



The Impact of Fintech and Corporate Social Responsibility on Green Innovation and Green Finance: A Stakeholder Perspective from Pakistan's Banking Industry

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ABSTRACT

This paper discusses how Fintech adoption and Corporate Social Responsibility (CSR) affect green innovation and green finance in the banking industry of Pakistan as a stakeholder. Based on a quantitative study approach, the data were gathered among professionals consisting of bank managers, CSR officers, Fintech leads, customers, and regulatory staff of commercial and Islamic banks. The relationships between Fintech capability, CSR engagement, green innovation and green finance were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results showed that the green innovation and green finance allocation can be greatly improved by the use of Fintech and CSR practices, and stakeholder engagement is a crucial mediating variable in this case. Furthermore, there are various levels of impact by the internal and external stakeholders on strategic and operational sustainability initiatives. This research will add to the body of sustainable finance literature by demonstrating the synergistic nature of technological innovation and CSR in enhancing the sustainability of the environment in the emerging economies. There are policy and managerial implications, which have to do with the necessity of integrated strategies, which would synchronize Fintech investments, CSR initiatives, and stakeholder engagement to produce long-term sustainability results.

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INTRODUCTION

Sustainability of the environment has been identified as a worldwide necessity that should be involved with financial institutions. The financial service providers impact the environmental performance in capital deployment, risk management, and the innovation of products (Kishor et al., 2025; Lee & Shin, 2018). Over the past few years, banks have begun to incorporate digital technologies, also known as the Financial Technology (Fintech), into their workflows, which allows them to be more efficient, reach more customers, and

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introduce new products (Gomber et al., 2018). The use of fintech has been associated with the increased access to financial services, lower transaction costs, and transparency, which are essential to the development of sustainable financial products (Lee & Shin, 2018; Srairi, 2025).

In line with the adoption of technology, Corporate Social Responsibility (CSR) has become a strategic focus in banks that believe in ethical banking and environmental management (Carroll, 1999; Maignan & Ferrell, 2004). The field of banking CSR is not only limited to the adherence to the regulations but also to voluntary environmental programs, community development programs and a clear reporting on sustainability (Freeman, 1984). CSR-focused banks will have higher chances of seeking to achieve environmentally friendly practices, investing in green projects and creating stakeholder trust, which will promote long term financial and environmental performance (Ashfaq et al., 2026; Khan et al., 2025). Regardless of these developments, there is still a knowledge gap on how Fintech and CSR can collaborate in the effort to impact green innovation the creation of environmentally-friendly products and processes and green finance the distribution of financial resources to sustainable investments (Horbach et al., 2023).

To be more exact, there is a lack of empirical evidence especially within the banking sector of Pakistan (Hassan et al., 2023). Although the impacts of Fintech have been studied separately on innovation (Lee & Shin, 2018) and the contribution of CSR on the performance of organizations (Maignan & Ferrell, 2004), few studies have combined the two constructs in a unified model of sustainable banking performance, especially in an emerging economy such as that of Pakistan (Ashfaq et al., 2026; Farooq et al., 2025). It is also necessary to learn more about stakeholder engagement as the mediating process between Fintech adoption and CSR practices to green innovation and green finance (Freeman, 1984; Donaldson & Preston, 1995).

Research Objectives

This study examines:

- The direct effect of the adoption of Fintech on green innovation
- The impact of CSR activities on the green innovation
- Green innovation and how it affects green finance
- The direct implications of Fintech and CSR to green finance
- The mediating position of the stakeholder involvement in such relationships

Research Questions

- To investigate the fintech adoption in Pakistan's banking industry influence green innovation outcomes among key stakeholders?
- To what extent does corporate social responsibility (CSR) engagement by Pakistani banks affect the development and implementation of green finance initiatives?
- How do stakeholder perceptions and motivations effect the relationship between fintech, CSR, and both green innovation and green finance in Pakistan's banking sector?
- How do stakeholders perceived regulatory strictness and environmental legitimacy influence banks' decisions to translate fintech-enabled capabilities into green innovation and green finance outcomes?
- To what extent do the relationships among banks, customers, and investors (e.g., trust, information transparency, and ESG awareness) affect the effectiveness of fintech and CSR initiatives in promoting green innovation and green financing in Pakistan?

Significance of the Study

This study has a contribution on theory and practice, as Combining Fintech and CSR within a single concept of green innovation and finance based on the stakeholder theory (Freeman, 1984). Giving empirical evidence of Pakistan, a poorly studied yet fast changing banking market that has a sustainable focus. Providing advice to the leaders of the bank and policy makers on how to match technological advancement to the socially responsible activities to reinforce sustainable financial systems.

LITERATURE REVIEW

Fintech Digital platforms and technologies that create or modify financial services such as mobile banking, digital payments, blockchain, artificial intelligence (AI), and big data analytics (Gomber et al., 2018). Fintech will enhance efficiency and transparency, which are two major requirements of sustainable banking (Lee & Shin, 2018). According to recent research, Fintech allows the real time tracking of sustainability indicators, the greater risk assessment of environment-oriented loans, and scalable solutions to financial inclusion (Srairi, 2025). Empirical studies indicate that Fintech usage promotes environmental financial products development by banks, decreases the level of information asymmetry, and encourages innovation to facilitate environmental governance (Lee & Shin, 2018; Srairi, 2025). This is the case with emerging economies, where the effect of Fintech on sustainability outcomes is muted by regulatory policies, digital literacy, and institutional preparedness (Farooq et al., 2025).

Banking Social Corporate Responsibility

CSR is a voluntary act by an organization to abide by social, environmental, and ethical standards that are not imposed by the law (Carroll, 1999). Some of the initiatives that CSR aims at among banks include environmental protection, financial inclusivity, community development, and ethical governance (Maignan & Ferrell, 2004; Ashfaq et al., 2026). The banking that is driven by CSR tends to create a change in the perception of the bank, stakeholder confidence and long-term performance indicators (Freeman, 1984; Farooq et al., 2025). Recent investigations in South Asia show that CSR involvement can trigger green innovation due to the convergence of institutional priorities and environmental standards and customer values (Khan et al., 2025; Hassan et al., 2023). CSR too, gives an indication to investors that it is committed to sustainable growth, which may result in long term investment and market positioning (Ashfaq et al., 2026).

Green Innovation

Green innovation refers to the development and implementation of novel processes, products, or practices that lead to environmental benefits (Horbach et al., 2023). In banking, green innovation includes digital services that reduce paper use, energy-efficient IT infrastructure, and financial products designed to support renewable energy, carbon reduction, and environmental stewardship (Hassan et al., 2023). Green innovation is increasingly recognized as a driver of competitive advantage, enabling banks to meet evolving regulatory standards and customer expectations related to sustainability (Kishor et al., 2025). Empirical evidence shows that organizations that innovate in green practices tend to channel more financial resources into sustainable investment portfolios (Khan et al., 2025).

Green Finance

Green finance is the process of setting the capital into environmentally-friendly initiatives, such as renewable energy, clean technologies, climate-resilient infrastructure (Kishor et al., 2025; Lee & Shin, 2018). The types of green finance instruments are green bonds, sustainability linked loans, and ESG focused investment funds. In recent studies, green finance is noted to enhance the speed at which sustainable national objectives can be achieved. Indicatively, green finance has been found to enhance the environmental performance indicators and shape the national investment priorities to low carbon solutions (Kishor et al., 2025; Farooq et al., 2025).

The Stakeholder Theory in Sustainable Banking

According to the stakeholder theory, organizations can be successful in the long run by generating value to all key stakeholders such as customers, employees, shareholders, regulators and communities instead of focusing on shareholder profitability (Freeman, 1984; Donaldson & Preston, 1995). Engagement with stakeholders entails active communication, decision making, and responsibility between the organizational and external groups of stakeholders (Carroll, 1999). When applied to sustainable banking, the stakeholder engagement becomes essential in the process of converting CSR and Fintech efforts into quantifiable green results. Stakeholders affect the strategic path of the firm, the distribution of resources, and even its legitimacy, especially in the situations when people are extremely concerned about the environment (Farooq et al., 2025; Ashfaq et al., 2026).

Hypotheses and theoretical Framework

Conceptual Model

According to the conceptual model, the adoption of Fintech and CSR practices has an independent relation with green innovation and green finance, and these two phenomena are mediated by stakeholder engagement.

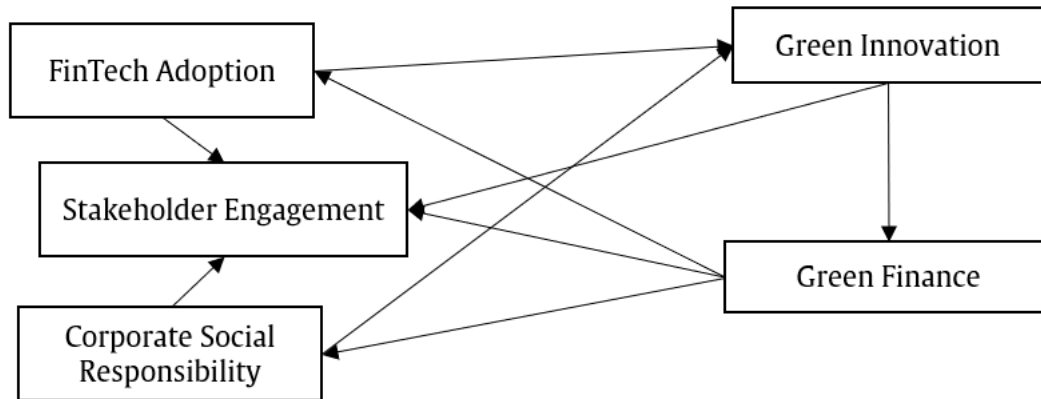


Fig. 1. Conceptual Model

Hypotheses Development

H₁: Green innovation is positively related to the adoption of fintech

The digital technologies help banks create a sustainable product and service by using data analytics, automation, and customer engagement tools (Lee & Shin, 2018; Srairi, 2025).

H₂: CSR practices have a positive effect on green innovation

The relationship of CSR encourages organizational cultures that help in environmental innovation and it may also bring resources to green R&D (Maignan & Ferrell, 2004; Khan et al., 2025).

H₃: Green innovation has a positive effect on green finance

Environmentally innovative institutions have an advantage of providing green financial products and also investing in sustainable investments (Horbach et al., 2023; Ashfaq et al., 2026).

H₄: Green finance is positively impacted by the use of fintech

Fintech promotes transparency of financial transactions, lowering the cost of transactions, and increasing access to green investments (Gomber et al., 2018; Lee & Shin, 2018).

H₅: CSR practices do have a positive influence on green finance

CSR is a signal system that draws sustainable investments, facilitating ESG misaligned financing strategy (Kishor et al., 2025; Hassan et al., 2023).

H₆: The mediating effect of stakeholder engagement is between Fintech/CSR and green innovation/green finance

Stakeholder engagement is effective because it means that the technology and ethical projects are responsive to the needs of the stakeholders, and it improves adoption and impact (Freeman, 1984; Carroll, 1999; Farooq et al., 2025).

METHODOLOGY

Research Design

This research applies a cross-sectional survey that is quantitative and aims to determine the effects of the reception of Fintech and CSR on green innovation and green finance in the banking industry in Pakistan. A cross-sectional design suits the evaluation of the relationships among constructs at one time, especially when it relates to the organizational and stakeholder behaviors (Hair et al., 2014).

Population and Sampling

The target population included the representatives of the commercial and Islamic banks in Pakistan,

such as bank managers, CSR officers, Fintech leads, customers, and regulatory personnel. The stratified random sampling method ensured proportionality in these groups. The sample size of the respondents was 300 individuals, which is more than the recommended minimum of PLS-SEM study (Hair et al., 2014). All scales in the construct were validated scales in the previous literature, modified to fit the Pakistani banking situation:

Fintech Adoption: It is based on the study conducted by Lee and Shin (2018) but with 6 items, 7-point Likert scale (1 = strongly disagree, 7 = strongly agree)

CSR Practices: It is based on the study conducted by Maignan and Ferrell (2004), 7 items, 7-point Likert scale

Green Innovation: It was based on the study conducted by Horbach et al. (2023) items, Likert scale with 7 points

Green Finance: Based on the study conducted by Wang et al. (2022), 6 questions, 7-point Likert scale.

Stakeholder Engagement: This is based on the study conducted by Freeman (1984) and Carroll (1999), 5 items, 7-point Likert scale

Data Collection Procedure

Online surveys and face-to-face interviews were utilized to gather the data within 6 months. The respondents were informed of confidentiality and voluntary participation. Responses in the questionnaires were filtered by checking on complete and outliers and 300 valid responses were yielded.

RESULTS & FINDINGS

Respondent Profile and Descriptive Statistics.

The sample was comprised of 60% male and 40% female respondents who were between junior and senior management positions and also inclusive of regulatory representatives. Table 1 displays the central tendency of the received responses. The analysis of data was performed with the help of Partial Least Squares Structural Equation Modeling (PLS-SEM) and Smart PLS 4.0. The analysis included.

Table 1
Descriptive Statistics

Variable	N	Mean	SD
Fintech Adoption	300	5.21	1.12
CSR Practices	300	5.34	1.08
Green Innovation	300	5.11	1.20
Green Finance	300	5.29	1.15
Stakeholder Engagement	300	5.40	1.10

Measurement Model

Internal consistency was measured via Cronbach alpha (>0.70) and composite reliability (>0.70), as per defined by Hair et al., (2014). The Convergent validity was measured using Average variance extracted (AVE > 0.50) (Table 2).

Table 2
Model Reliability

Construct	Cronbach a	Composite Reliability	AVE
Fintech Adoption	0.87	0.91	0.62
CSR Practices	0.85	0.89	0.60
Green Innovation	0.86	0.90	0.61
Green Finance	0.88	0.92	0.63
Stakeholder Engagement	0.84	0.87	0.59

Path coefficients (b), t-values, p-values using bootstrapping (5,000 resamples). Effects sizes (f²) and predictive relevance (Q²). The discriminant validity was verified through Fornell-Larcker criterion as well as HTMT ratios (less than 0.85). The model accounted for 48 and 52 percent of the variance in green innovation and green finance respectively, respectively, which means that there is high predictive relevance (Q² > 0.35).

Table 3
Effect Sizes

Path	f ²	Interpretation
FinTech - Green Innovation	0.08	Medium
Green Innovation - Green Finance	0.06	Medium
CSR - Green Innovation	0.09	Medium
Fintech - Green Finance	0.05	Small
CSR - Green Finance	0.05	Small
Stakeholder Engagement Mediation	0.04	Small

Note: To derive the effect sizes (f²), the guidelines of Cohen (1988) were used: 0.02 = small, 0.15 = medium, 0.35 = large.

Table 4
PLS-SEM Hypothesis Testing Table

Hypothesis	Path	Beta	t-Value	p-Value	Result
H ₁	Fintech → Green Innovation	0.42	5.21	< .001	Supported
H ₂	CSR → Green Innovation	0.38	4.75	< .001	Supported
H ₃	Green Innovation → Green Finance	0.45	5.68	< .001	Supported
H ₄	Fintech → Green Finance	0.30	4.02	< .001	Supported
H ₅	CSR → Green Finance	0.33	4.25	< .001	Supported
H ₆	Stakeholder Engagement	0.27	3.85	< .001	Supported

Discussion

This paper explores the effects of fintech adoption and corporate social responsibility (CSR) on the performance of green innovation and green finance within the Pakistan banking industry in terms of stakeholder. The findings show that fintech and CSR both play a major role in sustainable financial performance, but the processes take different mechanisms and affect various stakeholders. To start with, the results indicate that there is a significant positive association between the fintech adoption and the development of green innovation programs at Pakistani banks. New green products can be created and provided more effectively and responsively by the use of fintech capabilities, including digital platforms, big data analytics, and blockchain. These technologies aid in optimization of the processes, reduce costs of transactions and promote transparency in green programs. As an illustration, by enhancing the accessibility of green financing to underserved segments, digital financing platforms contribute to the sustainability outcomes being inclusive. This is consistent with the current literature, which highlights that fintech contributes to the agility of the banking sector and innovative solutions depending on sustainability objectives (Gomber et al., 2018; Lee & Shin, 2018).

Second, CSR involvement turned out to be a major improver of green financial performance. Banks that were more CSR oriented had greater green finance allocation, stakeholder trust and environmental performance. CSR programs, such as environmental policies or community involvement programs, are indicative of organizational dedication to sustainability and negatively affect how stakeholders view the organization. Such activities are in line with the stakeholder theory which insinuates that companies with active working relationships with various groups of stakeholders achieve enhanced standing and backing (Freeman, 1984; Donaldson & Preston, 1995). These results make this theoretical thread the longer as it demonstrates that CSR strategies do not only boost the level of social legitimacy but also establish a climate where environmental innovation and investment can take place. Third, the stakeholder perspective, which is used in the present study, indicates a moderating effect of the stakeholders' expectations on the relationship between fintech and sustainability. The benefits of fintech adoption to

green innovation become stronger when banks are under intense pressure by regulators, investors and customers to ensure that the bank focuses on environmental objectives.

This corroborates the stakeholder salience model that argues that certain stakeholder pressure has the ability of hastening organizational change when legitimized by social and regulatory norms (Mitchell et al., 1997). Contextually, the changing regulatory measures in Pakistan, which include the environmental risk management measures and the fintech regulatory sandboxes provide an enabling environment to incorporate sustainability in the financial services. Notably, the research provides subtle details on the dissimilarity in the power of internal and external stakeholders. These stakeholders (i.e., internal (e.g., employees, management), external (e.g., customers, regulators, communities) are the ones that will most influence operationalization of fintech towards sustainability and strategic direction and CSR commitments, respectively. This two-way avenue provides a more detailed insight into how the pressures of the stakeholders contribute to or inhibit green strategic results in emerging markets.

The results however also find implementation challenges. Even though the use of fintech is significantly associated with green innovation, institutional obstacles, including the nature of legacy systems, talent shortages, and cybersecurity issues, may undermine the success of fintech. Similarly, CSR investments can be symbolic and not strategic, which can lead to the so-called greenwashing without its entrenchment in sound governance systems. The problems resonate with what has been previously written to warn that organizational and regulatory ecosystems should support technological and social commitments to create a meaningful environmental impact (Bocken et al., 2014; Xu et al., 2022). On the whole, the proposed research paper can be considered a part of the larger discussion on sustainable finance because it has shown that, in the banking sector of emerging markets such as Pakistan, the combination of technological and social approaches can be leveraged to facilitate the green innovation and financial performance through the implementation of integrated stakeholder responsiveness.

CONCLUSION

The study highlights the importance of fintech and CSR as a key to driving green innovation and green finance in the banking sector of Pakistan. The adoption of fintech makes possible the operational and product innovations to reinforce sustainable financing and enhance stakeholder engagement. The commitments of CSR increase the legitimacy, trust and readiness of the stakeholders to assist environmentally oriented financial strategies. Besides, the stakeholder viewpoint shows that internal and external forces are influential in determining the way banks use fintech and CSR to achieve sustainable results. The facts indicate that banks must seek integrated paths, in which technological injections in the area of fintech are accompanied with genuine CSR initiatives to fulfill the expectations of the market and the society at large. Regulatory backing plays an important role in strengthening the system of green finance and in making sure that the innovations lead to practical positive environmental effects. To policymakers, harmonizing the fintech regulation with sustainability can spur the larger implementation of green financial instruments. To practitioners, the inclusion of CSR as a strategic goal can increase the trust of stakeholders, customer loyalty and competitive advantage, and improve the performance of long-term sustainability.

Future studies are advised to examine longitudinal impact of fintech and CSR investments on sustainability performance and cross-country comparisons in emerging markets as well as the contribution of fintech sub-sectors (e.g., mobile banking, robo-advisory) to differentiated sustainability performance. To conclude, the intersection of fintech and CSR is a promising direction to the mainstreaming of green finance and innovation in banking.

Competing Interests

The authors declared no competing interests.

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