

# **Riding the Digital Wave: Deciphering the Relationship of Fintech Adoption and Sustainable Finance in the ESG Era**

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## **Abstract**

Fintech, which stands for financial technology, refers to innovative technologies and platforms that change traditional financial services, such as mobile banking, digital payments, and robo-advisors, to increase efficiency and accessibility. The number of active internet users can serve as an indicator of fintech adoption, reflecting the increasing utilization of online platforms and digital services for financial transactions and activities. Sustainable finance refers to financial activities that incorporate ESG considerations into investment decisions, intending to generate long-term value while also contributing to environmental and social goals such as climate change mitigation, social equality, and responsible corporate governance. Assets under management (AUM) in ESG funds serve as an indicator of sustainable finance by reflecting the allocation of capital towards investments that consider environmental, social, and governance criteria, contributing to long-term sustainability goals and responsible investment practices.

This research paper seeks to establish a link between Financial Technology (Fintech) and Sustainable Finance by using the number of active internet users as a Fintech indicator and AUM in Environmental, Social, and Governance (ESG) funds as a Sustainable Finance indicator. Data from a secondary reliable source, covering the years 2019-2023 is used for analysis. Python programming is used to run correlation analysis and t-test to determine the statistical significance of the relationship between the two variables. The findings indicate a strong positive relationship between Fintech and Sustainable Finance, showing Fintech's expanding influence on the adoption and promotion of sustainable investment practices.

The study emphasizing the significant correlation between fintech and sustainable finance is aimed to provide management with valuable insights into how technological innovations influence sustainable investment decisions, guiding strategic planning and resource allocation to promote environmentally and socially responsible financial practices.

**Keywords:** Fintech, Sustainable Finance, ESG Funds, Correlation Analysis, Asset Under Management

## **1. Introduction**

The way people and organizations deal with their finances has changed dramatically as a result of financial technology, or Fintech. This shift includes a wide range of technological advancements, such as robo advisers, peer-to-peer financing, and mobile banking (Zetsche et al.,2017) . These developments have improved financial services' accessibility and made them more practical, effective and open to everybody. Simultaneously, the notion of Sustainable Finance has surfaced as an indispensable factor when making investment decisions. Environmental, social, and governance (ESG) considerations are included into financial analysis and decision-making procedures through sustainable finance (Scholtens et al.,2019). This strategy reflects a greater understanding of the environmental and social issues that the stakeholders and investors are confronting.

Fintech and sustainable finance coming in tandem offers a special chance to promote sustainable investing methods and improve financial inclusion(Arner et al. , 2020) By using Fintech options, like digital platforms and automated investment tools, investors can more successfully include ESG criteria into their investment plans.

The process of assessing and managing ESG-related risks and opportunities with the help of available platforms like MSCI ESG Resource, Sustainalytics, Bloomberg ESG database etc. is made easier by this integration, which also makes it easier to access sustainable investment options for instance CDFIs, Impact Investing Platforms, Sustainable REITs, Social Impact Bonds etc

Despite of sufficient literature available on sustainable finance and Fintech, there is seemingly a section pertaining to quantitative analysis that is quite amiss. Using assets under management (AUM) in ESG funds as a proxy for sustainable finance and the number of active internet users as a proxy for fintech adoption, this study seeks to understand the relationship between fintech and sustainable finance. The study aims to determine any synergies and dynamics between the uptake of Fintech solutions and the expansion of Sustainable Finance initiatives by examining these measures.

To fully utilize their combined potential to transform the financial sector, it is imperative to comprehend how Fintech and Sustainable Finance interact. This study intends to contribute to the advancement of sustainable investment principles on a common scale by clarifying how Fintech may help integrate ESG considerations into investment practices with reference to Indian landscape.

The paper has been segregated into seven major sections wherein the second section of the study provides the purpose of the study being able to create a link between FinTech adoption and growth in sustainable finance and to find the exact research gap from the existing literature. Third section of the study presents brief literature review on fintech adoption, ESG funds, Assets under management with respect to ESG funds and how the theoretical buildup appoints at a staggering relationship between FinTech The fourth section of the study pertains to research methodology implied in the The fifth section confer about the findings of the study indicating a strong positive and statistically significant correlation between Fintech adoption and sustainable finance thereby indicating that increase in the number of active internet users (Fintech adoption) is likely to be accompanied by a rise in the AUM of ESG funds (Sustainable Finance). This aligns with the theoretical arguments that Fintech platforms can facilitate access and awareness of ESG investment opportunities, potentially leading to increased investment in these funds. The sixth section discusses the theoretical and managerial implications of the study.

## 2. Purpose of the study

The purpose of this study is to delve into the nexus between FinTech and sustainable finance with a linchpin on understanding how FinTech adoption alter the development and growth of sustainable finance practices.

### 2.1 Research Gap

Researchers are interested in the interaction between Sustainable Finance, which is undeniably a developing field that focuses on investments that are socially and environmentally responsible and Fintech, the financial technology revolution. A significant empirical evidence gap exists. Upon careful consideration of the literature already existing, it has been determined that quantitative analysis of the two focal points in picture has yet to be done however there could be a limitation on the availability of literature. Taking this gap into picture quantitative analysis with the help of coefficient of correlation, a direction of the correlation is determined and to further test the significance. Although there is a dearth of hard evidence to measure the relationship in practice, current research frequently examines the theoretical advantages of this collaboration. By exploring the realm of numbers, the study seeks to precisely close this gap.

### 2.2 Research Objectives

1. To justify the linkage between the number of active internet users, as a proxy for Financial Technology (Fintech) adoption, and the increase of Assets Under Management (AUM) in ESG funds based on the available literature
2. To analyse the relationship between Fintech and sustainable financing via pearson correlation coefficient.
3. Totest the statistical significance of the relationship set with the help of T test.

**3. Review of literature**

Research indicates a notable surge in the global usage of Fintech. Global adoption rates are 64%, according to reports from EY (EY, 2019), with developing nations like India boasting far higher rates of 87%. This demonstrates how Fintech may close gaps in financial inclusion, especially in areas where a sizable portion of the population lacks access to banking.

India offers a distinct case study. India has seen a rise in Fintech firms due to its young, tech-savvy population and rising internet and smartphone penetration (Rajeswari & Vijai, 2021). The expansion of digital transactions is additionally accelerated by the government's initiatives.

The financial industry is undergoing a change owing to financial technology, or Fintech. Fintech businesses are simplifying traditional financial services and creating opportunities for a more sustainable financial future by utilizing cutting-edge technology like blockchain, big data, and artificial intelligence (AI) (Cryptomathic, 2023). Fintech companies use the power of the internet and mobile technology to reach previously unbanked populations, especially in remote places. In addition to giving people more power, this promotes responsible financial conduct and financial literacy, both of which can support sustainable resource management (PwC, 2023).

**3.1 Fintech Adoption**

The adoption of fintech has garnered increasing attention in recent times, with numerous research exploring the elements that impact this acceptance. Several characteristics, including brand image, Fintech perceived usefulness, user attitude, financial literacy, and user innovativeness, were shown to influence the adoption of Fintech, according to a study that conducted a systematic literature analysis of 14 articles on the subject (Firmansyah, et. al, 2023). Perceived utility and social impact were revealed to be major elements in another study that evaluated the drivers of Fintech adoption using an adapted technology acceptance model (Firmansyah et al., 2023).

Adoption of Fintech by small firms has been demonstrated to have a major effect on financial markets and financial institutions. Four conceptual themes of common interest—the use of Fintech payment services, their impact on small businesses, small businesses' use of Fintech financial services, and small businesses' impact on Fintech financial services—were found in a systematic review of Fintech research in the context of small businesses (Firmansyah et al., 2023).

A number of factors, such as security, perceived risk, literacy and Fintech use, perceived usefulness of Fintech, demographic factors, Fintech usage and satisfaction, evidence and heterogeneity at the national level, and Fintech and financial inclusion, all have an impact on the adoption of Fintech products in emerging economies (Mahmud et al., 2023).

A study conducted in an emerging economy discovered that security, perceived risk, and trust were significant factors influencing Fintech adoption, as were literacy and Fintech use, perceived usefulness of Fintech, demographic factors, satisfaction and usage of Fintech, country-level evidence and heterogeneity, and Fintech and financial inclusion (Mahmud et al., 2023).

Several factors influence Fintech product adoption in Germany, including security, perceived risk, and trust, literacy and Fintech use, perceived usefulness of Fintech, demographic factors, satisfaction and usage of Fintech, country-level evidence and heterogeneity, and Fintech and financial inclusion (Mahmud et al., 2023). A number of factors influence the adoption of Fintech products: brand image, perceived usefulness of Fintech, user attitude; financial literacy, user innovativeness; perceived usefulness, social influence; security, perceived risk; trust, literacy and Fintech use, demographic factors, Fintech usage and satisfaction, evidence and heterogeneity at the national level and financial inclusion. Comprehending these variables is crucial in fostering the acceptance of Fintech offerings across diverse settings.

**3.2 Active internet users: A Metric for Fintech Adoption**

Active internet users are an important statistic for Fintech adoption since they represent a big and increasing market for Fintech products and services.(Vijai,2019). According to the Global FinTech Adoption Index 2019, the number of customers who have utilized FinTech services has risen dramatically in recent years, from 16% in 2015 to 64% in 2019. This development is being driven in part by customers' growing awareness and comfort

with FinTech services, with 96% of global consumers aware of at least one alternative FinTech service for money transfers and payments.

Aside from awareness and comfort, additional factors driving FinTech acceptance among active internet users are perceived ease of use, perceived utility, and security concerns. A research investigating the impact of creative and innovative leadership on FinTech adoption discovered that perceived simplicity of use and perceived utility moderated the connection between creative and innovative leadership and FinTech adoption. This shows that executives who encourage creativity and innovation can have a favorable impact on the uptake of FinTech goods and services by boosting their perceived ease of use and usefulness.

Another study did a comprehensive literature analysis on FinTech adoption and discovered various aspects that influence it, including brand image, Fintech perceived utility, user attitude, financial literacy, and user innovativeness (Firmansyah et al., 2023). These considerations emphasize the need of understanding the requirements and preferences of active internet users in order to increase FinTech adoption. Security, perceived risk, literacy and Fintech use, perceived usefulness of FinTech, demographic factors, satisfaction and usage of FinTech, country-level evidence and heterogeneity, and Fintech and financial inclusion all have an impact on FinTech product adoption in emerging economies (Mahmud et al., 2023) Understanding these variables is critical for increasing the uptake of FinTech products and services in emerging markets. Active internet users are a substantial population for Fintech adoption, with the percentage of consumers using FinTech services expanding dramatically in recent years.

Research indicates a robust association between the adoption of Fintech and internet penetration. (Demir and Zhu's, 2019) research finds a positive correlation between using mobile payments, a crucial Fintech industry, and internet usage. This is consistent with research by A. Beck et al. (2020), which emphasizes how important internet access and smartphones are for making Fintech applications (FinTech apps) usable.

This association can be attributed to multiple variables. First of all, having access to the internet gives you the infrastructure you need to use Fintech services. A reliable internet connection is necessary for the primary operating systems of many Fintech solutions, which are online and mobile apps (World Bank, 2023). Second, education and awareness regarding Fintech products are promoted by the internet. Fintech organizations rely on websites, social media platforms, and online reviews as essential means of reaching and informing prospective users about their services (EY, 2022). But there are subtleties in the relationship as well. Research conducted in 2015 by Arner et al. shows that Fintech adoption is not guaranteed by having internet access alone. User behavior can be influenced by variables such as income levels, digital literacy, and trust in online platforms (World Bank, 2023).

### 3.3 ESG Funds: A subset of Sustainable Finance

Environmental, social, and governance (ESG) funds are a form of mutual fund that invests in firms that meet ESG criteria and prioritize sustainable growth. It makes investments in specific themes or sectors, such as renewable energy, healthcare, and technology.

ESG Funds exclusively invest in firms that prioritize environmental stewardship, social responsibility, and strong corporate governance procedures. And strives to deliver reasonable financial returns while simultaneously benefiting the environment.

Literature available confirms the moderating role of innovation between corporate governance and firm performance. Good governance facilitates innovation by creating an enabling environment, which enhances firm performance through improved processes, products, and services leading to better financial outcomes and competitive advantages. (Kijkasiwat et al., 2024)

ESG funds, a subset of sustainable finance, investigate many areas of environmental, social, and governance issues. ESG issues have sparked widespread interest, evolving from a specialist investment practice to a larger concern. Rating organizations, including major credit rating agencies like Moody's, Standard & Poor's, and Fitch, have begun to incorporate ESG criteria into their ratings. The European Commission's Sustainable Finance Disclosure Regulation (SFDR), which goes into effect in 2021, requires corporations to adopt sustainability

measures, with 30 of them mandatory out of 50. This rule has a direct impact on firms and investors ESG funds are relatively new to the Indian market but are gaining traction. Currently, India has nine ESG funds with an AUM (Asset Under Management) of around Rs. 9,986 crore.

### **3.4 Assets Managed under ESG Funds**

Assets under management (AUM) refers to the market value of investments handled by an individual or business on behalf of clients. When analyzing a corporation, AUM is considered alongside management performance and management experience.

According to Rohit Shimpi, fund manager, and Priyanka Dhingra, ESG analyst, SBI Mutual Fund, ESG-based investment in India is in its 'infancy'. The category performed well both globally and domestically during the Covid years of 2020 and 2021.

“Subsequently, ESG investing experienced a difficult period. The crisis in Ukraine prompted a global boom in defense stocks, while the rise in energy costs rekindled interest in oil, gas, and other fossil resource businesses”. Shimpi and Dhingra explain that these industries have traditionally been excluded from ESG portfolios, resulting in relative underperformance.

According to a survey by the US SIF Foundation, public pension funds own or manage \$2.74 of the \$4.72 trillion in ESG assets managed by institutional investors. ESG tools, such as online applications, websites, databases, and documentation, assist investors and advisors in identifying, assessing, and selecting sustainable assets. These tools produce an evaluation of the ESG orientation of single investments or the ESG orientation of an entire investment market segment. Research on investor expectations, beliefs, and perceptions of ESG investment has been considerable. According to a survey, investors regard high sustainability funds as not outperforming low sustainability funds in the equities market, bond market, and funds.

### **3.5 Theoretical Relationship between FinTech Adoption and Sustainable finance**

Fintech is also essential for enabling green investment. Fintech companies facilitate investments by individuals and institutions in eco-friendly initiatives and businesses by offering cutting-edge platforms (Cryptomathic, 2023). More effective risk assessment and portfolio management are made possible by AI and big data analytics, particularly for sustainable investment alternatives (Debrah et al., 2023). This encourages companies to use sustainable practices and supports the development of clean technology and renewable energy. Fintech additionally provides instruments to encourage ecologically mindful consumer behavior. According to PwC (2023), consumers might be encouraged to adopt sustainable purchasing habits by using transaction tracking and analysis. Fintech applications may, for example, provide incentives for taking public transit or draw attention to the environmental effects of particular product purchases. Fintech's potential for sustainable funding is not without its difficulties. Concerns about data security and privacy are still very important, particularly as new technologies are integrated (Cryptomathic, 2023). In order to provide fair access to Fintech solutions, it is also necessary to promote financial literacy among all group and overcome the digital gap. Now this gap could be fulfilled by the internet that has been acting up in recent years as the major source of information for the youth and the digitally literate.

An increasing amount of data points to a possible connection between the uptake of Fintech and the growth of sustainable finance, namely in the area of investments in Environmental, Social, and Governance (ESG) funds. Research by Sharma et al. (2023) demonstrate how Fintech platforms might use technology to make it easier for investors to access ESG investment choices. ESG funds have always been perceived as sophisticated or specialized securities. Fintech fills this void by providing automated investment tools, instructional materials, and user-friendly interfaces that increase retail investors' access to ESG funds. This has the potential to democratize sustainable investing and increase the amount of money available to fund businesses that uphold social and environmental responsibility.

Moreover, Chen et al.'s research from 2022 investigates how Fintech might improve data availability and openness in the financial industry . This openness may be very important to investors looking for ESG-compliant products. Investors can make better-informed decisions that are in line with their sustainability objectives by using fintech

solutions, which can offer easily accessible data on a company's ESG performance measures. Fintech's improved openness has the potential to boost trust in ESG investing and encourage greater adoption.

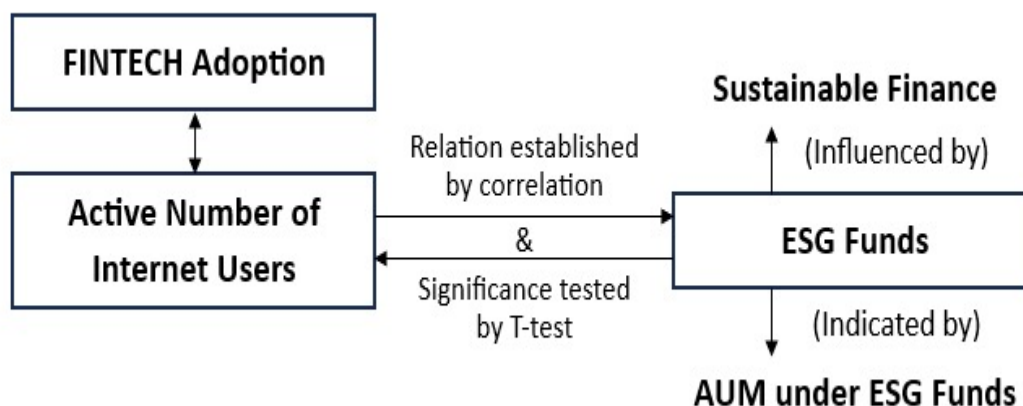
Since the complete study is based on linking Fintech with sustainable financing, The Institutional theory propounded by Scott in 1995 would further sustain that if an institution adopts sustainable financing with the help of Fintech other institutions would be compelled to do the same by isomorphism.

Based on the insights gleaned from the literature review and established theoretical frameworks, the hypothesis is formulated to guide the investigation into the potential relationship between Fintech adoption and the rise of Sustainable Finance in India, which is as follows :

**H0:**There is no significant correlation between the number of active internet users (Fintech adoption) and AUM in ESG funds (Sustainable Finance).

#### 4. Research Methodology

**Figure 1: Pictorial representation of Research Methodology**



As per the figure 1 Fintech is influenced by Fintech adoption and the later could be indicated by Active number of internet users and Sustainable Finance is greatly influenced by ESG Funds and such funds can be indicated by AUM under ESG funds. To examine the relationship between the uptake of Fintech and the expansion of Sustainable Finance, an empirical investigation is carried out. An easily known indicator, the number of active internet users in India, is utilised to gauge Fintech acceptance. This gives a good indication of how likely a population is to interact with Fintech platforms. The overall Assets Under Management (AUM) in ESG funds is monitored in India similar to the Sustainable Finance side. An essential part of sustainable finance are ESG funds, which take governance, social, and environmental aspects into account in addition to financial performance. It is intended to provide more clarity on the role of fintech in intensifying the sustainable finance by examining the relationship between these two measures, namely AUM in ESG funds and the number of active internet users.

It is aimed to answer the arising question that does an increase in AUM for ESG funds, indicating a possible boost to sustainable investment practices, correspond with an increase in internet users, indicating more potential Fintech adoption. By supplying quantitative evidence and going beyond theoretical arguments and into the domain of actual data analysis, this study seeks to provide an answer to this topic.

To gain a deeper understanding of the potential link between Fintech adoption and the rise of Sustainable Finance in India, data is gathered from Statista, a reputable statistics portal. Specifically, two key metrics (viz Number of active internet users and AUM under ESG funds) for the period 2019-2023 have been utilised

- **Number of Active Internet Users:** This metric serves as a proxy for Fintech adoption potential. A rising number of active internet users in India suggests a growing population with the ability to access and engage with Fintech platforms. These platforms can offer a variety of financial services, potentially bridging the gap for those previously excluded from traditional financial systems.
- **Assets Under Management (AUM) in ESG Funds:** This metric represents the total value of investments held in environmentally and socially responsible (ESG) funds within India. Growth in AUM for ESG funds signifies an increasing interest in sustainable investment practices. By analyzing these two metrics side-by-side, it is aimed to uncover a potential correlation. Does a rise in active internet users, indicating greater potential for Fintech adoption, translate to an increase in AUM for ESG funds, suggesting a potential boost in sustainable investment practices in India? Examining this relationship through the lens of data from Statista can provide valuable insights into the interplay between Fintech and Sustainable Finance in this dynamic market.

By testing the set hypothesis, it is aimed to statistically determine whether there's a meaningful connection between Fintech adoption and Sustainable Finance in India. In case the analysis rejects the set hypothesis, it would suggest that Fintech might be playing a role in driving the growth of sustainable investment practices in the Indian market, otherwise, it would indicate that there's no statistically significant link between these two factors, prompting further exploration of other potential drivers for Sustainable Finance in India.

**4.2 Data Analysis**

The research employs statistical technique to analyze the data collected on internet user activity and ESG fund assets. A correlation analysis is conducted to assess the strength and direction of the relationship between these two variables. This analysis reveals how closely the two metrics move together. A strong positive correlation had been found which suggest that as the number of active internet users increases (potentially signifying greater Fintech adoption), the AUM in ESG funds (indicating growth in sustainable investments) also rises.

**Table 1 : Value of AUM under ESG funds and Number of Active Users In India**

<b>Year</b>	<b>AUM in ESG Funds ( in crore)</b>	<b>No. Of Active internet users (in million)</b>
2019	2269	644.57
2020	3605	757.96
2021	10989	900.32
2022	12458	1060.08
2023	10427	1240.69

(Source: Staista )

Analysis of the data with the help of python programming languageshowed a strong correlation between Fintech adoption and sustainable finance being 0.8223

**Table 2 : T-Test: Paired Two Sample for Means**

	<b>AUM in ESG Funds ( in crore)</b>	<b>No. Of Active internet users (in million)</b>
Mean	7949.6	920.724
Variance	21711474.8	56241.95263

Observations	5	5
Pearson Correlation	0.822330327	
Hypothesized Mean Difference	0	
df	4	
t Stat	3.518811602	
P(T<=t) one-tail	0.012238146	
t Critical one-tail	2.131846786	
P(T<=t) two-tail	0.024476292	
t Critical two-tail	2.776445105	

(Calculated as per the secondary data retrieved by the author)

The t-test is run in order to confirm the correlation analysis's conclusions even more. The purpose of this statistical test is to ascertain the statistical significance of the observed correlation between the variables. Put differently, it evaluates if the correlation is the result of pure happenstance or if it signifies a real trend. Python is a flexible programming language used for the full data analysis process and is a great option to calculate the correlation coefficient and run the t-test because it has robust modules made especially for statistical analysis. This methodology guarantees precision and efficacy in the examination of the information and derives significant inferences regarding the plausible association between Fintech integration and Sustainable Finance in India.

Since the p value is less than the level of significance taken at 0.05 ( $p=0.0244 < 0.05$ ) resulting in rejection of null hypothesis The correlation coefficient and the statistically significant t-test result both clearly support this relationship. This suggests that the results indicate a positive correlation between the growth in sustainable investments represented by the Assets Under Management (AUM) of ESG funds and the number of active internet users, which indicates increased Fintech adoption.

## 5. Findings

The study's findings show a substantial positive association between the adoption of Financial Technology (Fintech) and the rise of Sustainable Finance practices, as measured by Assets Under Management (AUM) in Environmental, Social, and Governance funds. The correlation coefficient obtained for the relationship between the number of active internet users (a proxy for Fintech adoption) and the increase in AUM in ESG funds is 0.8223, indicating a strong positive relationship.

With respect to the previously set first objective, the finding deduced as per the literature review states that there is an existential theoretical relationship between the two variables set as an indicator of FinTech Adoption and sustainable finance.

With regards to second objective set, the finding extracted by data analysis shows a positive coefficient of correlation between Fintech Adoption and sustainable finance.

As for the third objective set, the data analysis proves that there is a statistically significant causal relationship between the two variables ( as proved by T-Test) implying that the development of FinTech adoption precedes the growth in AUM under ESG funds.

The fact that these two variables are positively correlated shows how Fintech platforms may encourage and facilitate the adoption of sustainable investing practices. Fintech can enable more investors to engage in socially and environmentally conscious investing by offering user-friendly interfaces, instructional materials, and expedited access to ESG investment opportunities. Consequently, this advances the wider objectives of attaining enhanced sustainability and social accountability in the financial sector. These results open up new avenues for

investigation into how financial institutions and legislators may take advantage of Fintech's potential to boost the development of Sustainable Finance and build a more sustainable future

## 6. Theoretical and Managerial Implications

### 6.1 Theoretical Implication

These findings add to the existing literature on both financial technology and sustainable finance. They provide actual evidence that supports the institutional theory (as propounded by Scott,1995), which holds that organizations tend to adopt similar structures and practices in response to external influences. In this scenario, the study shows how Fintech adoption serves as an external push, resulting in the spread of Sustainable Finance practices among financial institutions.

Furthermore, the study advances the understanding of the relationship between technological innovation and sustainable development. It emphasizes Fintech's role in achieving positive social and environmental consequences by facilitating investments in ESG funds and encouraging responsible financial behaviour.

### 6.2 Managerial Implication

With respect to financial institutions and governments, the findings highlight the necessity of embracing Fintech technologies to promote Sustainable Finance goals. Institutions can increase access to ESG investment options and encourage broader engagement in sustainable investing by utilizing Fintech solutions such as online investment platforms and robo-advisors.

Furthermore, the findings highlight the importance of strategic collaborations among Fintech businesses, traditional financial institutions, and regulatory agencies to create supportive frameworks and infrastructure for Sustainable Finance. This may include developing ESG disclosure requirements, putting in place incentive systems for sustainable investments, and incorporating ESG concerns into risk management methods.

Overall, the study's findings are relevant for both academia and business, leading future research efforts and informing policy decisions targeted at promoting the convergence of Financial Technology and Sustainable Finance for sustainable development.

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