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THE SYNERGY OF TECHNOLOGY AND SUSTAINABILITY: EXPLORING THE IMPACT OF FINTECH AND GREEN INVESTMENTS ON BANKING PERFORMANCE THROUGH CSR

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Abstract

The present research investigates the impact that the use of FinTech may have on the sustainable banking performance, particularly, the mediating role of the green investment and the moderating role of corporate social responsibility (CSR). The article is grounded on the Resource-Based View (RBV) and innovation-diffusion theory and founded on the study of implication of digital financial technologies in the advancement of environmental, social, and financial sustainability in a banking organization. The discussion demonstrates that FinTech implementation has both direct and indirect positive effects on sustainable performance since it boosts green investment plans which have been synthesized by the broader empirical and theoretical base. In addition, CSR is another significant moderator that enhances the nexus between the adoption of FinTech and sustainable outcomes by bringing the ethical and

socially responsible dimensions to the technology implementation. The implications of such results on the sphere of banking are important in terms of policy, strategy, and theory.

Keywords: *FinTech , CSR, RBV, innovation-diffusion sphere of banking.*

INTRODUCTION

During the last several years, the use of FinTech has already become an exemplary force in the financial services sector that not only is making the financial processes more efficient but is also complementing the sustainability of the banking institutions. FinTech as a general term encompassing blockchain technology, electronic payments, peer-to-peer lending, artificial intelligence (AI), and so forth have revolutionized the financial sector and made transactions real-time, cheaper, and more satisfying to consumers (Gomber et al., 2018). The core of this change is that it has the potential to address the global sustainability issues such as the enhancement of environmental sustainability and the inclusive economic development (Chuen et al., 2015).

The connection between the use of FinTech and the sustainable functioning of a bank has gained more and more academic and practical interest. Environmental responsibility, social impact, and governance practices (ESG) are usually used as the main pillars on which sustainable performance in the banking context is analyzed. These are the dimensions of sustainability that are necessary to promote long-term value addition in the financial institutions, especially with the increasing theme of environmental, social, and ethical concerns among consumers, investors, and regulators (Elkington, 1997). However, the direct and indirect impacts of FinTech adoption on these non-financial performance measures have been studied in few and scattered empirically (Badau et al., 2020).

Green investment is one of the critical processes that increase sustainability in the banking industry by adopting FinTech. Greener investments: Environmentally friendly financing green energy, green bonds and sustainable infrastructure development are crucial to financial systems that lead to mitigating climate change and long-term sustainability of the environment. FinTech is an essential element in facilitating such investments because it increases access to capital, minimizes the costs of carrying out

transactions, and increases transparency of the financial markets (Ng and Tao, 2020). In these ways, digital innovations are becoming a conduit to invest in green projects and, in this way, make the financial performance aligned with the more general sustainability goals.

Furthermore, FinTech adoption is linked to sustainable performance with a moderating effect of Corporate Social Responsibility (CSR) since the concept is gaining increased popularity in literature (Yasir et al., 2023). CSR is a term that is used to mean the ethical responsibilities that companies have to the stakeholders they operate in which they include environmental responsibility, equitable labor regulations, and strong corporate governance (Carroll, 1999). CSR practices can be seen as the intentions to incorporate social and environmental issues in the business processes to increase the legitimacy of an organization and the trust of the stakeholders. CSR can enhance the beneficial effects of technological transformations when banks implement the FinTech innovations because, in this case, financial products and services are to meet the ethical and sustainable requirements (Jamali and Karam, 2018).

1.1 RESEARCH OBJECTIVES

The objective of this study is to explore the complex relationships between FinTech adoption, green investment, and banking sustainable performance, with an emphasis on the moderating role of CSR. Specifically, the research aims to:

1. *To examine the impact of FinTech adoption on banking sustainable performance, with green investment as a mediator and CSR as a moderator.*

1.2 RESEARCH QUESTIONS:

1. *How does FinTech adoption influence banking sustainable performance?*
2. *What is the mediating role of green investment in the relationship between FinTech adoption and banking sustainable performance?*
3. *How CSR moderate the relationship between FinTech adoption and banking sustainable performance?*

2. LITERATURE REVIEW

2.1 FINTECH ADOPTION AND BANKING SUSTAINABLE PERFORMANCE

The advent of financial technology has greatly disrupted the traditional banking sector with new opportunities to enhance operation performance, customer satisfaction and sustainability performance. Digital financial solutions offered by FinTech include blockchain technology, artificial intelligence (AI), digital wallets, and peer-to-peer lending solutions. It has resulted in the modification of the services offered by financial institutions and banks and the business model (Gomber et al., 2018). The technological advances have been attributed to increased financial inclusiveness, reduced costs of conducting business, and automation of banking services, all of which have supported the business sustainability in general (Badau et al., 2020).

Fiscal efficiency is not the end of sustainable performance in banking, and it entails the aspects of environmental, social, and governance (ESG). In this regard, the introduction of FinTech can be regarded as a potentially significant initiative of positive sustainable outcomes due to the alignment of technological shifts to a more sustainable overall objective (Badau et al., 2020). As recent reports indicate, the digital finance technologies may be applied to integrate sustainability in the services offered by the financial institutions by increasing the transparency, green investment, and social responsibility (Gomber et al., 2018). Following this, one of the financial performance and sustainability objectives can be met through the utilization of FinTech and in the process that a bank can create long-term value, and simultaneously address global problems such as climate change (Chuen and Teo, 2015).

Additionally, the study by Ng and Tao (2020) shows that Internet channels, such as green bonds and crowdfunding can shift investments towards sustainable projects and therefore demonstrates that FinTech might be utilized to establish environmental sustainability. This opinion is in line with the theories of sustainable finance, which emphasize the fact that the financial products are to be combined with the objectives of social and environmental impacts. It is expected on this basis that FinTech

implementation will not only foster the performance of the banking sector with respect to the traditional financial measures of performance, but also non-financial environmental aspects that are of paramount importance to sustainability (Gomber et al., 2018).

Hypothesis 1: *Fintech Adoption has a positive impact on Banking Sustainable Performance (BSP).*

2.2 FINTECH ADOPTION AND GREEN INVESTMENT

FinTech integration is amongst the key aspects of the green investment improvement since it boosts financial market transparency, efficiency and accessibility. The technologies that can assist in monitoring and verifying green investments, including green bonds and renewable energy projects, by investors are blockchain, artificial intelligence (AI), and digital platforms (Gomber et al., 2018). The blockchain technology will ensure there is transparency that will guarantee the capital mobilization to ensure the intended environment goals are attained, which will facilitate investor confidence (Ng and Tao, 2020). Digital platforms have been used to democratize the opportunities of green finance, where smaller investors can participate in financing sustainable projects by using crowdfunding and peer-to-peer lending (Chuen and Teo, 2015). This brings about the scaling of green investments and transition to a sustainable economy due to the resultant increase in participation. Additionally, the AI and big data can support the process of making decisions by offering data on the performance of environmental projects in terms of environment and finance (Badau et al., 2020). Besides access, FinTech improves the efficiency of deploying capital to the green project and reduce transaction costs and speed up the financing of the project (Ng and Tao, 2020). Consequently, FinTech application will be necessary to facilitate the creation of green investments to align financial services with the global sustainability agenda and handle serious environmental issues.

Hypothesis 2: *FinTech Adoption has a positive impact on Green Investment*

2.3 GREEN INVESTMENT AND BANKING SUSTAINABLE PERFORMANCE

Green investment is defined as an investment into environmentally sustainable projects, that also encompass renewable energy, energy efficient technologies and low carbon infrastructure. The growing significance of the green investments in the achievement of global sustainability has become even more noticeable in the banking sector as a result of which the banks play a pivotal role in funding the initiatives designed to promote further environmental, social, and governance (ESG) initiatives (Badau and Hrebenciuc, 2020). To balance their sustainable performance, banks can include green investments in the portfolio in the coordination of their activities with the long-term interests of sustainability, as well as the ability to meet the needs of the environment-friendly financial products of the society (Gomber et al., 2018). The correlation between banking sustainable performance and green investment is mostly embedded on the ability of the banks to mobilize contribution to the environment and at the same time make financial returns. An example of financial products that can help a bank to channel capital towards green initiatives to achieve environmental sustainability and financial development of the bank is green bonds and sustainable asset management (Ng and Tao, 2020). Green investments are known to help banks in boosting the reputation of the brand, getting the attention of socially-conscious investors, and fulfilling regulatory requirements regarding environmental responsibility (Gomber et al., 2018). Moreover, the field of green investment has sub-impact on the banking performance in terms of better risk management. Banks reduce their risk to climate-related financial risks by financing projects that enhance environmental sustainability that may impact their long-term sustainability (Chuen & Teo, 2015). Green investment in the portfolio of the bank not only makes one more solid to the environment but also contributes to the overall sustainable performance by making sure that the investments are made into the long-term projects that could help minimize ecological damage and foster social good. To sum up, green investment can effectively contribute to the banking sustainable performance by aligning the financial targets with the sustainability targets, improving the risk management, and promoting positive social and environmental effects.

***Hypothesis 3**: Green Investment has a positive impact on banking*

sustainable performance

2.4 GREEN INVESTMENT AS A MEDIATOR

Green investment can be defined as an investment in the project or technology which has environmental benefits such as green infrastructure, sustainable agriculture, and renewable energy. Financial technology (FinTech) plays a critical role in the work of facilitating green investment, which adjusts sustainable financial products to easier access and simplifies the process of investment (Ng and Tao, 2020). One such example is the adoption of digital platforms including green bonds and impact-investing platforms that enable investors to invest in projects that are environmentally friendly which this development has been regarded as core in attaining environmental, social, and governance (ESG) targets in banking industry (Chuen & Teo, 2015). The empirical research confirms the efficiency of the FinTech in green investments, reducing the transaction costs, mitigating the information asymmetry, and helping in the management of risks to be better (Badau et al., 2020). In order to exemplify this, green finance transactions could become traceable and transparent in blockchain technology, which allows an investor to trace the way his/her investment would lead to environmental sustainability (Gomber et al., 2018). Consequently, green investing is an important process linking the FinTech utilization to the sustainability banking performance, which is an intermediary between technology and sustainability performance (Ng and Tao, 2020). Also, researchers offer that the combination of FinTech and green finances can be applied to scale green projects, thereby improving the mediating role of green investment on the relationship between FinTech and sustainable banking performance (Chuen and Teo, 2015). This assertion is also substantiated by researches by Badou et al. (2020) who postulate that green investments are inherent in the advancement of the long-term sustainability agenda in banks by ensuring that the bank is portfolio inclined to the global environmental agenda.

***Hypothesis 4**: Green Investment mediate the relationship between fintech adoption and banking sustainable performance*

2.5 CORPORATE SOCIAL RESPONSIBILITY (CSR) AS A MODERATOR

Corporate Social Responsibility (CSR) is an analytical model which explains the moral responsibilities of corporate organizations to their stakeholders, and it involves activities relating to environmental protection, social justice, and sound governance systems. In banking sector, the practice of CSRs is unavoidable in nurturing stakeholder trust and enhancing the overall effect of the adoption of FinTech to sustainable performance (Carroll, 1999). By enabling the adjustment of technological innovations, such as FinTech solutions, to current trends in social and environmental requirements, CSR increases their impact on sustainability rates (Jamali and Karam, 2018).

The mediating role of CSR relating to the nexus concerning the adoption of FinTech and banking sustainable performance can be explained through the lens of the Stakeholder Theory according to which organizations have the duty of balancing the interests of various stakeholders, which comprise shareholders, employees, customers and generally, the society (Freeman, 1984). By integrating CSR into their FinTech approach, banks can make sure that digital solutions are implemented in a socially responsible way, with regard to the environmental as well as the social implications of their innovations. As a result, CSR enhances the effectiveness of FinTech implementation in promoting sustainable performance by aligning the technological solutions with the expectations of heterogeneous groups of stakeholders. Empirical studies by Jamali and Karam (2018) highlight the fact that CSR is capable of influencing the process of making organizational decisions, therefore guiding the process of introducing technologies like FinTech into corporate strategies. Crafting an inclusive growth, environmental stewardship, ethical behaviors CSR ensures that financial technologies are developed of technologies that favour profit over sustainability, which is especially relevant in the banking industry where technologies that lacks stringent CSR policies will tend to employ, which is the case with the banking industry (Carroll, 1999). The practice of CSR can increase the role of FinTech in sustainable banking performance by focusing on long-term and sustainable effects that will guarantee that the

technological adoption is a basis of broader social and environmental goals (Jamali and Karam, 2018).

Hypothesis 5: *Corporate social responsibility moderates the relationship between fintech adoption and green investment.*

2.6 THEORETICAL FRAMEWORK

Corporate Social Responsibility (CSR) is an analytical model which explains the moral responsibilities of corporate organizations to their stakeholders, and it involves activities relating to environmental protection, social justice, and sound governance systems. In banking sector, the practice of CSRs is unavoidable in nurturing stakeholder trust and enhancing the overall effect of the adoption of FinTech to sustainable performance (Carroll, 1999). By enabling the adjustment of technological innovations, such as FinTech solutions, to current trends in social and environmental requirements, CSR increases their impact on sustainability rates (Jamali and Karam, 2018). The mediating role of CSR relating to the nexus concerning the adoption of FinTech and banking sustainable performance can be explained through the lens of the Stakeholder Theory according to which organizations have the duty of balancing the interests of various stakeholders, which comprise shareholders, employees, customers and generally, the society (Freeman, 1984). By integrating CSR into their FinTech approach, banks can make sure that digital solutions are implemented in a socially responsible way, with regard to the environmental as well as the social implications of their innovations. As a result, CSR enhances the effectiveness of FinTech implementation in promoting sustainable performance by aligning the technological solutions with the expectations of heterogeneous groups of stakeholders. Empirical studies by Jamali and Karam (2018) highlight the fact that CSR is capable of influencing the process of making organizational decisions, therefore guiding the process of introducing technologies like FinTech into corporate strategies. Crafting an inclusive growth, environmental stewardship, ethical behaviors CSR ensures that financial technologies are developed of technologies that favour profit over sustainability, which is especially

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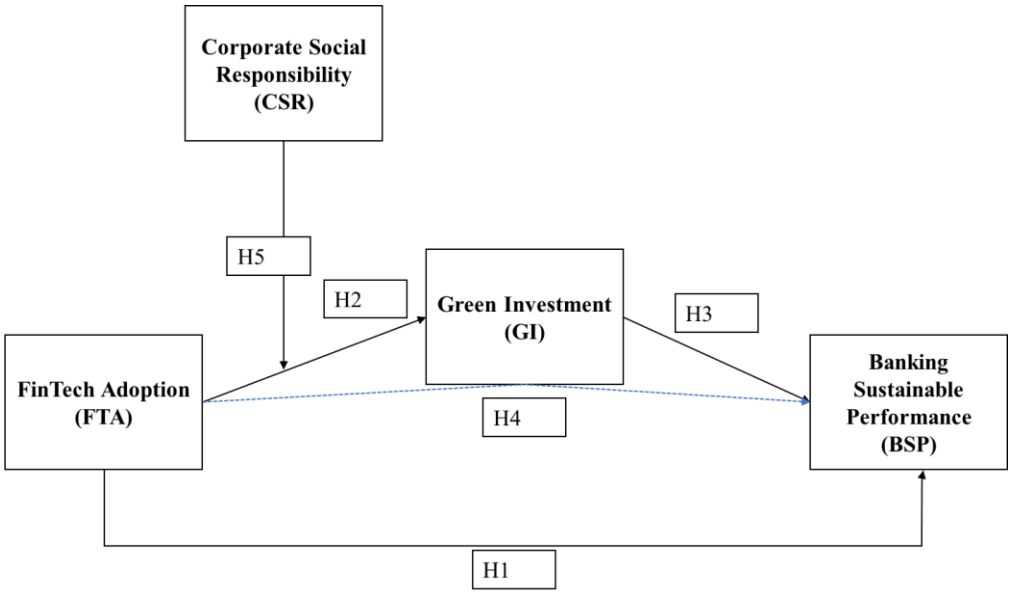

Figure 1: Research Model

3.MATERIALS AND METHODS

The paradigm that this research takes is the positivist paradigm that subsidizes the quantitative research and hypothesis testing, thus making it more appropriate when investigating the linkages between FinTech adoption, green investment, banking sustainable performance, and Corporate Social Responsibility (CSR). The positivist approach is better as it is focused on objectivity, empirical validation, and statistical hypothesis testing (Park & Kim, 2020). In line with this, it will measure the hypothesized relationships between the variables to say the extent to which they are mediated by green investment and moderated at the same time by CSR, which will ensure the structural rigor and offer a wholesome description of the relationships among the variables (Hair et al., 2019).

Resource-Based View (RBV) and the Diffusion of Innovation Theory

(DOI) are the theoretical assets of the present study. The resources and capabilities, FinTech infrastructure, green investment, and CSR practices are under the RBV and are required in attaining sustainable competitive advantage and realizing banks sustainable performance. Within the framework of the given study, the adoption of FinTech is theoretized as an important resource that contributes to sustainability due to the increased efficiency of the operations and enables environmentally friendly practices. In addition, green investment has been viewed as a resource that can be exploited by the banks to achieve financial and environmental goals and the CSR practices are seen as a separate ability that the banks can combine with FinTech to achieve better performance and add more reputation, which is becoming more and more associated with sustainability (Barney, 1991).

In its turn, DOI theory explains the process of the spread of innovations like FinTech technologies, and the impact of perceived benefits, relative advantage, and ease of use on them. In the banking industry, the use of FinTech is driven by the belief that digital instruments, such as mobile banking, digital payment, and blockchain, possess the same benefits in terms of efficiency, transparency, and sustainability. The theory argues that the more the banks realize that FinTech has a relative advantage in improving financial and sustainable performance, the more they are inclined to embrace such innovations thus supporting the sustainability goals on a larger scale. The research will focus on the banking sector and specifically how the adoption of FinTech can contribute to sustainable performance through green investments and CSR practices. The objective is to create an all-inclusive idea of how these technologies and practices will create long-term value creation in the banking sector. Quantitative research will be utilized, and the survey will be used to gather the data concerning the banking professionals who are engaged in the adoption of FinTech, green investment, and sustainability programs. The survey tool will assess important constructs in the form of FinTech adoption, green investment, banking sustainable performance, and CSR on the scale of validated scales of each variable.

The proposed hypotheses will be tested using structural equation modeling (SEM), and the specific research tool will help examine the direct and indirect connection between the specified variables. The method will help to investigate the mediating contribution of green investment and the moderating contributed of CSR in the interdependence between FinTech adoption and sustainable banking performance.

3.1 SAMPLING AND TARGET POPULATION

The sample of the research will include employees in the banking industry in Pakistan with one specific exclusion being the class four employees who do not directly deal with FinTech technologies as well as do not have sufficient knowledge about Green Investment (GI), Banking Sustainable Performance (BSP), or Corporate Social Responsibility (CSR). Class four employees do not typically play an active role in the adoption of FinTech and they lack the expertise required to play a significant part in research about sustainability practices and green investments in the banking environment. The convenience sampling strategy will be used and this is a nonprobability sampling technique. This will help in the selection of the respondents who are actively engaged in the adoption and sustainability performance of FinTech, and hence will be more relevant to the study objectives (Kaur, 2015). The sampling will be based in Punjab, which is the most notable province in the banking activities in Pakistan. The number of distributed questionnaires will be 500, and it will be distributed to employees working in the banking industry area and involvement in FinTech adoption. After the data cleaning, 116 of the respondents were eliminated as they had an empty or inaccurate response, and the final sample size is 384. As indicated in the Krejcie and Morgan (1970) sampling requirements, a sample of 384 is sufficient in a population of over one million, which implies that the hypothesis testing will be statistically adequate with a 95 per cent confidence level and a 5 per cent error. The obtained sample size can be considered as the best to test the hypothesis on the relations between FinTech adoption (FTA), green investment (GI), banking sustainable performance (BSP), and the moderating effect of CSR in the Pakistani banking industry. The validation of the scales (made to measure FinTech adoption (FTA), green investment (GI), banking sustainable performance

(BSP), and CSR) will be conducted in terms of expert evaluation and statistical reliability testing. This will ensure that the instruments are reliable and valid in the particular contextual set up of the study as well as in the sense that they conform to the research model that is proposed.

3.2 DATA COLLECTION AND INSTRUMENT DESIGN

The study incorporated a survey-based research methodology whereby structured questionnaires were used in accumulating quantitative data. A structured questionnaire was chosen because it is simple and efficient in terms of operations in extracting respondent information. The survey was carried out using offline survey tool and the results were obtained on Likert scale ranging between strongly disagree and strongly agree. The questionnaire was then subdivided into two major parts, where the first part collected the demographics of the participants, and the second part consisted of statements that were directly tailored to measure the variables of the study.

The questionnaire development was based on a strict procedural framework whereby the scales used were based on the available literature. These scales were taken as they are, provided that they have proven to be valid, and they are common to similar research settings. The magnitude to retain the scales of the preceding studies was pegged on the need to maintain consistency and reliability. The sources used to obtain the approved scales are outlined in Table 1.

Table 1 Sources of study variables

Sr. No	***Variables***	***Code***	***References***
1	*FinTech Adoption*	*FTA*	*(Al Doghan &Chong, 2023).*
2	*Banking Sustainable Performance*	*BSP*	*(Joshi & Karmacharya, 2024).*
3	*Green Investment*	*GI*	*(Al Doghan &Chong, 2023).*
4	*Corporate Social*	*CSR*	*(Ye and Dela 2023).*

	Responsibility		

3.3 DATA ANALYSIS AND TECHNIQUE

Structural Equation Modeling (SEM) was used through Smart PLS 4 and Average Variance Extracted (AVE) in this research to analyse the data to establish the reliability of the data that was collected. SEM is considered to be the most effective statistical tool to evaluate the connection between constructs and the credibility of findings (Hair et al., 2021). To assess the convergent validity of the measurement model, AVE was used to make sure that indicators in each construct are interrelated and empirically differentiated with other constructs. According to convergent and discriminant validity tests, the instrument was deemed valid and showed that the constructs are clear and accurately measure the targeted dimensions (Hair et al., 2021). Internal reliability of the responses was examined with the help of the CronbachAlpha coefficient, and the value of 0.70 was regarded as being satisfactory to provide the internal consistency (Hair et al., 2021). This measure also assures that the items in each construct are always a measure of the same underlying concept. Following the literature, the AVE value above 0.50 was considered suitable to achieve the convergent validity, which would prove that the measurement model accurately measures the conceptual aspects of the study variables, including FinTech adoption (FTA), green investment (GI), and banking sustainable performance (BSP). Also, the analysis of the relationships was conducted using SEM as the independent variable, FinTech adoption (FTA), and the dependent variable, which is banking sustainable performance (BSP). Mediation analysis was done to explore the relationship between FinTech adoption and sustainable performance when the green investment (GI) intervenes and the Corporate Social Responsibility (CSR) plays a moderating role. The significance tests were done using bootstrapping and the model is effective in dealing with the problem of multicollinearity, and the results are robust. Such a strict methodology will be optimal in evaluating how the adoption of FinTech has an effect on the sustainability performance of a developing state such as Pakistan (Hair et al., 2021).

The results are expected to provide valuable information concerning the mediation of FinTech adoption (FTA) by green investment (GI) and the banking sustainable performance (BSP) and the moderation of this relationship by CSR. The framework will not only serve theoretical progress but also practical application to the banking industry in Pakistan in which the policymakers and banking experts will gain insights to the bigger picture of the adoption of FinTech of sustainable banking practices.

4. RESULT AND ANALYSIS

The data obtained were analyzed using Partial Least Squares Structural Equation Modeling (PLS -SEM) with Smart PLS version 4.0 (Hair et al., 2021). PLS-SEM is a powerful statistical method, especially when the researcher is interested in studying complicated causal association between latent constructs; it has, therefore, gained popularity in exploratory and predictive research studies in the recent past. Compared to covariance-based CB-SEM, PLS-SEM gives more emphasis on R 2 maximization and is best used when the model contains both formative and reflective measures as it is in the current research. PLS-SEM has been chosen as the one able to provide accurate estimates of direct and indirect relationships, especially those related to studying the mediating role of Green Investment (GI) in the relationship between FinTech Adoption (FTA) and Banking Sustainable Performance (BSP). The results used 5000 bootstrap resamples to strengthen the quality of path coefficient estimates and determine the level of statistical significance (Hair et al., 2021). In addition to the structural modelling, a demographic analysis was done to assess gender, age, professional experience, and education level of the respondents.

Table 2 Demographic profile of respondent

Demographic Variables	*Group*	*Frequency*	*Percentage*
Gender	*Male*	*335*	*87%*
	Female	*49*	*13%*
Age	*25-35*	*170*	*50%*
	36-45	*101*	*26%*

	46-55	*70*	*18%*
	Above 55	*26*	*6%*
Education level	*Graduation*	*160*	*41%*
	Post-Graduation	*115*	*29%*
	Professional Qualifications	*118*	*30%*
Experience	*1 - 5 years*	*135*	*35%*
	6 - 10 years	*93*	*24%*
	11 - 15 years	*76*	*20%*
	16 – 20 years	*48*	*12%*
	21 years and above	*32*	*9%*

4.1 MEASUREMENT MODEL

Structural Equation Modeling (SEM) places significant importance on the measurement model to guarantee validity and reliability of constructs (Hair et al., 2021). Internal consistency of the constructs was assessed by using composite reliability and Cronbachs alpha. Reliability is acceptable when the alpha of Cronbach and composite reliability are 0.70 and above (Henseler et al., 2016). Table 3 reveals that all the values of Cronbach alpha and composite reliability exceed the threshold value, and thus show satisfactory reliability. On convergent validity, the Average Variance Extracted (AVE) per construct should be more than 0.50 (Hair et al., 2021). Table 3 shows high convergent validity where all the constructs have AVE of over 0.50.

Table 3 Reliability and Convergent Validity

Variables	*Items*	*Loadings*	*Cronbach Alpha*	*CR*	*AVE*
FinTech Adoption	*FA1*	*0.645*	*0.87*	*0.9*	*0.565*
	FA2	*0.661*			
	FA3	*0.814*			
	FA4	*0.779*			
	FA5	*0.833*			
	FA6	*0.827*			
	FA7	*0.672*			
	FA8	*0.674*			
Green investment	*GI1*	*0.733*	*0.86*	*0.902*	*0.697*
	GI2	*0.754*			
	GI3	*0.880*			
	GI4	*0.910*			
	GI5	*0.781*			
	GI6	*0.81*			
Corporate Social Responsibility	*CSR 1*	*0.762*	*0.70*	*0.789*	*0.576*
	CSR 2	*0.792*			
	CSR 3	*0.669*			
	CSR 4	*0.763*			
	CSR 5	*0.801*			
Banking Sustainable Performance	*BSP 1*	*0.847*	*0.89*	*0.882*	*0.521*
	BSP 2	*0.817*			

	BSP 3	0.780			
	BSP 4	0.622			
	BSP 5	0.581			
	BSP 6	0.687			
	BSP 7	0.667			
	BSP 8	0.75			
	BSP 9	0.668			
	BSP 10	0.764			

4.2 FORNELL–LARCKER CRITERION

The discriminant validity was measured using the FornellLarcker criterion (Fornell and Larcker, 1981) and the results are presented in Table 4. The average variance extracted (AVE) square root of each construct was larger than the cross-loading between two constructs, therefore, meeting the conventional requirements of discriminative validity (Hair et al., 2021). Besides, Multicollinearity was assessed by calculating Variance Inflation Factors (VIFs), and all of them were less than three, which implies that there was no significant multicollinearity in the data (Hair et al., 2021).

TABLE 4 FORNELL–LARCKER CRITERION: DISCRIMINANT VALIDITY

	FTA	***GI***	***CSR***	***BSP***
FTA	***0.865***			
GI	*-0.091*	***0.834***		
CSR	*-0.018*	*0.026*	***0.743***	
BSP	*-0.033*	*-0.055*	*0.285*	***0.743***

4.3 STRUCTURE MODEL

4.3.1 DIRECT RELATIONSHIP

Hypothesis 1: *Fintech Adoption has a positive impact on Banking Sustainable Performance (BSP).*

The study found a positive and meaningful connection between FTA and BSP (β = 0.778, t = 19.346, p < 0.05). This indicates that the research is supported by a sufficient amount of empirical data to substantiate H1.

Hypothesis 2: *FinTech Adoption has a positive impact on Green Investment*

The results of the algorithm output and bootstrapping revealed a positive and statistically significant relationship between FTA and GI (β = 0.517, t = 7.881, p < 0.05). Thus, H2 was supported.

Hypothesis 3*: Green Investment has a positive impact on banking sustainable performance*

A positive and statistically significant relationship between GI and BSP was found (β = 0.461, t = 6.603, p < 0.05). Thus, H3 was supported.

Table 5 Results of Direct Hypothesis

Hypotheses	***Relationship***	***β***	***SE***	***t-value***	***Decision***
H1	*FTA→BSP*	*0.778*	*0.040*	*19.346*	*Supported*
H2	*FTA→GI*	*0.517*	*0.066*	*7.881*	*Supported*
H3	*GI→BSP*	*0.461*	*0.070*	*6.603*	*Supported*

4.3.2 TESTING THE MEDIATION EFFECTS

Hypothesis 4*: Green Investment mediate the relationship between fintech adoption and banking sustainable performance*

The analysis using bootstrapping showed a strong indirect effect (β = 0.359; t = 6.65, p < 0.05). The 95% confidence interval for the indirect effect was [LL = 0.257, UL = 0.472], and it did not include zero. This means the mediation effect of green investment on the link between fintech adoption and banking sustainable performance was confirmed. In other words, hypothesis H4 was supported.

Table 6 Results of Mediation Effects

Hypotheses	Relationship	β	SE	t-value	95% CI		Decision
					LL	UL	
H4	FTA→GI→BSP	0.359	0.054	6.65	0.257	0.472	Supported

4.3.3TESTING OF MODERATING EFFECTS

Hypothesis 5: *Corporate social responsibility moderates the relationship between fintech adoption and green investment.*

CSR was found to have a significant effect on the relationship between FTA and BSP through GI (β = -0.099, t = 5.145, p < 0.05). The 95% Bootstrap confidence interval [LL = -0.139, UL = -0.063] did not include zero, which supports H3b. Figure 4.2 shows the simple slope curve that illustrates the moderating effect of job autonomy through proactiveness.

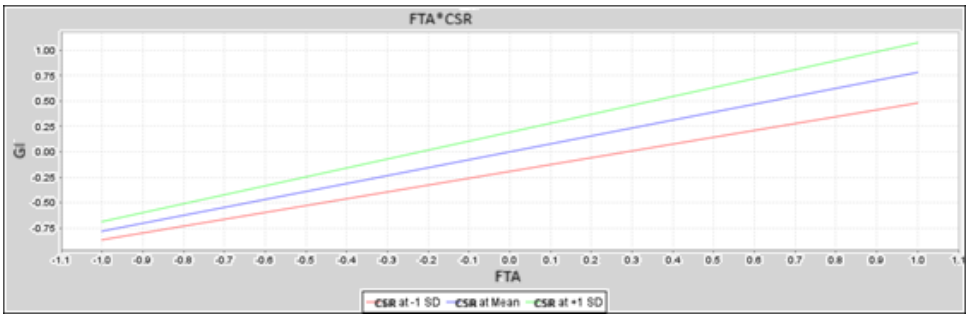

Table 7 Results of Moderating Effects

Hypotheses	Relationship	β	SE	t-value	95% CI		Decision
					LL	UL	
H5	CSR Moderates between FTA and BSP via GI	-0.099	0.019	5.145	-0.139	-0.063	Supported

5.DISCUSSION

All the hypotheses put forward are supported by the analysis conducted in the given research, as the significant relationships between FinTech adoption (FTA), green investment (GI), banking sustainable performance

(BSP), and corporate social responsibility (CSR) are proven. In particular, the results suggest that there is a positive and significant effect of the adoption of FinTech on the banking sustainable performance both directly and indirectly via green investment. It implies that the adoption of FinTech is crucial to promoting sustainable banking practices as it will allow conducting more effective and transparent operations in the financial sector, which will in turn contribute to environmentally and socially responsible investments. The results of the research are consistent with the previously implemented works that emphasized the role of green investment as a moderator variable between FinTech adoption and sustainable performance (Ng and Tao, 2020). Green investments do not entail wastage of financial resources in a futile way of investing in projects that are not environmentally-friendly but they invest in projects that are sustainable and enhance environmental performance of the banking institutions.

In addition, the CSR activities within banks were also found to mediate the relationship between the adoption of FinTech and the sustainable performance. The outcome supports the fact that CSR activities help to ensure that the introduction of FinTech does not contrast with the general societal and environmental aims and adds to the positive impact on the sustainable performance of the banking sector (Jamali and Karam, 2018).
This study also supports the use of PLS-SEM as the appropriate methodological tool that can be used to test the complex relationships in the model. The high outcomes presented in the study such as assessment of convergent and discriminant validation, multicollinearity and mediating variables are a good pointer of reliability and validity of results. The findings contribute to the current body of literature on the adoption of FinTech in the context of sustainable finance and provide some practical insights to the banks that strive to transform their sustainability performance through digitalization.

6.CONCLUSION

The present paper is informative about the role of FinTech adoption in promoting sustainable performance of banks. The findings identify the

mediation aspect of green investment in this relationship and the moderation aspect of corporate social responsibility (CSR) in the mechanism of attaining conformity between the FinTech implementation and sustainability objectives. The conclusion of the findings is that, with the help of FinTech technologies, the financial institutions will be able to enhance their environmental, social, and governance performance (ESG) that will result in the sustainability of the banking sector in the long run.

The paper emphasizes to the practitioners how FinTech and green investments and CSR practices should be united in order to attain sustainable banking performance. The implications of the results to the policymakers are that the regulatory frameworks should promote FinTech adoption in such a way that promotes the sustainability of the environment and social responsibility in the banking sector.

The weaknesses accompanying the study are that the study was limited to the banking industry in Pakistan and therefore could restrict the extrapolation of the study to a different geographical location. The future research will be dedicated to the impact of FinTech uptake on the sustainable performance of various countries and industries and conduct research on other variables that might influence the relationship between FinTech and sustainability. Moreover, further insight into how the mechanisms that promote sustainable banking practices operate could be provided by further studying the effect of FinTech innovations on green investment and CSR activities.

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