Intellectual capital and corporate performance: a case of Indian banks

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Abstract

Purpose – The purpose of this paper is to explore and explain the linkage between intellectual capital (IC) efficiency of banks and their performance.
Design/methodology/approach – In total, 39 public and private banks listed in Bombay Stock Exchange from 1999 to 2015 were considered for the study. Panel fixed effects technique is used to draw inferences.
Findings – Results of the study provide evidence of positive association between IC and performance of banks; however, only human capital and structural capital have shown instances of significant positive linkage with banks performance. The results also indicate that the IC efficiency of private sector banks is better than public sector banks in India.
Practical implications – This study may enable Indian banking firms to measure their IC efficiency and develop policies to promote and improve upon their intellectual potential to enhance banks performance.
Originality/value – It is a novel study in Indian context that considers interaction variables in extending the prior understanding of the role of IC in enhancing banks performance, which may build sustainable advantage for banks in emerging economies like India.

Keywords India, Panel data, VAIC™, Banks' performance, MVAIC
Paper type Research paper

1. Introduction

As per the neo-classical economic theory, tangible resources are the primary sources in determining corporate performance. But the proponents of alternate theory of the firm believe that intangible resources are equally important for better corporate performance (Daum, 2001). Intangible assets include skills of the workforce and its organization. Stewart (1997), pioneer in the study of such intangible assets, coined the term "Intellectual Capital (IC)" to refer to these assets. IC can be used to produce wealth, multiply output of physical assets and gain competitive advantage for the companies in an economy, mainly driven by knowledge (Edvinsson and Malone, 1997; Stewart, 1997; Pulic, 1998; Bontis, 1999). Actually, it is an essential ingredient for success in all organizations, be it manufacturing, service or agriculture. Only the degree of involvement differs, some are high knowledge intensive, some are less. Today the focus has shifted from less knowledge intensive to high knowledge intensive firms (Bagozzi and Phillips, 1982). Due to this increasing trend of innovation at workplace, IC has now become the most valuable economic resource (Drucker, 1993; Stewart, 1997; Sveiby, 1997; Bontis, 1999; Wang and Chang, 2005).

IC gained momentum with the two path breaking studies (Bontis, 1998; and Pulic, 1998, 2000) measuring the linkage between IC and corporate performance. Bontis (1998) conceptualized IC as a sum of human capital (HC), structural capital (SC) and customer capital; and supported the causal link between dimensions of IC and business performance based on an exploratory study using questionnaire survey. However, quantitative measurement using secondary data (accounting variables) was not possible until Pulic's (1998) path breaking work on IC. Pulic (1998) conceptualized IC as a sum of HC, SC and physical capital. He proposed the value added intellectual coefficient (VAIC™) in order

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to measure efficiency by adding capital value added and intellectual potential of the companies, that are expected to work as an indicator of company's competitiveness. This quantitative measure has been widely accepted and used in practice by several authors (Firer and Williams, 2003; Wang and Chang, 2005; Chen *et al.*, 2005; Kamath, 2007; El-Bannany, 2008; Zeghal and Maaloul, 2010; Joshi *et al.*, 2010; Maditinos *et al.*, 2011; Chang and Hsieh, 2011; Mehralian *et al.*, 2012; Alipour, 2012; Joshi *et al.*, 2013; among others) to compute efficiency and measure its impact on performance. The base VAIC^{TM} method has been extended by researchers (Joshi *et al.*, 2013; and Vishnu and Gupta, 2014; among others) using relational capital (RC) or customer capital as new ingredient into the model. Taking further the same logical construct of Pulic (1998) and its modified versions, we propose to measure the IC coefficient of banking firms and its impact on banks' performance in an emerging economy, India as a case. As per resource-based theory the competitive advantage of a firm lies primarily in the application of both tangible and intangible resources at the firm's disposal (Wernerfelt, 1984). Hence the positive association between firms' resources and measures of performance is gaining acceptance in the accounting, economic and strategic management literature (Canibano *et al.*, 2000).

Financial sector is the backbone of the global economy, providing capital for innovation, infrastructure, job creation and overall prosperity. Banking sector is the core of financial sector that owes its existence to the real sector and assists its progress. Banking is a knowledge intensive industry with high degree of technological innovation and customer interaction (Veltri and Silvestri, 2011). Therefore, it is important for the banking sector to invest in their development of intellectual potential in order to make competitive advantage sustainable and durable.

Government controlled Indian banking sector has undergone various reforms like deregulation, new licensing of private and foreign banks, globalization, financial innovation, and technological progression thus enhancing penetration, service quality and competitions in rural, semi urban and urban areas across nation since early 1980s. Further success of recent financial inclusion initiatives of the Government of India like Pradhan Mantri Jan Dhan Yojana, AADHAR linked direct subsidy transfer scheme, Pradhan Mantri Jeevan Jyoti Bima Yojana, Pradhan Mantri Suraksha Bima Yojana and Atal Pension Yojana in May 2015 entirely depends up on the robust banking system. Thus, empirical analysis pertaining to the dynamics between IC and corporate performance in Indian banking sector becomes the core public policy issue for further accelerating robust performance of the economy.

Review of related research brings forth the fact, that the association between IC and corporate performance is mixed. Studies have reported both positive (Riahi-Belkaoui, 2003; Mavridis, 2004; Youndt *et al.*, 2004; Bollen *et al.*, 2005; Wang and Chang, 2005; Ng, 2006; Pew Tan *et al.*, 2007; Tovstiga and Tulugurova, 2007; Diez *et al.*, 2010; Zeghal and Maaloul, 2010; Clarke *et al.*, 2011; Mehralian *et al.*, 2012; Joshi *et al.*, 2013; Anifowose *et al.*, 2017) and negative or weak (Firer and Williams, 2003; Zeghal and Maaloul, 2010; Gruian, 2011) association among the variables. However, Andriessen (2004) and Stahle *et al.* (2011) have critised the VAIC^{TM} model stating that the proposed model has nothing to do with IC rather it measures labor and capital efficiency of companies. Furthermore, the calculation method uses overlapping variables and a lack of focus on organizational problems. However, the growing researches in this area appear to reject their argument. Because the researchers commonly believe that physical capital, HC, SC and RC cumulatively enhances the overall intellectual potential of the firms, which in turn enhances the corporate profitability of firms. Moreover, it is also noticed that majority of the literature on IC concentrate on developed economies (Table AI). However, with global prosperity and stability increasingly dependent on developing economies because of its huge growth potential (low cost labor and huge potential market) amid global slowdown, there is a need to establish dynamics of IC evolution and its impact on corporate performance in an emerging economy that has different socioeconomic and political settings (Firer and Williams, 2003).

India is one such developing economy with huge growth potential (Global Economic Prospects Report, 2016). Few empirical studies, for example, Kamath (2007), Ghosh and Mondal (2009), Mondal and Ghosh (2012), Vishnu and Gupta (2014) have attempted to shed light on IC and its linkage with corporate performance in India. Using VAIC™ technique, Kamath (2007) estimated IC for banks in India for the period 2000-2004. Similarly, Ghosh and Mondal (2009) used VAIC™ technique to estimate IC of Software and Pharmaceutical companies for the period 2002-2006. Further, they used multiple regressions to establish linkage between IC and corporate performance. Mondal and Ghosh (2012) repeated the same for banking industry in India. However, Kamath (2007), Ghosh and Mondal (2009), and Mondal and Ghosh (2012) have not included RC. Vishnu and Gupta (2014) extended the base VAIC™ and proposed modified VAIC for Indian pharmaceutical firms for the period 2005-2011. Further, they used simple panel OLS technique to measure association between IC and corporate performance.

This study differs from previous studies on two counts. First, we have introduced interaction variables into the model while measuring the effectiveness of components of IC on corporate performance. Adding interaction terms to a regression model can greatly expand understanding of the relationships among the variables in the model. The presence of interaction indicates that the effect of one predictor variable on the response variable is different at different values of the other predictor variable. Second, study uses panel fixed effects technique to draw robust inferences from the underlying heterogeneous data set thus controlling for all time-invariant unobserved within-individual variation among individual banks (Baltagi, 2005), which past studies lack. The rest of the paper is organized as follows. In Section 2, we discuss the taxonomy of IC. Data and sample, research hypotheses and methodology is provided in Sections 3-5 respectively. Section 6 deals with empirical analysis of results and we conclude the study in Section 7.

2. Taxonomy of value added intellectual coefficient

Taxonomy of value added intellectual coefficient as synthesized from literature includes three components: Value added (VA), capital employed (CE), and IC:

(1) VA is the amount by which the value of an article is increased at each stage. It can be calculated using two methods i.e. direct and indirect. According to direct method, VA is the difference between output and input this can also be represented as the difference between net sales and cost of goods sold. According to indirect method VA is the aggregation of all components that belong to the stakeholders i.e. compensation to employees (C), interest (I), depreciation (DP), dividend (DD), taxes (T) and retained earnings (R) (see, details below). The study uses indirect method to estimate VA in our study which is consistent with the stakeholder's view of Donaldson and Preston (1995):

- Direct method: VA = Net sales (S) – Costs of goods sold (B)
- Indirect method: $\text{VA} = S\text{–}B = \text{DP} + C + I + \text{DD} + T + R$

(2) CE is the tangible resource on which the existence of business depends. Further, it is assumed that the existence of the CE is essential to allow the HC to contribute towards value creation (Chen-Goh, 2005; El-Bannany, 2008).

(3) Taxonomy of IC as synthesized from literature provides three interconnected constructs namely HC, SC, and RC:

- HC is individuals working in firms and is considered as the main element of IC (Moon and Kym, 2006). Human capital includes the competence, skills, experience, behavior and intellectual abilities of the employees (Bounfour, 2002; Brooking, 1996; Edvinsson and Malone, 1997; Roos and Roos, 1997; Stewart, 1997, Sullivan, 2000; Cohen and Kaimenakis, 2007; Schiuma and Lerro, 2008; and Anam *et al.*, 2012).

- SC is one of the primary components of IC that consists of the supportive infrastructure, processes, patents and trademarks and proprietary databases among others of the organization that enable human capital to function. It is owned by the firms and remains with the firms even when individuals leave the organization (Bounfour, 2002; Brooking, 1996; Edvinsson and Malone, 1997; Stewart, 1997; Roos and Roos, 1997; and Anam *et al.*, 2012).
- RC reflecting the value related to a business entity which is created through the relations between an organization and its constituencies. It is the ability of the firms in maintaining relationship between customers, suppliers, shareholders and the government. The quality of the relationship and the ability to create new customers are key factors for the success of a company (Bontis, 1998; Grasenick and Low, 2004; Montequin *et al.*, 2006; and Anam *et al.*, 2012).

3. Data and sample

The study focuses mainly on Bombay Stock Exchange listed public and private sector scheduled commercial banks. Currently public and private sector banks covers almost 84.5 percent of the total branch networks having 87.1 percent of the aggregate deposits accounts holdings with 92.6 percent values; and 81 percent credit accounts with 92.4 percent credit amount outstanding values. Regional rural banks though have almost 15.3 percent branch networks only with 3 and 2.6 percent deposit and credit amount share respectively. Further, foreign banks penetration is still in very nascent phase (as per RBI's Deposit and Credit Schedule of Banks group as on March 2015). Thus, public and private sector banks jointly covers lion's share in Indian banking sector, hence the study intends to explore the impact of IC on its performance. The study extracts relevant data from the Centre for Monitoring Indian Economy – prowess database for the sample of 39 banks comprising of public and private sector banks over the period March 1999-March 2015 based on the availability of data for the specified period for final analysis.

4. Research hypotheses

In order to measure the impact of IC on banks' performance in India, five testable research hypotheses have been constructed. First, it is hypothesized that IC of banking firms in India is positively related to their performance because IC leads to innovation which in turn leads to value creation which is the key to business success, especially in a knowledge economy where IC is considered to be an important resource as per resource based theory, that drives performance (Pulic, 1998, 2000; Daum, 2001; Kamath, 2007). Second, it is hypothesized that the components of IC are positively related to the performance of banks in India. Third, in order to measure the effect of variable interaction, it is assumed that components of IC do not work in isolation, but rather has some interdependency that complements each other and enhance banks' performance. Interaction terms are hardly new to social-science research; indeed, their use is now almost common. Including multiplicative terms in linear regressions is a common technique of incorporating conditional relationships into empirical analysis (Friedrich, 1982; Aiken *et al.*, 1991; Franzese and Kam, 2009). Hence, it is hypothesized that interaction variables when introduced into the model increases model explainabilty, because interaction variables moderates the effect of predictor variable on the response variable (Franzese and Kam, 2009). Fourth, in order to measure the effectiveness of modified VAIC over VAIC™ it is hypothesized that modified VAIC is a better measure of banks' performance because modified VAIC measure incorporates more informative variables than VAIC™ measure. Finally, in order to measure the effectiveness of IC on public and private sector banks in India, it is hypothesized that the positive linkage between IC and banks' performance is likely to be high in case of private sector banks, because the

estimated VAIC coefficient is comparatively high for private sector banks, which can be attributed to higher: CE efficiency, HC efficiency and SC efficiency (Table I). So, if the resource based theory works as advocated in literature, the proposed measure of IC should contribute to the better performance of private sector banks in India. Empirical studies (Sanyal and Shankar, 2011; Singh *et al.*, 2016) also provide evidence that private sector growth and performance has dominated public sector (see Figure A1 for recent trends on public and private sector banks in India).

5. Methodology

The VAIC^{TM} introduced by Pulic (1998) is considered as the efficiency measure of IC in the study. The VAIC^{TM} method provides the information about the efficiency of tangible and intangible assets that can enhance corporate performance. Analysis begins with estimation of VAIC^{TM} of banking firms followed by computing the modified value added intellectual coefficient (MVAIC) by including RC to measure the IC efficiency of banks during the various phases. Further, we construct regression models to measure the relative impact of IC efficiency (VAIC^{TM} and MVAIC) on banks' performance.

5.1 Estimation of VAIC^{TM}

VAIC^{TM} is calculated as the sum of CE efficiency, HC efficiency and SC efficiency. We further estimate the MVAIC for better understanding of intellectual efficiency. MVAIC is computed as a sum of VAIC^{TM} and RC efficiency. The VAIC^{TM} and MVAIC measure's the intellectual ability of banks. A higher value for VAIC^{TM}/MVAIC shows a greater efficiency in the use of banks capital. The procedures of calculating VAIC^{TM} and MVAIC are as follows:

$$\text{VAIC}^{TM} = \text{VACE} + \text{VAHC} + \text{SCVA} \tag{1}$$

$$\text{MVAIC} = \text{VACE} + \text{VAHC} + \text{SCVA} + \text{RCVA} \tag{2}$$

where VACE is VA by CE; VAHC is VA by HC SCVA is SC by VA; RCVA is RC by VA; CE is total assets minus current assets; HC is total compensation to employees; SC is VA minus HC; RC is sum of advertisement and marketing and selling and distribution expenses.

5.2 Regression models

In order to measure the relative impact of IC efficiency on banks' performance six regression models have been constructed. Model 1 and 1a examine the association between banks' performance (CP) and the aggregate measure of IC, i.e. VAIC^{TM} and its three major components, VACE, VAHC and SCVA. Similarly, model 2 and 2a examine the association between CP and the aggregate measure of IC i.e. MVAIC and its four major components, VACE, VAHC SCVA and RCVA. In model 1b and 2b, we add interaction variables to measure the simultaneous influence of two variables on the dependent variable in order to examine whether the interaction variables increase explanatory power of the model. This study employs return on assets (ROA), as a proxy for banks' performance as described earlier, as a dependent variable that reflects firms' efficiency, ceteris paribus, in utilizing total assets (Firer and Williams, 2003; Chen *et al.*, 2005; Vishnu and Gupta, 2014 among others). As a measure of robustness check return on equity (ROE) is also used as an alternate measure of banks' performance (Chen *et al.*, 2005; Vishnu and Gupta, 2014 among others). The study also uses size (natural log of total assets) and leverage (total borrowings/total assets) as control variables to remove their effects from the equation. Finally, as our dataset contains multiple observations per

Variables	Mean			Median			SD			Maximum			Minimum			Mean difference test for public and private sector
	Full sample	Public sector	Pvt. sector	Full sample	Public sector	Pvt. sector	Full sample	Public sector	Pvt. sector	Full sample	Public sector	Pvt. sector	Full sample	Public sector	Pvt. sector	t-statistic
VAIC	3.45	3.02	4.26	3.15	2.86	4.12	2.02	1.78	2.18	24.15	20.58	24.15	−14.57	−14.57	0.00	−7.38
MVAIC	3.49	3.03	4.32	3.17	2.88	4.14	2.03	1.78	2.18	24.34	20.58	24.34	−14.56	−14.56	0.00	−7.68
VACE	0.37	0.31	0.47	0.30	0.28	0.32	1.16	1.06	1.30	18.57	8.78	18.57	−17.19	−17.19	−2.15	−1.60
VAHC	2.55	2.22	3.15	2.19	2.04	3.01	1.46	1.31	1.54	19.40	19.40	11.93	0.00	0.00	0.00	−7.77
SCVA	0.53	0.49	0.62	0.54	0.51	0.67	0.19	0.17	0.18	1.00	1.00	0.92	0.00	0.00	0.00	−8.95
RCVA	0.03	0.01	0.06	0.01	0.01	0.02	0.10	0.01	0.17	2.35	0.08	2.35	0.00	0.00	0.00	−4.44
VACE × VAHC	0.97	0.67	1.51	0.67	0.61	0.91	3.99	2.16	5.98	88.99	13.24	88.99	−36.05	−36.05	−15.60	−2.09
VACE × SCVA	0.20	0.15	0.30	0.16	0.14	0.19	0.73	0.53	1.00	14.70	2.96	14.70	−8.99	−8.99	−1.85	−2.15
VAHC × SCVA	1.55	1.23	2.11	1.18	1.04	1.98	1.44	1.29	1.52	18.40	18.40	10.93	0.00	0.00	0.00	−7.54
VACE × RCVA	0.02	0.00	0.04	0.00	0.00	0.01	0.15	0.01	0.24	3.39	0.08	3.39	−0.25	−0.15	−0.25	−2.57
VAHC × RCVA	0.09	0.03	0.18	0.03	0.02	0.06	0.21	0.04	0.33	2.52	0.35	2.52	0.00	0.00	0.00	−6.98
SCVA × RCVA	0.02	0.01	0.03	0.01	0.01	0.01	0.04	0.01	0.06	0.40	0.06	0.40	0.00	0.00	0.00	−5.10
SIZE (ln)	13.90	14.12	13.33	13.06	13.43	11.96	14.46	14.58	13.99	16.84	16.84	15.69	9.29	11.03	9.29	5.65
LEV	0.94	0.95	0.92	0.95	0.95	0.93	0.03	0.02	0.05	1.07	1.07	0.97	0.59	0.87	0.59	8.75
ROA	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.02	0.05	−0.04	−0.04	−0.03	0.00
ROE	0.13	0.14	0.13	0.15	0.16	0.15	0.45	0.56	0.12	1.44	1.44	0.29	−10.97	−10.97	−0.94	0.35

Notes: Total panel (unbalanced) observations (N × T) = 649; mean difference test for public and private sector banks are significant at 0.05 level for all variables except VACE, ROA and ROE, hence we accept H_a:$u_1 \neq u_2$

Table I.
Descriptive statistics

firm; the potential confounding influence of unobserved heterogeneity due to firm-level effects is a concern. To overcome this issue, study employs fixed effects model to capture firm specific characteristics (Baltagi, 2005). Regression models for the study are as follows:

Model 1:

$$\text{Banks' performance}_{it} = \alpha + \beta_1(\text{VAIC}_{it}) + \beta_2(\text{Size}_{it}) + \beta_3(\text{Leverage}_{it}) + \varepsilon_{it}$$

Model 1a:

$$\text{Banks' performance}_{it} = \alpha + \beta_1(\text{VACE}_{it}) + \beta_2(\text{VAHC}_{it}) + \beta_3(\text{SCVA}_{it}) + \beta_4(\text{Size}_{it}) + \beta_5(\text{Leverage}_{it}) + \varepsilon_{it}$$

Model 1b:

$$\text{Banks' performance}_{it} = \alpha + \beta_1(\text{VACE}_{it}) + \beta_2(\text{VAHC}_{it}) + \beta_3(\text{SCVA}_{it}) + \beta_4(\text{VACE}_{it} \times \text{VAHC}_{it}) + \beta_5(\text{VACE}_{it} \times \text{SCVA}_{it}) + \beta_6(\text{VAHC}_{it} \times \text{SCVA}_{it}) + \beta_7(\text{Size}_{it}) + \beta_8(\text{Leverage}_{it}) + \varepsilon_{it}$$

Model 2:

$$\text{Banks' performance}_{it} = \alpha + \beta_1(\text{MVAIC}_{it}) + \beta_2(\text{Size}_{it}) + \beta_3(\text{Leverage}_{it}) + \varepsilon_{it}$$

Model 2a:

$$\text{Banks' performance}_{it} = \alpha + \beta_1(\text{VACE}_{it}) + \beta_2(\text{VAHC}_{it}) + \beta_3(\text{SCVA}_{it}) + \beta_4(\text{RCVA}_{it}) + \beta_5(\text{Size}_{it}) + \beta_6(\text{Leverage}_{it}) + \varepsilon_{it}$$

Model 2b:

$$\begin{aligned}\text{Banks' performance}_{it} = {} & \alpha + \beta_1(\text{VACE}_{it}) + \beta_2(\text{VAHC}_{it}) + \beta_3(\text{SCVA}_{it}) + \beta_4(\text{RCVA}_{it}) \\ & + \beta_5(\text{VACE}_{it} \times \text{VAHC}_{it}) + \beta_6(\text{VACE}_{it} \times \text{SCVA}_{it}) \\ & + \beta_7(\text{VAHC}_{it} \times \text{SCVA}_{it}) + \beta_8(\text{VACE}_{it} \times \text{RCVA}_{it}) \\ & + \beta_9(\text{VAHC}_{it} \times \text{RCVA}_{it}) + \beta_{10}(\text{SCVA}_{it} \times \text{RCVA}_{it}) \\ & + \beta_{11}(\text{Size}_{it}) + \beta_{12}(\text{Leverage}_{it}) + \varepsilon_{it}\end{aligned}$$

where ROA is EBITDA by total assets, ROE is net income by shareholders' equity, α is constant, $\beta_1, \ldots\ldots, \beta_{12}$ are coefficients, i is firm, t is time, ε is error term, details of other variables are discussed in section 5.1 and 5.2.

6. Empirical results

6.1 Descriptive statistics

The value of VAIC coefficient for Indian banking firms varies from −14.57 to 24.15 with a mean of 3.45 whereas modified IC coefficient varies from −14.56 to 24.34 with a mean of 3.49 representing mirror image of IC coefficient with minor difference. The descriptive statistics of other independent variables along with dependent variables are represented below (Table I). The highest correlation coefficient value of 0.88 is noticed between the interaction variables SCVA × RCVA and VAHC × RCVA, and VACE × RCVA and VACE × VAHC (Table II), but El-Bannany (2002) argues that since the correlation is less than 0.99, multicollinearity should not be considered a serious problem. He referred Neter (1985) who stated the fact that in multiple regression some or all independent variables are correlated among themselves, this does not, in general, inhibit our ability to

Table II. Correlation statistics

Independent variables	VACE	VAHC	SCVA	RCVA	VACE × VAHC	VACE × SCVA	VAHC × SCVA	VACE × RCVA	VAHC × RCVA	SCVA × RCVA	SIZE (ln)	LEV
VACE	1.00	0.03	0.05	0.05	0.81*	0.87*	0.03	0.69*	0.12*	0.14*	0.00	−0.14*
VAHC		1.00	0.78*	0.05	0.12*	0.09**	0.85*	0.07	0.38*	0.34*	0.00	−0.55*
SCVA			1.00	0.00	0.13*	0.12*	0.77*	0.08**	0.35*	0.35*	0.08**	−0.49*
RCVA				1.00	0.07	0.07	0.08	0.15*	0.43*	0.43*	0.00	−0.13*
VACE × VAHC					1.00	0.87*	0.12*	0.88*	0.17*	0.19*	0.00	−0.22*
VACE × SCVA						1.00	0.09**	0.82*	0.16*	0.18*	0.00	−0.21*
VAHC × SCVA							1.00	0.07	0.38*	0.34*	−0.01	−0.56*
VACE × RCVA								1.00	0.29*	0.31*	−0.02	−0.24*
VAHC × RCVA									1.00	0.88*	0.05	−0.36*
SCVA × RCVA										1.00	0.06	−0.33*
SIZE (ln)											1.00	−0.04
LEV												1.00

Notes: *,**Significant at 0.01 and 0.05 levels, respectively (two tailed)

obtain a good fit nor does it tend to affect inferences about mean responses, provided these inferences are made within the region of observations. Neter (1985) also stated that dropping some variables to reduce collinearity may reduce model's explanatory power and may lead to specification errors. Furthermore, Allison (2012) stated, if we specify a regression model with x, z, and xz, both x and z are likely to be highly correlated with their product. This is not something to be concerned about, however, because the p-value for xz is not affected by the multicollinearity. Based on the above arguments, it is assumed that multicollinearity has no adverse consequences on our models.

6.2 Overview of IC efficiency of Indian banking industry

In this section, we have captured the VAIC^{TM} and MVAIC of Indian banking industry for the period 1999-2015. The average VAIC^{TM} and MVAIC of banking industry for the full sample period is 3.45 and 3.49 whereas the latest five years average is estimated to be 3.40 and 3.42, respectively (Table III). It is also observed that Indian banking industry has no evidence of impact of 2007 subprime crises on their VAIC^{TM} and MVAIC as the mean difference is found to be insignificant (Table III). The banking system in India was insulated from the global financial crisis owing to heavy public ownership and cautious management. India has a highly regulated conservative financial system which did not allow banks taking deposits to enter into speculative activities and buy mortgaged back securities which was done by banks throughout the world.

The results presented in Table IV show that out of the total 39 banks being used as sample, 14 banks have VAIC^{TM} above average for full sample and out of those 14 banks, 79 percent of them belong to private sector. In all 64 percent of the sample banks are still struggling to achieve the industry average, and of those, 80 percent belong to public sector banks. Similarly, only 13 banks have MVAIC above average for full sample and out of those 13 banks, 77 percent of them belong to private sector. In all 67 percent of the sample banks are still struggling to reach the industry average, and of those, 77 percent belong to public sector banks. While analyzing the latest five years average from the sample it is found that 15 banks have VAIC^{TM} and MVAIC above average and out of those 15 banks, 73 percent of them belong to private sector. In all 62 percent of the sample banks are still struggling to achieve the industry average mark, and of those, 79 percent belong to public sector banks. Further, it can be seen from Table IV that there are very few banks from the public sector among the top performers because of their rising NPA's, meager investments in human resource development, and low technology intensity. Axis bank, City Union bank, Federal bank, HDFC bank, ICICI bank, IDBI bank, KarurVysya bank, Kotak Mahindra bank and Yes bank are the nine common banks across all the averages that have produced consistent above average VAIC^{TM}. The above mentioned banks remained same except Federal bank when measuring common consistent above average MVAIC performers.

In summary from above analysis it is clear that there is not much difference between VAIC^{TM} and MVAIC measure for Indian banking industry as of now and majority of the

	Industry average↓			
Estimates	Full sample	Latest 5 years	Pre crises: 2007	Post crises: 2009
VAIC	3.45	3.40	3.42	3.46
MVAIC	3.49	3.42	3.46	3.49

Mean difference test for pre and post crises (H_0: $u_1 = u_2$; H_a: $u_1 \neq u_2$)

Details	t-stats
VAIC (pre and post crises)	−0.51
MVAIC (pre and post crises)	−0.52

Note: Values are not significant at 0.05 level, hence we accept H_0: $u_1 = u_2$

Table III. Average VAIC and MVAIC values for banks

Banks name↓	VAIC↓ Full period average	VAIC↓ Latest 5 years average	MVAIC↓ Full period average	MVAIC↓ Latest 5 years average
Allahabad Bank	2.84[a]	3.00[a]	2.86[a]	3.02[a]
Andhra Bank	3.30[a]	3.37[a]	3.31[a]	3.38[a]
Axis Bank Ltd (*P*)	5.94	5.79	5.97	5.81
Bank Of Baroda	3.10[a]	3.83	3.11[a]	3.84
Bank Of India	2.74[a]	2.84[a]	2.75[a]	2.86[a]
Bank Of Maharashtra	2.61[a]	2.68[a]	2.62[a]	2.69[a]
Canara Bank	2.86[a]	2.99[a]	2.87[a]	3.00[a]
Central Bank Of India	2.04[a]	2.07[a]	2.05[a]	2.09[a]
City Union Bank Ltd (*P*)	4.52	4.83	4.56	4.9
Corporation Bank	4.22	3.72	4.24	3.73
D C B Bank Ltd (*P*)	2.49[a]	2.85[a]	2.67[a]	2.86[a]
Dena Bank	2.90[a]	3.08[a]	2.92[a]	3.10[a]
Dhanlaxmi Bank Ltd (*P*)	2.05[a]	1.47[a]	2.08[a]	1.53[a]
Federal Bank Ltd (*P*)	3.47	4.17	3.48[a]	4.19
H D F C Bank Ltd (*P*)	5.89	5.46	6.01	5.58
I C I C I Bank Ltd (*P*)	5.74	5.2	5.91	5.27
I D B I Bank Ltd.	5.71	3.94	5.73	3.95
I N G Vysya Bank Ltd (*P*)	2.31[a]	2.52[a]	2.33[a]	2.52[a]
Indian Bank	2.88[a]	3.63	2.89[a]	3.64
Indian Overseas Bank	2.54[a]	2.06[a]	2.55[a]	2.08[a]
Indusind Bank Ltd (*P*)	5.00	3.73	5.03	3.74
Jammu & Kashmir Bank Ltd (*P*)	4.04	3.57	4.05	3.57
Karnataka Bank Ltd (*P*)	3.49	3.12[a]	3.5	3.13[a]
KarurVysya Bank Ltd (*P*)	4.48	4.07	4.51	4.11
Kotak Mahindra Bank Ltd (*P*)	7.08	4.63	7.22	4.73
Lakshmi Vilas Bank Ltd (*P*)	2.63[a]	2.86[a]	2.65[a]	2.88[a]
Oriental Bank Of Commerce	3.78	3.19[a]	3.79	3.20[a]
Punjab National Bank	3.03[a]	3.36[a]	3.03[a]	3.36[a]
South Indian Bank Ltd (*P*)	3.06[a]	3.62	3.08[a]	3.65
State Bank Of Bikaner & Jaipur	2.33[a]	3.24[a]	2.34[a]	3.25[a]
State Bank Of India	3.00[a]	2.92[a]	3.01[a]	2.93[a]
State Bank Of Mysore	3.28[a]	2.89[a]	3.28[a]	2.90[a]
State Bank Of Travancore	2.79[a]	3.14[a]	2.80[a]	3.15[a]
Syndicate Bank	2.49[a]	2.75[a]	2.52[a]	2.77[a]
Uco Bank	2.28[a]	2.95[a]	2.30[a]	2.97[a]
Union Bank Of India	2.91[a]	2.79[a]	2.93[a]	2.82[a]
United Bank Of India	2.06[a]	2.08[a]	2.07[a]	2.10[a]
Vijaya Bank	2.60[a]	2.61[a]	2.61[a]	2.62[a]
Yes Bank Ltd (*P*)	4.53	5.59	4.57	5.62
Average	3.46	3.4	3.49	3.42
No. of banks above average	14	15	13	15
No. of banks below average	25	24	26	24

Notes: *P* shows private sector banks; full period is 1999-2015. [a]Shows values below average value

Table IV.
Computed value of VAIC and MVAIC for individual banks

banks are still struggling to reach the industry average, and of those, majority belong to public sector banks. Thus as far as value of VAIC™ and MVAIC is concerned it is the private sector banks that have shown greater efficiency in use of banks capital.

6.3 Does IC improves corporate performance

To measure the impact of IC on banks' performance we adopt the policy of general to specific. So, first we measure the overall impact of IC coefficient (VAIC™ and MVAIC) on

banks' performance, and then we measure the impact of individual components of VAIC™ and MVAIC on banks' performance.

The results of the regression models (ROA as dependent variable) reveal that co-efficient of VAIC™ is significantly positive in model 1 (full sample), but of the three components of VAIC™ only SCVA has significant positive relationship in model 1a (full sample). Further, introduction of interaction variables in model 1b (full sample) show that VAHC and SCVA have significant positive relationship but VAHC × SCVA has significant negative relationship. Noticeably, the adjusted R^2 substantially increases from 0.56 in model 1 (full sample) to 0.74 in model 1a (full sample), and 0.79 in model 1b (full sample) (Table V).

The regression results in model 2 (full sample) reveal that co-efficient of MVAIC is significantly positive, but of the four components of MVAIC, SCVA has significantly positive relationship and RCVA has significantly negative relationship in model 2a (full sample). Further, introduction of interaction variables in model 2b (full sample) show that VAHC and SCVA have significant positive relationship but VAHC × SCVA has significant negative relationship. Noticeably, the adjusted R^2 substantially increases from 0.55 in model 2 (full sample) to 0.76 in model 2a (full sample), and 0.79 in model 2b (full sample) (Table V).

We further conducted an in-depth analysis to get insights on the impact of IC on performance of public sector and private sector banks in India. In case of both public and private sector banks VAIC™ is found to be significantly positive in model 1 (public and private sector), but of the three components of VAIC™ only SCVA has significant positive relation in model 1a (public and private sector). Further, introduction of interaction variables in model 1b (public and private sector) show that VAHC, SCVA and VACE × VAHC have significant positive relationship and VACE, VACE × SCVA and VAHC × SCVA have significant negative relationship in case of public sector banks whereas in case of private sector banks VAHC and SCVA have significant positive relation and VAHC × SCVA has significant negative relation. Noticeably, the adjusted R^2 substantially increases from model 1 to model 1a to model 1b for both public and private sector banks (Table V).

Similarly, the co-efficient of MVAIC is significantly positive for both public and private sector banks in model 2 (public and private sector), but of the four components of MVAIC, SCVA has significantly positive and RCVA has significantly negative relationship in model 2a (public and private sector). Further, introduction of interaction variables in model 2b (public and private sector) show that VAHC, SCVA, VACE × VAHC, VACE × RCVA and VAHC × RCVA have significant positive relationship and VACE, VACE × SCVA, VAHC × SCVA and SCVA × RCVA have significant negative relationship in case of public sector banks whereas in case of private sector banks VAHC and SCVA have significant positive relation and VAHC × SCVA has significantly negative relation. Noticeably, the adjusted R^2 substantially increases from model 2 to model 2a to model 2b for both public and private sector banks (Table V). The *F*-statistic for joint insignificance of coefficient is significant at 5 percent level across all models, which rejects the null hypothesis of joint insignificance of coefficients and therefore suggests that the regression model is well specified (Gross, 2006).

The results of the regression models (ROE as dependent variable) reveal that co-efficient of VAIC™ is significantly positive in model 1 (full sample), but of the three components of VAIC™ only SCVA has significant positive relationship in model 1a (full sample). Further, introduction of interaction variables in model 1b (full sample) show that VAHC and SCVA have significantly positive relationship but VAHC × SCVA has significant negative relationship. Noticeably, the adjusted R^2 substantially increases from 0.02 in model 1 (full sample) to 0.06 in model 1a (full sample), and 0.12 in model 1b (full sample) (Table VI).

The regression results in model 2 (full sample) reveal that co-efficient of MVAIC is significantly positive, but of the four components of MVAIC, SCVA has significantly positive relationship in model 2a (full sample). Further, introduction of interaction variables

Table V. Panel fixed effect regression between Intellectual capital and corporate performance (dependent variable: ROA)

Models →		Model 1			Model 1a			Model 1b	
Independent variables ↓	Full sample	Public sector	Private sector	Full sample	Public sector	Private sector	Full sample	Public sector	Private sector
C	0.0859*	0.1363*	0.0616*	0.0583*	0.0590*	0.0445*	0.0468*	0.0277*	0.0272*
VAIC	0.0008*	0.0006*	0.0011*						
VACE				0	0.0001	−0.0002	0.0009	−0.0028*	−0.0018
VAHC				0	0.0001	0.0001	0.0160*	0.0141*	0.0196*
SCVA				0.0205*	0.0181*	0.0265*	0.0185*	0.0242*	0.0152*
VACE×VAHC							0.0001	0.0091*	−0.0006
VACE×SCVA							−0.0021	−0.0311*	0.006
VAHC×SCVA							−0.0161*	−0.0161*	−0.0187*
SIZE	−0.0000**	−0.0000*	0.0000*	−0.0000*	−0.0000*	0.0000*	−0.0000*	−0.0000*	0.0000*
LEV	−0.0849*	−0.1368*	−0.0610*	−0.0642*	−0.0629*	−0.0556*	−0.0673*	−0.0455*	−0.0520*
Adjusted R^2	0.5590	0.4559	0.6154	0.7400	0.6586	0.8099	0.7916	0.7466	0.8515
Prob (*F*-stat.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N×T	649	421	228	649	421	228	649	421	228
Models→	Model 2			Model 2a			Model 2b		
Independent variables↓	Full sample	Public sector	Private sector	Full sample	Public sector	Private sector	Full sample	Public sector	Private sector
C	0.0872*	0.1364*	0.0647*	0.0567*	0.0581*	0.0420*	0.0459*	0.0237**	0.0231*
MVAIC	0.0008*	0.0006*	0.0009*						
VACE				0	0.0001	−0.0002	0.0004	−0.0025*	−0.0006
VAHC				0	0.0001	0.0003	0.0151*	0.0147*	0.0192*
SCVA				0.0198*	0.0183*	0.0235*	0.0184*	0.0268*	0.0147*
RCVA				−0.0073*	−0.0318**	−0.0062*	−0.0019	−0.0484	−0.0004
VACE × VAHC							0.0002	0.0101*	−0.001
VACE × SCVA							−0.0014	−0.0374*	0.0087
VAHC × SCVA							−0.0153*	−0.0172*	−0.0184*
VACE × RCVA							−0.003	0.1033*	−0.0089
VAHC × RCVA							0.0001	0.0350*	0.0056
SCVA × RCVA							−0.0008	−0.1866*	−0.0299
SIZE	−0.0000**	−0.0000*	0.0000**	−0.0000*	−0.0000*	0.0000*	−0.0000*	−0.0000*	0.0000*
LEV	−0.0862*	−0.1368*	−0.0638*	−0.0619*	−0.0616*	−0.0511*	−0.0652*	−0.0423*	−0.0474*
Adjusted R^2	0.5541	0.4558	0.6026	0.7558	0.6631	0.8299	0.7922	0.7613	0.8520
Prob (*F*-stat)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N × T	649	421	228	649	421	228	649	421	228

Notes: Period: 1999-2015; cross-section fixed (dummy variables). Model 1: Performance (ROA) = f (VAIC, Size, Lev), Model 1a: Performance (ROA) = f (VACE, VAHC, SCVA, Size, Lev), Model 1b: Performance (ROA) = f (VACE, VAHC, SCVA, VACE × VAHC, VACE × SCVA, VAHC × SCVA, Size, Lev), Model 2: Performance (ROA) = f (MVAIC, Size, Lev), Model 2a: Performance (ROA) = f (VACE, VAHC, SCVA, RCVA, Size, Lev), Model 2b: Performance (ROA) = f (VACE, VAHC, SCVA, RCVA, VACE × VAHC, VACE × SCVA, VAHC × SCVA, VACE × RCVA, VAHC × RCVA, SCVA × RCVA, Size, Lev). *,**Statistically significant at 1 and 5 percent levels, respectively

Table VI.
Panel fixed effect regression between Intellectual capital and corporate performance (dependent variable: ROE)

Models→		Model 1			Model 1a			Model 1b	
Independent variables ↓	Full sample	Public sector	Private sector	Full sample	Public sector	Private sector	Full sample	Public sector	Private sector
C	0.3786	3.3852	−0.4147	−0.3846	−0.2427	−0.5588	−1.4946	−4.3653	−0.9484
VAIC	0.0273*	0.0286	0.0169*						
VACE				0.0080	0.0157	−0.0015	0.1048	0.0409	−0.0129
VAHC				−0.0211	−0.0167	−0.0062	1.4848*	2.4796*	0.4384*
SCVA				0.8419*	0.9707*	0.4492*	0.6788*	1.2387*	0.2090*
VACE × VAHC							0.0255	0.3350	−0.0061
VACE × SCVA							−0.2931	−1.4253	0.0524
VAHC × SCVA							−1.5247*	−2.6042*	−0.4298*
SIZE	−0.0000	−0.0000	0.0000	−0.0000	−0.0000	0.0000	−0.0000	−0.0000	0.0000
LEV	−0.3501	−3.4833	0.5200*	0.1513	−0.0341	0.4777*	−0.1286	1.6770	0.5470*
Adjusted R^2	0.0217	0.0256	0.3698	0.0581	0.0533	0.6466	0.1248	0.1632	0.7883
Prob (*F*-stat)	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N × T	649	421	228	649	421	228	649	421	228
Models →		Model 2			Model 2a			Model 2b	
Independent variables ↓	Full sample	Public sector	Private sector	Full sample	Public sector	Private sector	Full sample	Public sector	Private sector
C	0.4131	3.3855	−0.3383	−0.4130	−0.2609	−0.6464	−2.1136	−4.4661	−0.9016
MVAIC	0.0264*	0.0286	0.0136*						
VACE				0.0081	0.0155	−0.0002	0.1308	0.1341	0.0189
VAHC				−0.0211	−0.0176	−0.0003	1.8148*	2.4537*	0.2065*
SCVA				0.8293*	0.9753*	0.3444*	0.7792*	1.4364*	0.3072*
RCVA				−0.1288	−0.6730	−0.2152*	0.5729*	−7.8029	−0.1659*
VACE × VAHC							0.0244	0.4377	0.0023
VACE × SCVA							−0.3456	−2.3336	−0.0507
VAHC × SCVA							−1.8647*	−2.6072*	−0.2084*
VACE × RCVA							0.1305	19.8752	0.0514
VAHC × RCVA							0.5801	1.8558	0.1990*
SCVA × RCVA							−4.3242	−5.3300	−1.0200*
SIZE	−0.0000	−0.0000	0.0000	−0.0000	−0.0000	0.0000	−0.0000	−0.0000	0.0000**
LEV	−0.3839	−3.4841	0.4519*	0.1925	−0.0058	0.6352*	0.1438	1.7900	0.7112*
Adjusted R^2	0.0211	0.0256	0.3390	0.0573	0.0511	0.8015	0.1310	0.1691	0.8347
Prob (*F*-stat)	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N × T	649	421	228	649	421	228	649	421	228

Notes: Period: 1999-2015; cross-section fixed (dummy variables), Model 1: Performance (ROE) = f (VAIC, Size, Lev), Model 1a: Performance (ROE) = f (VACE, VAHC, SCVA, Size, Lev), Model 1b: Performance (ROE) = f (VACE, VAHC, SCVA, VACE × VAHC, VACE × SCVA, VAHC × SCVA, Size, Lev), Model 2: Performance (ROE) = f (MVAIC, Size, Lev), Model 2a: Performance (ROE) = f (VACE, VAHC, SCVA, RCVA, Size, Lev), Model 2b: Performance (ROE) = f (VACE, VAHC, SCVA, RCVA, VACE × VAHC, VACE × SCVA, VAHC × SCVA, VACE × RCVA, VAHC × RCVA, SCVA × RCVA, Size, Lev). *,**Statistically significant at 1 and 5 percent levels, respectively

in model 2b (full sample) show that VAHC, SCVA and RCVA have significant positive relationship but VAHC × SCVA has significant negative relationship. Noticeably, the adjusted R^2 substantially increases from 0.02 in model 2 (full sample) to 0.06 in model 2a (full sample), and 0.13 in model 2b (full sample) (Table VI).

We further conducted an in-depth analysis to get insights on the impact of IC on performance of public sector and private sector banks in India. Interestingly, in case of public sector banks VAIC^{TM} is not found to be significant in model 1 (public sector), whereas for private sector banks VAIC^{TM} is significantly positive in model 1 (private sector) but of the three components of VAIC^{TM} only SCVA has significant positive relation in model 1a (public and private sector). Further, introduction of interaction variables in Model 1b (public and private sector) show that VAHC and SCVA have significant positive relationship and VAHC × SCVA has significant negative relationship in case of both public and private sector banks. Noticeably, the adjusted R^2 substantially increases from model 1 to model 1a to model 1b for both public and private sector banks (Table VI).

Similarly, the co-efficient of MVAIC is significantly positive for private sector banks but the same is not significant for public sector banks in Model 2 (public and private sector), but of the four components of MVAIC, only SCVA has significantly positive relationship in model 2a (public and private sector). However, RCVA has significantly negative relationship in case of private sector banks. Further, introduction of interaction variables in model 2b (public sector) show that VAHC and SCVA have significant positive relationship and VAHC × SCVA has significant negative relationship in case of public sector banks whereas in case of private sector banks VAHC, SCVA and VAHC × RCVA have significantly positive relationship and RCVA, VAHC × SCVA and SCVA × RCVA have significantly negative relationship in model 2b (private sector). Noticeably, the adjusted R^2 substantially increases from model 2 to model 2a to model 2b for both public and private sector banks (Table VI). The *F*-statistic for joint insignificance of coefficient is significant at 5 percent level across all models, which rejects the null hypothesis of joint insignificance of coefficients and therefore suggests that the regression model is well specified (Gross, 2006).

From the above analysis it is clear that IC is positively associated with performance of banks and there is no substantial difference between the two IC measures, i.e. VAIC^{TM} and MVAIC. Though there is not much difference between ROA and ROE measure except few exceptions discussed above. However, the regression results indicate that for analyzing the impact of IC on performance of banking firms in India, ROA should be preferred over ROE as adjusted R^2 is comparatively higher in case of ROA models, similar findings were reported by Clarke *et al.*, 2011; Vishnu and Gupta, 2014 among others. It can also be clearly seen that interaction variables play an important role in enhancing IC's impact on banks' performance as adjusted R^2 is highest in case of model 1b and model 2b. Hence, the study supports the use of interaction variables into the model. Above analysis also reveal that VAHC and SCVA are the two major influencing factors of IC coefficient, model 1b and model 2b (full sample). Though, none of the interaction variables are significant for full sample but its moderation impact is well reflected through enhanced adjusted R^2. However, we have some evidence of positive impact of these interaction variables on performance of public sector banks (Table III: model 1b and model 2b). Thus, it can be inferred from the significance of interaction variables that VACE × VAHC: CE moderates the relationship between HC and banks' performance; VACE × RCVA: CE moderates the relationship between RC and banks' performance; VAHC × RCVA: HC moderates the relationship between RC and banks' performance. Finally, it is also noticed that adjusted R^2 is substantially high in case private sector banks revealing the fact that positive linkage between IC and banks' performance is high in case of private sector banks which is earlier confirmed by high VAIC^{TM} and MVAIC factor (Section 6.2).

7. Conclusions

Our empirical findings reveal that majority of the bank's IC coefficient falls below the estimated industry average. Further, exploration of IC coefficients of public and private sector banks brings forth the fact that IC coefficients of private sector banks are on average better than public sector banks in India (Table I). However, on average the IC coefficient of banks (3.45) of fastest growing economy in the world is substantially less than the IC coefficients of banks in Malaysia (7.58) (Muhammad and Ismail, 2009). Thus, the banking sector which is the core of financial sector that owes its existence to the real sector and assists its progress need to improve upon their intellectual capabilities more aggressively. The study also provides evidence of association between IC coefficient and profitability of banks. But while measuring the association between the components of IC coefficient and banks profitability it is noticed that only HC and SC have significant positive association with banks profitability. RC, irrespective of its theoretical support has little empirical value in the models. The results of the study are consistent with the findings of Bontis *et al.* (2000), Wang and Chang (2005), Vishnu and Gupta (2014) among others.

Both public and private sector banks have shown positive association between IC and banks' performance, but the model explainability of private sector banks is comparatively higher than public sector banks across all models, probably because of comparatively high IC coefficient in case of private sector banks (Table I). The interaction variables when used in the models (models 1b and 2b) improved the model explainability of the hypothesized relationship supporting the use of interaction variables. However, the significant negative association between VAHC × SCVA and banks' performance is probably due to mismatch between HC and SC in Indian banking industry. The potential reason for this mismatch may be attributed to the fact that although there is a surplus of human in terms of absolute numbers but skilled and professional human capital are limited in relative terms (Kamath, 2007).

Though IC and banks' performance are positively linked but their IC coefficient is on a lower side and the association impact is minimal probably because of limited investments in IC by Indian banks. Hence, it is very important to stimulate investments in developing IC for driving the banks sustainable long term growth (Chen *et al.*, 2005). Thus, it is important for the banks that their upcoming policy should focus towards improving IC coefficients that may lead to better banks' performance. This study can be used as a reference to guide the policy and decision makers to look at the banks efficiency levels and take requisite actions.

Like any other study this research work also has few limitations. First, the non-availability of data for most of the sample firms initially chosen for the study affects the final sample size, which may be a source of potential bias. Second, the study has been conducted on a single nation and single industry; hence generalization of findings requires caution. Additional research can be done using data from multi-nation and/or multi-industry for better generalization.

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Further reading

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Appendix 1

Authors	Sample size	Findings
Pulic (1998)	Conceptual study	Results suggested intellectual potential (IP) to be the decisive resource for corporate success
Bontis (1998)	Canada; $N = 64$; mix of firms	Findings support the causal link between dimensions of intellectual capital and business performance
Riahi-Belkaoui (2003)	USA; $N = 84$; multinational firms	The results revealed that there is a significant positive relationship between intellectual capital and firm performance
Firer and Williams (2003)	South Africa; period: 2001; $N = 75$; mix of public firms	Results indicate that relation between the efficiency of Value Added by a firm's major resource bases (physical capital, human capital and structural capital) and corporate performance dimensions (profitability, productivity and market valuation) are generally limited and mixed. Overall, the empirical findings suggest that physical capital remains the most significant underlying resource of corporate performance in South Africa despite efforts to increase the nation's intellectual capital base
Mavridis (2004)	Japan; period: 2000-01; $N = 141$; banking	The study highlights the fact that "intellectual capitalists" or "knowledge workers" are strongly contributing to the corporates performance of banks
Youndt *et al.* (2004)	USA; $N = 208$; publicly listed firms	Firms with high overall intellectual capital profiles show higher financial returns and Tobin's q than firms with low overall profiles
Bollen *et al.* (2005)	Germany; $N = 41$; pharmaceutical	Study suggests that including intellectual property in models linking intellectual capital to firm performance enhances the statistical validity of such models and their relevance for management
Wang and Chang (2005)	Taiwan; period: 1997-2001; all listed IT firms	Empirical outcome reveals that elements of intellectual capital directly affect business performance, with an exception of human capital. Human capital indirectly affects performance through the other three elements i.e. innovation capital, process capital, and customer capital. There also exists a cause-effect relationship among four elements of intellectual capital. Human capital affects innovation capital and process capital. Innovation capital affects process capital, which in turn influences customer capital. Finally, customer capital contributes to performance
Chen *et al.* (2005)	Taiwan; period: 1992-2002; 4254 firm year; mix of listed firms	The findings of the study support the hypothesis that firms' intellectual capital has a positive impact on its market value and financial performance, and also work as an indicator of future financial performance
Chen-Goh (2005)	Malaysia; period: 2001-2003; $N = 16$; banking	Investment in human capital yields a relatively higher return than investment in physical and structural capital
Ng (2006)	Canada; case study; wireless technology firms	It suggests correlation between different components of IC and business growth performance, which gave rise to the proposal for an IC flow statement

Table AI.
Brief overview of related studies

(*continued*)

Authors	Sample size	Findings
Pew Tan *et al.* (2007)	Singapore; $N=150$; mix of public listed firms	A positive relation exists between IC and the present and future performance of a company
Tovstiga and Tulugurova (2007)	Russia; $N=20$; technology intensive small firms	The findings concluded that the components of intellectual capital (human and structural) have a significant role in explaining the performance of Russian small enterprises
Kamath (2007)	India; period: 2000-2004; $N=98$; banking	The study concluded that there are vast differences in the intellectual and value creation of the Indian banks. However, the overall top performers in the value creation efficiency analysis were the foreign banks
Cabrita and Bontis (2008)	Portugal; $N=151$; mix of firms	Results reconfirms that intellectual capital has a significant and substantive impact on performance
El-Bannany (2008)	UK; period: 1999-2005; $N=60$; banking	Results indicate that the standard variables, bank profitability and bank risk, are important. The study confirms that investment in information technology (IT), bank efficiency, barriers to entry and efficiency of investment in intellectual capital variables are important determinants of intellectual capital performance
Muhammad and Ismail (2009)	Malaysia; period: 2007; $N=18$; mix of financial sector firms	Study confirms the association between IC and firms performance measured by profitability and Return on Assets (ROA). It was also reported that banking sector relied more on intellectual capital followed by insurance companies and Brokerage firms
Ghosh and Mondal (2009)	India; period: 2002-06; $N=80$; software and pharmaceutical	The findings of the study reveal that intellectual capital can explain profitability but not productivity and market valuation
Diez *et al.* (2010)	Spain; $N=211$; mix of firms	Results confirm the positive relation that exists between the use of human and structural capital indicators, and value creation measured by sales growth
Zeghal and Maaloul (2010)	UK; $N=300$; mix of high-tech, traditional, services	The study reported that companies' intellectual capital (IC) has a positive impact on economic and financial performance. However, it is noticed that the association between IC and stock market performance is only significant for high-tech industries and not traditional and service sectors. The study also indicate, that though capital employed is a major determinant of financial and stock market performance it has a negative impact on economic performance
Joshi *et al.* (2010)	Australia; period: 2005-07; $N=11$; banking	Study reveals significant relation with human costs and the value addition made by the Australian banks. Further banks have relatively higher human capital efficiency compared to capital employed efficiency and structural capital efficiency. Size, total number of employees and leverage has little or no impact on the IC performance of banks in Australia
Clarke *et al.* (2011)	Australia; period: 2004-08; $N=2161$; mix of listed firms	The findings suggest that there is a direct association between IC and performance of Australian publicly listed firms, particularly with CEE and to a lesser extent with HCE. A positive lag relationship between HCE, SCE and performance is also noticed
Maditinos *et al.* (2011)	Greece; period: 2006-08; $N=96$; mix of listed firms	Despite the fact that IC is increasingly recognized as an important strategic asset for sustainable competitive advantage, the results of the study fail to support

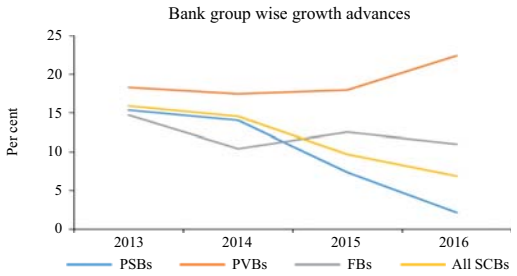
(*continued*)

Table AI.

Authors	Sample size	Findings
		such a claim. However, the study has reported statistically significant relationship between human capital efficiency and financial performance, concluding that the development of human resources seems to be one of the most essential factors of economic success in Greece
Chang and Hsieh (2011)	Taiwan; period: 2000-08; $N = 367$; semiconductor companies	Study reveals that intellectual capital (IC) in general has a negative impact on its financial and market performance in case of Taiwani companies. However, the association between innovation capital (R&D expenditure efficiency) and companies' operating, financial and market performance is statistically significant
Gruian (2011)	Romania; period: 2007-09; $N = 41$; publicly listed firms	The study brings forth the fact that the role of intellectual capital (IC) is essential for companies in achieving competitive advantages in emerging economies but performance is mainly driven by physical capital employed
Mehralian *et al.* (2012)	Iran; period: 2004-09; $N = 19$; listed pharmaceutical companies	Findings suggest that the performance of a company's intellectual capital (IC) can explain profitability but not productivity and market valuation for pharmaceutical companies in Iran. It was also found that physical capital (VACA) is the factor that has major impact on the profitability of the firms over the period of study
Mondal and Ghosh (2012)	India: period: 1999-2008; $N = 65$; banking	The results of the study indicate that IC is an important determinant of the bank's profitability and productivity. But among the components of IC the efficiency of HC plays major roles in enhancing the returns of banks
Alipour (2012)	Iran; period: 2005-07; $N = 39$; insurance	The findings of the study revealed that value added intellectual capital and its components have a significant positive relationship with companies' profitability
Joshi *et al.* (2013)	Australia; period: 2006-08; $N = 33$; financial sector firms	The study reveals that the performance of various components of VAIC and overall VAIC differs across financial sub-sectors. Investment companies have high value VAIC due to higher a level of human capital efficiency, as compared to banks, insurance companies, diversified financials and RIETs. Overall the value creation capability of financial sector in Australia is highly influenced by human capital
Vishnu and Gupta (2014)	India; period: 2005-11; $N = 22$; pharmaceutical	The study reveals instances of positive relationship between IC and corporate performance. However, relational capital (RC), does not demonstrate significant relationship with performance variables

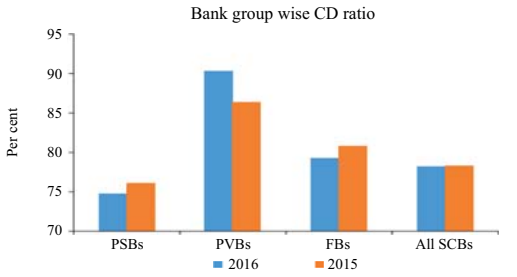
Table AI.

Appendix 2



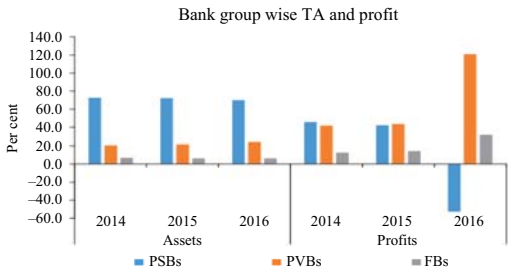
Growth in loans and advances of PSBs decelerated to 2.1 per cent in 2015-2016 from 7.4 per cent in the previous year. On the other hand it increased from 18 per cent to 21 per cent in the year 2016

where:
PSBs – public sector banks
PVBs – private sector banks
FBs – foreign banks
All SCBs – scheduled commercial banks



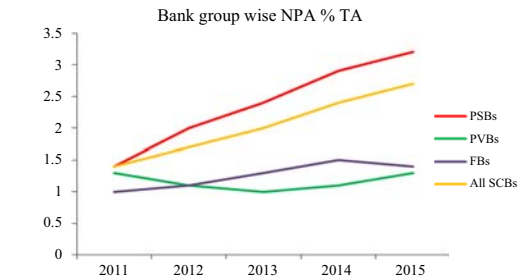
Credit-deposit (C-D) ratio of the banking system remained around 78 per cent, it was significantly higher at 90.3 per cent for private sector banks as on March 2016.

Where:
PSBs – public sector banks
PVBs – private sector banks
FBs – foreign banks
All SCBs – scheduled commercial banks



The declining trend in the share of total assets (TA) and profits of PSBs continued during 2015-2016 reflecting slower growth in assets and large losses. But private sector banks on the other hand have shown increasing trend.

Where:
PSBs – public sector banks
PVBs – private sector banks
FBs – foreign banks



The increasing trend in NPAs of PSBs continued during 2015 reflecting higher default rates. Private sector banks have the lowest NPA among the bank groups.

Where:
PSBs – public sector banks
PVBs – private sector banks
FBs – foreign banks
All SCBs – scheduled commercial banks
TA – total assets

Figure A1.
Recent trends in Indian banking industry

Source: Report on trend and progress of banking in India 2015-2016, RBI

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