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Clarifying the impact of corporate governance and intellectual capital on financial performance: A longitudinal study of Deutsche Bank (1957–2019)

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Abstract
This article empirically examines the nexuses between corporate governance, intangible resources, CEO traits, and financial performance. In contrast to prior research, this study examines these relationships in a longitudinal manner focusing on Deutsche Bank for the 1957–2019 period. To the best of our knowledge, this study is the first of its kind. Based on a novel hand collected dataset, our analysis suggests a significant positive relationship between intangible assets i.e., intellectual capital efficiency and financial performance measured by, return on assets (ROA) and return on equity (ROE). Our results further suggest that human capital efficiency drive the financial performance of Deutsche Bank at all times especially, during the economic malaise periods, suggesting that human capital is the main source of profitability for the Deutsche Bank. Additional results suggest that larger board size diminishes the impact of intangible resources on financial performance when the former CEO assumes board's chairmanship. Finally, our results suggest that CEO's education quality is an important determinant of financial performance during the crisis. Results observed in this study have important economic and policy implications for banks operating in the similar environments.

KEYWORDS
board diversity, CEO education quality, Deutsche Bank, financial performance, human capital efficiency, intellectual capital

1 | INTRODUCTION

Every organization has its own business model that enables it to create and deliver economic value to the society. The traditional business model of conventional banks has been to generate income from the difference between the interest charged to borrowers and the interest paid to savers. The rapid liberalization after the 1980s resulted in conventional banks developing new business models involving, among others, securitization of loans, investments, and trading activities, and the use of credit derivatives. The high-risk nature of such interest-based products has also been partly blamed for the financial crisis of 2007–2009.

In today's knowledge driven economic era, organizations are shifting from tangible physical capital resources to intangible resources to create value and sustain competitive advantage. This is relevant to survive in the modern, globalized and hardly dynamic business environment. Organizations need to cope with these drastic changes to profit from intangible resources with the aim to increase performance and competitiveness. For this reason, a rapid change from the production era to the knowledge era is being witnessed in economies around the world.

Banking and finance sector is the backbone of any country economy. It is one of the most knowledge-intensive sectors within any country economy (Nawaz, 2019). Banks being the financial services providers profoundly rely on intangible assets to maintain quality service as well as profitability in the ever-challenging business environment (Nawaz et al., 2020). Banks are relatively opaque, complex, and skill-intensive organizations, largely driving their profits from intangible assets, also referred to as intellectual capital. Intellectual capital is defined as *the knowledge resources used to create value and attain competitive advantage in the market*. The significance of intellectual capital (IC) in gaining and sustaining superior performance in the banking sector is well documented (see Nawaz et al., 2014; Nawaz & Haniffa, 2017).

IC studies have considered various banking sectors around the world, using different time periods and sample size, ultimately producing mixed results. Yet, there remains a flurry of empirical work examining the impact of intellectual capital on organizational outcomes in a longitudinal manner, especially in the banking services sector (few notable exceptions from the non-financial sector are, Campbell and Rahman (2010) and De Silva et al. (2014)). This study fills this gap by conducting a longitudinal study, first of its kind, into the impact of intellectual capital on financial performance of Deutsche Bank for the period 1957 to 2019.

On the other hand, corporate outcomes which financial performance is but one of them profoundly relies on good governance mechanisms to constrain agency problem and moral hazard (Nawaz, 2019). The significance of corporate governance is well recognized in the banking (De Cabo et al., 2012; Nawaz et al., 2020; Pathan & Faff, 2013) and non-banking sectors, including third-sector organizations (see, Nawaz, 2021). Besides, a few country-specific studies have been published, exploring the significance of governance practices in Germany (e.g., Hackethal et al., 2005). Nawaz and Haniffa (2017) note that corporate boards are responsible to watch over the organizational resources including, financial, physical, tangible, and intangible resources such as the intellectual

capital stocks. It is thus the fiduciary responsibility of the corporate board to ensure that managers have a continuous supply of these resources to create value not only for the principals but for a larger pool of stakeholders.

In the same vein, Nawaz et al. (2020) argues that value creation in today's knowledge-intensive era requires the financial institutions such as banks to maintain and strengthen their stocks of tangible and non-tangible resources, largely referred to as the intellectual capital resource base, hinting to study the impact of corporate governance and intellectual capital resources in a collective manner. Equally, research notes that agents including the Chief Executive Officer (CEO) possess certain talents and abilities subsumed under CEO traits that influence corporate outcomes (for example see, Hambrick & Quigley, 2014).

Despite the breadth and depth discussed in the existing empirical investigations, the reported results are mixed, at best, and they call for further investigation into the phenomenon. Notability, there remains a severe dearth of longitudinal studies in the context of banking and finance sector. With this background, we investigate the impact of corporate governance, including CEO traits and intellectual capital profiles on the financial performance of Deutsche Bank for the 1957–2019 period. We argue that the real impact of intangible resources can be witnessed in a longitudinal study because intangible assets take longer to develop internally and if acquired externally, they take longer to match the organizational culture and only influence corporate performance in the longer run. In doing so, we hope to explain the impact of corporate governance and intellectual capital on corporate performance in a prudent manner. Equally, we aim to enrich multiple literature streams such as corporate governance, intellectual capital, and bank performance with new insights derived from a longitudinal study.

Specifically, we add to the intellectual capital literature in general and the IC studies in the banking and finance (Joshi et al., 2013; Nawaz & Haniffa, 2017) by providing, first of its kind, longitudinal evidence on how IC and its subcomponents affect the performance outcomes of a leading global bank. While we supplement the handful of longitudinal studies in the IC literature (Campbell & Rahman, 2010; De Silva et al., 2014), results presented in this study extend our understanding of IC in value creation in a banking organization overtime. Relatedly, our results for the human capital efficiency provide new insights for the human capital theory of Pfeffer (1994), in recognizing the significance of human capital in maintaining and sustaining corporate performance in the financial services sector over a longer

period (Nawaz, 2019; Richard, 2000). Furthermore, results observed for the internal governance and monitoring mechanisms add to the lively debate in the corporate governance literature on the effectiveness of governance apparatus in large banking organizations (De Cabo et al., 2012; Nawaz et al., 2020; Pathan & Faff, 2013). Lastly, our results related to the agent heterogeneity underscore which CEO talent matters to the corporate performance outcomes measured by the financial proxies: return on assets (ROA) and return on equity (ROE), thereby, enriching an evolving literature stream (Hambrick & Quigley, 2014; Nawaz, 2021).

Results observed in this study have policy and economic implications that go beyond Deutsche Bank and can potentially serve a larger pool of stakeholders such as bankers, financial analysts, investors, academics/researchers, and the civic society, at large. Arguably, intangible assets such as IC has gained impetus resulting from the technological advances in the financial services sector also referred to as the FinTech, which has exposed the incumbents such as the Deutsche Bank in focus to some of the unanticipated challenges. Besides, heightening competition from Open Banks and the emerging trends in the financial markets such as the use of blank cheque companies or special purpose acquisition company (SPAC) in raising capital, are having direct impact on the bottom line of traditional commercial and investments banks and there is no exception for Deutsche Bank. These factors add further credibility to the arguments presented in our study by stemming the fact that competitive advantage lies in the efficient allocation and deployment of intangible resources. Thus, we suggest the banking and finance industry to capitalize on the intangible assets, should they wish to sustain competitive advantage and remain profitable even relevant -in this knowledge driven economy.

The paper is structured to discuss the theoretical underpinnings and background literature to drive the research hypotheses in Section 2. Followed by a description on data and research variables in Section 3. Section 4 presents the empirical analysis and discussion while Section 5 presents the concluding remarks.

2 | BACKGROUND AND HYPOTHESES

2.1 | Theoretical background

2.1.1 | Resource-based view of the firm

In today's knowledge economy, banks face an increasing competition from their rivals. The resource-based view explains how financial institutions can gain competitive advantage and link this to the impact of intangible assets. The resource-based view of the firm contends that the overall performance of a firm can largely be attributed to resources it owns, which are essential for sustainable competitive advantage in the market. The theory suggests that firms realize competitive advantage by an efficient allocation of organizational resources at their disposal (Barney, 1991). Moreover, the theory asserts that the prime focus of the management is to preserve a competitive advantage, which is fundamental for earning high profits (Richard, 2000).

Financial services firms such as banks possess a divergent bundle of resources with high levels of complexity and inimitability and the ownership of those resources is the key factor for earning profits. Richard (2000) notes that people or human intellectual capital are the most important asset for service providers such as banks for gaining competitive advantage. In contrast, structural intellectual capital, such as process or technologies, and capital employed is not challenging to replicate. For this reason, human intellectual capital can be seen as an essential factor (Nawaz, 2017; Pfeffer, 1994). Barney (1991) adds that competitive advantage is built on firm-specific recourses and these resources can be classified into four different characteristics, which are valuable, rare, imperfectly imitable, and non-substitutable. A valuable resource must create a surplus and to minimize inefficiency. A rare resource can produce value, which is unlikely to be reproduce by all competitors of the firm simultaneously. An imperfectly imitable resource is very difficult to imitate by competitor due to advanced technologies or complexity. A non-substitutable resource cannot easily be exchanged by another resource, which is either not imitable or rare.

Banks, such as the Deutsche Bank in focus, create value by offering products such as banking accounts or loans and other financial services i.e. financial advice or money transfer. To offer those products and services in an efficient manner, the bank deploys various resources such as buildings, financial capital, technologies, people, and skills. The handling of all the different resources within the process of producing goods and/or offering services empowers a bank with superior resources, which separates it from other business rivals (Richard, 2000). Accordingly, we argue that a sustainable competitive advantage for a bank is created by the uniqueness of advantageous resources owned by the bank and expect a direct significant impact of organizational resources i.e. intellectual capital base on performance outcomes.

2.1.2 | The agency perspective

A vast majority of the public listed companies have an organizational framework in which there is a clear

separation of ownership and control between principals and agents. The organization's owners (principals) hire employees or managers (agents) to act on their behalf and run the day-to-day business operations in principals' interest. Agency theory (Fama & Jensen, 1983) address the principal-agent phenomenon and explains the underlying complications. The theory assumes that there is a discrepancy of interests between agents and shareholders (principals). Agents are analytical but diplomatic. Additionally, the theory argues that agents tend to diverge to focus on personal gains rather than shareholders' wealth maximization thus violating the *agency contract* in the process. Managers (the agents) are hired, with promised rewards, by the principal to run the organization in all conscience. Therefore, the overall performance depends on the readiness to assume risks and efforts of the agents. The principal is at a disadvantage within this relationship because the agent's actions are not fully comprehensible or transparent to the principal. This leads to an information asymmetry between shareholders (principal) and manager (agent), which is problematic for the principal to validate the legitimacy of the benefits to the managers. For this reason, the principal is responsible to erect separate monitoring mechanisms to control agents' actions and to achieve overall transparency. The imbalance on information between principal and the agent leads to adverse selection. As the principals do not have the same access to organizational information as agents do, they are not able to evaluate agents' performance and cannot fully comprehend their achievements appropriately. Such lack of knowledge leads to the moral hazard and agency problems (Jensen & Meckling, 1976).

This phenomenon describes the circumstance of agents, which are not carrying out their duties in the most favourable manner for the principal. This hinders the principal to reward agents fairly. Because of that, a measurement system, which helps to evaluate managers, is of higher importance to the principal. Arguably, principals and agents need to come across with a trade-off between incentives and risk sharing. The incentive represents a motivational impulse for agents to deliver adequate performance. The risk sharing is an important factor for the agent as it is directly tied to the reward for their services. It is clear from the arguments presented above that corporate governance attributes such as board size, CEO-duality, and the proportion of non-executive directors have direct implications on performance outcomes. An effective governance mechanism is therefore necessary to monitor and direct the agents to work in the best interest of the principal, thereby, achieving required performance outcomes while maintaining competitive advantage over the competitors in the market (Fama & Jensen, 1983). Accordingly, we sought to analysis the impact of governance mechanisms on performance outcomes of Deutsche Bank.

2.2 | Intellectual capital efficiency and performance

2.2.1 | Value added intellectual coefficient (VAIC) and financial performance

As argued earlier, corporations are increasingly reliant on knowledge and experience, which constitutes IC, also referred to as the intangible assets, rather than pure financial assets to create value. An increasing number of studies pay attention to IC in the financial services sector (Joshi et al., 2013; Nawaz & Haniffa, 2017) and conclude that banking organizations need both physical and IC/intangible resources to create value (Nawaz et al., 2020).

Empirical studies that have employed VAIC methodology developed by Pulic (2000), report a significant positive relationship between IC efficiency and financial performance (see Nawaz et al., 2020 for a recent literature analysis especially, on the banking sector). However, the relationship between IC efficiency and banks' performance has been relatively unexplored in a longitudinal manner.

Resource-based view of the firm holds that an organization appraises the soundness of its resources before selecting an executable strategy. Since IC resources drive an organization's capability to innovate, we argue that the impact of IC resources will be more pertinent in a longitudinal study. Therefore, our first hypothesis, based on the financial performance is as follows:

> **Hypothesis 1.** there is a significant positive relationship between VAIC and financial performance of Deutsche Bank.

In order to fully understand the impact of VAIC on performance, it is imperative to consider the segregate impact of the sub-components of IC viz. human capital efficiency (HCE), structural capital efficiency (SCE) and capital employed efficiency (CEE). An analysis of sub-components will provide clearer evidence on which capital resources contribute and matter most to corporate performance outcomes.

2.2.2 | Human capital efficiency (HCE) and financial performance

Human capital efficiency refers to the value added by human resources stocks of an organization. Previous studies have suggested a significant relationship between human capital efficiency and financial performance of an organization (see Goh, 2005; Nawaz, 2019). Goh (2005) observe that financial performance of

Malaysian banks is mainly driven by human capital efficiency than by structural capital efficiency and capital employed efficiency. Joshi et al. (2013) investigated the intellectual capital performance within the Australian financial sector from 2006 to 2008 and reported that the examined banks had a higher human capital efficiency than structural capital and capital employed efficiencies. In conclusion, the empirical studies agree that human capital is strongly related to financial performance of banks. For Deutsche Bank human capital is of utmost importance as the bank facing continuous challenges in both internal and external markets and is fighting for its survival. The bank could potentially rely on its stock of human capital to maintain its position including its performance efficiency. The resource-based view of the firm thus give support to the following hypothesis:

> **Hypothesis 1.1.** there is a significant positive relationship between human capital efficiency and financial performance of Deutsche Bank.

2.2.3 | Structural capital efficiency (SCE) and financial performance

Nawaz (2019) contend that human capital cannot work alone and requires some sort of supporting mechanism in the form of structural/organizational capital. Structural capital thus works as a supporting mechanism for human and other capital resources within the firm to increase the overall efficiency of the organizational resources. This is especially the case for banking and finance organizations (Nawaz et al., 2020; Nawaz & Haniffa, 2017). Earlier research however has produced mixed results as to direction of the relationship between structural capital efficiency and performance (e.g., see Goh, 2005). The mixed results call for further investigation. For that reason and consistent with the aims and objectives of this study, we analyse the impact of structural capital efficiency on the financial performance of Deutsche Bank without predefining the direction of the relationship:

> **Hypothesis 1.2.** there is a significant relationship between structural capital efficiency and financial performance of Deutsche Bank.

2.2.4 | Capital employed efficiency (CEE) and financial performance

The final sub-component of VAIC is the capital employed efficiency (CEE). Several empirical studies found a positive and statistically significant relationship between CEE and firm performance. In support, earlier research (e.g., Joshi et al., 2013) report a positive impact of CEE on organizational performance. Employed capital and its efficiency will have direct implications for larger banks such as the Deutsche Bank in focus. Given its historical background in the field of financial services; we expect the bank to utilize its financial capital resources to maintain profitability. Accordingly, we expect a positive relationship between CEE and financial performance:

> **Hypothesis 1.3.** there is a significant positive relationship between capital employed efficiency and financial performance of Deutsche Bank.

2.3 | Corporate governance mechanisms and performance

Agency problem can be mitigated by erecting certain corporate governance mechanisms, which align the interests of managers (agents) to those of the owners/principals (Fama & Jensen, 1983). Empirical studies have considered the impact of several governance mechanisms on corporate performance outcomes. Accordingly, we include several corporate governance attributes in our analysis.

2.3.1 | Board size and financial performance

Board of directors have several functions. Their responsibilities range from setting corporate vision, mission, and values to providing strategic directions for the managers while monitoring their actions to safeguard the interests of the shareholders. Corporate board advises the CEO about strategic plans and strives to maintain maximum level of transparency for outsiders (Jensen, 1993). Most literature recommends smaller boards to be more preferable, because they seem to be more productive and be able to monitor the organization in a more effective way as opposed to larger boards, who are not critical to conflicts due to social loafing and therefore are less productive.

On the other hand, empirical studies that found a significant positive relationship between board size and financial performance argue that a larger board size is more advantageous. Nevertheless, Jensen (1993) recommended that the board size should not exceed eight members, as this size can be seen as ideal due to group dynamics. Given that, the sampled bank operates across

borders and given the nature and extent of its business and operational complexity, the bank may benefit from a larger board.

> **Hypothesis 2.1.** there is a significant positive relationship between board size and financial performance of Deutsche Bank.

2.3.2 | Board diversity and financial performance

Board composition in terms of diversity, largely refers to as board gender diversity i.e. fraction of female board of directors to board size, is one of the key cornerstone is explaining firm performance (Nawaz, 2021). Corporate governance literature advises to take female directors on board, because this reduces the risk of possible disagreements regarding the interests of shareholders, thereby, supporting the idea of increased representation of diversified directors on the board (see, De Cabo et al., 2012). Accounting for this tendency, we expect the board gender diversity i.e. higher fraction of female directors on the board to improve bank performance:

> **Hypothesis 2.2.** there is a significant positive relationship between board gender diversity and financial performance of Deutsche Bank.

2.3.3 | Former-CEO role duality and financial performance

CEO role-duality refers to the state when CEO simultaneously assumes the role of the board's chairperson. Jensen (1993) argues that CEO duality may weaken board of directors as the CEO assumes more power and with the potential to influence board and executives alike. Although, role duality was not detected within the annual reports of Deutsche Bank, the authors recognize that at Deutsche Bank the former CEO frequently served the role of the chairperson. With this background, we speculate that being the former CEO, the position holder may still be influential for the board due to long-term personal relationships with board members. We put this relationship to an empirical test:

> **Hypothesis 2.3.** there is a significant relationship between former-CEO-duality and financial performance of Deutsche Bank.

2.3.4 | CEO tenure and financial performance

Closely related to CEO role duality is CEO tenure. Longer serving CEOs may exploit their organizational knowledge to linger on to their position i.e. top executive of the organization. We thus, argue that longer serving CEO may spend more time on firm politics rather than focusing on organizational performance. Therefore, we expect a negative relationship between CEO role duality and financial performance:

> **Hypothesis 2.4.** there is a significant negative relationship between CEO-tenure and financial performance of Deutsche Bank.

2.4 | Control variables

Thus far, we have argued for the significance of board-level corporate governance variables in relation to financial performance of Deutsche Bank. Earlier research suggests that CEO traits have direct implications for corporate outcomes (for further analysis, see, Hambrick & Quigley, 2014; Nawaz, 2021, among others). Accordingly, we control for additional agent attributes that could influence corporate outcomes. Essentially, we profile each of the CEOs who served at Deutsche Bank over the past six decades to build a unique dataset, which measures the impact of CEO attributes *viz.* CEO age, CEO education (level and quality), CEO financial expertise, and experience on financial performance. Similarly, the above cited studies suggest that firm-specific attributes such as size and leverage potentially impact the organizational outcomes. Accordingly, we control for these variables in our analysis.

3 | DATA AND ANALYSIS

3.1 | Deutsche Bank

Deutsche Bank was founded in Berlin in 1870 with an annual turnover of €1.59 billion, it is the largest German bank existing. Deutsche Bank is organized into three divisional business segments, which are Corporate and Investment Bank (CIB), Private and Commercial Bank (PCB) and Deutsche Asset Management (DAM). Deutsche Bank has made few headlines lately as the bank received fines from the US financial regulator 1.9 billion USD in December 2013 and 725 million USD, 157 million USD in April 2017 and 41 million USD in May 2017 (Hamilton & Arons, 2017). While the ongoing legal battles are costly for the bank, they are also causing huge

TABLE 1 Descriptive statistics and correlation matrix

	Mean	SD	Min.	Max.	VIF	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. ROA	0.072	0.059	-0.127	0.309		1.000															
2. ROE	0.003	0.002	-0.004	0.015		**0.6762**															
3. VAIC	2.289	0.643	-0.897	2.922	4.26	**0.4222**	**0.4919**														
4. HCE	1.436	0.265	0.402	1.806	3.41	**0.449**	**0.344**	**0.3382**													
5. SCE	0.257	0.291	-1.485	0.446	3.57	**0.3847**	**0.3405**	**0.2567**	**0.3812**												
6. CEE	0.596	0.163	0.137	0.941	2.08	**0.573**	**0.2866**	**0.2138**	**0.3041**	**0.2584**											
7. Board-size	3	0.313	3	4	4.09	-0.064	0.0231	0.1954	0.2322	0.1055	0.2053										
8. Board-diversity	0.127	0.114	0	0.381	2.43	0.1257	0.2918	0.3996	**0.1237**	0.3267	0.3053	**0.2142**									
9. CEO-duality	0.35	0.481	0	1	6.26	-0.3159	**-0.1581**	-0.2429	-0.1679	-0.2472	-0.2442	**0.1323**	0.2047								
10. CEO-tenure	7	2.504	2	9	2.56	-0.0504	-0.2368	-0.2818	-0.2853	-0.2131	-0.268	-0.3156	-0.3229	-0.0421							
11. CEO-age	58	3.686	49	65	3.15	0.3096	**0.2165**	0.2608	0.1942	0.1905	**0.173**	0.1781	0.3655	-0.0565	-0.1878						
12. CEO-education	0.717	0.454	0	1	2.77	-0.0271	-0.041	-0.2912	**-0.3231**	-0.2571	-0.0029	**-0.1747**	**-0.305**	-0.3141	0.1552	-0.1398					
13. Education-quality	0.25	0.437	0	1	4.21	-0.2613	-0.5015	-0.4568	-0.4609	-0.4199	-0.3042	-0.1895	-0.6248	0.3833	0.4267	**-0.2677**	**0.163**				
14. CEO-FINEX	0.917	0.279	0	1	3.12	-0.0082	-0.1324	-0.11	-0.2467	-0.1357	0.2088	0.1387	0.0968	0.2212	0.2825	0.0959	-0.1896	0.1741			
15. CEO-experience	26	6.307	13	38	4.59	-0.0151	0.1765	0.2998	0.3334	0.2236	0.2417	**0.1948**	**0.1929**	0.243	-0.6015	-0.0424	-0.2132	-0.2919	**-0.2386**		
16. Bank-size	11.054	0.886	9.631	12.343	5.72	-0.126	-0.3791	-0.4234	-0.3848	-0.3489	**-0.4226**	**-0.1527**	**-0.2156**	-0.0258	**0.3548**	**-0.4392**	**0.4211**	**0.2312**	0.0368	**-0.3912**	
17. Leverage	4.309	0.083	4.209	4.499	3.53	-0.2792	-0.3081	-0.3317	**-0.4778**	**-0.4274**	**-0.3584**	**-0.4282**	**-0.3795**	0.2111	0.4019	-0.3539	0.3994	0.2386	0.0245	**-0.3443**	**0.4372**

Note: Table 1 provides descriptive statistics, correlations matrix as well as results for the variance inflation factors (VIFs) to test for all regressions to check for multicollinearity. Table 1 also provides the definitions of research variables used in this study. *Dependent variables:* Return on Assets (ROA) and return on Equity (ROE) are our main dependent variables, which are the ratio of net income to average total assets, and net income to shareholder's equity, respectively. *Independent variables:* VAIC is the value added intellectual coefficient, a composite sum of HCE + SCE + CEE. CEE is capital employed efficiency. SCE is structural capital efficiency. HCE is human capital efficiency. *Board attributes:* Board-size is the natural logarithm of total number of directors serving on the board. Board-diversity is the ratio of female board of directors to total board size. Former CEO-duality takes the value of one if the current board chair served as CEO of bank previously, and zero otherwise. *Agent heterogeneity:* CEO-tenure and CEO-age are computed in years. CEO-education is a dummy variable which is coded one if the CEO holds a college degree, and zero otherwise. Education quality is a dummy variable which is coded one if the CEO graduated from top100 universities, and zero otherwise. CEO-expert (CEO-FINEX) is a dummy variable which is coded one if the CEO graduated with a degree in finance, and zero otherwise. CEO-experience is computed in years. *Firm-level controls:* Bank-size is the log of total assets and leverage is total debt to total equity ratio. Variables significant at $p < 0.05$ and $p < 0.01$ are in bold.

reputational damage to Deutsche Bank's reputation. In addition, Deutsche Bank share price seems to be in an unstoppable downswing since the economic crisis in 2007–09. In 2006, Deutsche Bank's share price reached its top level at 91€. In September 2017, the share price was 13.42€, which indicates the tough time for the organization and in September 2020 the share price stood just under 8€ per share. Nevertheless, the Deutsche Bank was a very successful bank for many years in its history and became one of the most successful and largest banks in the world. For this reason, and for the reason that no literature has been published on the impact of intellectual capital on the financial performance of a German bank, the Deutsche Bank is selected for further investigation. Another reason for choosing Deutsche Bank is its higher amounts of fines in recent year as discussed above. Therefore, the corporate governance structure of Deutsche Bank seems to be a reasonable topic for further investigation as well and will be linked to the financial performance of the bank.

3.2 | Data

This is a longitudinal study on Deutsche Bank. With this aim in mind, we started collecting financial and corporate governance data. We wanted to include the maximum number of firm year observations. We were able to stretch our sample period over six decades. We extract data from bank's annual reports, quarterly reports, press releases, newspaper articles, bank's website, individual CEO's personal or company websites (where applicable), and other publically available, independently verifiable, resources. We dropped observations where we were unable to verify the collected data from at least two independent sources. Our final sample consists of sixty-two firm-year observations, covering the 1957–2019 period. Table 1 provides definitions of variables.

3.3 | Descriptive statistics and correlation matrix

Table 1 presents the descriptive statistics and correction matrix for all the variables included in this study. Our main dependent variables return on assets (ROA) and return on equity (ROE) have mean values of 0.072 and 0.003, indicating the financial performance trends at Deutsche Bank during the study period. As for the continuous independent variables, the mean for VAIC,[1] HCE, SCE, and CEE are 2.28, 1.44, 0.26, and 0.59, respectively. Figure 1 illustrates trends in intellectual capital efficiency proxied by VAIC and financial performance computed by ROA during the study period (1957–2019).

Similarly, the average board-size is 3 with 13 percent gender diversity ratio while 35% of the CEOs included in our sample later on took the board's chairperson role and the average CEO tenure is around 7 years. Turning to the CEO-related control variables, it can be seen that the average age of the CEO is over 58 years with over 70% of the CEOs with college degree, including 25% who graduated from top100 universities. Majority of the CEOs are finance graduates with an average working experience of 25 years with minimum and maximum values of 13 and 38 years. Finally, the average values for bank-size and leverage during the study period are 11.05 and 4.31, respectively.

We also run the Variance Inflation Factors (VIFs) test for all regressions to check for multicollinearity. Results reported in column 6 show no problems of multicollinearity between the independent variables. The average VIF score is 3.72 with maximum and minimum values of 6.26 and 2.08, respectively.

4 | EMPIRICAL ANALYSIS AND DISCUSSIONS

4.1 | Econometrics specification

We used the following model to test our research hypotheses.

$$\text{Financial performance} = \alpha + \beta_1 \text{IC} + \beta_2 \text{CG} + \gamma \text{Control} + \varepsilon$$

where financial performance is the proxy for the performance (captured using financial ratios, ROA and ROE), variable IC is the matrix of intellectual capital efficiency, variable CG is the matrix of corporate governance mechanisms (i.e. board size, board diversity, CEO duality and CEO tenure), Control is a matrix of CEO-traits and bank-specific characteristics ε is the error term, α is the constant, and β and γ are the vectors of coefficient estimates. We use this model to analyse the effects of (i) intellectual capital efficiency (VAIC, HCE, SCE and CEE) and corporate governance attributes on financial performance of Deutsche Bank.

4.2 | The impact of intellectual capital on financial performance measured by ROA

We analyse the impact of intellectual capital measure by VAIC on financial performance measured by return on assets (ROA), using the econometric model defined above. Results reported in Table 2 show a statistically significant, at the 1% level, positive relationship between IC
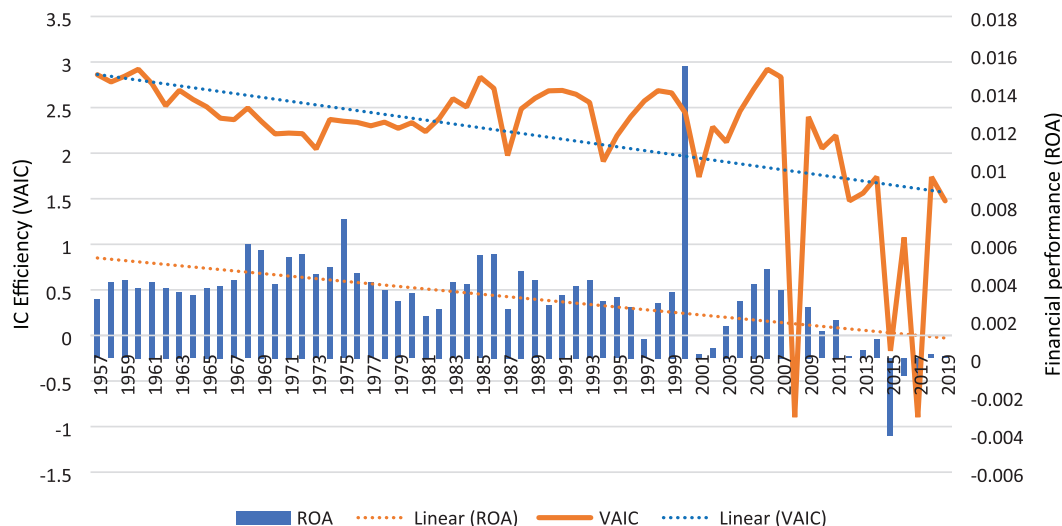
FIGURE 1 Trends in IC efficiency (VAIC) and financial performance (ROA) during the study period (1957–2019) [Colour figure can be viewed at wileyonlinelibrary.com]

efficiency and ROA. These results are consistent with the earlier studies (e.g., Goh, 2005; Nawaz & Haniffa, 2017, among others). The relationship remains statistically significant across models. Therefore, we accept our first research hypothesis (H_1). These results suggest that Deutsche Bank is efficient in using its intellectual capital resources to generate higher profitability during the study period.

Next, we introduce the corporate governance related variables in our regression equation. Results reported in columns 3, 4, and 5 suggest that board-size and CEO role duality relate negatively, at the 10% level, with ROA. Thus, we reject hypothesis ($H_{2.1}$) with weak statistical significance that larger board size may improve financial performance. The latter results i.e. hypothesis ($H_{2.3}$) suggest that when a former CEO leads the board, financial performance suffers. Our analysis further suggests that higher fraction of female board of directors improve financial performance. The statistically significant relationship, at the 5% level, provides support for hypothesis ($H_{2.2}$). Our results add to the ongoing debate on board room gender diversity (e.g., De Cabo et al., 2012). We do not find any statistical support to accept or reject hypothesis ($H_{2.4}$).

Surprisingly, none of the CEO-related control variables i.e. CEO age, education level and quality, financial expertise, and CEO experience explains financial performance. As for the bank-specific control variables, we find that bank size (positively) and leverage (negatively) relate with financial performance (ROA).

To supplement the observed results, we run further regressions with interaction variables. We regress the joint impact of board-size and former-CEO role duality (Board-size*CEO-duality) on ROA. Results reported in

column 7 suggest a statistically significant, negative, relationship, at the 1% level, implying that when a former CEO leads a relatively larger board, bank's financial performance suffers. The relationship turns positive when we interact board-size and board diversity (Board-size*Board-diversity) but our results remain statistically insignificant. Nonetheless, the latter results suggest that board diversity may correct corporate board's direction in monitoring the agents.

4.3 | The impact of intellectual capital on financial performance measured by ROE

We repeat the same analysis by changing our main dependent variable, financial performance measure from return on assets (ROA) to return on equity (ROE). Results reported in Table 3 are consistent with those observed in Table 2 for the alternative proxy. These results are largely consistent with varying degrees statistical support for certain variables however, they add further value to our findings and strengthen our arguments.

4.4 | The impact of intellectual capital (IC) and IC sub-components (human, structural and capital employed efficiency) on financial performance

In Table 4, we report results for the impact of intellectual capital and IC sub-components (human, structural and capital employed efficiency) on alternative financial

TABLE 2 The impact of intellectual capital (VAIC) on financial performance measured by ROA

Dependent variable: Return on assets (ROA)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VAIC	0.00151***	0.00156***	0.00169***	0.00168***	0.00167***	0.00178***	0.00187***	0.00189***
	(7.472)	(6.251)	(6.513)	(5.909)	(5.895)	(5.032)	(5.112)	(4.952)
Board-size (Ln)		-0.00124*	-0.000943	-0.000479	-0.000476	0.000375	0.0150***	0.0145***
		(-1.998)	(-1.337)	(-0.592)	(-0.584)	(0.553)	(2.953)	(3.214)
Board-diversity			0.0159**	0.0162**	0.0162**	0.0163**	0.0934***	0.0954**
			(2.018)	(2.038)	(2.016)	(2.482)	(2.869)	(2.610)
CEO-duality				-0.000541*	-0.000540*	-0.000424	-0.000252	-0.00418
				(-1.368)	(-1.406)	(-0.550)	(-0.326)	(-0.453)
CEO-tenure (Ln)					-0.000192	-8.962105	-0.000252	-0.000277
					(-0.497)	(-0.144)	(-0.436)	(-0.487)
CEO-age (Ln)						0.00411	0.00428	0.00384
						(0.476)	(0.493)	(0.469)
CEO-education						0.000517	0.000158	0.000308
						(1.086)	(0.301)	(0.519)
Education-quality						-0.000507	-0.000593	-0.000510
						(-0.179)	(-0.210)	(-0.188)
CEO-FINEX						-0.00107	-0.000673	-0.000853
						(-0.425)	(-0.262)	(-0.367)
CEO-experience (Ln)						-0.0128	-0.00662	-0.0114
						(-0.280)	(-0.142)	(-0.285)
Board-size*CEO-duality							-0.0242***	-0.0248**
							(-2.821)	(-2.556)
Board-size*Board-diversity								0.00125
								(0.432)
Bank-size (Ln)	0.00157	0.000997	0.00144	0.00111	0.00118	0.000624	0.000737	0.000700
	(1.257)	(0.687)	(0.945)	(0.713)	(0.761)	(0.334)	(0.393)	(0.384)
Leverage	-0.0247**	-0.0208	-0.0161	-0.0114	-0.0116	-0.00390	-0.00348	-0.00381
	(-2.166)	(-1.631)	(-1.588)	(-1.043)	(-1.074)	(-0.273)	(-0.244)	(-0.270)
Year dummy	Included	Included	Included	Included	Included	Included	Included	Included
Constant	0.0891**	0.0824**	0.0464*	0.0282	0.0289	-0.0135	-0.0655	-0.0592
	(2.489)	(2.161)	(1.919)	(1.007)	(1.048)	(-0.112)	(-0.502)	(-0.485)
Adj. R^2	0.408	0.413	0.507	0.502	0.493	0.476	0.487	0.478

Note: Table 2 provides results for the regression analysis, analysing the effects of intellectual capital on financial performance: return on assets (ROA). The econometric analysis is conducted to test research hypotheses (H_1, $H_{2.1}$, $H_{2.2}$, $H_{2.3}$, and $H_{2.4}$). Table 1 provides definitions for all variables. Robust *t*-statistics in parentheses.

***$p < 0.01$. **$p < 0.05$. *$p < 0.1$.

performance proxies namely, return on assets (ROA) in Panel A and return on equity (ROE) in Panel B. We use the same econometric equation to extract results for Model 1, Model 1a, Model 1b, and Model 1c with ROA as the dependent variable. We repeat our analysis with ROE as the dependent variable to extract results for

Model 2, Model 2a, Model 2b, and Model 2c, respectively.

IC and its sub-components viz. human capital efficiency (HCE), structural capital efficiency (SCE), and capital employed efficiency (CEE), all relate positively with both the financial measure proxies, ROA, and

T A B L E 3 The impact of intellectual capital (VAIC) on financial performance measured by ROE

Dependent variable: Return on equity (ROE)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VAIC	0.0668***	0.0676***	0.0704***	0.0704***	0.0710***	0.0738***	0.0754***	0.0755***
	(11.73)	(11.82)	(12.90)	(12.78)	(12.70)	(11.68)	(11.24)	(10.61)
Board-size (Ln)		-0.0179	-0.0114	-0.0131	-0.0133	-0.00267	0.285**	0.282***
		(-1.382)	(-0.771)	(-0.690)	(-0.707)	(-0.143)	(2.526)	(2.696)
Board-diversity			0.346**	0.345**	0.345**	0.327**	1.849**	1.862**
			(2.447)	(2.414)	(2.406)	(2.679)	(2.652)	(2.482)
CEO-duality				-0.00202	0.00197	-0.0111	-0.00768	-0.0346
				(-0.184)	(0.177)	(-0.552)	(-0.386)	(-0.181)
CEO-tenure (Ln)					0.00967	0.00478	0.00158	0.00140
					(1.163)	(0.371)	(0.131)	(0.117)
CEO-age (Ln)						0.164	0.168	0.165
						(0.956)	(0.957)	(0.959)
CEO-education						0.00363	-0.00344	-0.00242
						(0.316)	(-0.254)	(-0.157)
Education-quality						0.0112	0.00951	0.0101
						(0.209)	(0.178)	(0.194)
CEO-FINEX						0.00278	0.0107	0.00945
						(0.0589)	(0.224)	(0.215)
CEO-experience (Ln)						-0.154	-0.0323	-0.0651
						(-0.177)	(-0.0363)	(-0.0808)
Board-size*BEO-duality							-0.478**	-0.482**
							(-2.426)	(-2.295)
Board-size*Board-diversity								0.00855
								(0.143)
Bank-size (Ln)	0.0442*	0.0359	0.0455	0.0467	0.0432	0.0215	0.0237	0.0235
	(1.937)	(1.349)	(1.652)	(1.669)	(1.550)	(0.611)	(0.675)	(0.684)
Leverage	-0.365*	-0.308	-0.207	-0.224	-0.211	0.0390	0.0473	0.0451
	(-1.733)	(-1.320)	(-1.065)	(-1.080)	(-1.015)	(0.124)	(0.150)	(0.142)
Year dummy	Included	Included	Included	Included	Included	Included	Included	Included
Constant	1.004	0.906	0.126	0.194	0.156	-1.324	-2.350	-2.307
	(1.491)	(1.280)	(0.244)	(0.323)	(0.259)	(-0.551)	(-0.910)	(-0.921)
Adj. R^2	0.565	0.563	0.643	0.637	0.633	0.625	0.632	0.624

Note: Table 3 provides results for the regression analysis, analysing the effects of intellectual capital on financial performance: return on equity (ROE). The econometric analysis is conducted as an early robustness test with an alternative proxy for firm performance, namely ROE. Table 1 provides definitions for all variablesRobust t-statistics in parentheses.
***$p < 0.01$. **$p < 0.05$. *$p < 0.1$.

ROE with varying degrees of statistical significance. Thus, we accept hypotheses ($H_{1.1}$, $H_{1.2}$, and $H_{1.3}$). Our results suggest that human capital and capital employed mainly drive IC efficiency, relative to structural capital. These findings add to the earlier literature (e.g., Joshi et al., 2013; Nawaz et al., 2020; Nawaz & Haniffa, 2017).

4.5 | Further analysis

Financial sector, banks with complexed business models such as the Deutsche Bank, in particular, has received increased scrutiny from stakeholders following the financial crisis, which had affected bank performance. As mentioned earlier in Section 3.1, Deutsche Bank has also

TABLE 4 The impact of intellectual capital (IC) and IC sub-components (human, structural and capital employed efficiency) on financial performance

	Panel A: Dependent variable, ROA				Panel B: Dependent variable, ROE			
	Model 1	Model 1a	Model 1b	Model 1c	Model 2	Model 2a	Model 2b	Model 2c
VAIC	0.0738***				0.00178***			
	(11.68)				(5.032)			
HCE		0.191**				0.00494***		
		(8.399)				(5.355)		
SCE			0.140**				0.00334**	
			(9.578)				(4.500)	
CEE				0.281***				0.00572**
				(2.977)				(2.141)
Board-size (Ln)	-0.00267	-0.00508	-0.000946	-0.0164	0.000375	0.000348	0.000409	1.722105
	(-0.143)	(-0.257)	(-0.0467)	(-0.654)	(0.553)	(0.488)	(0.602)	(0.0224)
Board-diversity	0.327**	0.353***	0.294**	0.298**	0.0163**	0.0171**	0.0155**	0.0154**
	(2.679)	(2.997)	(2.390)	(2.030)	(2.482)	(2.639)	(2.363)	(2.260)
CEO-duality	-0.0111	-0.0247	-0.00974	-0.0104	-0.000424	-0.000733	-0.000400	-0.000507
	(-0.552)	(-1.460)	(-0.367)	(-0.395)	(-0.550)	(-1.044)	(-0.463)	(-0.544)
CEO-tenure (Ln)	0.00478	0.00378	0.000898	0.0128	-8.960105	-0.000112	-0.000183	6.541205
	(0.371)	(0.287)	(0.0730)	(0.776)	(-0.144)	(-0.182)	(-0.300)	(0.100)
CEO-age (Ln)	0.164	0.234	0.203	0.0822	0.00411	0.00565	0.00508	0.00300
	(0.956)	(1.520)	(1.014)	(0.383)	(0.476)	(0.702)	(0.560)	(0.290)
CEO-education	0.00363	0.0220	0.00187	-0.0410**	0.000517	0.00105*	0.000464	-0.000511
	(0.316)	(1.478)	(0.149)	(-2.527)	(1.086)	(1.738)	(0.949)	(-1.014)
Education-quality	0.0112	0.0189	0.0251	-0.0213	-0.000507	-0.000324	-0.000172	-0.00113
	(0.209)	(0.369)	(0.442)	(-0.344)	(-0.179)	(-0.118)	(-0.0600)	(-0.400)
CEO-FINEX	0.00278	0.0456	0.0134	-0.0662	-0.00107	-2.853206	-0.000812	-0.00239
	(0.0589)	(0.984)	(0.269)	(-1.030)	(-0.425)	(-0.00114)	(-0.315)	(-0.762)
CEO-experience (Ln)	-0.154	0.0452	0.180	-0.423	-0.0128	-0.00943	-0.00447	-0.0143
	(-0.177)	(0.0569)	(0.197)	(-0.374)	(-0.280)	(-0.219)	(-0.0962)	(-0.257)
Bank-size (Ln)	0.0215	0.0137	0.0542	-0.00153	0.000624	0.000341	0.00142	0.000335
	(0.611)	(0.412)	(1.476)	(-0.0273)	(0.334)	(0.198)	(0.759)	(0.143)
Leverage	0.0390	0.121	-0.370	0.380	-0.00390	-0.000852	-0.0138	0.000968
	(0.124)	(0.411)	(-0.943)	(0.692)	(-0.273)	(-0.0647)	(-0.914)	(0.0663)
Year dummy	Included	Included	Included	Included	Included	Included	Included	Included
Constant	-1.324	-2.094	-0.0436	-1.970	-0.0135	-0.0355	0.0174	-0.0221
	(-0.551)	(-0.946)	(-0.0157)	(-0.672)	(-0.112)	(-0.306)	(0.138)	(-0.182)
Adj. R^2	0.625	0.630	0.575	0.390	0.476	0.502	0.456	0.376

Note: Table 4 provides results for the regression analysis, analysing the effects of IC sub-components on financial performance: ROA (panel A) and ROE (panel B). The econometric analysis is conducted to test research hypotheses ($H_{1.1}$, $H_{1.2}$, and $H_{1.3}$). Table 1 Provides definitions for all variables. Robust *t*-statistics in parentheses.
***$p < 0.01$. **$p < 0.05$. *$p < 0.1$.

been in the spotlight due to some of the irregularities which led to huge financial penalties against the bank in addition to reputational damages which had a direct impact on Deutsche Bank's market valuation. Nawaz (2019) highlights the significance of organizational resources during the economic malaise and reports

TABLE 5 The impact of intellectual capital (IC) and IC sub-components on financial performance: stable period vis-à-vis economic malaise

Dependent variable: Return on assets (ROA)								
	Panel A: Stable period				Economic malaise			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
VAIC	0.00317***				0.00165**			
	(4.182)				(2.517)			
HCE		0.00410**				0.00595***		
		(2.578)				(2.985)		
SCE			0.00905**				0.00275*	
			(2.677)				(2.360)	
CEE				0.00376				0.00967
				(1.262)				(1.667)
Board-size (Ln)	-0.000290	-0.000132	-9.952105	0.000471	-0.00381	-0.00101	-0.00453	-0.00734
	(-0.452)	(-0.188)	(-0.143)	(0.671)	(-0.586)	(-0.196)	(-0.640)	(-1.069)
Board-diversity	0.00568	0.00758*	0.00774*	0.00936	0.0200	0.0202	0.0230	0.0130
	(1.248)	(1.746)	(1.792)	(1.681)	(0.901)	(1.095)	(0.967)	(0.465)
CEO-duality	-0.00118	-0.00116	-0.00119	-0.000825	0.00271	0.00158	0.00333	0.00249
	(-1.342)	(-1.279)	(-1.307)	(-0.937)	(0.584)	(0.352)	(0.717)	(0.511)
CEO-tenure (Ln)	-0.000543	-0.000571	-0.000602	-0.000428	0.000402	-0.000195	0.00253	-0.00398
	(-1.278)	(-1.311)	(-1.402)	(-0.947)	(0.0487)	(-0.0304)	(0.290)	(-0.316)
CEO-age (Ln)	-0.00362	0.000456	0.000165	-0.000654	-0.0163	-0.0167	-0.0187	-0.00953
	(-0.547)	(0.0666)	(0.0242)	(-0.0877)	(-0.544)	(-0.578)	(-0.610)	(-0.255)
CEO-education	-0.000172	0.000292	0.000269	-0.000172	0.00437	0.00624	0.00466	0.000599
	(-0.315)	(0.537)	(0.484)	(-0.256)	(0.628)	(0.909)	(0.672)	(0.0625)
Education-quality	-0.00532	-0.00451	-0.00443	-0.00908	0.00369**	0.00315**	0.00318**	0.00195
	(-0.931)	(-0.828)	(-0.780)	(-1.099)	(2.749)	(2.126)	(2.136)	(1.402)
CEO-FINEX	-0.00389***	-0.00221*	-0.00230*	-0.00350*	-0.00331	-0.00177	-0.002	-0.00248
	(-3.075)	(-1.745)	(-1.826)	(-1.776)	(-1.013)	(-0.365)	(-1.226)	(-0.736)
CEO-experience (Ln)	-0.0607**	-0.0396	-0.0397	-0.0378	-0.117	-0.132	-0.144	-0.0254
	(-2.555)	(-1.479)	(-1.515)	(-1.354)	(-0.441)	(-0.506)	(-0.559)	(-0.0640)
Bank-size (Ln)	-0.000459	-0.000442	-0.000413	-0.000928	0.00324	0.00235	0.00268	0.00555
	(-0.354)	(-0.278)	(-0.261)	(-0.647)	(0.561)	(0.449)	(0.461)	(0.637)
Leverage	-0.0377	-0.0259	-0.0264	-0.00992	-0.0316	-0.0239	-0.0442	-0.00348
	(-1.599)	(-1.079)	(-1.082)	(-0.377)	(-1.022)	(-0.775)	(-1.456)	(-0.0926)
Year dummy	Included	Included	Included	Included	Included	Included	Included	Included
Constant	0.198*	0.123	0.129	0.0653	0.198	0.166	0.275	0.0203
	(1.874)	(1.206)	(1.252)	(0.536)	(0.631)	(0.561)	(0.869)	(0.0459)
Adj. R^2	0.521	0.456	0.462	0.388	0.227	0.302	0.196	0.156

Note: This provides results for the regression analysis, analysing the effects of IC and its sub-components viz. human capital efficiency, structural capital efficiency, and capital employed efficiency on financial performance, measured by ROA in two separate periods: stable period (Panel A) and economic crisis period (Panel B). Our econometric specification remains unchanged, except for controlling for the respective periods. Table 1 provides definitions for all variables. Robust t-statistics in parentheses.

***$p < 0.01$. **$p < 0.05$. *$p < 0.1$.

on their efficiencies in a comparative manner. Following Nawaz's (2019) suggestion, we perform a further analysis controlling for periods of economic distress covered during the study period.

Results reported in Table 5 show that intellectual capital and the efficiency of its sub-components relate positively with the financial performance at all times. However, the relationship is not statistically strong during the economic crisis periods, except for the human capital efficiency. This indicates human capital is the most significant capital resource that has helped Deutsche Bank to maintain its profitability, not only in the stable periods but during the economic malaises as well. This is further strengthened by the results for the CEO's education quality. The plausible interpretation of the positive and statistically significant relationship between CEO's education quality and financial performance is that CEOs who graduate from top100 universities are better equipped with the knowledge and skills to lead large and complexed organizations during periods of financial distress. These results merit further investigation.

5 | CONCLUSION

The main objective of this paper is to empirically investigate the impact of corporate governance mechanisms and intellectual capital (IC) on bank performance. In contrast to prior research, this study analysis these relationships in a longitudinal manner focusing on one of the leading banks in the world: Deutsche Bank for the 1957–2019 period. We further analyse the nexuses between corporate governance, intangible resources and financial performance while controlling for CEO traits and bank-specific attributes during stable periods vis-à-vis the period of economic distress. Additionally, we measure the impact of IC sub-components viz. human capital, structural capital and capital employed efficiencies on financial performance of Deutsche Bank during the study period. Financial performance is measured using two alternative proxies: return on assets (ROA) and return on equity (ROE). To the best of our knowledge, this longitudinal study is the first of its kind conducted on a German-based bank.

Based on a novel hand collected dataset, extracted from various sources, our analysis suggests a significant positive relationship between intangible assets i.e. intellectual capital and financial performance measures. Our results remain consistent across performance measures: ROA and ROE. Furthermore, the segregate analysis suggests that IC efficiency is determined by human capital efficiency and capital employed efficiency and to a lesser extent by structural capital efficiency. We

further report that human capital efficiency drives the financial performance of Deutsche Bank at all times, especially, during the periods of economic meltdowns, suggesting that human capital is the main source of profitability for the bank.

Results for the impact of corporate governance features and financial performance suggest that board gender diversity i.e. ratio of female directors on the board relate positively with the financial performance across measures. Finally, we report that CEO's education quality i.e. when the CEO holds a degree from a top100 university, is an important determinant of financial performance during the crisis.

Our study makes several incremental contributions to multiple literature streams. First, we add to the intellectual capital literature, particularly, studies that focus on banking organizations (Joshi et al., 2013; Nawaz & Haniffa, 2017) by providing, first of its kind, longitudinal evidence on how IC and its subcomponents affect the performance outcomes of a leading global bank. Second, while we supplement to the handful of longitudinal studies in the IC literature such as Campbell and Rahman (2010) and De Silva et al. (2014), results presented in our study extend the general understanding of IC in value creation in a banking organizations overtime, extending the timeline to over six decades. Third, our results for the human capital efficiency provide new insights for the human capital theory of Pfeffer (1994), in recognizing the significance of human capital in maintaining and sustaining corporate performance in the financial services sector over a longer period (Nawaz, 2019; Richard, 2000). Strong and statistically significant results across stable economic periods and financial distress suggest that human capital is the main value driver in the banking industry. Fourth, results observed for the corporate governance mechanisms supplement the lively debate on the effectiveness of governance apparatus in large banking organizations (De Cabo et al., 2012; Nawaz et al., 2020; Pathan & Faff, 2013). Fifth, our results related to CEO attributes show which CEO attribute matters to the corporate performance, thereby, enriching an evolving literature stream (Hambrick & Quigley, 2014; Nawaz, 2021). Particularly, the noted results for the positive link between CEO education quality and bank performance during the financial crisis period merit further empirical investigation.

To the best of our knowledge, this longitudinal study is the first of kind, which examines the impact of corporate governance and intellectual capital on Deutsche Bank's financial performance. Results observed in this study thus have policy and economic implications that go beyond Deutsche Bank in focus and can potentially serve a larger pool of stakeholders such as bankers, financial

analysts, investors, academics/researchers, and the civic society, at large. Arguably, intangible assets such as IC has gained impetus resulting from the technological advances in the financial services sector also referred to as the FinTech, which has exposed the incumbents such as the Deutsche Bank in focus to some of the unforeseen challenges. One such challenge is the outdated IT systems (i.e., the structural capital resources), which are not compatible to the latest FinTech solutions. As a result, an emerging type of banks i.e. Open Banks, which are well equipped to match the FinTech initiatives are catering the financial needs of a larger clientele and directly posing heightening competition to conservative incumbents in commercial banking. Besides, emerging trends in the financial markets such as the use of blank cheque companies or special purpose acquisition company (SPAC) to raise financial capital, are having direct impact on the bottom line of investments banking organs of the incumbents and there is no exception for Deutsche Bank. These factors add further credibility to the arguments presented in our study by stemming the fact that competitive advantage lies in the efficient allocation and deployment of intangible resources. Thus, we suggest the banking and finance industry -both executives and the monitoring authorities such as the corporate boards -to capitalize on the intangible assets, should they wish to sustain competitive advantage and profitability in this knowledge driven economy.

Results observed in this study have important implications for banks operating in the similar environments and thus are not limited to the Deutsche Bank in focus. The results, however, can potentially assist Deutsche Bank's strategic direction by suggesting which organizational resource is more important for profitability and competitive advantage. Likewise, the results provide novel insights to other market participants such as financial analysists, individual and organizational investors, researchers, academics, and the public. Equally, we hope to encourage the potential researchers to undertake longitudinal research when analysing the impact of organizational resources, intangible resources such as IC, in particular, on corporate outcomes. Precisely, we encourage the future research to account for other corporate governance attributes such as board busyness, frequency of board meetings, board members recruitment background etc. and their impact of corporate outcomes. While we use only accounting-based performance measures i.e. ROA and ROE, the future research may consider the market-based measures such as Tobin's Q while analysing the impact of corporate governance features and intellectual capital (IC) on economic performance.

ENDNOTE

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DATA AVAILABILITY STATEMENT

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