and argued that investment in HC generates higher efficiency, and consequently, the sustainable performance of Pakistani banks increases. Regarding the other IC components, i.e., SCE and RCE, Model 1 did not report a significant relationship between them and the sustainable performance, i.e., profitability, and productivity, of PFIs. Thus, H₄ and H₅ are not supported. This insignificant relationship between SCE and performance is consistent with the findings of Nawaz and Haniffa [39], Alhassan and Asare [72], Ozkan, Cakan and Kayacan [34], Maji and Goswami [32], Joshi, Cahill, Sidhu and Kansal [18], and Ting and Lean [71]. The insignificant relationship between RCE and performance is consistent with the findings of Soetanto and Liem [38], Vidyarthi [40], and Nimtrakoon [63]. This can be because of the fact that not all investment made into IC components can be profitable for financial institutions [108], because the multiple forms of IC components may be unproductive [109] due to the trade-offs between IC components. This can also be explained by the fact that since Pakistan is an emerging economy, the culture of PFIs is not fully developed and supportive, and therefore, higher investment in SC and RC generates lower efficiencies, and consequently, the performance of PFS decreases [4].

7. Conclusions

This study attempted to examine the impact of IC on the sustainable performance of financial institutions in an emerging country, i.e., Pakistan, by regressing two IC measures, i.e., VAIC and MVAIC. Sustainable performance was measured by two profitability indicators, i.e., ROA and NOM, and one productivity indicator, i.e., ATO. Using the large data set of 111 Pakistani financial institutions, the fixed effect and GMM regressions were applied to offer a robust relationship between IC and sustainable performance. The results reported the positive impact of IC on performance, which is consistent with many previous studies [18,27,28,30,36,37,39–41,43,58,69,71,77], and also affirmed an inverted U-shaped relationship between IC and performance. This inverted U-shaped relationship is consistent with Haris, Yao, Tariq, Malik and Javaid [4] and our proposed hypothesis H₁ that financial institutions in Pakistan are capable, up to a certain level, of generating value and sustaining competitive advantage through their IC and financial capital resources. Among the IC components, the study reported that human capital is the most influential intangible resource for the financial institution by offering the positive impact of HCE on performance, as hypothesized in H₃ that investment in human capital is significant because enhanced skills and expertise improve the performance of Pakistani financial institutions. The positive relationship between HCE and performance is consistent with many previous studies [4,30,32–34,39–41,58,63,67,69,71,72,74].

The findings of our study disclose the significance of IC to sustain improved profitability and productivity, implying that, for management, regulators, and policy-makers of financial institutions, investment in IC has an economic relevance to the performance of financial institutions. In lieu of the current findings, we propose that the Pakistani financial sector put a certain limit on investing in IC in order to sustain the improved performance. This provides a note of caution for policy-makers and management, that investment in IC produces a positive performance to a certain degree, but then a declining trend begins. Considering the idiosyncratic and knowledge-intensive nature of the financial industry, it requires well trained experts and skills in human resources to deal with the complexity

of the financial operations and regulations and alleviate the agency problems by building a strong relationship with other stakeholders. Therefore, investment in human capital has great potential in sustaining improved profitability and productivity by playing its influencing rule in IC performance. The study sheds light on the need for PFIs to place emphasis on human capital development, which may reflect positively on overall performance. Further, for PFIs, there is an urgent need to develop a mechanism to produce value from structural capital. They should develop a strong IT system and the right management control systems and develop and sustain a positive organizational culture to support internal business operations. Concerning relational capital, there is another important implication we disclosed, which is that the impact of VAIC and MVAIC is almost the same because the difference in the impact of both IC measures lies with the investment in RC. The PFIs with a relatively low level of relational networks may require enhancing the relationships with stakeholders. Moreover, they should develop a mechanism to invest more in relational capital in order to generate the value creation efficiency of RC, so that the role of RC in enhancing the IC performance of PFIs can be significant.

The theoretical implications of this study based on the scientific contributions are now unfolded. This is the first study analyzing the IC performance, i.e., productivity and profitability, of Pakistani financial institutions by using two IC measures, i.e., VAIC and MVAIC. In addition, the study also deployed a comprehensive set of different IC indicators, i.e., relational, physical, structural, and human capital, in order to offer in-depth analysis. The current study provides the base for future IC studies. The results of VAIC and MVAIC endorse and support the resource-based view by extending the significant impact of IC on profitability and productivity. This suggests that investment in IC generates a higher performance for financial institutions. Moreover, the positive impact of the efficiency generated from human capital also endorses and supports the stakeholder and resource-dependence views. This indicates that investment in human capital motivates and enables employees to build a strong relationship and act as the agents of shareholders in minimizing the agency problems to improve sustainable performance. Thus, based on the examined theories, the findings of this study motivate management to invest more in IC resources in order to sustain their competitive advantage.

Although the study was based on the large fraction of all Pakistani financial institutions and considered the two measurements of IC and a comprehensive set of control variables, it has some limitations. The study is limited to the financial industry of Pakistan, which opens the avenues for future research. For instance, this study could be extended to comparative analysis of manufacturing and other service industries. We also suggest that the same set of variables used in this study be replicated in other emerging markets sharing the same or different governance and political structure in order to offer a comparative analysis between Pakistan and other emerging countries. Further, the efficiency of VAIC is still questionable, and therefore, we suggest that future studies may include a new component such as social capital to see if the results can be improved further. Moreover, this study measured IC performance using VAIC and MVAIC. However, future studies may utilize other methodologies, and it would be interesting to see if different results are generated. Lastly, this study could be extended to measure the influence of corporate governance characteristics such as board size, the director's remuneration and background, and CEO background and qualifications in both the financial and nonfinancial sectors.

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Appendix A

Table A1. Descriptive statistics.

Variables	PFS			BFIs			NBFIs			ICs		
	Obs.	Mean	SD	Obs.	Mean	SD	Obs.	Mean	SD	Obs.	Mean	SD
ROA	1105	0.013	0.070	474	−0.001	0.053	631	0.024	0.079	296	0.037	0.083
NOM	1105	−0.036	1.191	474	−0.096	1.585	631	0.008	0.770	296	0.066	0.559
ATO	1105	0.198	0.243	474	0.109	0.079	631	0.264	0.297	296	0.334	0.179
VAIC	1105	3.929	7.531	474	2.456	4.563	631	5.035	5.035	296	3.926	9.488
MVAIC	1105	3.941	7.447	474	2.475	4.546	631	5.042	8.878	296	3.934	9.271
CEE	1105	0.335	1.137	474	0.344	1.569	631	0.327	0.647	296	0.397	0.581
HCE	1105	2.880	5.039	474	1.70	3.775	631	3.765	5.653	296	2.444	2.527
SCE	1105	0.715	5.452	474	0.411	2.240	631	0.944	6.943	296	1.085	9.284
RCE	1105	0.012	0.143	474	0.020	0.082	631	0.007	0.175	296	0.008	0.250
INSSIZE	1105	15.889	2.546	474	17.650	2.398	631	14.566	1.721	296	14.819	1.653
LEV	1105	0.635	0.340	474	0.807	0.258	631	0.506	0.338	296	0.499	0.348
AGE	1105	2.890	0.946	474	2.603	1.023	631	3.105	0.816	296	3.357	0.827
RDIV	1105	0.161	0.277	474	0.147	0.151	631	0.172	0.342	296	0.202	0.446
OE	1105	0.550	0.552	474	0.511	0.509	631	0.580	0.581	296	0.447	0.380
EGR	1105	23.769	0.374									
CRISIS	1105	0.134	0.341									

Notes: PFS refers to the Pakistani financial sector. BFIs are banking financial institutions. NBFIs are nonbanking financial institutions. ICs are insurance companies.

Table A2. Augmented Dickey Fuller (ADF) unit root.

	Level		First Difference	
	Coef.	PV	Coef.	PV
ROA	46.027	0.000	74.810	0.000
NOM	39.149	0.000	78.654	0.000
ATO	17.106	0.000	78.270	0.000
VAIC	40.534	0.000	82.226	0.000
MVAIC	40.768	0.000	81.942	0.000
CEE	28.988	0.000	70.449	0.000
HCE	39.718	0.000	77.333	0.000
SCE	35.266	0.000	86.796	0.000
RCE	41.735	0.000	97.579	0.000
INSSIZE	5.907	0.000	39.518	0.000
LEV	16.300	0.000	51.850	0.000
AGE	369.208	0.000	369.208	0.000
RDIV	16.684	0.000	66.493	0.000
OE	18.777	0.000	68.253	0.000
EGR	25.645	0.000	14.400	0.000
CRISIS	19.216	0.000	39.317	0.000

Table A3. Correlation matrix.

	ROA	NOM	ATO	VAIC	MVAIC	CEE	HCE	SCE	RCE	INSSIZE	LEV	AGE	RDIV	OE	EGR	CRISIS	VIF
ROA	1.000																
NOM	0.569 ^a	1.000															
ATO	0.242 ^a	0.061 ^b	1.000														
VAIC	0.277 ^a	0.213 ^a	0.078 ^a	1.000													2.19
MVAIC	0.281 ^a	0.216 ^a	0.079 ^a	0.999 ^a	1.000												2.17
CEE	0.029	0.040	0.090	0.191	0.193	1.000											1.03
HCE	0.443 ^a	0.337 ^a	0.094 ^a	0.675 ^a	0.683 ^a	0.073 ^b	1.000										1.10
SCE	-0.033	-0.026	0.002	0.718 ^a	0.710 ^a	-0.013	-0.007	1.000									3.45
RCE	0.051 ^c	0.025	0.010	-0.599 ^a	-0.587 ^a	0.016	0.011	-0.841 ^a	1.000								3.47
INSSIZE	0.047	0.094 ^a	-0.257 ^a	-0.013	-0.012	0.042	-0.008	-0.019	0.045	1.000							1.10
LEV	-0.155 ^a	-0.095 ^a	-0.089 ^a	-0.100 ^a	-0.101 ^a	0.081 ^a	-0.135 ^a	-0.029	0.007	0.453 ^a	1.000						1.33
AGE	0.193 ^a	0.044	0.062 ^c	0.078 ^a	0.078 ^a	0.018	0.063 ^b	0.048	-0.085 ^a	0.015	-0.104 ^a	1.000					1.10
RDIV	0.203 ^a	0.294 ^a	-0.054 ^c	0.055 ^c	0.056 ^c	0.010	0.081 ^a	-0.000	-0.007	0.002	-0.049 ^c	0.047	1.000				1.03
OE	-0.418 ^a	-0.513 ^a	-0.171 ^a	-0.122 ^a	-0.125 ^a	-0.090 ^a	-0.204 ^a	0.038	-0.043	-0.372 ^a	-0.035	-0.080 ^a	-0.070 ^b	1.000			1.27
EGR	0.056 ^b	0.047	0.013	0.041	0.041	0.050 ^c	0.047	0.002	-0.020	0.025	-0.027	0.245 ^c	0.100 ^a	0.101 ^a	1.000		1.66
CRISIS	-0.160 ^a	-0.059 ^b	-0.038	-0.113 ^a	-0.114 ^a	-0.078 ^a	-0.149 ^a	-0.002	0.002	-0.006	0.019	-0.110 ^a	-0.120 ^a	-0.035	-0.591 ^a	1.000	1.58

Notes: ^{a, b, c} represent significance level at 1%, 5%, and 10%, respectively.

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