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Abstract

The rapid development of financial technology is changing the banking industry, making banks more efficient and encouraging sustainable financial practices. This study uses corporate social responsibility (CSR) and green finance (GF) as intermediary factors to examine the effects of fintech on banking sustainability in Pakistan. This research used a quantitative approach to obtain data from 200 banking experts including credit managers and sustainability officers who work in different conventional banks across Pakistan. The analysis employed PROCESS Hayes Model 6 as the sequential mediation analysis technique. Fintech plays a fundamental role in promoting sustainability in banking operations across emerging Pakistani markets along with other countries where digital financial solutions advance environmental and social economic advancement goals.

Keywords: Fintech, banking sector, green finance, corporate social responsibility

INTRODUCTION

The world has been highly subjected to ecological imbalance, drastic climate changes leading to increasing natural disasters, the loss of marine life and pollution collectively with many more factors have become a big threat to our survival in the later years of human race. These are some great challenges for us humans, so we require shifts and changes in our projects, operations, activities and programs to protect our planet and find ways to grow us and our economy without harming nature. According to a study by Al-Hammouri, Billeh, and Alkhseilat (2023), international community prioritizes new environmental issues and even the United Nations, it is having a serious negative impact on the international peace and security. In this respect, to overcome these challenges, green finance has appeared as a critical instrument. Green finance has been adopted worldwide for the betterment of the planet earth and in alarming concern for the rising challenges for human survival in the long run. Banks are comparatively more interested in projects of fossil fuels than in green energy predominantly because several risks still surround the new technologies, and they bring less return. If we intend to fulfill strategies for sustainable development, we need to make projects and schemes to increase investment that has energy and environmental returns which would include green bonds, carbon market investments, fiscal and monetary policy, green central banking, different

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financial technologies, green banks, green funds-community based, which is referred to as "green finance" (Sachs et al., 2019; Hun et al., 2024; Sulehri et al., 2024; Mbodj & Laye, 2025). As Pakistan continues to wrestle with the environmental and economic challenges, green Finance has become highly important. Moreover, Fintech platforms provide new channels to grasp green energy initiatives by using tools such as green bonds and crowd funding (Fatima & Zaman, 2020; Sulehri & Ali, 2024; Wadood, 2025). These innovations in finance open green finance to more investors, encouraging them to join the green energy revolution. Our study will explore how green finance can enhance sustainability performance and how green finance, CSR, sustainability performance and Fintech have influence on each other.

LITERATURE REVIEW

RELATION BETWEEN FINTECH AND SUSTAINABILITY PERFORMANCE

Fintech encompasses a broad range of technologies including block chain, artificial intelligence, and digital payment services, which are revolutionizing traditional financial services. Recent studies highlight that these innovations are instrumental in advancing sustainability goals. For instance, block chain technology is increasingly being employed to increase transparency and traceability in supply chains, which is vital for ensuring sustainable sourcing and reducing environmental impacts (Tapscott and Tapscott, 2021; Bozic & Bozic, 2025). Anshari et al. (2019) highlights that combining Fintech with digital marketplaces can significantly enhance sustainability by addressing financial barriers and distribution inefficiencies. . According to Cruz Rambaud and López Pascual (2023), as we delve deeper into various factors including industry specific influences and intermediary elements, the discourse stresses the importance of an integrated approach that aligns technology with sustainable practices, regulatory frameworks, and societal goals. The findings of the research conducted by Subanidja et al. (2022) indicate that fintech entities play a key role in driving sustainable bank performance, both directly and indirectly, through competitive advantage. It states that the presence of fintech is a critical factor in achieving strong performance. The informants in this research revealed that collaboration with fintech entities is essential, as banks initially approached business operations based on experience.

H1. Fintech significantly impacts Pakistan's banking sustainability performance.

MEDIATING ROLE OF GREEN FINANCE AND CORPORATE SOCIAL RESPONSIBILITY IN THE RELATIONSHIP BETWEEN FINTECH AND SUSTAINABILITY PERFORMANCE

Green finance, which involves funding projects and investments aimed at environmental sustainability, is a crucial mediator in the connection between sustainability performance and fintech. A study by Flammer (2021), discusses how digital platforms are expanding the reach and impact of green bonds. According to Flammer, platforms such as the Green Bond Principles offer a framework for the issuance of green bonds, bolstered by fintech innovations that enhance investor confidence and transparency. According to a survey conducted by the Global Impact Investing Network (GIIN), fintech innovations and platforms are improving the flow of finance towards sustainable projects. It highlights the improvements in transparency, engagement, and the overall impact on the sustainable investment landscape. In the last few

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decades, people have been taking steps for economic stability and creating awareness about it which helps in understanding different financial systems, new technologies can be implemented in the banking sector, new laws and policies relevant to help in practicing sustainability. As per Shamim (2023), with the advent of this connection, from Fintech, Environmental innovation and Green Finance, it has been a focus of interest for scholars, decision-makers, and even businesses. As highlighted by Amighini, Giudici and Ruet (2022), In recent years, green banking has become more and more popular, emphasizing environmental sustainability in internal operations as well as its role in encouraging sustainability among clients. According to Zheng et al. (2021), fintech and green finance are crucial instruments for regulators to accomplish the Sustainable Development Goals (SDGs) and the objectives of the Paris consent, particularly in developing nations. By implementing cutting-edge technologies like block chain, green banking, and internet banking, banks may significantly contribute to the promotion of sustainability.

H2. Fintech has a substantial impact on sustainability performance by mediating the roles of green finance and corporate social responsibility (CSR) in Pakistan's banking sector.

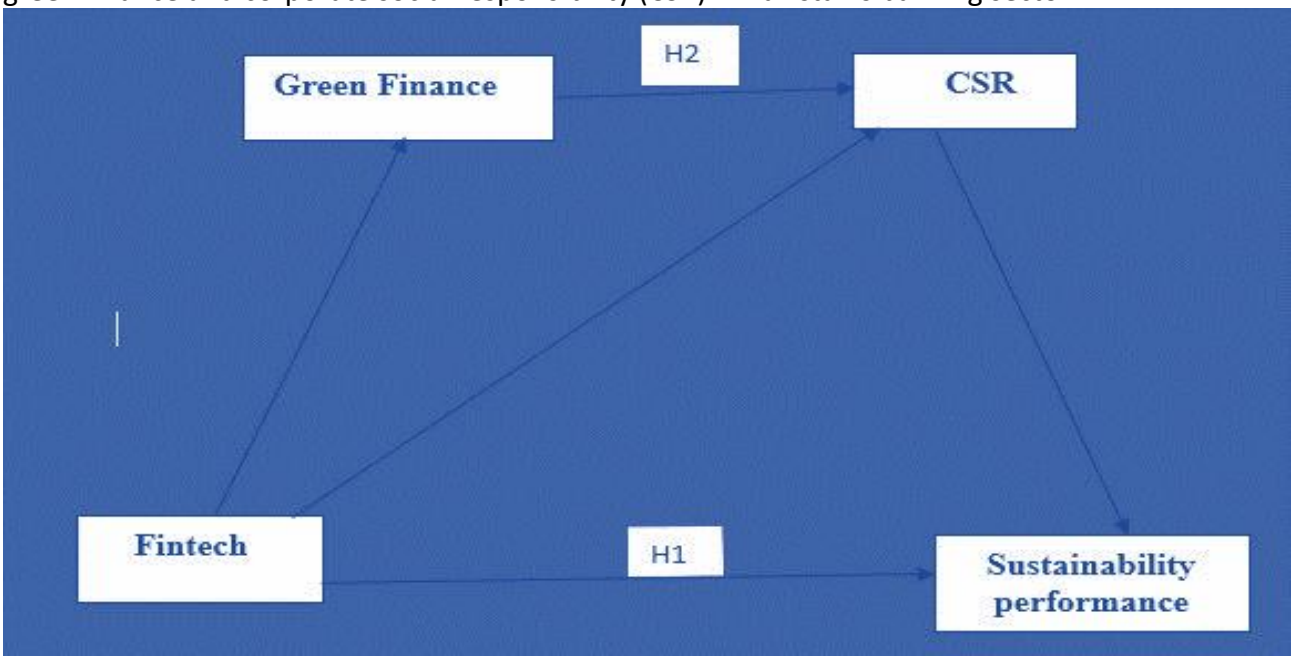

FIGURE 1. THEORETICAL FRAMEWORK

METHODOLOGY

The research design uses quantitative methods to examine the effects of green finance on the banking sectors sustainability performance in Pakistan. The research has been conducted through structured questionnaires to investigate the impact of green finance on the sustainability performance of the banking sectors of Pakistan. The study setting included various banking institutions across Pakistan, focusing mainly on the conventional banks to ensure a thorough understanding of the sector. Examining the function of fintech in Pakistan's banking industry with an emphasis on how it affects sustainability performance was the aim of this study.

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The study primarily looked at how fintech advances affect sustainability practices and financial performance, as well as how CSR and green finance function as mediators in this relationship. By examining these factors, the study aimed to offer insightful information about how fintech might be used to improve sustainability results in the banking industry of Pakistan, ultimately supporting the more general objectives of environmental responsibility and economic growth. The independent variable (X) was fintech. The dependent variable (Y) was sustainability performance. The mediating variables were M1 (green finance) and M2 (Corporate social responsibility). The population for this study included all banking institutions in Pakistan that are involved in green finance activities. This encompasses conventional banks that have adopted the initiatives of green to promote sustainability. The sample size for this study consisted of 200 respondents, this number is considered sufficient to provide a representative overview of the banking sector in Pakistan and allows for reliable statistical analysis. In our study, sequential mediation statistics were used which help in understanding the process through which a dependent variable is influenced by the independent variable via the multiple mediators that operate in a specific sequence.

MEASURE AND DATA ANALYSIS

In Model 6, the outcome variable is AVGSP, with AVGFINTE as the predictor and AVGCSR and AVGGF as mediators. The model investigates both direct and indirect effects of AVGFINTE on AVGSP through the two mediators. The sample size is 210. There are multiple hypotheses tested in this model: (1) the direct effect of AVGFINTE on AVGSP, (2) the indirect effects of AVGFINTE on AVGSP through AVGCSR and AVGGF, and (3) the combined indirect effect via both mediators. The confidence intervals (LLCI and ULCI) will help evaluate the precision of the coefficient estimates, while the bootstrap results will allow for assessment of the indirect effects. The p-value for the overall model is 0.0013, which suggests statistical significance.

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MODEL 6

```
Model  : 6
    Y  : AVGSP
    X  : AVGFINTE
   M1  : AVGCSR
   M2  : AVGGF

Sample
Size:  210

**************************************************************************
OUTCOME VARIABLE:
 AVGCSR

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .2460      .0605      .2768    13.3956     1.0000   208.0000      .0003

Model
             coeff         se          t          p       LLCI       ULCI
constant    2.8388      .2753    10.3129      .0000    2.3840    3.2935
AVGFINTE     .2612      .0714     3.6600      .0003     .1433     .3792

**************************************************************************
OUTCOME VARIABLE:
 AVGGF

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .3577      .1280      .3308    15.1861     2.0000   207.0000      .0000

Model
             coeff         se          t          p       LLCI       ULCI
constant    1.7693      .3699     4.7825      .0000    1.1580    2.3805
AVGFINTE     .3555      .0805     4.4162      .0000     .2225     .4886
AVGCSR       .1599      .0758     2.1092      .0361     .0346     .2851
```

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OUTCOME VARIABLE:
 AVGSP

Model Summary
          R       R-sq        MSE          F        df1         df2          p
      .2712      .0736      .2469     5.4523     3.0000   206.0000      .0013

Model
              coeff         se          t          p       LLCI       ULCI
constant     2.5310      .3368     7.5155      .0000     1.9746     3.0875
AVGFINTE      .1803      .0728     2.4784      .0140      .0601      .3005
AVGCSR        .0845      .0662     1.2772      .2030     -.0248      .1939
AVGGF         .0833      .0600     1.3867      .1670     -.0159      .1825

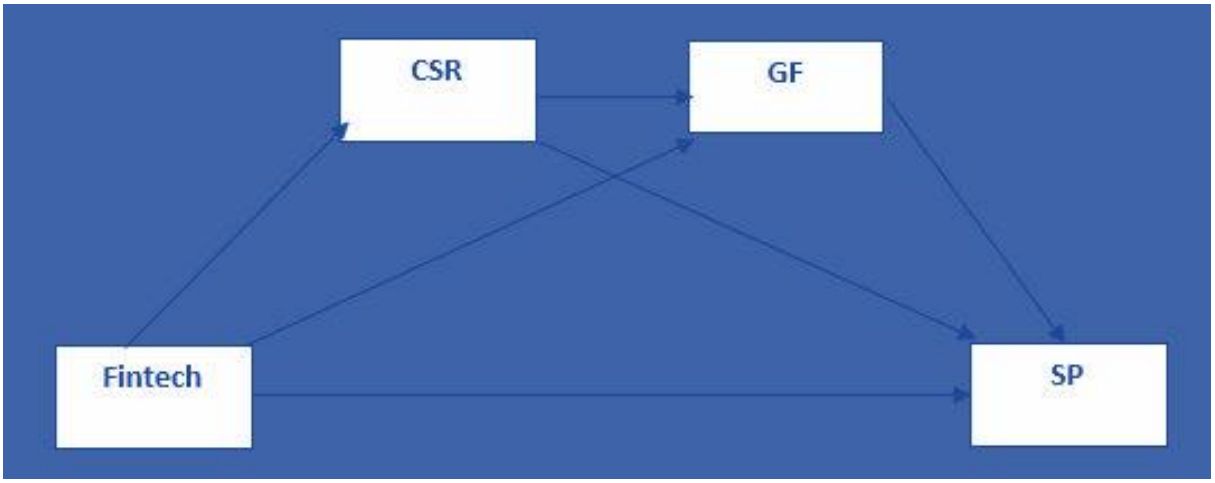
****************** DIRECT AND INDIRECT EFFECTS OF X ON Y *****************

Direct effect of X on Y
     Effect         se          t          p       LLCI       ULCI
      .1803      .0728     2.4784      .0140      .0601      .3005

Indirect effect(s) of X on Y:
          Effect     BootSE   BootLLCI   BootULCI
TOTAL      .0552      .0336      .0059      .1151
Ind1       .0221      .0211     -.0072      .0598
Ind2       .0296      .0267     -.0095      .0779
Ind3       .0035      .0043     -.0010      .0120

Indirect effect key:
Ind1 AVGFINTE    ->    AVGCSR      ->    AVGSP
Ind2 AVGFINTE    ->    AVGGF       ->    AVGSP
Ind3 AVGFINTE    ->    AVGCSR      ->    AVGGF       ->    AVGSP
```

FIGURE 2: SPSS OUTPUT – MEDIATION ANALYSIS USING PROCESS HAYES MODEL 6



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SIGNIFICANCE BASED ON P-VALUE

The relationship between AVGFINTE and AVGCSR is significant, with a p-value of 0.0003, indicating a positive effect. For the second part of the model, AVGFINTE significantly affects AVGGF with a p-value of 0.0000, and AVGCSR has a significant effect on AVGGF (p-value of 0.0361). Regarding the outcome variable AVGSP, the direct effect of AVGFINTE on AVGSP is significant (p-value of 0.0140), but the direct effects of AVGCSR (p-value of 0.2030) and AVGGF (p-value of 0.1670) are not significant.

SIGNIFICANCE BASED ON CONFIDENCE INTERVALS (LLCI AND ULCI)

The confidence interval for the direct effect of AVGFINTE on AVGSP (0.0601 to 0.3005) does not include zero, confirming a statistically significant relationship. The confidence intervals for AVGCSR on AVGSP (-0.0248 to 0.1939) and AVGGF on AVGSP (-0.0159 to 0.1825) include zero, indicating no significant direct effects. For the indirect effects, the confidence intervals for Ind1 (AVGFINTE → AVGCSR → AVGSP), Ind2 (AVGFINTE → AVGGF → AVGSP), and Ind3 (AVGFINTE → AVGCSR → AVGGF → AVGSP) do not contain zero, suggesting significant indirect effects of AVGFINTE on AVGSP through the mediators.

SIGNIFICANCE BASED ON BOOTSTRAP OR INTERACTION TERMS

The bootstrap results for the indirect effects show that the total indirect effect of AVGFINTE on AVGSP is 0.0552, with a bootstrap confidence interval of 0.0059 to 0.1151, which does not contain zero, indicating a significant indirect effect. The individual indirect effects (Ind1, Ind2, and Ind3) have confidence intervals that do not contain zero, with Ind1 and Ind2 showing some overlap with zero, suggesting weaker but still significant indirect pathways through the mediators. This suggests that the indirect effect of AVGFINTE on AVGSP is mediated by both AVGCSR and AVGGF, albeit with some variability in the strength of these indirect relationships.

TABLE 1: MEASUREMENT ITEMS

	Variables	No. of Items	Author	Sample Items
1.	Green Finance	5	(Abuatwan, 2023)	Green financing significantly improves the revenue and market share of our bank. Green financing significantly decreases the operational expenditure of our bank. Green financing significantly reduces paper usage and energy consumption in our bank.
2.	Fintech	4	(Anita et al., 2023)	Fintech services can save time. Fintech services can improve efficiency. I think the operation interface of Fintech is friendly and understandable.
3.	Corporate Social Responsibility	7	(Turker, 2009)	Our company provides a wide range of indirect benefits to improve the quality of employees' lives. The employees in our company receive a

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				reasonable salary to maintain an acceptable quality of life.
4.	Sustainability Performance	5	(Zheng et al., 2021)	Green finance improves the relationship between the community and stakeholders. Green financing creates more competitive advantage.

CONCLUSIONS

Based on the results, Model 6 can be considered a valid model for explaining AVGSP. The direct effect of AVGFINTE on AVGSP is statistically significant, and the indirect effects through the mediators AVGCSR and AVGGF are also significant, as confirmed by the bootstrap results and confidence intervals. However, the direct effects of AVGCSR and AVGGF on AVGSP were not significant, suggesting that these variables function primarily as mediators rather than direct influencers. The significant indirect effects support the notion that AVGFINTE impacts AVGSP through these mediators. Overall, this model meets the necessary criteria for approval, as both direct and indirect effects are statistically significant, and the mediation pathways provide insight into how AVGFINTE influences AVGSP.

The research evaluated how fintech affects sustainability results in Pakistani banking through green finance and corporate social responsibility (CSR) as mediators. Fintech creates a direct positive relationship with sustainability performance measurements. Fintech have a substantial impact on both green finance and CSR which function as intermediaries to improve sustainability performance. Moreover, the study demonstrates that green finance alongside CSR do not demonstrate a statistically significant link to sustainability performance. Our research establishes multiple important additions to scholarly knowledge regarding fintech research together with sustainability performance and green finance frameworks. It extends current knowledge about how fintech affects sustainable banking practices by empirically validating its direct impact on sustainability performance. Moreover, our research benefits the discourse regarding green finance and CSR by showing how these elements function as mediators which require adequate regulatory structures to operate effectively.

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