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Corporate Governance and FinTech Innovation: Evidence from Saudi Banks

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Abstract: The rising adoption of FinTech is changing the financial sector. However, the determinants of FinTech have not been examined thoroughly. The purpose of this paper is to examine whether corporate governance is related to FinTech products in the banking sector, given that governance may influence the quantity and quality of innovation. Specifically, we investigate the association between the size of the board of directors, the percentage of independent directors on the board and FinTech services. Furthermore, we show how the composition of the board can influence the association between FinTech services and a bank's performance. Using a sample of 12 Saudi banks for the period 2014–2019, we find that board size is significantly and negatively associated with a bank's FinTech score. We further show that independent members on the board contribute to performance by bringing more FinTech services (innovation development) to the banks. As the first study examining the determinants of FinTech in the Saudi banking sector, this paper may help regulators to better understand the drivers of FinTech and its quality in the banking sector.

Keywords: corporate governance; FinTech services; FinTech firms; Islamic banks; conventional banks; financial performance

JEL Classification: G20; G21

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1. Introduction

The importance of FinTech in the banking industry has increased since 2008 as new companies have begun to provide financial services to customers directly, raising the competition for the banking industry (Thakor 2020). In fact, Phan et al. (2020) suggests that emerging FinTech companies could replace banks since they are more effective and efficient. This has pushed the banking industry to give more attention to FinTech, increasing the number of FinTech products over time (Wang et al. 2020; Hornuf et al. 2020). In spite of these developments, the determinants of FinTech quality in the banking industry are hardly understood. To this end, the purpose of this paper is to examine whether corporate governance is related to the quality of FinTech products. Corporate governance is one of the most important mechanisms to assure sustainable development in firms. This includes investing more in innovation, including financial innovation. Many countries, including Saudi Arabia, have updated their corporate governance codes to enhance corporate governance practices and assure that managers act in the best interests of shareholders.

Existing studies suggest that corporate governance mechanisms could reduce agency costs and improve decision making. One of the most important corporate governance mechanisms is the board of directors. Resource dependency theory holds that the board of directors may bring more knowledge and experience to firms, allowing them to manage uncertainty in the external environment and obtain access to important resources (Hillman et al. 2009; Pfeffer and Salancik 2003). In this regard, the board of directors may help banks to develop rapidly in the market, leading them to achieve better FinTech quality.

Alternatively, agency theory focuses on the role of directors in monitoring management and reducing conflicts of interest that may arise from the separation of ownership and management. From this point of view, the board of directors may lead to excessive monitoring, which hinders FinTech quality. To better investigate these possibilities, we focus on two important factors in the composition of boards of directors, namely board size and board independence.

Previous studies argue that the board of directors can bring and influence firms' innovation (Jaskyte 2009; Wu and Lee 2007). King (1992) states that leadership brings new innovation to firms. Members on the board may plan for strategic changes (including initiating innovation) to improve the firm's performance and to compete in the market (Davis 1991). In this regard, the board of directors might appreciate new FinTech products and facilitate financial technology as a response to the rapid changes in the financial sector.

Even though prior studies assert the importance of the board of directors, there is still a gap in the literature examining the relationship between the board of directors and innovation in banks. Empirical studies on innovation have ignored the characteristics of the board of directors (Markman et al. 2001; O'Sullivan 2000). One of the unexplored areas in this field is the influence of the board of directors on FinTech quality. Therefore, we contribute to the existing literature on innovation by filling this gap, as innovation is well known to be key to firm survival, alongside the fact that a capable board that governs for innovation can bring a competitive advantage to a firm (Miozzo and Dewick 2002).

In this study, we use a hand-collected dataset from 12 listed banks in Saudi Arabia covering a period of 6 years, ranging from 2014 to 2019. Saudi Arabia is rapidly adopting FinTech, as evidenced by the new cryptocurrency "ABER" set between the Saudi Arabia Monetary Authority (SAMA) and the United Arab Emirates Central Bank (UAECB), which requires further examination on the various aspects of FinTech within the region.[1] A number of initiatives have been provided to support the FinTech sector in Saudi Arabia. For example, the Fintech Saudi initiative was launched by the Saudi Central Bank in partnership with the Capital Market Authority in April 2018 to act as a catalyst for the development of the financial services technology (FinTech) industry in Saudi Arabia. The ambition of this initiative is to transform Saudi Arabia into an innovative FinTech hub with a thriving and responsible FinTech ecosystem. Regulators have released a number of amendments to improve the corporate governance codes in Saudi Arabia. These amendments started in 2006, with the last amendment released in 2023.

We find that board size has a negative association with FinTech services, suggesting that a large board may focus on the outward environment rather than the internal environment. Furthermore, this paper shows that independent members on the board contribute to the bank's performance by improving its FinTech quality.

This paper makes several contributions to both the corporate governance and the FinTech literature. First, prior studies have shown an association between corporate governance and R&D performance (Chung et al. 2003), bank performance (Grove et al. 2011) and risk-taking (Aljughaiman and Salama 2019), yet we extend this body of literature by showing the association between corporate governance and FinTech service quality. Second, FinTech studies mainly concentrate on the implication of FinTech for bank performance (Al-Matari et al. 2022; Arena et al. 2023) or risk-taking (Deng et al. 2021). We extend this by examining the determinants of FinTech and show that board characteristics are associated with FinTech services. Finally, this paper extends the analysis by investigating the board of directors' effectiveness in innovation-related decisions.

Our findings have several implications for regulators and banks, as they contribute to the innovation polices and regulation in the financial sector. In particular, and to the best of our knowledge, this is the first paper that empirically shows the association between board characteristics and FinTech services and products in the Saudi banking sector. Such findings may highlight for policy makers and investors the importance of governance as a driver of FinTech in banks, which can be crucial for the competitiveness of banks and the financial sector in the country as a whole.

The rest of the paper is structured as follows: Section 2 reviews the literature and develops hypotheses. Section 3 presents the data and the methodology. Section 4 presents the empirical evidence, and the conclusion is presented in Section 5.

2. Literature Review and Hypothesis Development

2.1. FinTech and Corporate Governance

FinTech relates to the usage of technology to deliver better financial services (Thakor 2020; Goldstein et al. 2019). This innovation should provide a more effective and efficient method to deliver these services. Furthermore, the usage of this technology in the financial sector allows firms in the market to create new financial products such as digital payments, online money transfers, crowdfunding, micro-lending, digital accounts, robo-advisory services, online wealth management solutions and blockchain-based cryptocurrency.

However, empirical studies provide contradicting views on the impact of FinTech on bank performance. This is because innovation is not always productive as many new technologies fail to achieve the goal of providing better financial services.

On the one hand, some studies suggest that FinTech has a positive impact on bank performance. For example, Ky et al. (2019) find a positive relation between FinTech and bank performance. Moreover, Deng et al. (2021) found that the adoption of FinTech reduced risk-taking in banks, which in part came from an increase in a bank's efficiency and improvements in their governance. Similarly, Al-Matari et al. (2022) studied whether board characteristics and FinTech impact corporate performance. They also examined whether or not FinTech moderates this relationship. Examining the financial sector of Saudi Arabia, they found that FinTech is positively associated with corporate performance and that it does not moderate the relationship between performance and board characteristics.

Moreover, Mohd Haridan et al. (2023) argue that the adoption of FinTech enhances the ability of the Shariah Board to provide timely assurance with respect to a bank's compliance with Sharia considerations. This can potentially lead well-governed firms to adopt more FinTech solutions to aid in their governance role in addition to improving performance. Further, Almahadin et al. (2023) argue that the adoption of FinTech may improve the performance of a company through channels such as efficiency improvements and cost saving, enhanced transparency, faster payouts and a reduced likelihood of fraud. Also, Arena et al. (2023) find that FinTech improves a bank's performance, and that better governance reduces the negative relation between FinTech and the riskiness of banks, which may point to a decline in the conflicts of interest. These arguments may suggest that effective boards may accelerate the adoption of FinTech products.

On the other hand, Almulla and Aljughaiman (2021), Beccalli (2005), Alber (2011) and Jalal-Karim and Hamdan (2010) find a negative relationship between FinTech and a bank's performance. More recently, Zhao et al. (2022) found that FinTech has a negative impact on a bank's performance and the quality of their assets, especially in large, state-owned commercial banks.

These conflicting findings highlight the importance of understanding the determinants of FinTech and the factors that can potentially impact the nature of the relationship between FinTech and a bank's performance. One of the possible factors that may control FinTech quality is corporate governance mechanisms. Corporate governance refers to a set of internal and external mechanisms that reduce agency conflicts stemming from the separation of ownership and management (Baysinger and Hoskisson 1990; Shleifer and Vishny 1997). These mechanisms might relate to innovations and high technologies. Davis (1991) argues that corporate governance has an important impact on bringing innovation to a firm. Prior studies report that higher insider ownership and institutional ownership are positively associated with R&D investments (Baysinger et al. 1991). Further, He and Tian (2013) find that stronger analyst coverage is associated with fewer patents and patents with lower impacts, in line with the view that analyst coverage fosters short-termism. In contrast, other studies find that while analyst coverage leads to lower R&D investments, it

pushes firms to make better investments in R&D, leading to better innovations and patents (Guo et al. 2018).

According to resource dependence theory (Hillman et al. 2009; Pfeffer and Salancik 2003), the external environment may affect firm behavior. In detail, firms need to bring in experts to compete with external threats and be able to access external sources. Board members have experience, knowledge, skills, reputation and social relationships. Consequently, an effective board of directors may be able to improve a firm's ability to access critical resources and may bring the most innovative tools to help the firm to compete with their competitors. Therefore, an effective board of directors might be able to enhance a bank's financial technology due to their experience and ability to access outside resources. FinTech can be classified as innovation products that allow banks to meet customer needs, which in turn enhances the bank's reputation and performance. Thus, an effective board of directors might be associated with higher-quality FinTech products.

2.2. Board Size

Board composition contributes to the differences in the amount of environmental uncertainty (Pfeffer 1973; Pfeffer and Salancik 2003). While a large board may concentrate on the firm's goals, objections and strategies, it is also possible that it might be less concerned with these areas and focus on the firm's internal activities. Large boards seem to be more outwardly focused (Alexander et al. 1993). The empirical literature shows that conflicting views exist on the relationship between board size and agency problems and performance. On the one hand, it is possible that larger boards are associated with lower FinTech quality because they can be influenced by the CEO and are slower at making decisions (Cheng 2008; Jensen 1993; Yermack 1996) and coordinating within the firm (Cheng 2008; Wintoki et al. 2012). This is because larger groups may struggle in their internal communication and in reaching the consensus needed to reach critical decisions. Staikouras et al. (2007) find that larger boards are associated with lower profitability in European banks. The same is also found to be true in Chinese banks (Liang et al. 2013).

On the other hand, board members are resources to the firm (Kiel and Nicholson 2003) and increase its pool of expertise (Grove et al. 2011). Arguably, having more resources on the board (i.e., directors) may provide the firm with a wider network, which it can tap into to obtain the required talent and information. Thus, larger boards may lead to better FinTech quality.

As the literature supports two possible directions for the influence of board size on FinTech quality, we suggest a non-directional hypothesis as follows:

H01. *There is a significant association between board size and FinTech quality.*

2.3. Board Independence

Prior studies provide conflicting arguments on whether board independence improves corporate performance. One strand of the literature suggests that independent directors might be related to better FinTech quality as they prevent managers from pursuing their private agendas and short-termism. Lu and Wang (2015) find that independent directors are associated with lower capital investments and higher R&D investments, consistent with the view that independent directors reduce agency problem related to free cash flow. Moreover, board independence could lead to better monitoring and control of myopic cuts to innovation, which are required for improvements in FinTech (Rodrigues et al. 2020). Liang et al. (2013) find that board independence is related to better bank performance and asset quality, while Staikouras et al. (2007) do not find a systematic relationship.

Another strand of the literature suggests that independent directors may know less about the nature of the business, leading to a negative association between board independence and FinTech quality. This possibility might be more pronounced in the banking industry due to its complexity (Grove et al. 2011). This complexity is likely to be greater around FinTech products given their innovative nature.

H02. *There is no relationship between board independence and FinTech quality.*

3. Data and Methodology

3.1. Sample

This study consists of a sample of 12 listed banks in Saudi Arabia, 4 of which are Islamic banks (IBs) and 8 are conventional banks (CBs), for the period 2014 to 2019.[2] We followed the previous literature to filter the sample (e.g., Aljughaiman and Salama 2019; Beck et al. 2013) as follows: the banks need to (1) have FinTech data; (2) be fully fledged commercial banks; and (3) have three years of data. The final sample includes 60 bank–year observations. Table 1 presents the sample distribution.

Table 1. Sample distribution.

Year	Freq.	Percent
2014	10	16.67
2015	10	16.67
2016	10	16.67
2017	10	16.67
2018	10	16.67
2019	10	16.67
Total	60	100

We obtained the consolidated financial data from the Bloomberg database. The corporate governance and bank FinTech services data were collected manually from the banks' annual reports available on their official websites.[3] GDP and inflation variables were collected from the World Bank databases.

3.2. Measurement of Variables

To measure our dependent variable, we used a new approach to assess the quality of the banks' FinTech services. Following Almulla and Aljughaiman (2021), we examined the banks' reports and websites and the previous literature to determine the common FinTech services provided. We obtained a total of 7 FinTech services provided by banks in Saudi Arabia during our testing period: consumable micro-lending, digital payments, digital savings associations, crowdfunding, robo-advisors, blockchain and robo-portfolio management. Consequently, we created 7 dummy variables that represent each FinTech service provided by a bank in a certain year. Finally, we summed up the score for each bank in each year to find a score that expresses the banks' development of new FinTech services every year (2014–2019). For instance, if a bank has a FinTech score of 4 out of 7 in 2015, it means that the bank developed 4 FinTech services in 2015.

For our main explanatory variables, we used board size and board independence to represent the effectiveness of the boards of directors. Following Aljughaiman and Salama (2019) and Mollah and Zaman (2015), we measured board size by taking the total number of board members. We also calculated the percentage of independent members by dividing the total number of independent members in the board by the total number of board members. We controlled for firm-specific variables following existing FinTech studies (Ky et al. 2019; Phan et al. 2020). These include firm size measured using a natural logarithm of total assets (size); bank performance measured by taking the return on total assets (ROAs); the capital ratio, i.e., total capital to total assets (CAP); the market risk measured using the CAPM model (beta);[4] and Islamic banks by creating a dummy variable that takes the value of 1 if the bank is Islamic, and 0 otherwise (Islamic). The reason we included firm size and performance in our model is that small-sized firms might have limited fund resources, restricting their ability to invest in innovation. Bank financial performance is also one of the important factors that can influence firms' ability to invest in innovation. The capital ratio and market risk can provide a picture of the level of risk taken by firms, which could affect

their investment in innovation. Furthermore, we controlled for country-specific variables, namely the gross domestic product growth rate (GDP) and inflation rate (INF). Please look at Table 2 for more information regarding variable definitions.

Table 2. Definitions and abbreviations of variables.

Variables	Description	Abbreviation
	Dependent variables	
FinTech services	Score of bank's usage of FinTech	FS
	Independent variables	
Board size	The number of members on the board	BS
Independent directors	The percentage of independent directors on the board	IND
	Control Variables	
Banks' performances	Net profit to total assets	ROA
Bank size	Natural log of total assets	SIZE
Capital ratio	Total capital to total assets	CAP
Islamic bank	A dummy that takes the value of 1 if the bank is Islamic, and 0 otherwise	Islamic
Beta	The market risk, computed using the CAPM model using the prior 3 years of returns (monthly)	BETA
GDP	Annual GDP growth rate	GDP
Inflation	Annual inflation rate (consumer price index, CPI)	INF

Note: this table presents the definitions and abbreviations of all variables.

3.3. Estimation Models

We used Pooled Ordinary Least Squares (OLS) to examine our hypotheses. We also controlled heteroscedasticity by taking robust standard errors. Furthermore, we re-ran our model using an ologist approach as our main dependent variable has a restriction value between 1 and 7 and to control for the ordinal nature of the dependent variable (Aljughaiman et al. 2023). It is argued that when dependent variables are ordinal rather than continuous, it is better to use an ordered logit model. We used different classifications of control variables such as firm-specific variables to test the sensitivity of the results. We also controlled for the year fixed effect. Furthermore, we re-estimated our model using the lagged approach to control endogeneity problems.

We used the following models:

$$Fintech\ Services_{it} = \alpha it + \beta it Xit + \varepsilon it$$

where:

$Fintech\ Services_{it}$ is the bank FinTech score i at time t;
i refers to an individual bank, and t refers to the year;
αit is a constant;
Xit is the independent and control variables;
εi is an error term.

$$Fintech\ Services_{it} = \alpha_0 + \beta_1 BSize_{it} + \beta_2 IND_{it} + \beta_3 CAP_{it} + \beta_4 Size_{it} + \beta_5 ROA_{it} + \beta_6 beta_{it} + \beta_7 islamic_{it} + \beta_8 GDP_{it} + \beta_9 INF_{it} + \epsilon_{it}$$

4. Main Results

4.1. Descriptive Statistics and Correlation

Table 3 presents the descriptive statistics for all the variables used in our model.[5] The mean value of the FinTech score is 4.61, which means that on average banks provide around five types of FinTech services. The boards of banks in Saudi Arabia consist of approximately 9 members, and the maximum number of members on a board is 13. The

results in Table 3 show that the mean value of the full sample for the independent member percentage is around 45%. Furthermore, the range of this sample is between 11% and 91%. Also, the mean values of the bank size, bank performance, bank capital ratio and bank beta are 10.3, 1.3%, 27% and 1.6, respectively. In addition, 45% of the banks in our sample are Islamic banks.

Table 3. Descriptive statistics.

Variable	N	Mean	p50	sd	Min	Max
FS	60	4.617	5.000	1.786	1.000	7.000
BoardS	60	9.242	9.000	1.868	3.000	13.000
IND	60	0.452	0.429	0.142	0.111	0.909
Size	60	10.393	10.509	1.828	6.391	13.619
ROA	60	1.346	1.580	0.988	−1.833	2.756
CAP	60	0.275	0.253	0.123	0.053	0.796
BETA	60	1.649	0.844	4.606	−6.661	18.825
Islamic	60	0.450	0.000	0.499	0.000	1.000
GDP	60	2.711	2.434	1.471	−0.742	5.106
INF~e	60	1.625	2.018	1.699	−2.093	4.070

Table 4 presents the correlation matrix for all the variables in our model to investigate any multicollinearity problems. The table reveals that there is no strong association between the explanatory variables as there is no coefficient value higher than 80%.

Table 4. Correlation matrix.

	1	2	3	4	5	6	7	8	9
BoardS (1)	1								
IND (2)	0.0674	1							
Size (3)	0.0409	−0.057	1						
ROA (4)	−0.0209	−0.0061	0.4523 *	1					
CAP (5)	−0.1375 *	0.1696 *	−0.4445 *	−0.1006	1				
BETA (6)	0.1138 *	0.0075	−0.0171	0.0603	0.0913	1			
Islamic (7)	−0.1981 *	−0.0018	−0.3055 *	−0.1436 *	0.2043 *	0.0695	1		
GDP (8)	−0.0894	0.0223	−0.2221 *	0.011	0.0733	0.048	0.021	1	
INF (9)	−0.0509	−0.0282	−0.1977 *	−0.0066	0.0805	−0.0688	0.018	0.6109 *	1

Note: Heteroscedasticity—robust standard errors are in parentheses. * $p < 0.1$

4.2. Multivariate Analyses

We regressed the composition of the boards of directors on the quality of the banks' FinTech services. Table 5 presents the results for the association between board size, board independence and FinTech services. Column (1) shows the results using the OLS estimation method, while column (2) shows the same relationship using the Ologit method. Both estimation methods reveal that there is a significant negative association between board size and FinTech service quality. This means that a larger board may negatively affect a bank's innovation by restricting its development of FinTech products. It is possible that larger boards struggle to communicate and reach the consensus needed to make complex decisions. They may also face the free-rider problem as board members over-rely on their peers. Smaller boards are more effective in improving firm innovation and thus developing FinTech services. This is consistent with the study by Alexander et al. (1993). The results also show that the presence of independent members on the board is not related to FinTech services. This is consistent with H02.

Table 5. Regression results: association between BOD and FinTech.

Variables	(1) OLS	(2) Ologit
BoardS	−0.279 ***	−0.484 ***
	(0.103)	(0.185)
IND	−2.035	−2.876
	(1.275)	(1.952)
Size	0.0535	−0.0710
	(0.276)	(0.514)
ROA	−0.201	−0.313
	(0.372)	(0.858)
CAP	−2.631	−0.973
	(5.174)	(10.78)
BETA	−0.0162	−0.0234
	(0.0322)	(0.0691)
Islamic	0.865 **	2.089 **
	(0.377)	(0.823)
GDP	−2.211 ***	−4.110 ***
	(0.550)	(1.195)
INF	0.768 **	1.246 *
	(0.331)	(0.748)
Constant	12.74 ***	−20.74 **
	(4.123)	(8.876)
Year effects	YES	YES
Observations	58	58
R-squared	0.666	0.313

Note: Heteroscedasticity—robust standard errors are in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

For the control variables, the bank size, performance, capital ratio and beta show no significant association with FinTech services. Interestingly, the table shows that Islamic banks in Saudi Arabia adopt more FinTech services than conventional banks. Furthermore, GDP growth has a significant negative impact on FinTech services, while inflation is positively related to the latter.

4.3. Additional Test

For a robustness check, we re-ran our model using the lagged approach. This was to control the endogeneity problem that can be created as a result of reverse causality. Therefore, we lagged out the main variables (board size and board independence) for one previous year. The results are presented in Table 6. Nevertheless, we tested the boards' effectiveness in managing bank development and innovation. In other words, we investigated whether the boards of directors' decisions for improving the banks' FinTech services are associated with positive performance. To this end, we assessed the moderating effect of the board of director variables on the association between FinTech services and bank performance. Specifically, we created two additional variables by taking the interaction between the composition of the board of directors and FinTech. We present the results of these tests in Table 7. We find that board size has no influence on the association between FinTech and performance. However, we discovered that the presence of independent members could enhance banks' FinTech quality, and thus increase their performance.

Table 6. Lagged approach.

Variables	(1) FS
l.BoardS	−0.234 ***
	(0.0766)
l.IND	−1.563
	(1.072)
Size	-7.66×10^{-6}
	(0.295)
ROA	0.0398
	(0.393)
CAP	−1.227
	(4.263)
BETA	−0.0107
	(0.0289)
Islamic	1.141 ***
	(0.375)
GDP	−1.188 ***
	(0.265)
INF	0.359 *
	(0.192)
Constant	10.53 ***
	(3.759)
Year effects	YES
Observations	49
R-squared	0.674

Heteroscedasticity—robust standard errors are in parentheses. * $p < 0.1$; *** $p < 0.01$.

Table 7. The moderating effect of the board on the association between FinTech and performance.

Variables	(1) ROA
FS	−0.251
	(0.352)
BODS_FS	−0.0197
	(0.0348)
IND_FS	0.923 **
	(0.350)
BoardS	0.0466
	(0.153)
IND	−3.554 **
	(1.457)
Size	0.496 ***
	(0.120)
CAP	0.0244 **
	(0.0113)
BETA	0.247
	(0.156)
Islamic	0.442 **
	(0.214)

Table 7. *Cont.*

Variables	(1) ROA
GDP	−0.230 *
	(0.127)
INF	−3.583 **
	(1.709)
Year effects	YES
Observations	58
R-squared	0.582

Note: Heteroscedasticity—robust standard errors are in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

5. Conclusions

In this study, we investigate the association between the corporate governance and FinTech service quality of banks. Specifically, we examine the association between board size and independence and FinTech services in banks. The growth of FinTech services in Saudi Arabia specifically and the world more generally has motivated this study. The previous literature does not cover the influence of FinTech services on the banking sector. We also extend our analysis to examine the effectiveness of boards in attracting successful FinTech services. Our sample covers 12 Saudi banks for the period 2014 to 2019. We find that the board size has a significant negative effect on the quality of FinTech services. We also show that the presence of relevant members on the board may enhance the bank's performance by adopting new FinTech services.

This study contributes to the existing literature by moving one step beyond the association between FinTech and bank performance. To the best of our knowledge, this research is the first to examine the association between the composition of the board of directors and FinTech services. Our study also examines the board's effectiveness in introducing good-quality FinTech. This paper has implications for regulators and banks, as it is linked to the financial industry.

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Data Availability Statement: The data are available upon request.

Conflicts of Interest: The authors declare no conflicts of interest.

Notes

1 https://www.sama.gov.sa/en-US/News/Pages/news29012019.aspx, accessed on 12 June 2022.

2 This period was chosen due to the significant increase in FinTech in Saudi Arabia during the past decade (FinTech Saudi 2020). Furthermore, we tried to exclude the effect of COVID-19, starting from 2020. Most firms have been influenced by the pandemic, which might affect their innovation investments.

3 Examples of FinTech services that are provided by banks: consumable micro-lending, digital payments, digital savings associations, robo-advisors, blockchain and wealth management.

4 We used the prior 3 years of returns (monthly) to calculate standard deviation.

5 We windsorized all variables at 5–95% to eliminate skewness or kurtosis problems.

References

Alber, Nader. 2011. The effect of banking expansion on profit efficiency of Saudi Arabia Commercial Banks. *Journal of Global Business and Economics* 3: 11–23.

Alexander, Jeffery A., Mary L. Fennell, and Michael T. Halpern. 1993. Leadership instability in hospitals: The influence of board-CEO relations and organizational growth and decline. *Administrative Science Quarterly* 38: 74–99. [CrossRef]

Aljughaiman, A. Abdullah, and Aly Salama. 2019. Do banks effectively manage their risks? The role of risk governance in the MENA region. *Journal of Accounting and Public Policy* 38: 106680. [CrossRef]

Aljughaiman, A. Abdullah, Aly Salama, and Thanos Verousis. 2023. Corporate governance, Shari'ah governance and financial flexibility: Evidence from the MENA region. *International Journal of Finance & Economics*, 1–20. [CrossRef]

Almahadin, Hamed, Maha Shehadeh, Anwar S. Al-Gasaymeh, Ibrahim A. Abu-AlSondos, and Anas Ahmad Bani Atta. 2023. Impact of Blockchain Technology and Fintech on Sustainable Performance. Paper presented at 2023 International Conference on Business Analytics for Technology and Security (ICBATS), Dubai, United Arab Emirates, March 7–8; pp. 1–5. [CrossRef]

Al-Matari, Ebrahim Mohammed, Mahfoudh Hussein Mgammal, Mushari Hamdan Alosaimi, Talal Fawzi Alruwaili, and Sultan Al-Bogami. 2022. Fintech, Board of Directors and Corporate Performance in Saudi Arabia Financial Sector: Empirical Study. *Sustainability* 14: 10750. [CrossRef]

Almulla, Dur, and Abdullah A. Aljughaiman. 2021. Does financial technology matter? Evidence from an alternative banking system. *Cogent Economics & Finance* 9: 1934978.

Arena, Claudia, Simona Catuogno, and Valeria Naciti. 2023. Governing FinTech for performance: The monitoring role of female independent directors. *European Journal of Innovation Management* 26: 591–610. [CrossRef]

Baysinger, Barry, and Robert E. Hoskisson. 1990. The composition of boards of directors and strategic control: Effects on corporate strategy. *Academy of Management Review* 15: 72–87. [CrossRef]

Baysinger, Barry D., Rita D. Kosnik, and Thomas A. Turk. 1991. Effects of Board and Ownership Structure on Corporate R & D Strategy. *The Academy of Management Journal* 34: 205–14.

Beccalli, Elena. 2005. Does IT investment improve banks' performance. Evidence from Europe. *Journal of Banking & Finance* 31: 2205–30.

Beck, Thorsten, Asli Demirgüç-Kunt, and Ouarda Merrouche. 2013. Islamic vs. conventional banking: Business model, efficiency and stability. *Journal of Banking & Finance* 37: 433–47.

Cheng, Sshijun. 2008. Board size and the variability of corporate performance. *Journal of Financial Economics* 87: 157–76. [CrossRef]

Chung, Kee H., Peter Wright, and Ben Kedia. 2003. Corporate governance and market valuation of capital and R&D investments. *Review of Financial Economics* 12: 161–72.

Davis, Gerald F. 1991. Agents without principles? The spread of the poison pill through the intercorporate network. *Administrative Science Quarterly* 36: 583–613. [CrossRef]

Deng, Liurui, Yongbin Lv, Ye Liu, and Yiwen Zhao. 2021. Impact of Fintech on Bank Risk-Taking: Evidence from China. *Risks* 9: 99. [CrossRef]

FinTech Saudi. 2020. FinTech Saudi Annual Report. Available online: https://fintechsaudi.com/wp-content/uploads/2020/03/Fintech_Saudi_Annual_Report-Eng.pdf (accessed on 12 June 2022).

Goldstein, Italy, Wei Jiang, and G. Andrew Karolyi. 2019. To FinTech and beyond. *The Review of Financial Studies* 32: 1647–61. [CrossRef]

Grove, Hugh, Lorenzo Patelli, Lisa M. Victoravich, and Pisun Xu. 2011. Corporate governance and performance in the wake of the financial crisis: Evidence from US commercial banks. *Corporate Governance: An International Review* 19: 418–36.

Guo, Bing, David Perez-Castrillo, and Anna Toldrà-Simats. 2018. Firms' innovation strategy under the shadow of analyst. *Journal of Financial Economics* 131: 456–83. [CrossRef]

He, Jie (Jack), and Xuan Tian. 2013. The dark side of analyst coverage: The case of innovation. *Journal of Financial Economics* 109: 856–78. [CrossRef]

Hillman, Amy J., Michael C. Withers, and Brian J. Collins. 2009. Resource dependence theory: A review. *Journal of Management* 35: 1404–27. [CrossRef]

Hornuf, Lars, Milan F. Klus, Todor S. Lohwasser, and Armin Schwienbacher. 2020. How do banks interact with FinTech startups? *Small Business Economics* 57: 1505–26. [CrossRef]

Jalal-Karim, A., and A. M. Hamdan. 2010. The impact of information technology on improving banking performance matrix: Jordanian banks as case study. Paper presented at European Mediterranean and Middle Eastern Conference on Information System, Abu Dhabi, United Arab Emirates, April 12–13; pp. 21–33.

Jaskyte, K. 2009. Innovation in Human Service Organizations. In *Human Services as Complex Organizations*. Edited by Y. Hasenfeld. Thousand Oaks: Sage.

Jensen, Michael C. 1993. The modern industrial revolution, exit, and the failure of internal control systems. *The Journal of Finance* 48: 831–80. [CrossRef]

Kiel, Geoffrey C., and Gavin J. Nicholson. 2003. Board composition and corporate performance: How the Australian experience informs contrasting theories of corporate governance. *Corporate Governance: An International Review* 11: 189–205. [CrossRef]

King, Nigel. 1992. Modelling the innovation process: An empirical comparison of approaches. *Journal of Occupational and Organizational Psychology* 65: 89–100. [CrossRef]

Ky, Serge, Clovis Rugemintwari, and Alain Sauviat. 2019. Is FinTech Good for Banks' Performance? The Case of Mobile Money in the East African Community. Available online: https://ssrn.com/abstract=3401930 (accessed on 5 June 2019).

Liang, Qi, Pisun Xu, and Pornsit Jiraporn. 2013. Board characteristics and Chinese bank performance. *Journal of Banking & Finance* 37: 2953–68.
Lu, Jun, and Wang Wang. 2015. Board independence and corporate investments. *Review of Financial Economics* 24: 52–64. [CrossRef]
Markman, Gideon D., David B. Balkin, and Leon Schjoedt. 2001. Governing the innovation process in entrepreneurial firms. *The Journal of High Technology Management Research* 12: 273–93. [CrossRef]
Miozzo, Marcela, and Paul Dewick. 2002. Building competitive advantage: Innovation and corporate governance in European construction. *Research Policy* 31: 989–1008. [CrossRef]
Mohd Haridan, Nurfarahin, Ahmad Fahmi Sheikh Hassan, Sabarina Mohammed Shah, and Hasri Mustafa. 2023. Financial innovation in Islamic banks: Evidence on the interaction between Shariah board and FinTech. *Journal of Islamic Accounting and Business Research* 14: 911–30. [CrossRef]
Mollah, Sabur, and Mahbub Zaman. 2015. Shari'ah supervision, corporate governance and performance: Conventional vs. Islamic banks. *Journal of Banking & Finance* 58: 418–35.
O'Sullivan, Mary. 2000. The innovative enterprise and corporate governance. *Cambridge Journal of Economics* 24: 393–416. [CrossRef]
Pfeffer, Jeffrey. 1973. Size, composition, and function of hospital boards of directors: A study of organization-environment linkage. *Administrative Science Quarterly* 18: 349–64. [CrossRef]
Pfeffer, Jeffrey, and Gerald R. Salancik. 2003. *The External Control of Organizations: A Resource Dependence Perspective*. Stanford: Stanford University Press.
Phan, Dinh Hoang Bach, Paresh Kumar Narayan, R. Eki Rahman, and Akhis R. Hutabarat. 2020. Do financial technology firms influence banks' performance? *Pacific-Basin Finance Journal* 62: 101210. [CrossRef]
Rodrigues, Ricardo, Antonio Samagaio, and Teresa Felício. 2020. Corporate governance and R&D investment by European listed companies. *Journal of Business Research* 115: 289–95.
Shleifer, Andrei, and Robert W. Vishny. 1997. A survey of corporate governance. *The Journal of Finance* 52: 737–83. [CrossRef]
Staikouras, Panagiotis K., Christos K. Staikouras, and Maria-Eleni K. Agoraki. 2007. The effect of board size and composition on European bank performance. *European Journal of Law and Economics* 23: 1–27. [CrossRef]
Thakor, Anjan V. 2020. FinTech and banking: What do we know? *Journal of Financial Intermediation* 41: 100833. [CrossRef]
Wang, Rui, Jiangtao Liu, and Hang (Robin) Luo. 2020. FinTech development and bank risk taking in China. *The European Journal of Finance* 27: 397–418. [CrossRef]
Wintoki, M. Babajide, James S. Linck, and Jeffry M. Netter. 2012. Endogeneity and the dynamics of internal corporate governance. *Journal of Financial Economics* 105: 581–606. [CrossRef]
Wu, Hsueh-Liang, and Cheng-Yu Lee. 2007. The effects of board competence on operational innovation: Tests of universal, contingency and configurational models. *International Journal of Technology Management* 39: 330–45. [CrossRef]
Yermack, David. 1996. Higher market valuation of companies with a small board of directors. *Journal of Financial Economics* 40: 185–211. [CrossRef]
Zhao, Jinsong, Xinghao Li, Chin-Hsien Yu, Shi Chen, and Chi-Chuan Lee. 2022. Riding the FinTech innovation wave: FinTech, patents and bank performance. *Journal of International Money and Finance* 122: 102552. [CrossRef]