Governing FinTech for performance: the monitoring role of female independent directors

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Received 10 November 2022
Revised 23 February 2023
28 March 2023
Accepted 3 April 2023

Abstract

Purpose – The use of digital technologies in the financial service industry has brought new complexities to the corporate governance in banks. Relying on the agency perspective of the shareholder, debtholder and societal governance in banks, this research examines the impact of financial technology innovation (FinTech) on banks' performance by enlightening the monitoring role of female independent directors.

Design/methodology/approach – Relying on a sample of Italian banks observed during the period 2016–2020, the authors hand-collected data on the use of FinTech by considering (1) the in-house provisions of FinTech solutions, (2) the collaboration with external FinTech firms and (3) a combination of both measures. The authors run a panel data regression analysis with fixed effects, measuring bank performance through bank competitiveness and bank riskiness.

Findings – The authors find that FinTech increases bank competitiveness in gathering money from depositors and that independent women on board mitigate the negative relationship between FinTech and the riskiness of banks' assets, ameliorating the conflicting interests among shareholders, debtholder and societal governance.

Originality/value – This study emphasizes the complexities of bank governance when dealing with FinTech in the wider perspective of equity governance, debt governance and the societal governance spotlighting the importance of appointing female directors in independent positions to enhance the bright sides of financial innovation. The authors enrich the literature on FinTech with a finer understanding of the drivers and implications of in-house provisions of FinTech solutions versus the collaboration with external FinTech firms.

Keywords FinTech, Banks, Women on board, Board independence performance, Agency problems

Paper type Research paper

1. Introduction

Bank-specific corporate governance research has revealed that the optimal design of bank governance and bank regulation implies the convergence of objectives of bank shareholders, depositors and society-at-large (John *et al.*, 2016). Financial institutions are more likely to hold greater liability risk and to be much more accountable to their stakeholders and banking regulators (Adams and Ferreira, 2012). Empirical evidence reports a link between the structure and features of boards of directors and the performance of banks. In particular, past research has demonstrated that a bigger board improves the efficacy of monitoring and control operations, allowing for improved risk management decision-making (Andres and Vallelado, 2008).

As the banking industry adapts to Industry 4.0', the complexity of corporate governance increases especially concerning the in-house provision of Financial Technology services

European Journal of Innovation Management
Vol. 26 No. 7, 2023
pp. 591-610
Emerald Publishing Limited
1460-1060
DOI 10.1108/EJIM-11-2022-0621

(i.e. FinTech) or the collaboration with FinTech firms. Indeed, anecdotal evidence suggests that the provision of FinTech services creates problems in compliance with governance codes and has been charged with financial fraud (e.g. Revolut corp).

FinTech is an essential expression of financial sector innovation and many studies have analyzed its bright and the dark sides for bank competitiveness and performance (Beck *et al.*, 2016; Chen, 2020; Wang *et al.*, 2021). On the one hand, FinTech has reduced transaction costs and mitigated the information asymmetry problem caused by distance restrictions (Elia *et al.*, 2022). With the development of FinTech solutions banks experience a growth in their operations, which in turn is likely to enhance their competitiveness (Dwivedi *et al.*, 2021). In addition, Fintech might produce diversification effect, thus improving risk management and reducing bank credit risk (Wang and Cao, 2022). On the other hand, FinTech development may wreak havoc on bank performance, as Internet lending and investing platforms eat into their profits. Similarly, the provision of financial services may increase the bank riskiness associated with governance complexities, cybersecurity, customer protection and regulatory activity (Cheng and Qu, 2020). Along with the above mentioned debate, the complexity of corporate governance for banks is also spurred by the issues related to women on the board of directors as the authorities urge banks to take all necessary steps to create a more equal composition of their governance and management structures (European Banking Authority, 2020). The topic of female representation in bank boardrooms relates to the broader debate in corporate governance research over the effects of women on firm value calling the need to expand the presence of women in the governance bodies (Nguyen *et al.*, 2020).

Despite the fast move in the current bank practices, there is a lack of evidence to establish a univocal relationship between FinTech and performance (Cai, 2018). Extant literature on FinTech has addressed the driver of the specific FinTech business models, highlighting the role of geographical and technological factors (Haddad and Hornuf, 2019), legal and cultural traits (Cumming and Schwienbacher, 2021) and the characteristics of CEOs (Sannino *et al.*, 2020). Nevertheless, how FinTech applications influence bank competitiveness and bank risks and the role of the board of directors in driving FinTech impacts become an interesting question that motivates this research. Relying on the agency perspective of the shareholder, debtholder and societal governance in banks (John *et al.*, 2016) in this paper we explore the effect of FinTech on Italian banks' performance, also considering the monitoring role of female independent directors. In particular, we hypothesize that FinTech shapes the level of information asymmetries between the bank and its stakeholders, thus influencing bank competitiveness and riskiness and that the presence of female independent directors on board moderates this relationship. To this aim, we rely on a sample of Italian banks observed during the period 2016–2020 and measure bank competitiveness with bank deposits while bank riskiness with risk-weighted assets (RWA). Then, we run fixed-effects regression models measuring FinTech alternatively with a combined index of FinTech in-house solutions and the collaborations between banks and FinTech companies. We find that FinTech is positively and significantly associated with bank competitiveness in gathering money from depositors. Moreover, female independent directors on board ameliorate the negative relationship between the effective provision of FinTech in-house solutions and bank riskiness.

This study makes several contributions to theory and practice. First, it employs the enlarged perspective of the corporate governance in banks (Hill and Jones, 1992; John *et al.*, 2016) to explain that Fintech business models require better mitigation of the conflicting interests of shareholders, debtholders and society to the benefit of the bank's wealth. Second, it puts gender diversity (Bøhren and Staubo, 2016; Bennouri *et al.*, 2018) research forward by spotlighting the usefulness of having independent women on board to oversight the provision of effective new business models that boost bank performance. Third, it contributes to the debate on the bright and the dark sides of financial innovations in banks (Beck *et al.*, 2016) particularly enriching the nascent literature on Fintech innovation (Elia *et al.*, 2022;

Lee *et al.*, 2021; Zhao *et al.*, 2022) with a finer understanding of the efficacy of in-house provisions of FinTech solutions versus the collaboration with external FinTech firms. We also provide practical implications by reinforcing the awareness of investors, government authorities and financial supervisors on the need for pro-innovation policies and initiatives.

2. Theory and hypothesis

2.1 The board monitoring in banks

In this paper we take the perspective of the agency theory, which emphasizes the board's key role as a governance mechanism to reduce agency conflicts between principals and agents (Fama and Jensen, 1983), promoting better monitoring of the executives to maximize firm performance (Jensen and Meckling, 1976).

Besides the traditional framework which emphasizes the alignment of the interests between managers and shareholders aimed at maximizing the market value of the equity (i.e. equity governance), highly leveraged institutions such as banks, are particularly affected by agency conflicts with debtholders (i.e. debt governance). Being the main claim holders, the debtholders (depositors) are highly exposed to moral hazard problems by shareholders who hold divergent interests (John and Qian, 2003; Macey and O'Hara, 2001). In case of failure, the whole risk stemming from unsuccessful projects shifts from shareholders to creditors. This gives rise to agency costs of debt, increasing the need for strict monitoring and/or effective managerial incentives.

Finally, banks' choices might not be aligned with the socially optimal financial system stability, creating additional governance issues (societal governance) with the other stakeholders not bearing equity or debt claim and the society at large (John *et al.*, 2016).

In banks, the board monitoring function (Adams and Ferreira, 2007) is particularly complex compared to that of non-financial companies because it implies the convergence of objectives of depositors, bank shareholders and society-at-large.

To this aim bank-specific corporate governance research has revealed that banking entities require boards that are bigger and more independent with greater scrutiny than those in the non-financial sector (De Andrés *et al.*, 2021). In addition, literature reports that women possess a better monitoring ability compared to their male counterpart (Adams and Ferreira, 2009). The benefits of women on board have been addressed from several theoretical perspectives in previous literature (Terjesen *et al.*, 2015; Post and Byron, 2015; Kirsch, 2018; Ain *et al.*, 2022). Nevertheless, findings from empirical research on bank performance are more contradicting (Terjesen *et al.*, 2015). Previous empirical studies investigating the influence of board gender diversity on the bank performance (Gallucci *et al.*, 2022; Grove *et al.*, 2011) suggest that more women are better able to lower operating costs (Chakrabarty and Bass, 2014) and improve financial performance (Strøm *et al.*, 2014) especially when they reach a critical mass of at least three (Liu *et al.*, 2017). However, the positive effect of gender lessens during the crisis periods (Pathan and Faff, 2013). Differently, other studies report a negative or null relationship between women on the board and bank performance (Smith *et al.*, 2006). Analyzing multiple dimensions of diversity simultaneously, some scholars find that gender diversity increases bank performance while national diversity decreases it (García-Meca *et al.*, 2015). As a result, the attempt to find a direct and unique link between gender diversity and corporate performance does not appear to yield shared results.

2.2 FinTech and bank performance

The introduction of digital technologies has increased the complexity of corporate governance in banks. According to Lee and Shin (2018), FinTech comprises six business models embracing (1) online foreign payment, overseas remittances; digital-only branches banking; peer-to-peer payments; in-store mobile phone payments; (2) investment

management, financial planning, retirement and pensions tools; (3) crowdfunding platforms; (4) online loan providers, marketplaces and brokers; (5) capital market business model; (6) insurtech and insurance. Additional FinTech business models include digital currency and cryptocurrency, robo-advisors and mobile point of sale (mPOS) (Liu *et al.*, 2020).

United Nations general assembly acknowledges that FinTech is one of the key innovations that can facilitate financial inclusion intended as the delivery of financial services at an affordable cost to all parts of society increasing the financial returns associated with it (Arner *et al.*, 2020). FinTech increases the efficiency in the management of personal savings and daily life, allows the diversification of individual financial risks and supports economic growth. Indeed, it directs the financial resources toward individuals and small and medium enterprises (SMEs) whose access to finance is limited, especially in the aftermath of financial and economic crises (Abbasi *et al.*, 2021). In this regard, following the 2008 global financial crisis, commercial banks reported a downturn in their performance and FinTech turned out to be a solution in the provision of new profit, increase of regulatory efficiency and in the ability to meet customers' demands (Liu *et al.*, 2020).

At the very basis of FinTech, there are some principles related to low-profit margin, light assets, expandability, innovation and easy compliance (Lee and Teo, 2015). As a matter of fact, FinTech helps the bank to streamline its processes, by reinventing the value chain and creating enhanced customer-oriented services. It increases the collaboration among stakeholders across industries allowing a reduction in transaction cost to the benefit of the existing customer base, the acquisition of new clients and the increasing their engagement (Obeidat and Saxena, 2015).

When managed strategically FinTech, might result in a reduction of asymmetric information problems and enhanced effectiveness and efficiency (Merello *et al.*, 2022). Through the use of FinTech, banks bring value to the different categories of stakeholders to increase competitiveness and improve profitability. FinTech services could also produce a diversification effect, which contributes to improving bank risk management efficiency and result in a stronger market position (Wang and Cao, 2022). Undoubtedly FinTech boosts the creation of economic and social growth with the potential to enlarge the bank customer base (Anshari *et al.*, 2019).

Nevertheless, as outlined by the scholarly debate on the bright and the dark sides of financial innovations (Beck *et al.*, 2016), the digitization of financial services by the mean of FinTech opens a series of risks associated with expropriation activities, cybersecurity, customer protection and regulatory risk (Cheng and Qu, 2020). In particular, FinTech might boost the value of bank deposits (Buchak *et al.*, 2018), which in turns results in an increased likelihood of agency conflicts with debtholders as depositors become highly exposed to the risk of adverse selection and moral hazard by bank shareholders. Furthermore, FinTech business models, such as P2P and crowdfunding, might intensify the competition and the risk profile of the loans, with negative implications for the bank shareholders and society at large. In addition, FinTech services bring increased uncertainty about regulations, especially when they are offered using external collaboration with FinTech firms, that, without being banks, do not bear the fixed cost of holding capital.

Therefore, we posit the following non-directional hypothesis on the relationship between the use of FinTech and bank financial performance:

H1. FinTech business models affect bank financial performance.

H1a. FinTech business models positively affect bank financial performance.

H1b. FinTech business models negatively affect bank financial performance.

2.3 Women independent directors, FinTech and bank performance

Whether FinTech adds economic value to the banking industry may specifically depend upon the ability of female independent directors on board to effectively address equity, debt

and societal governance in banks by mitigating the agency conflicts through the following three channels: (1) lowering risks associated with shareholder expropriation activities (Barber and Odean, 2001; Niederle and Vesterlund, 2007); (2) optimally contracting with debtholders (depositors) to mitigate their higher exposition to moral hazard problems with shareholders who hold divergent interests (John and Qian, 2003; Macey and O'Hara, 2001); (3) lowering the default rates for loans and increasing financial stability and inclusion (Beck *et al.*, 2014).

Extant literature reports several implications of having female directors on bank boards (Ben Rejeb *et al.*, 2020; Zhong *et al.*, 2022). For example, some studies report a positive link between female directors and firm risk (Adams and Funk, 2012) while others find that female loan officers pursue less aggressive acquisition strategies (Levi *et al.*, 2014), reducing the default rates (Beck *et al.*, 2014) and thereby increasing the chance of bank survival (Nguyen *et al.*, 2016).

In this study, we make the point that women have strong monitoring incentives (Almazan and Suarez, 2003) and are more likely to be appointed as independent directors (Bøhren and Staubo, 2016). This monitoring task is highly relevant to the banking industry where the bank board pursues the objective of shareholders' wealth maximization as well as the safeguarding of depositors, borrowers, clients and other stakeholders (Pathan *et al.*, 2007). In such vein, as predicted by the agency theory, the independence of directors is particularly important to guarantee better supervision over the management team given that independent directors have fewer conflicts of interest with top management (Hermalin and Weisbach, 2001) and have greater reputational concern in the directorship market (Fama and Jensen, 1983). Thus, appointing women as independent directors could benefit board monitoring in the banking system potentially preventing the failure of the board monitoring and resulting in financial turmoil and recessions.

Moreover, from a sociological perspective (Nielsen and Huse, 2010), innate female attributes such as unbiased thinking, resilience in addressing problems and increased diligence in their duties and responsibilities could reinforce the oversight of independent directors over bank efficiency (Ramly and Nordin, 2018). Indeed, it has been found that women have better attendance records and are more likely to join monitoring committees (Adams and Ferreira, 2009). Furthermore, they tend to be more risk averse in financial decision-making than their male counterparts thus containing managerial risk-taking behavior (Barber and Odean, 2001; Niederle and Vesterlund, 2007).

Therefore, the participation of women independent directors in bank boardrooms enhances the board monitoring effectiveness aligning the interests among shareholders, debtholders and the society a large (Bennouri *et al.*, 2018), ensuring that FinTech will be used to bring value to banks stakeholders and achieve competitiveness. In particular, we posit the following:

H2. Female independent directors on boards positively moderates the relationship between FinTech and bank performance.

3. Method

Our sample consists of 138 Italian banks operating on the Italian territory in the period 2016–2020. The data is primary, as it was collected manually starting from the list of all banks operating on the Italian territory (https://www.tuttitalia.it/banche/classifica/). From this list we collected the data for the Italian banks that had at least several branches equal to or greater than 20; then we examined the websites and the balance sheets of each bank and collected the data necessary for our investigation. Even though the initial sample had 691 observations (bank year), the sample size was lowered due to a lack of data.

3.1 Dependent variable: bank performance

With the aim of testing our first set of hypotheses, we use two measures. The first is bank deposit to measure the competitiveness of banks in gathering money from depositors, proxied by the logarithm of the total customer (DEP) (Claessens and Laeven, 2004; Vennet, 2002). The second is the RWA to total assets ratio to proxy for risk-taking in banks. Since credit, operational and market risks are represented by risk weights employed by bank regulators, the variables in this study adjust assets for those risks (Abou-El-Sood, 2019).

Indeed, RWA are used to determine the minimum amount of capital a bank must hold about the risk profile of its lending activities and other assets. This is done to lessen the likelihood of insolvency and safeguard stakeholders (depositors). A bank requires more cash on hand the more risk it is exposed to. For each type of bank asset, a risk assessment is used to determine the capital need.

3.2 Independent variables: FinTech

Our independent variable relies on the use of FinTech by banks, which might occur through in-house provisions of FinTech solutions and the collaboration with external FinTech firms or a combination of both. Therefore, we compute hand-collect data on these two aspects from bank reports and corporate websites and compute our measure of FinTech as follows. First, we follow prior literature (Lee and Shin, 2018; Liu *et al.*, 2020) and assess whether the bank provides the following most widely used FinTech in-house services (IN_HOUSE _FINTECH): (1) digital payment; (2) cardless cash withdrawal from automated teller machine (ATM); (3) chatbot; (4) online loan providers; (5) crowdfunding platforms; (6) insurance; (7) investment management services and (8) robo-advisor.

Then we also consider the number of collaborations between banks and FinTech companies (COLL_FINTECH). Collaboration with FinTech companies can represent a great acceleration and innovation factor for the bank concerning information technology (IT), process, compliance and pricing issues. FinTech companies that profit from digital capabilities produce new and customer-centric services as banks struggle with innovation issues in their operations.

Finally, we combine the in-house provisions of FinTech solutions and the external collaboration through a principal component analysis of the two measures retaining the first component with an eigenvalue greater than 1 (eigenvalue = 1.445) creating the variable (COMPONENT_FINTECH). Furthermore, as additional analysis, we also run our models using IN_HOUSE FINTECH and COLL_FINTECH, separately.

3.3 Moderator variable: independent female directors

As a moderator variable we used the percentage of independent female directors (W_INDEP) measured as the number of independent female directors divided by the total number of independent directors (Srinidhi *et al.*, 2011). Theory influences the variable that we chose as we are interested in the role of women directors appointed in independent positions. In addition, prior scholars have emphasized that is more appropriate to utilize the proportion of female independent directors than the percentage of female directors as the latter includes non-independent women directors, whose participation could only be symbolic (token) (Sanan, 2016).

3.4 Control variables

Adding the control variables helps us to deal with the omitted variable issue. Moreover, we account for bank-fixed effects and control for time dummy variables. The first set of bank-specific control variables include a profitability indicator to measure the banks' ability to

generate returns on their asset (ROA), bank size (LNTA), capital (TIER) and interest income on interest expense (INTEREST). We control also board dimension (BODSIZE) measured by the total number of directors on the board. According to the agency theory, larger boards introduce inefficiencies due to transaction costs and other additional expenditures to obtain group consensus (Adams, 2009).

All dependent, independent and control variables were chosen based on the most common criteria in the literature (Amran and Haniffa, 2011; Helfaya and Moussa, 2017; Galletta *et al.*, 2021) and are detailed in Table 1.

3.5 Descriptive statistics

Tables 2 and 3 exhibit descriptive statistics and the correlation between the variables used, respectively. The data are described using standard descriptive statistics: the mean value with the standard deviation for the numeric variables, minimum and maximum value (see Table 2). The pairwise correlation coefficient between the dependent variables DEP and RWA, independent and control variables is shown in Table 3.

This investigation's variance inflation factor (VIF) values are less than 10, showing that multicollinearity is not a concern.

3.5.1 Regression model specification. To investigate the relationship between FinTech and the usage of financial services we estimate the following panel data models with fixed effects, clustering heteroscedasticity standard errors at the bank level to account for the serial correlation of the dependent variables for each bank. The study regression equations are modeled as follows:

$$BANK\_PERFORMANCE_{it} = \alpha_i + \beta_1 FINTECH_{it} + \beta_2 W\_INDEP_{it} + \beta_3 ROA_{it} + \beta_4 LNTA_{it} + \beta_5 TIER_t + \beta_6 BODSIZE_i + \beta_7 INTEREST_{it} + \delta_t + \varepsilon \quad \text{Equation (1)}$$

Variable	Description
Dependent variable	
DEP	Log of total customer deposits including time, savings and demand deposits
RWA	Risk-weighted asset intensity on total assets
Independent variable	
COMPONENT_ FINTECH	Principal component computed from the combination of in- house FinTech services and external collaboration with FinTech firms
IN_HOUSE FINTECH	Binary variable that takes the value of 1 when the bank offers at least 4 out of 8 FinTech business models, 0 otherwise
COLL_FINTECH	Number of collaborations between banks and FinTech companies
Moderator variable	
W_INDEP	Percentage of women independent directors out of the total number of independent directors
Control variable	
ROA	Net income by the average of its total assets
LNTA	Natural logarithm of total assets for banking size
TIER	Tier 1 capital/risk-weighted assets
BODSIZE	The total number of board members at the end of the fiscal year
INTEREST	Interest income on interest expense

Source(s): Authors' own creation

Table 1. Description of variables

Variable	Obs	Mean	Std.Dev	Min	Max
DEP	442	21.335	1.569	16.127	26.711
RWA	442	15.812	80.589	0.000	470.802
COMPONENT_FINTECH	442	0.091	1.243	−1.076	3.922
IN_HOUSE_FINTECH	442	0.149	0.357	0.000	1.000
COLL_FINTECH	442	1.190	0.964	0.000	4.000
W_INDEP	442	40.826	33.298	0.000	100.000
ROA	442	0.356	0.941	−2.380	6.330
LNTA	442	18.703	3.795	8.217	24.392
TIER	442	0.163	0.064	0.076	0.490
BODSIZE	442	10.620	2.660	4.000	19.000
INTEREST	442	0.016	0.058	0.000	0.718

Table 2.
Descriptive statistics

Source(s): Authors' own creation

$$BANK\_PERFORMANCE_{it} = \alpha_i + \beta_1 FINTECH_{it} + \beta_2 W\_INDEP_{it} + \beta_3 FINTECH\ X\ W\_INDEP_{it} + \beta_4 ROA_{it} + \beta_5 LNTA_{it} + \beta_6 TIER_t + \beta_7 BODSIZE_i + \beta_9 INTEREST_{it} + \delta_t + \varepsilon$$

Equation (2)

where BANK_PERFORMANCE is alternatively competitiveness (DEP) and bank riskiness (RWA). As for FINTECH, we perform three distinct models for COMPONENT_FINTECH, IN_HOUSE FINTECH and COLL_FINTECH alternatively while W_INDEP refers to independent female directors.

In many recent banking investigations, panel regression has been used (Buallay, 2020; Siueia *et al.*, 2019). The model considers the customer deposits a proxy of competitiveness in terms of the usage of financial services and RWA to total assets ratio to proxy for riskiness in banks as the dependent variables; β_1 and β_2 are the coefficients for independent variables, β_3 (equation 2) is the coefficient for our moderator variable; β_4 -β_{10} are the coefficients for control variables; δ_t is a year dummy; and α_i is a bank-specific fixed effect. Fixed effects account for bank properties that are constant throughout time.

4. Empirical results and discussion

4.1 Multivariate analysis

In this study, a panel data regression analysis was performed using two ordinary least squares models: the fixed-effects model and the random-effects model. Hausman and Breusch–Pagan Lagrangian multiplier (LM) tests were used to select the best model. The results of the Hausman test revealed a *p*-value of 0.000. The fixed-effect model was shown to be the most appropriate model.

Table 4 displays the regression results reporting the effect of FinTech on bank competitiveness, measured by deposits (DEP). The three models were alternately run with different FinTech measures (i.e. COMPONENT_FINTECH, IN_HOUSE FINTECH and COLL_FINTECH). Column 1 of each model shows the relationship between FinTech and bank deposits, while column 2 of each model shows the results with the interaction of the variable that measures the presence of female independent directors on the board (W_INDEP).

Variables	VIF	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) DEP		1.000										
(2) RWA	1.23	0.228***	1.000									
(3) COMPONENT_FINTECH	3.61	0.472***	0.092*	1.000								
(4) IN_HOUSE_FINTECH	1.12	0.459***	0.117**	0.872***	1.000							
(5) COLL_FINTECH	3.53	0.340***	0.036	0.835***	0.458***	1.000						
(6) W_INDEP	1.01	0.013	0.000	0.019	0.008	0.025	1.000					
(7) ROA	1.12	−0.075	−0.059	−0.040	0.011	−0.085*	−0.062	1.000				
(8) LNTA	1.21	−0.114**	−0.394***	−0.090*	−0.123***	−0.026	0.021	0.103**	1.000			
(9) TIER	1.12	−0.189***	−0.060	0.016	0.110**	−0.095**	−0.061	0.221***	−0.042	1.000		
(10) BODSIZE	1.15	0.500***	0.195***	0.314***	0.287***	0.247***	0.029	−0.074	−0.121**	−0.030	1.000	
(11) INTERST	1.08	−0.251***	−0.007	−0.122**	−0.061	−0.152***	0.061	0.193***	0.036	−0.072	−0.056	1.000

Note(s): ***$p < 0.01$, **$p < 0.05$ and *$p < 0.1$

Source(s): Authors' own creation

Table 3.
Pairwise correlations

Variables	Model 1 COMPONENT_ FINTECH (1) Deposit	(2) Deposit	Model 2 IN_HOUSE FINTECH (1) Deposit	(2) Deposit	Model 3 COLL_FINTECH (1) Deposit	(2) Deposit
FINTECH	0.100***	0.106***	0.259***	0.306***	0.126***	0.121***
	(0.012)	(0.016)	(0.049)	(0.075)	(0.013)	(0.015)
W_INDEP	0.001*	0.001*	0.001*	0.001*	0.001	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FINTECH#W_INDEP		−0.000		−0.001		0.000
		(0.000)		(0.001)		(0.000)
ROA	−0.661	−0.700	−0.513	−0.617	−0.592	−0.582
	(1.344)	(1.381)	(1.308)	(1.377)	(1.336)	(1.333)
LNTA	−0.019***	−0.019***	−0.018***	−0.018***	−0.018***	−0.018***
	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)	(0.006)
TIER	0.251	0.263	0.587	0.598	0.425	0.416
	(0.542)	(0.544)	(0.592)	(0.594)	(0.541)	(0.543)
RWA	−0.000	−0.000	−0.000	−0.000	−0.000	−0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
BODSIZE	−0.003	−0.003	−0.003	−0.004	−0.004	−0.004
	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)	(0.012)
INTEREST	−4.695**	−4.684**	−4.876**	−4.862**	−4.715**	−4.724**
	(1.825)	(1.817)	(1.925)	(1.915)	(1.848)	(1.850)
CONSTANT	21.721***	21.722***	21.628***	21.633***	21.557***	21.565***
	(0.182)	(0.182)	(0.175)	(0.176)	(0.183)	(0.182)
YEAR FE	YES	YES	YES	YES	YES	YES
OBSERVATIONS	442	442	442	442	442	442
R-SQUARED	0.310	0.311	0.246	0.248	0.315	0.315
NUMBER OF BANKS	104	104	104	104	104	104

Table 4.
The effect of Fintech on competitiveness (DEP)

Note(s): Robust standard errors in parentheses ***$p < 0.01$, **$p < 0.05$ and *$p < 0.1$
Source(s): Authors' own creation

Model 1 reports the results using as independent variables the FinTech composite indicators (COMPONENT_FINTECH). Specifically, Column 1, Model 1 shows a significant and positive relationship at the 1% of significance level between COMPONENT_FINTECH and bank deposits. Model 2 presents the outcomes considering the internal provision of FinTech (IN_HOUSE FINTECH) as our measure of FinTech. Column 1, Model 2, confirms the positive and significant relationship at the 1% of significance level between FinTech and DEP. The same results are confirmed by Model 3 column 1, which uses the external provision of FinTech services by FinTech firms as the main independent variable (COLL_FINTECH). Here too there is a positive and significant relationship at the 1% of significance level between FinTech and bank deposits. These results support Hypothesis 1a, which confirms a positive impact of FinTech on performance in terms of competitiveness.

Column 2 of each Model shows the moderating effect of independent women on the relationship between FinTech and deposits. In all three models, the results show a non-significant relationship of the moderating effect of independent women (FINTECH#W_INDEP), but the models show a significant and positive direct effect of the percentage of independent women (W_INDEP) on the board on bank deposit (DEP).

Table 5 shows the regression results on the effect of FinTech on bank asset riskiness (RWA). Like the previous table, there are three models where column 1 of each model displays the relationship between FinTech (in its three measures) and RWA, while column 2 of each

Table 5.
The effect of Fintech on bank riskiness

	Model 1 COMPONENT_FINTECH		Model 2 IN_HOUSE FINTECH		Model 3 COLL_FINTECH	
	(1)	(2)	(1)	(2)	(1)	(2)
Variables	RWA	RWA	RWA	RWA	RWA	RWA
FINTECH	−0.214	9.100	−2.387	28.420	0.444	10.020
	(6.932)	(6.021)	(19.842)	(23.046)	(9.462)	(8.465)
W_INDEP	−0.028	0.002	−0.029	0.078	−0.028	0.275
	(0.123)	(0.122)	(0.129)	(0.117)	(0.123)	(0.245)
FINTECH#W_INDEP		−0.222*		−0.691*		−0.244
		(0.122)		(0.382)		(0.163)
ROA	−210.090	−264.496	−208.433	−272.656	−212.407	−227.936
	(489.279)	(492.499)	(482.171)	(480.309)	(496.873)	(505.590)
LNTA	−9.092**	−8.782**	−9.073**	−8.878**	−9.119**	−8.847**
	(3.715)	(3.430)	(3.739)	(3.542)	(3.712)	(3.452)
TIER	−164.432	−142.048	−161.240	−149.111	−168.128	−147.111
	(145.222)	(124.143)	(159.953)	(144.401)	(145.875)	(126.510)
BODSIZE	4.861*	4.127	4.848*	3.887	4.865*	4.769
	(2.800)	(3.039)	(2.840)	(2.958)	(2.763)	(2.911)
DEP	−18.739 (37.544)	−19.376 (37.207)	−18.344 (32.441)	−19.938 (32.441)	−19.660 (39.449)	−18.637 (39.064)
INTEREST	−103.700	−88.703**	−102.906	−101.321	−106.148	−83.512
	(116.920)	(119.560)	(109.460)	(107.710)	(123.011)	(130.288)
CONSTANT	564.424	575.226	555.618	589.724	584.604	543.282
	(778.721)	(778.242)	(664.518)	(670.053)	(811.868)	(811.818)
YEAR FE	YES	YES	YES	YES	YES	YES
OBSERVATIONS	442	442	442	442	442	442
R-SQUARED	0.155	0.179	0.155	0.174	0.155	0.171
NUMBER OF BANKS	104	104	104	104	104	104

Note(s): Robust standard errors in parentheses ***$p < 0.01$, **$p < 0.05$ and *$p < 0.1$
Source(s): Authors' own creation

model shows the results with the moderating variable that measures the independence of women on the board (W_INDEP).

In all three models, the results show a non-significant relationship between FinTech (measured with COMPONENT_FINTECH, IN_HOUSE FINTECH and COLL_FINTECH) and RWA.

However, the results in Model 1 column 2 show a negative and significant moderating effect of the percentage of independent women on the board (FINTECH#W_INDEP) in the relationship between COMPONENT_FINTECH and bank asset riskiness. The same result is confirmed by Model 2 column 2, indeed it is possible to notice a negative relationship at the 1% significance level between FINTECH#W_INDEP and RWA.

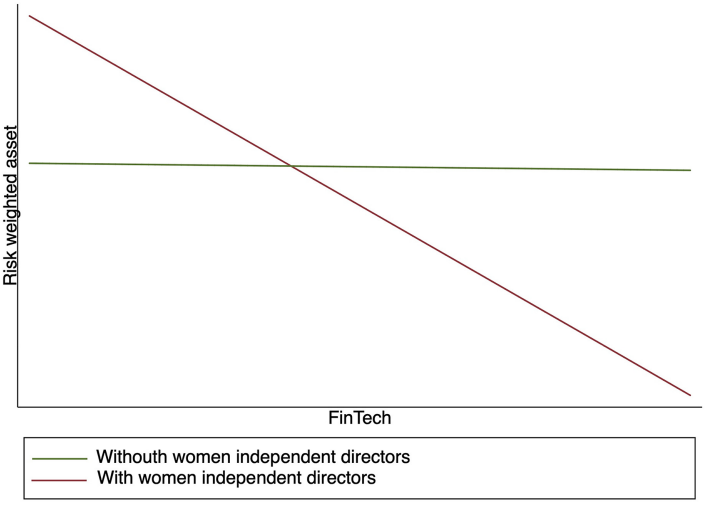
These findings demonstrate that a higher percentage of independent women on the board reduces the riskiness of the bank's assets. Nevertheless, this result does not show any significance with the external provision of FinTech services by FinTech firms (COLL_FINTECH).

Overall, these results support Hypothesis 2, which indicates that independent women on boards positively moderate the relationship between FinTech and bank performance ameliorating the negative implication of FinTech on the bank asset riskiness, especially when FinTech services are provided by in-house business models.

The regression plot for the validation dataset is presented in Figure 1. The figure shows the relationship between RWA and FinTech without (green line) and with the interaction of independent women on the board (red line). The graph shows that there is no significant relationship between FinTech and RWA; however, it does show a negative significant linear relationship between FinTech and RWA in presence of female independent directors.

4.2 Additional analysis

To further support the findings reported in the previous section, we conducted additional analyses by measuring independent women on the board as the ratio between the number of independent women and the size of the board of directors (%). Results are reported in Table 6. Specifically, columns 1 of Models 1, 2 and 3 show a significant and positive relationship



Source(s): Author's own creation

Figure 1.
Regression plot of bank asset riskiness (RWA) and FinTech (IN_HOUSE FINTECH) and the moderating effect of independent women on boards (FINTECH#W_INDEP)

Variables	Model 1 COMPONENT_FINTECH (1) Deposit	(2) Deposit	Model 2 IN_HOUSE FINTECH (1) Deposit	(2) Deposit	Model 3 COLL_FINTECH (1) Deposit	(2) Deposit
FINTECH	0.099***	0.116***	0.257***	0.343***	0.125***	0.131***
	(0.012)	(0.014)	(0.049)	(0.075)	(0.013)	(0.015)
W_INDEP/SIZE	0.000	0.000	0.000	0.001	−0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
FINTECH#W_INDEP/SIZE		−0.001		−0.000		−0.000
		(0.000)		(0.001)		(0.001)
ROA	−0.912	−0.994	−0.887	−1.047	−0.747	−0.752
	(1.013)	(1.062)	(1.024)	(1.095)	(1.006)	(1.018)
LNTA	−0.019***	−0.019***	−0.018***	−0.018***	−0.018***	−0.018***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
TIER	0.213	0.224	0.547	0.495	0.383	0.400
	(0.548)	(0.551)	(0.596)	(0.587)	(0.546)	(0.559)
RWA	−0.000	−0.000	−0.000	−0.000	−0.000	−0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
INTEREST	−4.722**	−4.693**	−4.904**	−4.862**	−4.748**	−4.741**
	(1.839)	(1.829)	(1.934)	(1.907)	(1.862)	(1.863)
CONSTANT	21.725***	21.722***	21.631***	21.634***	21.548***	21.536***
	(0.150)	(0.147)	(0.153)	(0.149)	(0.149)	(0.144)
YEAR FE	YES	YES	YES	YES	YES	YES
OBSERVATIONS	442	442	442	442	442	442
R-SQUARED	0.304	0.310	0.240	0.250	0.310	0.310
NUMBER OF BANKS	104	104	104	104	104	104

Note(s): Robust standard errors in parentheses ***$p < 0.01$, **$p < 0.05$ and *$p < 0.1$
Source(s): Authors' own creation

Table 6.
Additional analysis on the effect of Fintech on competitiveness (DEP)

between FinTech and bank deposits. These results support Hypothesis 1a, which confirms a positive impact of FinTech on performance in terms of competitiveness. Table 7 also confirms the previous results, i.e. a negative and significant moderating effect of the percentage of independent women on the board (FINTECH#W_INDEP/SIZE) in the relationship between FinTech and bank asset riskiness. This leads to support Hypothesis 2, which indicates that higher percentage of independent women on the board ameliorates the negative implication of Fintech on the bank asset riskiness.

5. Discussion

The findings on FinTech and performance are crucial for understanding how FinTech can improve competitiveness in the banking sector and encourage banks to better serve the real economy. These outcomes are consistent with Lv *et al.* (2022) assertion: banks need to invest in the introduction of technology, the slow advancement of technology and the incomplete fusion of business and technology will inevitably lower bank earnings. However, as the use of FinTech expands, banks will be able to get more advantages at reduced input costs, which will boost their performance.

These results add to the literature on the bright and the dark sides of financial innovation and technology adoption in banks (Beck *et al.*, 2016), confirming the studies reporting that FinTech development significantly affects various aspects of banks' performance, including

Table 7.
Additional analysis on the effect of Fintech on bank riskiness

	Model 1 COMPONENT_FINTECH		Model 2 IN_HOUSE FINTECH		Model 3 COLL_FINTECH	
	(1)	(2)	(1)	(2)	(1)	(2)
Variables	RWA	RWA	RWA	RWA	RWA	RWA
FINTECH	−0.224	9.205	−2.623	29.235	0.514	9.804
	(6.815)	(6.041)	(19.411)	(23.151)	(9.389)	(8.375)
W_INDEP	0.060	0.080	0.059	0.246	0.061	0.547
	(0.183)	(0.189)	(0.182)	(0.211)	(0.184)	(0.427)
FINTECH#W_INDEP		−0.400**		−1.251**		−0.429
		(0.196)		(0.609)		(0.271)
ROA	−261.214	−307.903	−258.725	−320.513	−264.253	−271.041
	(510.227)	(509.523)	(500.713)	(493.959)	(518.469)	(520.894)
LNTA	−9.001**	−8.730**	−8.980**	−8.926**	−9.031**	−8.677**
	(3.727)	(3.409)	(3.751)	(3.566)	(3.723)	(3.402)
TIER	−157.393	−144.713	−153.778	−165.150	−161.520	−131.602
	(145.918)	(125.249)	(160.501)	(147.857)	(146.187)	(126.945)
DEP	−19.625 (37.873)	−23.071 (35.637)	−19.181 (32.874)	−23.330 (31.545)	−20.644 (39.683)	−21.192 (37.941)
INTEREST	−83.160	−83.70	−82.340	−88.476	−85.845	−78.908
	(114.590)	(114.485)	(107.616)	(107.056)	(121.345)	(123.240)
CONSTANT	629.476	695.460	619.396	704.287	651.841	641.385
	(795.492)	(757.405)	(684.116)	(664.359)	(823.512)	(795.324)
YEAR FE	YES	YES	YES	YES	YES	YES
OBSERVATIONS	442	442	442	442	442	442
R-SQUARED	0.147	0.177	0.147	0.171	0.147	0.168
NUMBER OF BANKS	104	104	104	104	104	104

Note(s): Robust standard errors in parentheses ***$p < 0.01$, **$p < 0.05$ and *$p < 0.1$
Source(s): Authors' own creation

capital adequacy, asset quality, management efficiency and liquidity ratios (Lee *et al.*, 2021; Zhao *et al.*, 2022).

The findings on the moderating role of female independent directors reveal intriguing insights. On the one hand, our results are in line with the strand of studies on women's preference for risk aversion (Adams and Funk, 2012) reporting that female directorship engages in less risky strategies (Bennouri *et al.*, 2018), especially with regard to the R&D activities.

On the other hand, our results connect to the debate on the benefits of having independent directorship. However, while extant literature is not conclusive on the implications of board independence for corporate performance (e.g. Adams and Ferreira, 2007), we find that the benefits of independent directors in terms of independent judgment in monitoring and advising the management team can be reinforced when combined with the positive attributes of women on board. Indeed, the oversight on the emerging FinTech-related complexities provided by female independent directors implies better mitigation of bank riskiness to the advantage of various stakeholders such as equity and debt capital providers, suppliers and employees, with positive implications on the performance of the banking industry.

Our evidence is in line with the finding of Bøhren and Staubo (2016) reporting that the implementation of gender quota in Norway increases board independence as well as with Ramly's *et al.* (2017) finding on the role of female independent directors for bank efficiency.

In addition, our results indicate that FinTech boosts bank performance provided that effective monitoring of the risks associated with the governance of emerging FinTech-related complexities, cybersecurity issues and increased regulatory constraints is guaranteed by the presence of female independent directors. In this vein, independent women on boards may assist to lessen agency issues (Fama and Jensen, 1983; Jensen and Meckling, 1976) related to shareholders, debtholders and society at large, with positive implications on bank wealth.

6. Conclusion

This research investigates the implication of FinTech on bank performance as measured by competitiveness in gathering money from depositors and bank riskiness, accounting for the role played by the female independent director on board.

We find that FinTech increases bank competitiveness and that independent women on boards ameliorate the relationship between FinTech and performance, reducing the riskiness of the bank's assets. This is in line with the requirements of capital regulations which advise banks to prevent excessive risk-taking and related capital adequacy.

This research has theoretical implications. We confirm the proposition of the agency theory (Adams and Ferreira, 2007; Adams and Ferreira, 2009) and the findings of prior studies on the positive effect of female directors' roles on firm performance (Ramly and Nordin, 2018; Mazzotta and Ferraro, 2020; Rubino *et al.*, 2021; Galletta *et al.*, 2021) and complement this view with the evidence that the monitoring of women independent directors ameliorates the risks associated with the complexities of FinTech governance. Specifically, the presence of independent women in the boardroom is likely to reduce agency conflicts related to FinTech from the wider perspective of shareholders, debtholders and society. In this vein, we foresee that the right positioning of women directors in bank boards is essential to gain a performance effect of FinTech business models, thus enhancing the key principles of equity, debt and societal governance.

In addition, our findings confirm the enlarged perspective of the agency theory that expands the standard principal-agent paradigm of financial economics to create the stakeholder-agency theory according to which monitoring tools that reduce the information asymmetry between managers and stakeholders ensure that the former act in the interest of the latter (Hill and Jones, 1992). Indeed, we enrich this view by proving that banks supporting

the inclusion of women on the board offer more recognition to shareholders, debtholders and society and create pro-innovation board structures (Ben Rejeb *et al.*, 2020; Makkonen, 2022) that are capable of lowering agency costs and improve performance.

This study also offers managerial implications. First, based on our results of a positive link between FinTech and competitiveness, we suggest that traditional banks should step up and accomplish their digital transformation and innovation since the FinTech infrastructure makes fulfill the current demands of financial development. Indeed, FinTech innovations are an important component of a bank's overall business strategy and their successful adoption necessitates independent directors taking a proactive role in monitoring the risks of technological transformation. However, as the internal set-up of IT infrastructure can be difficult, costly and can require a long period to be implemented, small banks should leverage external cooperation with FinTech companies to expand their business models and realize their digital transformation and innovation.

Second, this study emphasizes the positive implication of appointing female independent directors to enhance the technological and digital development and availability of financial services and improve the overall bank performance. Banks and banking authorities may consider recruiting independent women directors to enrich the board oversight role over the implementation of innovation, which will be at the heart of business transformation over the next decade. This digital transformation will meet the needs of the entire society if it is managed considering the diversity of perspectives in work teams (Sierra-Morán *et al.*, 2022). Accordingly, this study provides a deeper understanding to Italian regulatory bodies on the importance of including independent female members on board as a vital contributing factor for leveraging banks' competitiveness. Indeed, it has been showing that the presence of women on a board of directors with innate soft skills (Hong, 2016) is an important factor in having governance that is open to any cultural, educational and emotional contamination. Given the current challenges for organizations (COVID-19, smart working, supply chain crisis, etc.), having a board characterized by greater empathy, flexibility and resilience, is certainly a resource both for the company itself and for its stakeholders and shareholders.

This study has some limitations. Indeed, our sample refers to the period before the coronavirus disease 2019 (COVID-19) pandemic. Given the use of technology and telematics distribution channels by banks to ensure product and service offerings during the pandemic time, future research could consider the effect of COVID-19. Second, in addressing the contribution of board gender diversity to bank performance, we focus on the role of women appointed as independent directors. In line with the recent call (Rubino *et al.*, 2021), future studies may consider additional corporate governance mechanisms such as lead independent directors, board meeting frequency, board makeup, management ownership and foreign ownership. Finally, we have observed gender diversity under the lens of agency theory, future studies could use alternative theoretical approaches to investigate the role of women in FinTech and the financial structure of banks such as the critical mass theory (Joecks *et al.*, 2013) or social construction theory (Bannò *et al.*, 2022).

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