



VILNIUS GEDIMINAS TECHNICAL UNIVERSITY

FACULTY OF BUSINESS MANAGEMENT

DEPARTMENT OF FINANCIAL ENGINEERING

Viktoriiia Stankevych

**ASSESSING FINTECH AS A TOOL TO ENHANCE FINANCIAL
INSTITUTIONS' VALUE IN THE CONTEXT OF SUSTAINABLE
DEVELOPMENT**

Master's degree Thesis

Financial Engineering study programme, state code 6211LX060

Financial Technologies (FinTech) specialisation

Finance study field

Vilnius, 2025

VILNIUS GEDIMINAS TECHNICAL UNIVERSITY

FACULTY OF BUSINESS MANAGEMENT

DEPARTMENT OF FINANCIAL ENGINEERING

APPROVED BY
Head of Department

(Signature)
doc. dr. Algita Miečinskienė
(Name, Surname)

(Date)

Viktoriiia Stankevych

**ASSESSING FINTECH AS A TOOL TO ENHANCE FINANCIAL
INSTITUTIONS' VALUE IN THE CONTEXT OF**

Master's degree Thesis

Financial Engineering study programme, state code 6211LX060

Financial Technologies (FinTech) specialisation

Finance study field

Supervisor Indrė Lapinskaitė _____
(Title, Name, Surname) (Signature) (Date)

Consultant _____
(Title, Name, Surname) (Signature) (Date)

Consultant _____
(Title, Name, Surname) (Signature) (Date)

Vilnius, 2025

VILNIUS GEDIMINAS TECHNICAL UNIVERSITY
FACULTY OF BUSINESS MANAGEMENT
DEPARTMENT OF FINANCIAL ENGINEERING

Finance study field
Financial Engineering study programme, state code 6211LX060
Financial Technologies (FinTech) specialisation

APPROVED BY
Head of Department
Algita Miečinskienė
2025-12-18

OBJECTIVES FOR MASTER THESIS

No. FTfmu-24-12171

Vilnius

For student Viktoriia Stankevych

Master Thesis title: Assessing Fintech as a Tool to Enhance Financial Institutions' Value in the Context of Sustainable Development

Deadline for completion of the final work according to the planned study schedule.

THE OBJECTIVES:

Tasks for the Master's Final Thesis:

1. Conduct an in-depth literature review to analyse existing theories and empirical studies on FinTech as a tool to enhance financial institutions' value in the context of sustainable development.
2. To identify an appropriate methodology for the empirical analysis.
3. Apply the established methodology to investigate how FinTech plays as a tool to enhance financial institutions' value in the context of sustainable development.

Academic Supervisor Associated Professor Indrė Lapinskaitė

Vilnius Gediminas Technical University		ISBN	ISSN
Faculty of Business Management		Copies No.	
Department of Financial Engineering		Date-.....-.....	

Master Degree Studies Financial Engineering study programme Master Graduation Thesis	
Title	Assessing Fintech as a Tool to Enhance Financial Institutions' Value in the Context of Sustainable Development
Author	Viktorija Stankevych
Academic supervisor	Indrė Lapinskaitė

	Thesis language: English
--	---------------------------------

Annotation

This thesis analyses the role of financial technologies (FinTech) in enhancing the value of financial institutions in the context of sustainable development, with particular attention to environmental, social, and governance (ESG) performance. The growing integration of digital technologies in financial services, alongside increasing regulatory and stakeholder pressure to align business models with sustainability goals, makes FinTech a strategically important driver of institutional transformation.

The study emphasises FinTech-related indicators, as well as both financial and non-financial dimensions of institutional value, and evaluates their role in supporting sustainable performance as measured by ESG scores. Using panel data from 19 financial institutions across Europe, North America, the Asia-Pacific region, and Latin America from 2015 to 2024, the research employs correlation analysis and fixed-effects regression models to test three hypotheses.

The empirical results demonstrate that FinTech adoption has a statistically significant influence on key financial and non-financial value indicators, including profitability, operational efficiency, and governance quality, which in turn contribute to the sustainable development of financial institutions. While the direct impact of FinTech on ESG performance differs across regions, reflecting variations in market maturity and regulatory environments; the indirect effect through institutional value creation remains consistently strong.

Overall, the findings position FinTech not only as a technological innovation but also as a strategic tool for enhancing sustainability by strengthening value creation mechanisms within financial institutions. The study contributes to the literature by clarifying the pathways through which FinTech supports sustainable development, offering empirical evidence relevant for policymakers, regulators, and financial institution managers seeking to balance competitiveness with long-term sustainability objectives.

Keywords: FinTech; financial institutions; sustainable development; ESG performance; financial value; non-financial value; institutional value creation.

Vilniaus Gedimino technikos universitetas	ISBN	ISSN
Verslo vadybos fakultetas	Egz. sk.	
Finansų inžinerijos katedra	Data-.....-.....	

Antrosios pakopos studijų Finansų inžinerijos programos magistro baigiamasis darbas	
Pavadinimas	Finansinių technologijų kaip įrankio, skirto didinti finansinių institucijų vertę darnaus vystymosi kontekste, vertinimas
Autorius	Viktorija Stankevych
Vadovas	Indrė Lapinskaitė

	Kalba: anglų
--	---------------------

Anotacija

Šiame darbe analizuojamas finansinių technologijų (FinTech) vaidmuo didinant finansų institucijų vertę tvaraus vystymosi kontekste, ypatingą dėmesį skiriant aplinkosauginiams, socialiniams ir valdysenos (ESG) rodikliams. Sparčiai auganti skaitmeninių technologijų integracija finansinių paslaugų sektoriuje, kartu su didėjančiu reguliuotojų ir suinteresuotųjų šalių spaudimu suderinti verslo modelius su tvarumo tikslais, lemia, kad FinTech tampa strategiškai svarbiu institucinių transformacijų veiksmu.

Tyrime akcentuojami su FinTech susiję rodikliai, taip pat finansiniai ir nefinansiniai institucijų vertės aspektai, vertinant jų vaidmenį užtikrinant tvarią veiklą, matuojamą ESG rodikliais. Naudojant 19 finansų institucijų iš Europos, Šiaurės Amerikos, Azijos-Ramiojo vandenyno regiono ir Lotynų Amerikos 2015–2024 m. laikotarpio panelinius duomenis, taikoma koreliacinė analizė ir fiksuotųjų efektų regresijos modeliai trims hipotezėms patikrinti.

Empiriniai rezultatai rodo, kad FinTech diegimas turi statistiškai reikšmingą poveikį pagrindiniams finansiniams ir nefinansiniams vertės rodikliams, įskaitant pelningumą, veiklos efektyvumą ir valdysenos kokybę, kurie savo ruožtu prisideda prie finansų institucijų tvaraus vystymosi. Nors tiesioginis FinTech poveikis ESG veiklos rezultatams skiriasi tarp regionų, atspindėdamas rinkų brandos ir reguliacinės aplinkos skirtumus, netiesioginis poveikis per institucijų vertės kūrimą išlieka nuosekliai stiprus.

Apibendrinant, tyrimo rezultatai leidžia FinTech vertinti ne tik kaip technologinę inovaciją, bet ir kaip strateginį įrankį, stiprinantį tvarumą per finansų institucijų vertės kūrimo mechanizmus. Darbas prisideda prie mokslinės literatūros, aiškindamas, kokiais kanalais FinTech skatina tvarų vystymąsi, ir pateikia empirinius įrodymus, aktualius politikos formuotojams, reguliuotojams bei finansų institucijų vadovams, siekiantiems suderinti konkurencingumą su ilgalaikiais tvarumo tikslais.

Prasminiai žodžiai: FinTech; finansinės institucijos; darnus vystymasis; ESG veiklos rezultatai; finansinė vertė; nefinansinė vertė; institucinės vertės kūrimas; panelinių duomenų analizė

CONSENT TO THE USE OF PERSONAL DATA

2025-12-22

(Date)

With this consent I, [[Viktoriiia Stankevych](#)] (hereinafter referred to as the Data subject) agree to the processing of my personal data for the learning purposes of other students by Vilnius Gediminas Technical University, legal entity code 111950243, address – Saulėtekio al. 11, LT-10223 Vilnius (hereinafter referred to as the Data controller). I agree to the processing of the following personal data (mark the relevant item):

- ☐ name, surname, Bachelor's final thesis;
- ☐ Bachelor's final thesis without name and surname;
- ☒ name, surname, Master's final thesis;
- ☐ Master's final thesis without name and surname.

Personal data processed for this purpose will not be transferred by the Data controller to any third parties, students will be allowed to access the final theses in the internal information system.

The personal data of the Data subject will be used for this purpose for a maximum of 5 years.

By this consent, the Data subject confirms that he / she is aware of the following rights:

- Access to his/her data and how it is processed (right of access);
- Require the rectification or, depending on the purposes of the processing of personal data, the addition of incomplete personal data (right of rectification);
- Destroy his/her data or suspend the processing of data (excluding storage) (right to destroy and right to be "forgotten");
- Require the Data controller to restrict the processing of personal data (right to restrict);
- The right to transfer data (right to transfer);
- Do not consent to the processing of personal data when such data are processed or are intended to be processed for other purposes;
- File a complaint with the State Data Protection Inspectorate.

The Data subject has the right to withdraw his consent at any time.

Viktoriiia Stankevych

[Name, surname and signature of Data subject]

Data controller details:

Vilnius Gediminas Technical University

Legal entity code: 111950243

Address: Saulėtekio al. 11, LT-10223 Vilnius, Lithuania

Tel. (+370 5) 274 5030

E-mail: vilniustech@vilniustech.lt

VAT payer code: LT119502413

Data protection officer tel. (+370 5) 251 2191, e-mail: dap@vilniustech.lt

TABLE OF CONTENTS

INTRODUCTION	14
1. FINTECH AS A TOOL TO ENHANCE FINANCIAL INSTITUTIONS' VALUE IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT: A COMPREHENSIVE LITERATURE REVIEW.....	16
1.1. Financial technologies and their role in financial institutions	16
1.2. Value creation in financial institutions	17
1.2.1. <i>Financial value creation</i>	17
1.2.2. <i>Non-financial value creation</i>	20
1.3. Sustainable development of financial institutions	22
1.3.1. <i>Defining and measuring sustainable development of financial institutions: the context of sustainable development</i>	23
1.3.2. <i>Financial value creation in the context of sustainable development</i>	25
1.3.3. <i>Non-financial value creation in the context of sustainable development</i>	26
1.4. Enhancing financial institutions' value in the context of sustainable development through Fintech	29
2. METHODOLOGY FOR ASSESSING FINTECH AS A TOOL TO ENHANCE FINANCIAL INSTITUTIONS' VALUE IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT.....	33
2.1. Data collection and preparation	34
2.2. Correlation analysis.....	37
2.3. Regression analysis	41
3. EVALUATING THE IMPACT OF FINTECH ON FINANCIAL INSTITUTIONS' VALUE IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT.....	45
3.1. Individual institution analysis on the impact of FinTech on financial institution's value in the context of sustainable development.....	47
3.1.1. <i>Empirical testing of Hypothesis 1 at the institutional level</i>	47
3.1.2. <i>Empirical testing of Hypothesis 2 at the institutional level</i>	48
3.1.3. <i>Empirical testing of Hypothesis 3 at the institutional level</i>	50
3.2. European institution analysis on the impact of FinTech on financial institution's value in the context of sustainable development.....	53
3.2.1. <i>Empirical testing of Hypothesis 1 in European region</i>	53

3.2.2. <i>Empirical testing of Hypothesis 2 in European region</i>	56
3.2.3. <i>Empirical testing of Hypothesis 3 in European region</i>	58
3.3. North American institutions analysis on the impact of FinTech on financial institution's value in the context of sustainable development	60
3.3.1. <i>Empirical testing of Hypothesis 1 in North American region</i>	60
3.3.2. <i>Empirical testing of Hypothesis 2 in North American region</i>	64
3.3.3. <i>Empirical testing of Hypothesis 3 in North American region</i>	66
3.4. Asia Pacific institutions analysis on the impact of FinTech on financial institution's value in the context of sustainable development.....	68
3.4.1. <i>Empirical testing of Hypothesis 1 in Asia Pacific region</i>	68
3.4.2. <i>Empirical testing of Hypothesis 2 in Asia Pacific region</i>	71
3.4.3. <i>Empirical testing of Hypothesis 3 in Asia Pacific region</i>	72
3.5. Latin American institutions analysis on the impact of FinTech on financial institution's value in the context of sustainable development	74
3.5.1. <i>Empirical testing of Hypothesis 1 in Latin American region</i>	74
3.5.2. <i>Empirical testing of Hypothesis 2 in Latin American region</i>	77
3.5.3. <i>Empirical testing of Hypothesis 3 in Latin American region</i>	78
3.6. Cross-regional institutions analysis on the impact of FinTech on financial institution's value in the context of sustainable development	80
3.6.1. <i>Empirical testing of Hypothesis 1 across four regions</i>	80
3.5.2. <i>Empirical testing of Hypothesis 2 across the four regions</i>	83
3.6.3. <i>Empirical testing of Hypothesis 3 across the four regions</i>	85
CONCLUSIONS	88
REFERENCE	90
APPENDICES	100

LIST OF FIGURES

Figure 1. Value creation in financial institutions aligned to key pillars of sustainability in financial institutions	29
Figure 2. Research structure	33
Figure 3. The figure of indicators used for the direct and indirect analysis	46
Figure 4. Selected financial and non-financial value indicators related with Fintech.....	47
Figure 5. Selected financial and non-financial value indicators related with Fintech.....	49
Figure 6. The result of the research on impact of FinTech on the value creation of financial institutions in the context of sustainable development with the direct and indirect approach .	51
Figure 7. Financial and non-financial value indicators influenced by FinTech in European region	53
Figure 8. Financial and non-financial value indicators influenced by FinTech in European region and included in H2 testing.....	56
Figure 9. The result of the research on impact of FinTech on the value creation of financial institutions in the context of sustainable development in European region with the direct and indirect approach	58
Figure 10. Financial and non-financial value indicators influenced by FinTech in North American region	60
Figure 11. Financial and non-financial value indicators influenced by FinTech in North American region and included in H2 testing.....	64
Figure 12. The result of the research on impact of FinTech on the value creation of financial institutions in the context of sustainable development in North American region with the direct and indirect approach.....	67
Figure 13. Financial and non-financial value indicators influenced by FinTech in Asia Pacific region	68
Figure 14. Financial and non-financial value indicators influenced by FinTech in Asia Pacific region and included in H2 testing.....	71
Figure 15. The result of the research on impact of FinTech on the value creation of financial institutions in the context of sustainable development in Asia Pacific region with the direct and indirect approach	73
Figure 16. Financial and non-financial value indicators influenced by FinTech in Latin America region	75

Figure 17. Financial and non-financial value indicators influenced by FinTech in Asia Pacific region and included in H2 testing.....	77
Figure 18. The result of the research on impact of FinTech on the value creation of financial institutions in the context of sustainable development in Latin America region with the direct and indirect approach.....	79
Figure 19. Financial and non-financial value indicators influenced by FinTech in four regions	81
Figure 20. Financial and non-financial value indicators influenced by FinTech in four regions and included in H2 testing	83
Figure 21. The result of the research on impact of FinTech on the value creation of financial institutions in the context of sustainable development across 4 regions with the direct and indirect approach	86

LIST OF TABLES

Table 1. Financial values of financial institutions.....	19
Table 2. Non-financial values of financial institutions.....	22
Table 3. Financial value of financial institutions in the context of sustainability	25
Table 4. Non-financial value of financial institutions in the context of sustainability.....	27
Table 5. Fintech factors which contribute to the sustainable development of financial institutions	31
Table 6. The list of indicators/metrics used for the research on impact of FinTech on financial institution's value in the context of sustainable development.....	35
Table 7. Pearson correlation coefficients range and interpretation	39
Table 8. Examples of similar studies employing Pearson's correlation	40
Table 10. Multiple linear regression output interpretation	42
Table 11. Examples of similar studies employing multiple linear regression model.....	43
Table 12. List of largest banks by assets used for evaluating of the impact of FinTech on financial institution's value in the context of sustainable development.....	45
Table 13. Summary of empirical testing of Hypotheses 1–3 at the institutional level across regions	52
Table 14. Regression analysis on the impact of the Active digital customers on financial and non-financial values for the financial institution's in European region	53
Table 15. Regression analysis on the impact of the Active mobile users on financial and non-financial values for the financial institution's in European region.....	54
Table 16. Regression analysis on the impact of the Tech expenditure on financial and non-financial values for the financial institution's in European region.....	55
Table 17. Regression analysis on the impact of the financial and non-financial values on the ESG score for the financial institution's in European region	57
Table 18. Regression coefficients of the independent variables for European region	57
Table 19. Regression analysis on the direct impact of the FinTech values on the ESG score for the financial institution's in European region.....	58
Table 20. Summarisation of the hypothesis testing for the financial institution's in European region	59
Table 21. Regression analysis on the impact of the Active mobile users on financial and non-financial values for the financial institution's in North American region.....	61
Table 22. Regression analysis on the impact of the Active digital customers on financial and non-financial values for the financial institution's in North American region.....	62

Table 23. Regression analysis on the impact of the Tech, communications & equipment expense on financial and non-financial values for the financial institution's in North American region	63
Table 24. Regression analysis on the impact of the financial and non-financial values on the ESG score for the financial institution's in North American region	65
Table 25. Regression coefficients of the independent variables for North American region ..	65
Table 26. Regression analysis on the direct impact of FinTech values on the ESG score for the financial institutions in the North American region	66
Table 27. Summarisation of the hypothesis testing for the financial institutions in the North American. region	67
Table 28. Regression analysis on the impact of the Active digital customers on financial and non-financial values for the financial institution's in Asia Pacific region	69
Table 29. Regression analysis on the impact of the Active mobile users on financial and non-financial values for the financial institution's in Asia Pacific region.....	70
Table 30. Regression analysis on the impact of financial and non-financial values on ESG score for financial institutions in the Asia Pacific region.....	71
Table 31. Regression coefficients of the independent variables for Asia Pacific region	72
Table 33. Regression analysis on the direct impact of FinTech values on the ESG score for financial institutions in the Asia Pacific region.....	72
Table 34. Summarisation of the hypothesis testing for the financial institutions in the Asia Pacific region.....	74
Table 35. Regression analysis on the impact of active digital customers on financial and non-financial values in the Latin American region.....	75
Table 36. Regression analysis on the impact of active mobile users on financial and non-financial values in the Latin American region.....	76
Table 37. Regression analysis on the impact of technology expenditure on financial and non-financial values in the Latin American region.....	76
Table 38. Regression analysis on the impact of financial and non-financial values on ESG score for financial institutions in the Latin American region	77
Table 39. Regression coefficients of the independent variables for Latin American region ...	78
Table 40. Regression analysis on the direct impact of FinTech values on the ESG score for financial institutions in the Latin American region	79
Table 41. Summarisation of the hypothesis testing for the financial institutions in the Latin American region	80

Table 42. Regression analysis on the impact of active digital customers indicators on financial and non-financial values across all banks.....	81
Table 43. Regression analysis on the impact of active mobile users' indicators on financial and non-financial values across all banks.....	82
Table 44. Regression analysis on the impact of Tech, communications & equipment expense on financial and non-financial values across all banks.....	82
Table 45. Regression analysis on the impact of financial and non-financial values on ESG score for financial institutions across all regions	84
Table 46. Regression coefficients on the independent variables for cross-regional analysis (H2).....	84
Table 47. Regression analysis on the direct impact of FinTech values on the ESG score for financial institutions across four regions	85
Table 48. Summary of the hypothesis testing for financial institutions across four regions....	86

APPENDICES

Appendix 1. Correlation analysis and regression analysis on the impact of FinTech on financial and non-financial value indicators at the institutional level	100
Appendix 2. Correlation analysis on the impact of Fintech in the European region.....	118
Appendix 3. Correlation analysis on the impact of the Fintech in North American region...	120
Appendix 4. Correlation analysis on the impact of the Fintech in Asia Pacific region	121
Appendix 5. Correlation analysis on the impact of the Fintech in Latin American region....	122
Appendix 6. Correlation analysis on the impact of the Fintech in Latin American region....	123

INTRODUCTION

Relevance of the topic. FinTech is the rapid progress of financial technologies that is changing the face of the financial industry. FinTech signifies the integral role that innovative tools play in fostering efficiency, accessibility, and transparency within the industry. FinTech may play a major role in redefining operations in financial institutions, based on state-of-the-art technologies like artificial intelligence, blockchain, and digital platforms in order to improve the decision processes and customer experience (Almadadha, 2024).

FinTech, in this recent movement of sustainable development, has gained increasing relevance by aligning financial services with broader goals in environmental, social, and governance criteria (Bayram et al., 2022). According to Statista (2024), global investment in FinTech reached 118,2 billion U.S. dollars in 2023, highlighting the growing importance of these technologies in the financial sector. This investment growth reflects FinTech's potential to address sustainability challenges through innovations that foster financial inclusion, promote responsible investing, and enhance transparency in ESG reporting. The convergence of ESG principles can drive sustainable development, promoting ethical and responsible practices, organisational values aligned with stakeholders' expectations, and data-driven approaches in tracking and improving sustainability performance (Hasan et al., 2024). FinTech platforms that advance financial inclusion are helping underserved populations gain access to basic banking services and, in effect, furthering the UN's Sustainable Development Goals. In addition, digitalisation of the financial services through green finance products will be contributing decisively towards solving the global challenges of sustainability; examples include carbon tracking tools and blockchain for transparent ESG reporting. Furthermore, the embedded finance market, which is valued at \$82,48 billion in 2023, is expected to experience tremendous growth and, hence, further underlines the contribution of FinTech toward creating inclusive and sustainable financial ecosystems (Oxford Global Resources, 2024).

The purpose of this thesis is to discover how FinTech could help to increase the value of financial institutions in terms of sustainable development. This paper will attempt to provide insight on how FinTech can contribute to a sustainable financial ecosystem by analysing emerging trends, such as increased focus on ESG metrics and movements toward digitalised inclusive financial services. This is an important topic because the way technology-driven financial solutions promote sustainability while adding value to institutions in an increasingly competitive market is not well understood.

Problem: What is the influence of FinTech on financial institutions' value in the context of sustainable development

Research object – FinTech impact on financial institutions' value in the context of sustainable development

Aim – to investigate how FinTech can enhance financial institutions' value in the context of sustainable development.

Tasks:

1. Conduct an in-depth literature review to analyse existing theories and empirical studies on FinTech as a tool to enhance financial institutions' value in the context of sustainable development.
2. To identify an appropriate methodology for the empirical analysis.
3. Apply the established methodology to investigate how FinTech plays as a tool to enhance financial institutions' value in the context of sustainable development

Research Methods.

- Systematic literature analysis
- Secondary data collection
- Linear interpolation
- Pearson correlation analysis (Python)
- Regression analysis (Python)

Limitations:

- The data is collected from 2015 to 2024 due to the limited data availability.
- The gaps from the data set were forecasted with Linear interpolation.
- Only 4 world regions were analysed: Europe, North America, Asia Pacific and Latin America.
- Only 7 non-financial metrics were implemented into the analysis due to limited data availability: Sustainable Finance, Ethics & Compliance, Board Composition, Executive Compensation, Shareholder Rights, Audit, Marketing & Labelling, and Labour & Employment Practices.
- Only 3 FinTech indicators were implemented into the analysis due to limited data availability: Active digital customers, Active mobile users, and Tech, communications & equipment expense.

1. FINTECH AS A TOOL TO ENHANCE FINANCIAL INSTITUTIONS' VALUE IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT: A COMPREHENSIVE LITERATURE REVIEW

1.1. Financial technologies and their role in financial institutions

Financial institutions have been rather conservative in adopting disruptive technologies, often slowed down by legacy systems and strict regulatory requirements. However, the increasing need for digital services and the rapidly growing competition from FinTech disruptors have driven financial institutions to speed up their digital transformation agendas. (Kapoor et al., 2024). Important reasons that drive FinTech adoptability in institutions relate to more effective operational efficiency, collaborated on through AI and RPA, which at the fundamental level help in streamlining work processes with cost reductions and an increase in speed of delivery (Thakor, 2020).

Digital banking platforms have given access to underserved people in emerging markets. Similarly, AI-driven predictive analytics have been instrumental in helping institutions detect fraud and assess creditworthiness, and in using FinTech to help retain market share against increased competition (Goswami & Verma, 2024). Institutions that are principally technology-driven have a driver to disrupt markets in which they aspire to challenge incumbent firms by offering financially more effective, cheaper, and accessible services (Kartanto, 2021). The other important driver is customer-centric innovation, whereby these institutions, through big data and AI, offer highly personalised services such as tailored investment advice and dynamic credit scoring (Wang et al., 2021). The fast adoption of FinTech has increased financial inclusion. Mobile-centric platforms have facilitated access to financial services for populations that were previously unbanked, particularly in developing nations (Moro-Visconti, 2024).

Some institutions focus on achieving improvements within their processes, meeting regulatory demands, and fulfilling customer needs. Others emphasise innovation and financial inclusion (Chen & Shen, 2024). While some institutions emphasise incremental improvements, others focus more on disruptive innovation. However, all institutions contribute to adding value and promoting sustainability through FinTech (El Amri et al., 2021).

The interaction of FinTech with financial institutions happens through various models. Many institutions use FinTech to modernise their core systems, meet new regulations, and improve service delivery. Many of these align with sustainability goals via better resource utilisation, offering green finance products, and meeting ESG standards (Bouattour et al., 2024). However, the adoption speed of financial institutions is normally hindered by bureaucratic

structures and responsibilities to conform to various regulatory requirements (El Amri et al., 2021). Conversely, some financial institutions embed FinTech in their core operations, thereby enabling them to innovate and scale up quickly. This agility allows them to concentrate on excluded groups and build inclusive financial products (Alhassan et al., 2024).

The integration of financial technology solutions by financial institutions represents a complicated risk-benefit relationship (Lu et al., 2024). FinTech developments bring about prospects for better efficiency, improved customer engagement levels, and a rise in access to finance. At the same time, these innovations raise challenges in the form of regulatory compliance risks, cyber-risks, and competitive pressures. Understanding these dynamics is important for financial institutions if they are to negotiate the changing financial landscape effectively (Shadrack Obeng et al., 2024). Wu et al. (2024) review the consumer benefits by mentioning that changes in the FinTech domain have fostered customer experiences. Through the use of digital platforms, financial institutions may offer their customers customised and effective services to meet the emerging needs of consumers for convenience and speed (Chen & Shen, 2024). Another important aspect brought out by Pandey et al. (2025) is the role that FinTech plays in promoting financial inclusion.

1.2. Value creation in financial institutions

1.2.1. Financial value creation

Financial values in financial institutions represent fundamental indicators that shape financial performance, stability, and long-term sustainability. Scholars have highlighted these values as crucial for measuring institutional efficiency, investor confidence, and regulatory compliance.

Profitability remains one of the most critical financial values, reflecting how efficiently an institution converts resources into profits. Studies have emphasised that key metrics such as Return on Assets (ROA), Return on Equity (ROE), and Net Profit Margin provide insights into institutional financial performance and sustainability (Lukanima, 2023). Similarly, research on financial data analysis has underlined the role of income and profitability indicators in shaping financial strategies and valuation models (Triwacananingrum et al., 2024).

Asset efficiency has been discussed as another essential financial value, illustrating how well financial institutions utilise assets to generate income. Prior research indicates that institutions with higher efficiency ratios tend to outperform their competitors, as reflected in metrics such as Interest Income to Total Assets and Earnings per Share (Bratian et al., 2025).

These findings align with broader studies on corporate financial strategies, where asset utilisation remains a key determinant of profitability (Kulwizira, 2023).

Liquidity and risk management also play a pivotal role in financial institutions, ensuring their ability to meet financial obligations and withstand economic downturns. Studies have identified the Liquidity Coverage Ratio (LCR), Capital Adequacy Ratio (CAR), and Non-Performing Loan (NPL) Ratio as essential indicators of financial resilience (Anindyajati & Hanggraeni, 2022). Furthermore, discussions on distributed ledger technologies have demonstrated their potential in improving transparency and risk management in financial operations (Dewi et al., 2024).

Market value and shareholder wealth have been widely analysed as critical financial values, often linked to investor confidence and long-term valuation. Metrics such as Market Capitalisation, Stock Price, and Dividend Yield serve as indicators of financial institutions' attractiveness in capital markets (P. Kumar & Li, 2016); (Beltrame, Floreani, et al., 2017). Recent studies have emphasised that institutional ownership and financial leverage significantly impact shareholder value and dividend policies (Qowiyyul Adib et al., 2024).

Operational efficiency is another crucial aspect of financial values, reflecting an institution's ability to optimise resources while maintaining cost-effectiveness. Scholars have pointed out that Cost-to-Income Ratio and Operational Expense Ratio are key indicators of how well financial institutions manage their expenses to maximise profits (Mathieu, 2022). Additionally, research on process automation and financial technology integration has reinforced the importance of improving efficiency in daily financial operations (Munachi Ijeoma Ononiwu et al., 2024).

Revenue growth serves as a long-term performance indicator, showcasing an institution's ability to expand its financial base. Metrics such as Year-over-Year Revenue Growth and Compound Annual Growth Rate (CAGR) are commonly used to measure financial stability and adaptability to market changes (Diorio et al., 2022). These findings are consistent with research that highlights revenue growth as a determinant of strategic financial positioning (Ashimiyu Nafiu et al., 2025).

Credit performance has been extensively studied, with a particular focus on risk assessment and credit allocation efficiency. Studies indicate that the Loan-to-Deposit Ratio, Credit Default Rate, and Average Loan Maturity are key measures of credit risk management and institutional stability (W. Wu & Zhou, 2022). Moreover, discussions on fintech applications have suggested that technological advancements can improve credit monitoring and reduce default risks (Tien & Nguyen, 2023).

Overall, financial values in financial institutions go beyond short-term profitability and encompass broader aspects such as liquidity management, market positioning, operational efficiency, and revenue sustainability. By understanding these values, financial institutions can optimise decision-making, enhance shareholder confidence, and navigate dynamic financial environments successfully. The summarisation table of the financial institution's financial values is presented below in the Table 1, grouped by value dimensions and their representing metrics/indicators.

Table 1. Financial values of financial institutions

Financial value dimension	Metrics/Indicators	Description	References
Profitability	Return on Assets (ROA), Return on Equity (ROE), Net Profit Margin, Earnings Before Interest and Taxes (EBIT), EBITDA, Net income	Measures how effectively the institution converts resources into profits.	Kulwizira Lukanima (2023), Antić et al. (2022), Gustinya (2022), Babarinde (2022), Sukmadewi (2024)
Asset efficiency	Interest Income to Total Assets, Earnings per Share (EPS), Operating Income to Total Assets Ratio	Reflects the ability to generate income relative to asset utilisation.	Kravets, (2023), Gao et al., (2020), Stratmann (2009), Hadinata (2023)
Liquidity & Risk management	Liquidity Coverage Ratio (LCR), Capital Adequacy Ratio (CAR), Non-Performing Loan (NPL) Ratio, Cash flow	Assesses the institution's ability to meet financial obligations and withstand economic shocks.	Aldizar & Agustina, (2022), Antić et al. (2022), Oktaviana & Prasetyo, (2023)
Market value & shareholder wealth	Market Capitalisation, Stock Price, Dividend Yield, Price-to-Earnings (P/E) Ratio, EPS	Measures investor confidence and long-term shareholder value.	Kumar (2016), Beltrame et al, (2017), Natania Naftali et al., (2024)
Operational efficiency	Cost-to-Income Ratio, Operational Expense Ratio, Average Processing Time	Captures how efficiently resources are utilised in daily operations.	Cibaroglu et al. (2019), Olarewaju et al., (2017), Hussain, 2014, James (2022), Bhatt (2024)
Revenue growth	Year-over-Year Revenue Growth, Total Revenue, Compound Annual Growth Rate (CAGR)	Indicates the institution's ability to expand its revenue base over time.	Kang et al. (2022), Beltrame et al., (2017), Gustinya (2022)
Credit performance	Loan-to-Deposit Ratio, Credit Default Rate, Average Loan Maturity	Reflects the effectiveness of credit allocation and management.	Kumar (2016), Gustinya (2022), Wu (2022), Sukmadewi (2024)

Source: created by the author based on Berger & Bouwman (2013), Elnahass et al. (2021), Aldasoro et al. (2020), Alt et al. (2018)

The profitability ratios, such as Return on Assets (ROA), Return on Equity (ROE), and Net Profit Margin, reflect the capacity of an institution to generate revenues. Alternatively, the asset utilisation measures, namely Asset Turnover Ratio and Earnings per Share (EPS), reflect how the institution's assets are used to drive the effectiveness of overall performance (Wijaya & Amelia, 2018). Further, management risk and liquidity measures, namely liquidity coverage ratio (LCR) and capital adequacy ratio (CAR), reflect the institution's capacity to absorb monetary shocks and pay its obligations (Hawaldar et al., 2022).

1.2.2. Non-financial value creation

Non-financial value in financial institutions encompasses a broad range of intangible assets that contribute to long-term performance, resilience, and social legitimacy. These include customer satisfaction and trust, employee engagement, corporate social responsibility, innovation, and governance practices (Hannigan, 2019). Unlike financial metrics, non-financial values often reflect stakeholder perceptions and ethical commitments, offering insights into how institutions build loyalty, enhance reputation, and maintain sustainable relationships (Čufar & Belak, 2024).

Customer satisfaction is strongly positioned as a prime driver of loyalty and retention in financial institutions. Findings underscore the strategic importance of service excellence as a competitive tool in the financial sector (Setyadi et al., 2023).

Trust is another cornerstone of non-financial value and functions both as a direct predictor and a mediator of customer loyalty. It enhances the relationship between satisfaction and loyalty by fostering a sense of security, transparency, and confidence in institutional practices. As highlighted by (Andri Prabu & Siti Nurhaliza, 2023) and (Chowdhury et al., 2024), trust is essential for the development of long-term customer relationships, particularly in environments characterised by high uncertainty or complexity. In digital finance contexts, where face-to-face interactions are limited, trust is shaped by factors such as platform security, user privacy, and the perceived reliability of digital services (Suryawan et al., 2024).

Corporate social responsibility (CSR) is today a key element of non-financial value for financial institutions, informing their long-term reputation, risk management, and sustainable performance. CSR activities in the financial services sector extend beyond philanthropy and compliance with regulation; they are strategic instruments for stakeholder relationship management and business practice alignment with social and environmental objectives (Yongo et al., 2024). Mayuri-Ramos et al. (2023) emphasise that CSR initiatives enhance institutional reputation and reduce exposure to non-financial risks by addressing key environmental, social, and governance (ESG) factors. In the context of the Pakistani banking sector, (Sindhu et al., 2023) demonstrate a positive link between CSR and financial performance, suggesting that ethical practices and innovation can coexist to drive value creation. However, (Narvind Kumar et al., 2023) note that the relationship between CSR and firm value is sector-dependent and may not always be mediated by financial performance.

Environmental sustainability is a growing non-monetary value among financial institutions, reflecting their changing role in facilitating the transition to a sustainable economy. By integrating environmental considerations into their investment decisions and operations,

financial institutions contribute not only to global sustainability goals but also to improved long-term risk management and institutional resilience (Kashif et al., 2024). Strengthening corporate governance, compliance, and risk oversight is essential to overcome these barriers and ensure that sustainability becomes a consistent strategic priority across the sector (Arakelyan, 2024).

Human capital, referring to the skills, knowledge, and creativity of employees, plays a vital role in enabling financial institutions to innovate and respond to complex challenges. Studies show a consistent positive association between human capital and firm value, particularly when it contributes to higher productivity and service innovation (Pavlović, 2018).. This component is especially relevant in financial institutions where operational efficiency and technological infrastructure are key to maintaining competitiveness (Penkala, 2024).

Ethical governance enhances not only transparency and accountability but also long-term organisational credibility. In financial institutions, particularly in sectors such as Islamic banking, ethical standards are deeply embedded in institutional frameworks and public legitimacy, shaping the foundation for stakeholder trust and operational integrity (Christianah Pelumi Efunniyi et al., 2024). Strong governance structures are designed to prevent ethical lapses by enforcing effective risk management, robust compliance systems, and strategic oversight (Verhezen, 2024).

Innovation and technology have become essential non-financial values for financial institutions, driving transformation across operational, strategic, and customer-facing domains. The integration of FinTech tools such as artificial intelligence and blockchain has improved efficiency, security, and personalisation of services (Munira, 2025). These advancements not only reduce costs but also allow institutions to deliver faster and more accurate financial services (Li & Ding, 2024). The adoption of embedded finance models has expanded access to banking by integrating financial functions into non-financial platforms, creating new value streams (Muslimin et al., 2023).

The table 2 below highlights the non-financial values of financial institution and their possible measurement obtained from the literature analysis.

Table 2. Non-financial values of financial institutions

Non-financial value dimension	Metrics/Indicators	Description	References
Customer satisfaction & trust	Net Promoter Score (NPS), Customer Satisfaction Index, Retention Rate, Customer Effort Score, Marketing & Labelling Score	Measures customer loyalty, trust, and satisfaction with financial services.	Kampani et al.(2023), Armanto & Gunarto (2024)
Corporate social responsibility	Carbon Footprint Reduction, Green Financing Volume, Community Engagement Index	Indicates alignment with societal goals and environmental stewardship.	Ahmad & Aljifri (2024), Ben Fatma & Chouaibi (2023), Ma (2024), (Purwanti et al., 2024),(Thenmozhi.S et al., 2024)
Ecological sustainability	Green Loan Volume, Renewable Energy Investments, Sustainable finance score, Energy Efficiency Initiatives	Reflects contributions to environmental sustainability and reduction of ecological impacts.	Khanday et al. (2023), (Connell, 2023),(Aumbur Kwaghter Sule et al., 2024), (Ghosh & Singh, 2024)
Intellectual capital	Employee Satisfaction, Training Hours, Knowledge Retention Rate, Innovation Index, Labour & Employment Practice Score, Employee Turnover Rate, Employee Net Promoter Score (eNPS),	Represents the institution's capacity to innovate, adapt, and build competitive advantages through human capital.	Pitre-Cedeño & Herrera-Rodríguez 2024), (C.-W. Lee & Dampha, 2024), (Nowara, 2024), (Kanishka, 2024), Ibrahim et al. (2021), (Ibrahim et al., 2021), (Endraswati et al., 2022), (Duc, 2022)
Governance, ethical standards	Compliance Score, Board Independence Ratio, Risk Management Index, Anti-Money Laundering (AML) Rate, Board Composition, Executive Compensation, Shareholder Rights Score, Audit Score	Assesses transparency, accountability, and adherence to ethical practices.	Kouzo & Falikhatun (2023), (Padam Dongol & Sajeeb Kumar Shrestha, 2024), (Lamarque, 2022), (Kudirat Bukola Adeusi et al., 2024), (Ejuma Martha Adaga et al., 2024), (Srivastava, 2023)
Innovation and technology	R&D Investment, Digital Transformation Index, Number of Patents Filed	Measures the institution's focus on technological advancements.	Sunday (2024), (MidhundeV et al., 2023)

Source: created by the author

Non-financial values concern themselves with things such as customer satisfaction, innovation, sustainability and intellectual capital. Metrics like Net Promoter Score (NPS) and Retention Rate speak to the need to earn the trust and loyalty of customers, which are the cornerstones of market differentiation and sustainability (Mehta & Handriana, 2024). Moreover, the attention to Corporate Social Responsibility (CSR) and sustainability supports the effort of bringing an institution with the aims of society (Sindhu & Arif, 2017).

1.3. Sustainable development of financial institutions

Financial institutions can take an active part in rallying for sustainable development by adopting strategies that incorporate environmental, social, and governance objectives within the operations of their ESG goals. Green banking practices invest in projects committed to environmentally friendly goals while minimising environmental risks to enhance sustainable development. Incorporating environmental risk assessments within investment portfolios can

mitigate ecological threats and reinforce long-term financial stability (Shireesha et al., 2024). Moreover, social responsibility remains pivotal, with financial institutions aiming to enhance inclusivity by offering equitable financial services and ethical business practices (Guang-Wen & Siddik, 2022). Strong governance frameworks have been found to improve institutional credibility and reduce credit risks, which are definitive of high-quality CSR reporting (Gambetta et al., 2017). Long-term economic viability, which guarantees that financial institutions harmonise their profitability and operational strategies with the bigger picture of sustainability goals and thereby realise financial resilience over time (Gambetta et al., 2024).

1.3.1. Defining and measuring sustainable development of financial institutions: the context of sustainable development

Sustainability in financial institutions is determined by a number of core pillars that support their strategic and operative structures (Lee & Koh, 2024).

Financial institutions can consider and implement green banking initiatives that cover projects and investments which are ecologically viable. Neitzert & Petras (2022) emphasise the role of the environmental aspect in the CSR activities undertaken by banks in mitigating risks. They observed that an emphasis on the environmental aspect is considered vital for effective risk management in banking.

Social responsibility in financial institutions is positioned on the promotion of inclusive and equitable finance practices (Mayuri-Ramos et al., 2023). In this context, research studies bring forth the CSR practices of banks in terms of community-oriented lending and non-exploitative labour practices (Guang-Wen & Siddik, 2022).

Governance here involves policies and a framework that allow for accountability, transparency, and ethics in the conduct of business in financial institutions. Mayuri-Ramos et al. (2023) stressed that governance measures provide enhancement to the credibility of an institution and earn it investors concerned with ethics in doing business. While conducting a study on the banking risk profile in Europe, it has been proved that good governance structure is important for handling credit risk and results in high-quality reporting of CSR (Gambetta et al., 2024).

Long-term economic viability is a fundamental pillar in ensuring the sustainability of financial institutions (Putri et al., 2025). The financial institutions should be integrated at strategic points with sustainability practices that bring forth ethical behaviour, employees' wellbeing, and environmental stewardship. Ameer & Othman (2012) suggests that organisations that focus on these aspects tend to enjoy better financial performances over time, meaning that sustainability and long-term financial success are highly interconnected.

As argued by Hu et al. (2023), banks that embed ESG factors into their strategic decision-making demonstrate stronger stability, lower default probabilities, and improved risk-adjusted returns. It reinforces the idea that sustainable finance depends on the interaction between financial soundness and the non-financial foundations that uphold stakeholder trust and institutional credibility (Neitzert & Petras, 2021).

By integrating financial metrics with ESG considerations, financial institutions can better navigate the complexities of sustainable development. However, achieving high ESG performance is underpinned by the institution's capacity to deliver strong financial and robust non-financial values. Hwang (2024) argues that strong ESG performance arises because financial institutions with superior financial performance can absorb the costs of ESG integration. Meanwhile, research by La Torre et al. (2021) highlights that banks' governance and non-financial dimensions materially affect their resilience and thus their ability to sustain ESG outcomes over time. Asih & Kurniawati (2025) found that both traditional financial indicators - like profitability and operational efficiency - and non-financial dimensions - such as environmental initiatives and social investment - contribute jointly to improved overall ESG performance. Similarly, Horobet et al. (2025) emphasise that financial institutions that align operational and strategic performance with high non-financial benchmarks - are more likely to demonstrate consistent sustainability outcomes.

In effect, the “context of sustainable development” for a financial institution becomes a dynamic environment in which financial value creation, non-financial value building and ESG outcome measurement interact. Institutions that actively invest in both domains - by improving cost-to-income ratios, diversifying green finance portfolios, enforcing ethical labour practices, or strengthening governance structures—are better equipped to meet ESG criteria and generate resilient, long-term value.

Further, the ESG performance of financial institutions can be assessed through a combination of quantitative scores and qualitative disclosures, which together reflect an institution's commitment to sustainability.

The Bloomberg ESG Score is one of the most widely cited benchmarks for evaluating corporate sustainability performance. It aggregates over 900 data points per company (when available), weighted across three pillars: Environmental (E), Social (S), and Governance (G). These include indicators like GHG emissions, employee turnover, board independence, and policy disclosures. Hu et al. (2023) using ESG data from Bloomberg covering 19 A-share banks and securities firms in China, demonstrated that governance scores (G) were the most strongly associated with corporate financial performance - highlighting the operational relevance of Bloomberg's granular ESG framework.

In another study, Asih & Kurniawati (2025) analysed the ESG performance of Indonesian firms using Bloomberg ESG data and found that higher aggregate ESG scores correlated positively with financial performance, particularly when environmental and social factors were emphasised. Moreover, a comparative study by Balan et al. (2025) critiqued ESG scoring methodologies of Bloomberg versus S&P Global.

1.3.2. Financial value creation in the context of sustainable development

Financial sustainability within financial institutions has come into focus as a realm of concern for regulators, investors, as well as other stakeholders, as a result of experiences with frequent instances of financial crises, along with increasing awareness of environmental, social, as well as governance considerations. Financial sustainability includes aspects more than mere profits, such as their capacities for persistent returns, sufficient capital provisioning

The Table 3 below highlights key financial value dimensions that can reveal how successfully financial institutions contribute to the sustainable development.

Table 3. Financial value of financial institutions in the context of sustainability

Financial value dimension	Metrics/Indicators	Relationship to Sustainability	Reference
Profitability	ROA, ROE, Net Profit Margin, EBIT, EBITDA, Net income	Ensures long-term financial stability, enabling banks to invest in sustainable initiatives and comply with ESG regulations.	Konovalova & Caplinska, (2020) Kulwizira Lukanima (2023)
Liquidity & Risk Management	Liquidity Coverage Ratio (LCR), Capital Adequacy Ratio (CAR), Non-Performing Loan (NPL) Ratio, Cash flow	Helps banks withstand economic shocks, maintain financial sustainability, and finance sustainable projects.	Kravets, (2023) Zabolotnyy & Wasilewski, (2019), Aldizar & Agustina, (2022)
Market Value & Shareholder Wealth	Market Capitalisation, Stock Price, Dividend Yield, Price-to-Earnings (P/E) Ratio, EPS	Banks with high ESG ratings attract sustainability-focused investors, increasing market value and ensuring long-term growth.	Konovalova & Caplinska, (2020)
Operational Efficiency	Cost-to-Income Ratio, Operational Expense Ratio	Efficient banks optimise resources and allocate more funds to sustainability-related investments and green finance.	Zabolotnyy & Wasilewski, (2019), Berger & Bouwman (2013)
Revenue Growth	YoY Revenue Growth, Total Revenue, CAGR	Stable, long-term revenue growth supports continued funding of sustainable initiatives rather than short-term financial gains.	Konovalova & Caplinska (2020)

Source: created by the author

Profitability has been historically evidenced as one of the key elements of financial sustainability, as it provides the institution with the ability to earn stable profits in the long run.

Risk management, as well as liquidity, is considered essential for financial sustainability because, through them, the strength of a bank in withstanding economic shock and maintaining its day-to-day operations can be identified. Banks with higher liquidity levels and strong capital buffers are better equipped to fund sustainable projects while mitigating financial risks. Furthermore, effective risk management through stringent credit assessments and diversified loan portfolios enhances financial resilience and ensures sustainable banking operations (Qin, 2024).

Market value, as well as shareholder value, is also an important consideration in determining financial sustainability. Embedding sustainability principles within financial decision-making practices was found to positively increase organisational reputation as well as capital inflows from impact investment funds (Edmans & Kacperczyk, 2022).

Another factor that helps in determining sustainability is operational efficiency, which is a measure of the ability of the institution to optimise resource use, thereby minimising wasteful spend. An effective operational framework helps financial institutions remain resilient in terms of financial sustainability, allowing them to invest in green finance projects, minimise environmental risks, and adhere to regulatory requirements for financial sustainability. In addition, cost savings, resulting from effective operational frameworks, allow financial institutions to reinvest proceeds in environmental, social, and governance (ESG)-aligned financial products and services (Chen et al., 2024).

Revenue growth has a direct impact on the long-term sustainability of financial institutions. Konovalova & Caplinska (2021) argue that financial institutions that prioritise long-term revenue stability over short-term profits are more likely to integrate sustainability into their business models. Sustainable revenue growth helps banks to finance green projects, support community development initiatives and apply to international sustainability goals.

1.3.3. Non-financial value creation in the context of sustainable development

The non-financial factors discussed in this section - customer satisfaction and trust, corporate social responsibility, ecological sustainability, and governance and ethical standards - were selected based on the broader analysis of non-financial values presented earlier. Each of these factors plays a distinct role in aligning financial institutions' operations with long-term environmental, social, and ethical objectives, thereby reinforcing their sustainability frameworks. The Table 4 below describes the key non-financial value dimensions and their relationship to the sustainability of financial institutions.

Table 4. Non-financial value of financial institutions in the context of sustainability

Non-financial value dimension	Metrics/Indicators	Relationship to Sustainability	References
Customer satisfaction & trust	Net Promoter Score (NPS), Customer Satisfaction Index, Retention Rate, Customer Effort Score, Marketing & Labelling Score	High customer satisfaction and trust contribute to the brand strength and long-term client relationships that further enhance the market competitiveness.	Kampani et al.(2023), Armanto & Gunarto (2024)
Corporate social responsibility	Carbon Footprint Reduction, Green Financing Volume; Community Engagement Index	This metric measures the institution's efforts toward bettering societal welfare through responsible business practices, social impact projects, and ethical considerations	Ahmad & Aljifri (2024), Ben Fatma & Chouaibi (2023), Ma (2024), (Purwanti et al., 2024),(Thenmozhi.S et al., 2024)
Ecological sustainability	Green Loan Volume, Renewable Energy Investments, Sustainable finance score, Energy Efficiency Initiatives	Metrics here measure the institution's commitment to being environmentally responsible in supporting sustainable projects and reducing environmental impacts.	Khanday et al. (2023), (Connell, 2023),(Aumbur Kwaghter Sule et al., 2024), (Ghosh & Singh, 2024a), Aldasoro et al. (2020),
Intellectual capital	Employee Satisfaction, Training Hours, Knowledge Retention Rate, Innovation Index, Labour & Employment Practice Score, Employee Turnover Rate, Employee Net Promoter Score (eNPS), Workplace Wellness Index	Represents a financial institution's capacity to drive long-term sustainability through the strategic use of human capital, institutional knowledge, and organisational learning. High intellectual capital enables banks to adapt to regulatory changes, develop ESG-aligned financial products, and respond proactively to sustainability risks.	Pitre-Cedeño & Herrera-Rodríguez 2024), (C.-W. Lee & Dampha, 2024), (Nowara, 2024), (Kanishka, 2024), Ibrahim et al. (2021), (Ibrahim et al., 2021), (Endraswati et al., 2022), (Duc, 2022)
Governance, ethical standards	Compliance Score, Board Independence Ratio, Risk Management Index, Anti-Money Laundering (AML) Compliance Rate, Board Composition, Executive Compensation, Shareholder Rights Score, Audit Score	Strong governance practices provide for transparency, accountability, and adherence to regulations, reinforcing institutional resilience and ethical conduct/	Kouzo & Falikhatun (2023), (Padam Dongol & Sajeeb Kumar Shrestha, 2024), (Lamarque, 2022), (Kudirat Bukola Adeusi et al., 2024), (Ejuma Martha Adaga et al., 2024), (Srivastava, 2023), Gambetta et al. (2017)
Innovation and technology	R&D Investment, Digital Transformation Index, Number of Patents Filed	Captures the institution's commitment to integrating technological advancements	Sunday (2024), Midhunde et al., (2023),

Source: created by the author

Customer satisfaction and trust form the basis for developing lasting relationships. Financial companies that focus on service excellence, effective communication, and integrity will thus be better equipped for customer retention, as well as enhanced reputation within their brand (Subedi & Bhandari, 2024). As identified in the studies conducted by Leclercq-Machado et al. (2022), positive correlation was established between CSR practices undertaken within the Peruvian banking industry. Indeed, this indicates that higher customer satisfaction is reflected through their loyalty towards more socially responsible organisations.

Closely related is the role of CSR, which reflects a financial institution's commitment to addressing societal challenges through ethical business practices, inclusive finance, and community development (Ahmad & Aljifri, 2024). CSR enhances stakeholder engagement and

institutional reputation while also positively influencing firm performance and long-term value creation (Makau, 2024).

Ecological sustainability, as another non-financial pillar, has gained prominence with the expansion of green finance and environmental risk assessments in the banking sector. Financial institutions that proactively integrate environmental concerns - such as carbon footprint reduction, green lending, and support for renewable energy - demonstrate not only ethical commitment but also sound risk management practices (Niamh, 2024). Pramitasari (2024) underscore the importance of incorporating climate-related financial risks into institutional frameworks, noting that environmentally responsible institutions are more likely to sustain regulatory compliance and investor confidence over the long term.

Indicators such as Employee Satisfaction, Training Hours, Employee Turnover, and Workplace Wellness Index reflect a bank's ability to retain knowledge and build sustainable competencies. As emphasised in recent ESG studies by Prakasa et al. (2025), intellectual capital contributes to adaptability and ESG innovation, particularly when supported by employee development and engagement initiatives.

Metrics including R&D Investment, Digital Transformation Index, and Patent Count reflect an institution's innovation capacity.

Finally, appropriate governance practices form the basis of all sustainable development elements as they provide transparency, accountability, and compliance. Governance principles such as independent boards, risk assessment, as well as ethics, serve as tools that allow financial institutions to be more resilient in their environment. Gambetta et al. (2024) suggest that effective governance structures are key in managing credit risk, improving CSR reporting, and fostering ethical corporate cultures, when all of this contributes directly to sustainability goals. Another critical metric, 'compensation,' designed to focus on non-financial aspects, would form a necessary tool within strategic frameworks for integrating sustainability within leadership frameworks.

After reviewing the key financial and non-financial value dimensions relevant to financial institutions in the context of sustainable development, it becomes essential to align these metrics with the broader ESG framework. Scientific Grouping the values under ESG categories facilitates a more strategic understanding of how institutions contribute to and benefit from sustainable development (Pan et al., 2023). The Figure 1 presents value creation in financial institutions aligned to key pillars of sustainability in financial institutions

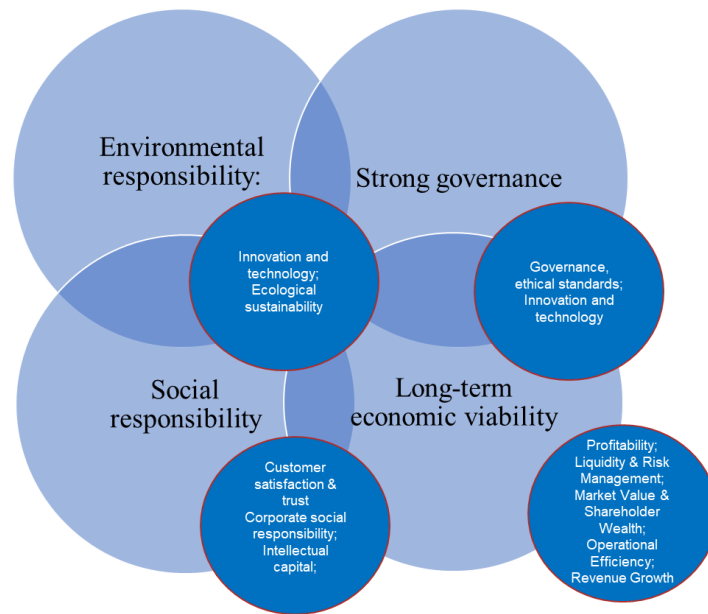


Figure 1. Value creation in financial institutions aligned to key pillars of sustainability in financial institutions

Source: created by the author based on Maheshwari & Patidar (2024), Gaurav & Aman (2022), Hwang (2024), Pramitasari (2024), Pan et al. (2023)

These ESG categories converge into the overarching dimension of long-term economic viability, which encompasses core financial metrics such as profitability, operational efficiency, liquidity and risk management, market value, and revenue growth

Together, these non-financial values reinforce the long-term viability and credibility of financial institutions and create a sustainable development context, through which financial institutions can enhance ESG performance. When aligned with strategic sustainability objectives, they support inclusive growth, enhance social legitimacy, and build adaptive capacity in the face of global challenges. As such, non-financial performance is not simply a reputational asset but a measurable and actionable pathway toward sustainable development.

1.4. Enhancing financial institutions' value in the context of sustainable development through Fintech

Fintech can be considered an important factor in enhancing the environmental and social dimensions of financial institutions. Fintech provides several opportunities for traditional financial institutions to create value (Divya et al., 2024). Technologies, such as AI and blockchain, can notably enhance operational efficiency by way of process simplification and reduction in costs associated with better profitability (Chen, 2024)

Digital financial inclusion will break present barriers with the easiest access possible to financial services. Arner et al. (2018) highlight the role of fintech in breaking barriers to

financial access through scalable electronic payment systems and digital identification frameworks, such as e-KYC.

Transparency and accountability are critical for building trust in financial institutions. Blockchain technology has emerged as a cornerstone of transparency, providing tamper-proof records and mitigating fraud. Aro et al. (2024) demonstrate how blockchain applications improve transaction accountability while enhancing governance practices. This technology not only ensures compliance with regulatory standards but also fosters stakeholder trust, crucial for sustainable growth in financial institutions. Digital payment platforms enhance customer satisfaction by enabling seamless and efficient transactions. The use of big data analytics and artificial intelligence (AI) enhances strategic decision-making and risk management in financial institutions (Beirne et al., 2023).

Digital banking has emerged as a cornerstone in financial institutions' strategy for sustainable development. Gomber et al. (2018) emphasised that the integration of mobile, internet, and agency banking channels facilitates broader financial access while significantly lowering operational costs. Thuranira et al. (2024) supported this by showing how these digital channels enhance financial sustainability in commercial banks, particularly in developing economies like Kenya, with mobile banking showing the strongest impact.

Mo (2025) explored how big data, AI, and blockchain can be employed across the ESG lifecycle - improving data integrity, disclosure transparency, and automated performance evaluation. Sun & Wu (2025) further demonstrated that fintech stimulates regional innovation, directly boosting ESG outcomes through reduced innovation costs and improved efficiencies.

Fintech elements include digital financial inclusion, financial transparency, digital payment platforms, big-data analytics, personalised financial products and services, and cybersecurity technology that have a significant impact on the sustainable development of financial institutions. These innovations bear directly on ESG scores by enhancing accessibility, governance, operational efficiency, and customer trust, while reducing environmental impacts. Indirectly, they drive financial and non-financial values including profitability, resource optimisation, and customer satisfaction. These technologies, taken together, help financial institutions better align with sustainability goals and create long-term resilience and value (Zhao, 2024).

The Table 5 underlines the fintech factors such as digital financial inclusion, AI-based solutions, blockchain, digital payments, big data analytics, personalised services, and cybersecurity. Each factor has been tied to its specific influence on sustainable development, measured by several indicators of customer satisfaction, trust, efficiency of operations, and effectiveness in risk management.

Table 5. Fintech factors which contribute to the sustainable development of financial institutions

Fintech factor	Influence on sustainable development off financial institutions	Measurement indicators	References
Digital financial inclusion	Expands access to financial services for underserved populations, increasing inclusivity and boosting customer satisfaction.	Number of new accounts opened, mobile banking adoption rate, digital transaction volume.	Sinha (2023), Chu (2018), Mpofu & Mhlanga (2022), Shaikh (2021).
Financial transparency and accountability	Increases transparency and accountability in transactions and reporting, boosting trust and improving governance practices.	Number of successful blockchain-based transactions, fraud detection rate, reporting accuracy.	D. W. Arner et al. (2018), Harold Nwariaku et al. (2024), Tran & Le, (2024)
Digital payment platforms	Facilitates seamless and efficient financial transactions, increasing customer convenience and satisfaction.	Transaction speed, digital payment adoption rate, customer effort score.	Deb & Agrawal (2017)
Big data analytics and AI	Enhances data-driven decision-making capabilities, supporting strategic planning and risk management, improving employee engagement and satisfaction.	Decision accuracy rate, risk-adjusted return metrics, ROI on data-driven initiatives.	Lyons et al. (2019), Guang-Wen & Siddik (2022)
Personalized financial services	Enables tailored services based on customer profiles and needs, increasing loyalty and customer satisfaction.	Customer satisfaction index, customer retention rate, net promoter score, personalise digital services,	Akter et al. (2021)
Cybersecurity technologies	Protects sensitive data and reduces risk of breaches, enhancing stakeholder trust and institutional resilience.	Number of cyber incidents, financial losses from breaches, cybersecurity investment as a percentage of IT budget.	Calis & Kelleci (2023)
Digital Banking Adoption	Improves access, lowers costs, reduces carbon footprint, and supports long-term digital transformation.	Active digital clients, mobile-banking users, app registrations, MAUs, digital account-holders.	Gomber et al., 2018, Buallay, (2019).
Digital Customer Interaction & Automation	Reduces paper usage, increases efficiency, and enhances customer experience.	Digital sales %, digital transaction share, online request volume, Chatbot requests, Technology services on cloud, Transactions concentrated on mobile and internet	Touma (2021), Wihelmina Afua Addy et al. (2024).
Technology Investment	Drives innovation, enhances system reliability, supports ESG governance.	Technology spend, ICT investment, startup investments.	Thakor (2020), Wu et al. (2023).
Digital Credit & Lending Innovation	Increases inclusion, and strengthens sustainable economic growth.	Lending via digital platforms, online loan approvals.	Frost (2020) Bazarbash (2019)

Source: created by the author

Digital financial inclusion through mobile banking and digital payment platforms contributes substantially to the social dimension of ESG scores. Fintech fosters inclusivity by expanding access to financial services for underserved populations, thus aligning with broader social sustainability goals. Advanced big data analytics and artificial intelligence further make

it possible for ESG issues with information relying on objective facts, which can be advanced to support setting goals for better environmental and social outcomes (Lyons et al., 2019). At the same time, AI-based risk management tools increase liquidity and improve capital adequacy, ensuring better financial resilience and stability (Martinez et al., 2024). FinTech innovations can significantly enhance the non-financial values by addressing customer satisfaction, ecological sustainability, and governance standards. Personalised financial services lead to better levels of customer retention and trust, which can be reflected in improved NPS (Vimal & Kumar, 2024). Improved cybersecurity technologies reduce the incidence of breaches, and in a result buttressing customer trust and institutional reliability (Calis & Kelleci, 2023). In relation to responsibility, FinTech enhances community engagement through focused CSR initiatives, aligning financial institutions with objectives related to social sustainability (Shaikh, 2021). While green financing enabled by fintech technologies advances ecological sustainability by providing funding for renewable energy projects and reducing carbon footprints (Guang-Wen & Siddik, 2022b).

From all these observations, it is clear that fintech is not just a technology but a strategic enabler that functions in the nexus of institutional value creation and sustainable development. By enhancing financial inclusion, operational transparency, customer experience, and facilitating environmentally friendly decision-making, fintech plays a role in transforming financial institutions' financial and non-financial value creation. The aforementioned shifts not only serve core performance indicators but also bring institutions into alignment with broader ESG agendas. As such, the following hypotheses are formulated to test empirically the degree to which fintech uptake facilitates institutional value creation and alignment with sustainability goals:

H1: FinTech influences both financial and non-financial value indicators in financial institutions in the context of sustainable development.

H2: Financial and non-financial institutional values contribute to the sustainable development of financial institutions.

H3: There is a direct interaction effect between FinTech growth and sustainable development of financial institutions.

This literature shows that fintech acts as a catalyst in creating sustainable value in financial institutions by filling financial inclusion gaps, improving operational and asset efficiency, and enabling trust with the help of transparency and cybersecurity. Recent progressions not only strengthen the financial indicators, such as profitability and liquidity, but also enhance non-financial aspects like customer satisfaction and ecological sustainability.

2. METHODOLOGY FOR ASSESSING FINTECH AS A TOOL TO ENHANCE FINANCIAL INSTITUTIONS' VALUE IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

This research chart presents a comprehensive structure for examining the impact of Fintech on financial institution's value in the context of sustainable development.

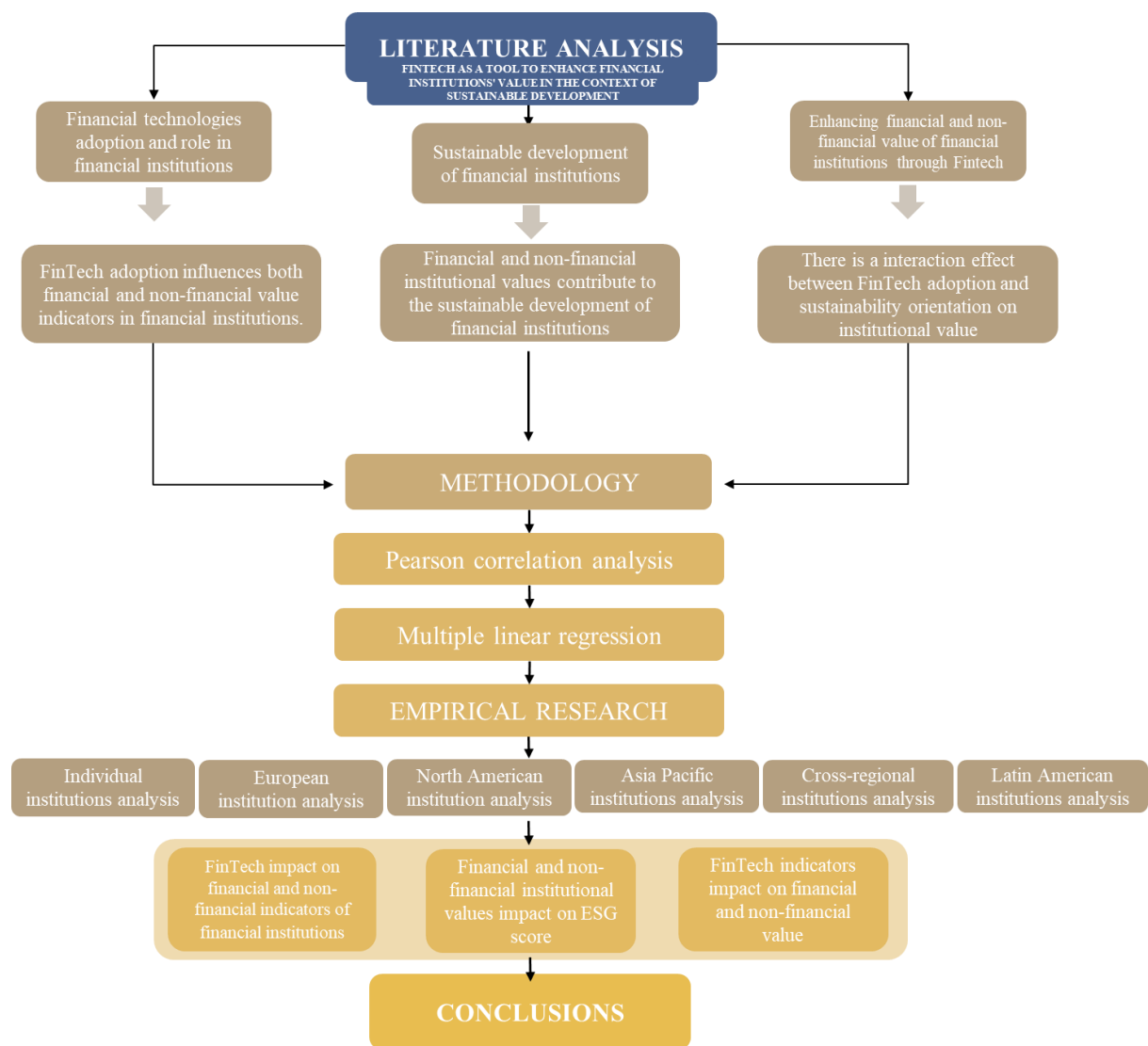


Figure 2. Research structure

Source: created by the author

The research is framed around a comprehensive literature review that guides the conceptual and analytical framework of the research. The research starts with analysing the adoption of financial technologies and changing roles in financial institutions, and how fintech developments is reshaping institutional operations, customer experience, and regulatory compliance. Extending this, the research explores the generation of institutional value on two

dimensions - financial and non-financial. Financial value consists of metrics such as profitability, operational efficiency, and liquidity management, whereas non-financial value consists of metrics such as customer satisfaction, corporate social responsibility, ecological sustainability, and ethical governance. These value axes are then connected with the grand goal of sustainable development, which is theorised through the use of ESG performance. Literature asserts that FinTech not only facilitates operational efficacy and innovation but also makes sustainability practices possible through promoting inclusivity, transparency, and accountability. Based on these theoretical assumptions, the empirical study is framed in terms of three hypotheses: (1) that there is a FinTech adoption impact on financial and non-financial dimensions of financial institution value; (2) that financial and non-financial institutional values are determinants of sustainable development as reflected in ESG scores; and (3) that there is an interaction between FinTech and sustainability orientation in creating institutional values. To test these hypotheses, the study takes a quantitative method using Pearson correlation analysis and multiple linear regression models. The empirical testing is structured in three blocks according to each hypothesis, in turn examining the influence of FinTech on value creation, the influence of value indicators on ESG results, and the moderating role of sustainability orientation. This methodological approach enables a systematic analysis of how FinTech uptake increases institutional efficiency with a view to furthering overall sustainability goals.

2.1. Data collection and preparation

In this research, the indirect relationship between FinTech growth and the sustainable development of financial institutions is examined by analysing a comprehensive set of financial and non-financial indicators that reflect institutional value creation. These indicators capture various dimensions of financial performance, operational efficiency, governance quality, ethical conduct, and social responsibility.

The model also includes the 3 FinTech indicators as the independent variables and the ESG score as the dependent variable, measuring the overall sustainability performance of financial institutions. The full list of indicators, their descriptions, and measurements used in this analysis is presented in the table below.

While the literature review and conceptual framework referenced a broader set of potential indicators across financial and non-financial dimensions, certain metrics were excluded from the final dataset due to the unavailability of standardised, consistent. The Table 6 represents all indicators which will be further utilised in the analysis.

Table 6. The list of indicators/metrics used for the research on impact of FinTech on financial institution's value in the context of sustainable development

Indicator	Description	Measurement / Unit
Active digital customers	Represents the amount of people having the digital account within the bank	Millions of users
Active mobile users	Represents the amount of people having the mobile account within the bank	Millions of users
Tech, communications & equipment expense	Represents the spend for the technology, communications and equipment development a	USD m
ROA	Indicates the efficiency of financial institutions in generating net income from total assets.	$\text{Net income} / \text{Total assets} \times 100$
ROE	Reflects shareholders' return on equity and financial leverage effectiveness.	$\text{Net income} / \text{Shareholders' equity} \times 100$
Basic EPS	Captures the profit attributable to each share, serving as a core indicator of earnings performance.	$\text{Net income} / \text{Number of outstanding shares}$
CAR	Capital adequacy ratio measures financial stability and risk resilience of institutions.	$\text{Tier 1} + \text{Tier 2 capital} / \text{Risk-weighted assets} \times 100$
Cost-to-Income Ratio	Reflects cost efficiency by comparing operating expenses to operating income.	$\text{Operating expenses} / \text{Operating income} \times 100$
YoY Revenue Growth	Shows annual percentage change in revenue, indicating business expansion and market performance.	$(\text{Revenue}_t - \text{Revenue}_{t-1}) / \text{Revenue}_{t-1} \times 100$
EBITDA	Measures earnings before interest, taxes, depreciation.	$\text{Operating income} + \text{Depreciation} + \text{Amortisation}$
P/E ratio	Evaluates market expectations and investor confidence by comparing stock price to earnings.	$\text{Market Price per Share} / \text{Earnings per Share (EPS)}$
Sustainable Finance	Represents the extent of integration of environmental and social aspects into financial activities.	Index based on sustainable investment practices
Ethics & Compliance Score	Reflects adherence to ethical standards, transparency.	Index score measuring ethical conduct.
Board Composition Score	Evaluates diversity, independence, and structure of the institution's governing body.	Qualitative index based on board independence, gender balance, and expertise
Executive Compensation Score	Measures fairness and transparency of remuneration practices relative to performance and ESG goals.	Ratio of executive pay to average employee compensation
Shareholder Rights Score	Indicates protection of investor rights and participation in corporate governance.	Score or index measuring voting rights, information access
Audit Score	Reflects the quality and transparency of external and internal auditing processes.	Presence of independent audit and audit quality index.
Marketing & Labelling Score	Captures responsible communication and truthful representation of products and sustainability claims.	Index based on compliance with ethical marketing.
Labour & Employment Practices Score	Measures the institution's commitment to employee welfare, diversity, and working conditions.	Index assessing employment equality, training
ESG Score	Represents the composite sustainability performance of financial institutions across environmental, social, and governance dimensions.	ESG index score (0–100) published by ESG data providers or aggregated from sub-indices

Source: created by the author

Due to the large time series (years 2015 through 2024) and the different reporting practices of the financial institutions being considered, some of the correlation coefficients had

missing values, which were tackled with two well-established tools in time series analysis: linear interpolation and forward/backward filling. This tool is preferred in empirical studies, such as finance or sustainability, as they do not disturb the integrity of the time series. The primary method applied was linear interpolation, which estimates an unobserved value between two known points by assuming a constant rate of change over time.

This method was applied where there were at least 4 valid data points within the year that was missing. Linear interpolation can be regarded as suitable for financial as well as ESG metrics that develop sequentially over the years, such as Sustainable Finance scores, digital adoption metrics, operational metrics (Cost-to-Income Ratio), as well as non-financial governance metrics.

Normalisation can enhance model performance, especially in algorithms that are affected by input feature scales. By allowing all features to contribute equally to the model's predictions, normalisation aids in decreasing biases towards some features, thus resulting in better models. Normalising economic data entails converting it into values comparable to one another, just as normalising scores. This process removes measurement units, thereby facilitating substantive comparisons across various scales (Martin, 2022). Normalisation also plays an important role in the choice of maximum likelihood estimates and the design of confidence intervals. It guarantees proper identification and evades spurious statistical uncertainties in econometric models (Hamilton et al., 2007).

In this research on the influence of fintech on the value creation of financial institutions, it was important that there was a standard and uniform analytical framework. Z-score normalisation was applied to normalise the data, providing a comparison platform for the various scales and units inherent in the variables of interest. Z-score normalisation, or simply standardisation, is a statistical technique for normalising the values in a dataset. The process is especially useful in economics and other research disciplines where the comparison of data points across unlike scales or distributions is required (Bin Mohamad et al., 2013). This approach was especially relevant to our research since it enabled standardising the different scales and variances of the datasets. Z-score normalisation was selected since it can preserve the distribution of data, enhance detection and treatment of outliers, and match the natural assumptions of the statistical models used in this study. By converting data into Z-scores, data points could then be measured as to how much each differed from the mean in terms of standard deviations, thereby allowing a comprehensive and consistent comparative analysis. This standardisation was important in ensuring that our subsequent analysis could accurately capture and interpret the complex effects of fintech factors on financial and non-financial values,

without the distorting effects of differing scales or the disproportionate influence of variables with wider ranges (Warner, 2016).

This statistical procedure converts the dataset to achieve a distribution with zero mean and standard deviation of one. That is, for each individual reading, the mean of the dataset itself was deducted from the respective value, and the resulting difference was divided by the standard deviation of the dataset. The formula applied to calculate the Z-score (Z) for any data point X is (5) (Warner, 2016):

$$z = \frac{(x - \mu)}{\sigma} \quad (5)$$

where μ represents the mean of the dataset, and σ denotes the standard deviation. Through this normalisation process, the data were rendered dimensionless, providing a relative measure of dispersion and enabling the application of parametric statistical techniques that assume normally distributed data.

2.2. Correlation analysis

Statistical techniques, like correlation analysis, are employed in examining the relationships among variables. Examining the inter-variable relations is often the focus of interest, and correlation is one common statistical technique in achieving this. Correlation measures the extent to which two or more variables are related to each other. In correlational analysis, direction and size of linear relationships between variables are investigated and statistical significance testing is necessary. It is a test of whether observed association is due to chance variation, where the null hypothesis is no variable relationship and the alternative hypothesis is the existence of a relationship (Prematunga, 2012).

Pearson correlation analysis is employed in this research to confirm the direction and strength of linear relationships among FinTech adoption determinants and institutional value measurements - financial and non-financial. This method is particularly useful given the quantitative nature of the variables that are involved, many of which are continuous and derived from institutional performance metrics and ESG components. Pearson's coefficients offer a simple yet statistically powerful means to determine the level of association between independent variables like digital financial inclusion, transparency, or big data analytics and dependent variables like profitability, customer satisfaction, or ecological sustainability.

Linear correlation is applied in data analysis of empirical data for measuring the relationship between independent variable X and dependent variable Y according to Pearson correlation. The primary objective of correlation analysis is to identify and estimate both the direction and size of association between random variables. Pearson's correlation is best applied to estimate the intensity of linear associations between two continuous variables. This is necessary because economic data that has been examined, including FDI inflows and SDG indices, are continuous in nature and therefore require a method that can estimate linear association effectively. The Pearson correlation treats both variables on an equal footing as joint variables and doesn't imply causation. This is appropriate for application in this research because the approach includes the strength and direction of the associations. Pearson's correlation does well in picking up linear trends in the data. Since economic relationships are usually supposed to possess linear characteristics, Pearson's method is an appropriate method for revealing and measuring such linear relationships and hence very well suited for initial investigations of relationships in economic data (Zou et al., 2003).

Pearson correlation represents a score that varies between -1 and 1. With the use of two data samples $X^m=(x_1, \dots, x_m)$, $Y^m=(y_1, \dots, y_m)$, the Pearson correlation coefficient is calculated by the formula (6) (Shrestha, 2020):

$$r_{xy} = \frac{\sum_{i=1}^m (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^m (x_i - \bar{x})^2 (y_i - \bar{y})^2}} \quad (6)$$

where:

- x_i and y_i values of variables X and Y in i period (month, year);
- $\bar{x}$ and $\bar{y}$ are average X and Y;

The observations are explained based on the magnitude of the correlation coefficient. In correlated data sets, a change in the magnitude of a variable is associated with a corresponding change in the magnitude of another variable, which may occur in a similar or diverging fashion. Basically, increasing values of a variable tend toward either high (reflective of a positive correlation) or low (reflective of a negative correlation) values of another variable, and the reverse (Schober & Schwarte, 2018). The coefficient typically ranges from -1 to 1, where:

- +1 indicates a perfect positive relationship,
- -1 indicates a perfect negative relationship,
- 0 indicates no relationship.

An interpretation of the correlation coefficient is presented in the Table 7.

Table 7. Pearson correlation coefficients range and interpretation

Correlation Coefficient Range	Interpretation	Description
-1,0 to -0,7 or 0,7 to 1	Very strong correlation	Represents very strong linear relationship.
-0,7 to -0,5 or 0,5 to 0,7	Strong correlation	Represents a strong linear relationship.
-0,5 to -0,3 or 0,3 to 0,5	Moderate correlation	Represents a moderate linear relationship.
-0,3 to -0,1 or 0,1 to 0,3	Low correlation	Represents a weak linear relationship.
<-0,1 or <0,1	Very low or no correlation	Represents no or negligible linear relationship.

Source: created by the author based on Schober & Schwarte, (2018)

In order to test the statistical significance of the Pearson correlation coefficient (r), scientists commonly employ a hypothesis test. The test under consideration determines whether the correlation observed between the variables differs significantly from zero, meaning there is no linear relationship in the population. The test examined the null hypothesis that every correlation coefficient equaled zero versus the alternative hypothesis of a nonzero correlation. Null hypothesis is a fundamental concept in statistics for hypothesis testing. Null hypothesis declares that there is no effect or difference to be detected between groups or variables under test in a specific research situation. In effect, the null hypothesis says that all the variations or significant results obtained in a data set are merely by chance or random. Formulating a null hypothesis is directed towards setting up a basic or default stance stating the lack of an effect or relationship (Puth et al., 2014).

In statistical analysis, the null hypothesis is the statement that researchers are interested in disproving with respect to the alternative hypothesis. The alternative hypothesis is that an effect, difference, or relationship among groups or variables does indeed exist.

The test statistic for Pearson's correlation is calculated using the formula (7) (Puth et al., 2014):

$$t = r \sqrt{\frac{n - 2}{1 - r^2}} \quad (7)$$

Where:

r is the Pearson correlation coefficient.

n is the number of pairs of data.

This formula transforms the correlation coefficient into a t-statistic that follows a t-distribution with $n - 2$ degrees of freedom, assuming the null hypothesis of no correlation is true.

The test statistic's p-value is the probability of getting a correlation as strong as the one observed under the premise that the null hypothesis is true. If the p-value is lower than the predetermined significance level ($\alpha = 0.05$), this results in the null hypothesis being rejected, indicating the correlation is statistically significant.

Pearson correlation enables recognition of statistically significant trends facilitating hypothesis formation and refinement, lending initial evidence of the probable positive or negative relations between FinTech innovations and institutional value creation. As a typical empirical finance and sustainability studies approach, Pearson correlation analysis follows conventional norms of initial variable examination and maintains methodological rigour in early quantitative analysis phases. The following examples of comparable studies illustrate the usefulness and effectiveness of the method in revealing the intricacies of economic data relationships in question. Not only do the studies attest to the suitability of Pearson's correlation to the data given, but also to its potential to derive meaningful, applicable conclusions in economic research

Table 8. Examples of similar studies employing Pearson's correlation

Author(s)	Study Title	Method Used	Description of Findings
Bajpai, (2024)	The Impact of Fintech Startups on Financial Institutions' Performance and Default Risk	Pearson correlation, Questionnaire Design, Hypothesis Testing:	The analysis revealed a Pearson Correlation value greater than 0.8, indicating a strong correlation between the variables studied. This high correlation suggests that as fintech solutions are adopted, there is a corresponding improvement in the performance and risk management of financial institutions
Begum et al. (2023)	The Nexus Between Technology and Finnovation: A Sustainable Development Model	Quantile Regression, Conceptual Model Development, Pearson correlation	The findings imply that investors may increasingly prefer company stocks that contribute to financial inclusion. This preference is linked to the broader goals of sustainable development, suggesting that the growth of fintech can influence investment strategies and decision.
Thakkar & Bhuyan (2024)	Effect of Fintech on Sustainable Development Goals: An Empirical Analysis	Pearson correlation, : Simultaneous Equation Modelling (SEM) and Poisson Pseudo-Maximum Likelihood (PPML) methods.	The study finds that the adoption of FinTech has a significant positive effect on various SDGs in developing nations. This indicates that FinTech plays a crucial role in advancing sustainable development efforts in these regions.

Source: created by the author

Many recent empirical studies in financial technology and sustainable development have used Pearson correlation analysis to examine the linear correlation between the main

variables. The method has been successful in examining the strength and direction of the relationship between FinTech usage and institutional performance, including financial performance, risk management, and achievement of sustainable development goals. Empirical evidence from research constantly demonstrates strong positive correlations, which validate that the integration of FinTech solutions results in a quantifiable enhancement of financial and non-financial performance in institutions. The application of Pearson correlation in these studies validates the usefulness of this measure in determining statistically significant correlations in intricate financial and sustainability settings.

2.3. Regression analysis

Regression analysis is a statistical method with the purpose of explaining the association between dependent variables and one or more independent variables. The primary objective of regression is to predict or explain the direction of the dependent variable with respect to movement along the independent variables. The approach calculates the strength of the relationship, thereby giving quite informative information regarding the manner in which changes in input variables affect the output variable. This method is extremely crucial in a number of areas, including economics and social science, as it enables data-driven decision-making and facilitates the comprehension of intricate relationships (Stapor, 2020).

The hallmark of regression is that it generates a mathematical formula describing the relationship among variables. The formula is most often used for prediction, where researchers can estimate the value of the dependent variable based on known values of independent variables. Further, regression analysis enables hypothesis testing of causal relationships, and thus it is a very useful instrument in empirical research (A. Goswami, 2018).

In regression analysis, models are typically described in terms of the number of predictor variables they contain and the shape of relation they are designed to represent. Simple linear regression and multiple linear regression are two broad categories in this context. Simple linear regression deals with the prediction of a dependent variable based on a single independent variable. It describes the linear relationship between the two variables using a simple equation, making it applicable to situations where the outcome is believed to be influenced by one predominant factor. Multiple linear regression extends this concept by incorporating two or more independent variables. This method is employed to assess the influence of many variables on a dependent variable all at once, allowing a broader and more intricate comprehension of the concealed forces. This type of classification is vital in statistical modelling as it enables researchers to design studies according to the actual situation being investigated, from basic

one-to-one relationships to sophisticated interconnections among many variables (Liu et al., 2004).

The equation of a simple linear regression model can be represented as (8) (Pardoe, 2006):

$$Y = a + bX + u \quad (8)$$

Where:

Y - the dependent variable will be predicted or explained

X - the independent variable using to predict the Y

a - is the intercept of the regression line, which is the expected value of Y when X=0

b - beta coefficient is the slope of the explanatory variable

u - is the error value, capturing the variation in Y that cannot be explained by the linear relationship with X.

Multiple linear regression extends the simple linear regression model to include two or more independent variables. This essential for the effect of several variables on a single dependent variable. The equation for a multiple linear regression model is (9) (Pardoe, 2006):

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 \dots b_tX_t + u \quad (9)$$

The t-test application tests the significance of the regression coefficients, with coefficients having p-values below the threshold value of significance (typically 0,05) being statistically significant. R-squared values examine model adequacy. The joint significance of the independent variables is tested with the F-statistic. Below there is a table summarising the key components of multiple linear regression output.

Table 10. Multiple linear regression output interpretation

Component	Description
Intercept (β_0)	The expected value of the dependent variable when all independent variables are zero.
Coefficients ($\beta_1, \beta_2, \dots$)	Indicate the estimated effect of each independent variable on the dependent variable.
R-squared (R^2)	Represents the proportion of the variance in the dependent variable explained by the model.
Adjusted R-squared	Adjusts R^2 for the number of predictors, providing a more accurate model fit in multiple regression.
Standard Error (SE)	Measures the average distance that the observed values fall from the regression line.
t-statistic	Tests whether a regression coefficient is significantly different from zero.
p-value	Indicates whether the effect of a predictor is statistically significant.
F-statistic	Tests the overall significance of the regression model compared to a model with no predictors.
Significance F	Indicates if the overall regression model is statistically significant.

Source: created by the author based on Roustaei (2024)

The decision to implement multiple linear regression model, specifically using the, was influenced by a thorough review of similar studies in the field. This review revealed that many reputable research works have successfully utilised this method to obtain significant results when examining the impact of variables.

Table 11. Examples of similar studies employing multiple linear regression model

Author(s)	Study Title	Methodology	Description of the Findings
Zhou & Wang (2023)	FinTech matters in sustainable finance: Does it redistribute the supply of financial services?	Multiple linear regression model, Comparative Analysis	Application of FinTech as a suitable promoter of sustainable finance, especially in the redistribution of financial services to firms that require them most urgently. Even as FinTech has the potential to enhance accessibility and lower the costs, it also plays an important role in making the provision of financial services highly compatible with the sustainability initiatives of firms.
Ma & Wang (2024)	The Impact of the Use of Fintech on Enterprise Value	Descriptive Statistic, Collinearity Check, Multiple linear regression model	The research highlights that businesses can increase their intrinsic value by adopting financial technology solutions. The result is especially applicable to businesses that aim to improve their competitive position and operational effectiveness through technological innovation.
Kartanto (2021)	The Effect of The Application of Financial Technology (Fintech) on the Value of Companies in the Banking Industry Listed on the Indonesia Stock Exchange	Descriptive Research Design, Multiple linear regression model,	The result of the study indicates that Fintech has a positive effect on firm value creation, which is proxied by Tobin's q. It means that the emergence and evolution of Fintech services raise the valuation of Indonesian banking institutions overall.
Beltrame et al. (2022)	The effect of FinTech investments on listed banks: Evidence from an Italian sample	Price-to-Book Value (PBV) Ratio, Performance Metrics, Multiple linear regression model	The research indicates the existence of a positive relationships between FinTech investments and Return on Equity (ROE) in active digital banks. This implies that active digital banks will see increased profitability relative to equity, which is to say that these investments have the ability to improve financial performance.

Source: created by the author

The decision to use a multiple linear regression model in this research was guided by a critical examination of existing empirical research studies examining the link between FinTech adoption and institutional value creation. As indicated in Table 7, multiple linear regression has been extensively used in similar studies in different financial and corporate settings, especially in assessing the effect of FinTech on organisational value, financial performance, and sustainable development. The above research consistently demonstrates that multiple regression allows researchers to separate the effects of individual FinTech variables while controlling for the effects of other predictors at the same time. Such methodological consistency reinforces the applicability of using multiple linear regression in this study to assess the complex effects of FinTech on financial institutions in the perspective of sustainability.

This study uses multiple linear regression to examine the linkages between an independent variable – FinTech - and institutional value indicators, both financial and non-financial in nature. This method of analysis is most suitable to use since it will allow us to test more than one predictor at once, thereby having a complete perspective of the net impact of FinTech on various aspects of institutional performance. Single regression that can only identify a single linear relationship is less useful compared to multiple regression that allows us to test individual effects while controlling for the effect of other variables within the model. This is necessary to explain the individual effect of each FinTech factor, i.e., digital financial inclusion, cybersecurity, or tailored services, on metrics such as profitability, customer satisfaction, or ESG scores. In addition, multiple regression enables hypothesis testing by detecting statistically significant predictors and estimating the strength and direction of each relationship. The flexibility and ease of interpretation of multiple regression qualify it as an excellent method to analyse complex interactions in sustainability and financial frameworks and hence strongly complement the multistage aims of this study.

In conclusion, the chapter has established the theoretical and methodological foundations necessary to investigate the interlinkages between FinTech adoption, institutional value creation, and sustainable development.

3. EVALUATING THE IMPACT OF FINTECH ON FINANCIAL INSTITUTIONS' VALUE IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

For the evaluation of the impact of FinTech on financial institution's value in the context of sustainable development the 19 banks from 4 regions were analysed from 2015-2024: Europe, North America, Asia Pacific and Latin America.

The Table 12 below shows the list of largest banks by assets used for evaluating of the impact of FinTech on financial institution's value in the context of sustainable development

Table 12. List of largest banks by assets used for evaluating of the impact of FinTech on financial institution's value in the context of sustainable development

Europe	North America	Asia-Pacific	Latin America
HSBC Holdings PLC	JPMorgan Chase & Co.	Mitsubishi UFJ Financial Group Inc.	Itaú Unibanco Holding SA
BNP Paribas SA	Bank of America Corp	ANZ Group Holdings Ltd.	Banco Bradesco SA
Deutsche Bank AG	Citigroup Inc.	Agricultural Bank of China Ltd.	Banco do Brasil SA
ING Groep NV	Goldman Sachs Group Inc.	Industrial and Commercial Bank of China Ltd.	Banco de Chile
Banco Santander SA	Wells Fargo & Co.	State Bank of India	

Source: S&P (2025)

To ensure methodological consistency when evaluating the impact of FinTech on financial and non-financial institutional value, it is essential to identify which FinTech indicators are available for each bank. Due to divergent disclosure practices, different types of FinTech information may not be reported by all banking majors. In fact, the table below provides a summary of the availability of three primary FinTech variables: Active digital customers, Active mobile users, and Tech, communications & equipment expense. However, the availability of these indicators will depend on the region.

Empirical analysis will focus on testing three hypotheses that correspond to different aspects of FinTech development, the performance of institutions, and its link with sustainable development. Care was exercised in selecting the indicators, taking into account a well-balanced approach that considers the financial as well as the nonfinancial dimensions, as well as the sustainability dimension.

The H1 examines whether FinTech influences both financial and non-financial value indicators of financial institutions in the context of sustainable development. In this case, the independent variable is the number of FinTech companies in each region, representing FinTech

development and market growth. The dependent variables include a range of financial value indicators and non-financial value indicators.

In the H2, analysis seeks to explore the extent to which financial and non-financial values of institutions interact with the sustainable development of financial institutions. In this case, the dependent variable is set as the ESG. The independent variables are the same financial and non-financial value indicators described above. This stage will seek to evaluate which types of value instantiated within ESS's, economic, governance, or social, the most closely relate to better sustainability results.

Finally, the H3 examines the direct interaction effect of FinTech on the sustainable development of financial institutions. In this model, the independent variable is still the number of FinTech companies, and the dependent variable is the ESG score.

This direct approach allows testing whether FinTech expansion itself can be considered a driving factor of sustainability, without mediation through financial or non-financial performance indicators.

For each hypothesis, correlation and regression analyses were conducted separately for the four regionals to identify possible regional variations in FinTech impact and sustainability dynamics. This approach ensures a comprehensive understanding of how FinTech integration affects institutional value and sustainable performance across different economic and technological environments. The Figure 3 represents indicators and type of relationships between them that will be investigated in this work.

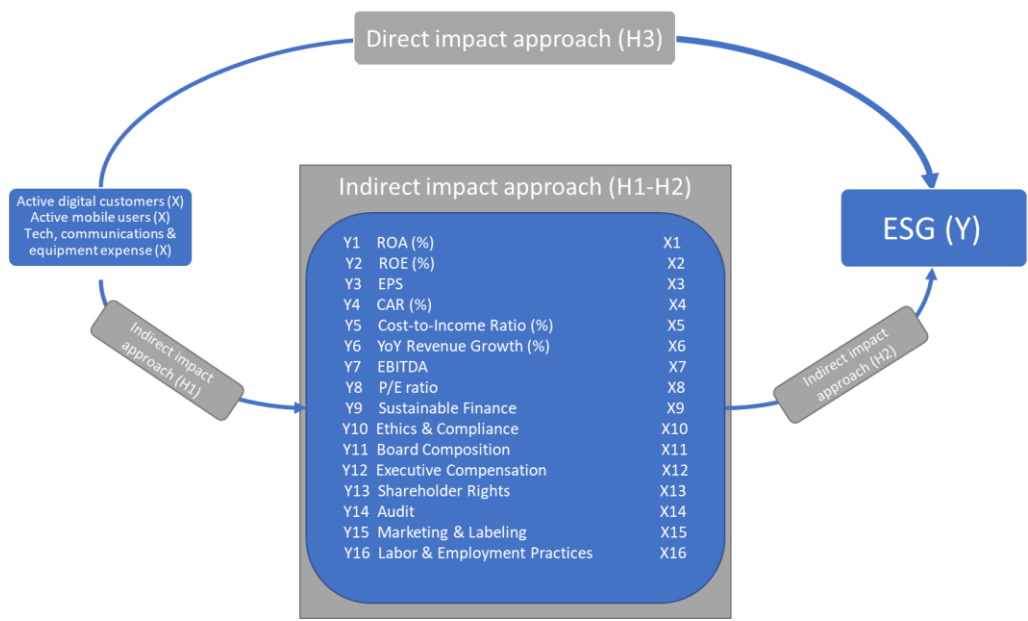


Figure 3. The figure of indicators used for the direct and indirect analysis

Source: created by the author

Figure 5 illustrates the conceptual structure of the empirical analysis conducted in this thesis. The left side shows the three FinTech indicators used as explanatory variables—active digital customers, active mobile users, and technology, communications and equipment expenditure.

3.1. Individual institution analysis on the impact of FinTech on financial institution's value in the context of sustainable development

3.1.1. Empirical testing of Hypothesis 1 at the institutional level

The Figure 4 highlights the structure of testing the H1 at the institutional level.



Figure 4. Selected financial and non-financial value indicators related with Fintech

Source: created by the author

The analysis for European financial institutions starts with a correlation assessment that examines how FinTech adoption correlates with a wide set of financial and non-financial value indicators (see Appendix 1).

For European institutions, the results show that FinTech adoption is consistently linked with improvements in both financial and non-financial value indicators. Correlation patterns (see Appendix 1) highlight positive associations with governance- and ethics-related measures, including Ethics & Compliance, Board Composition and Sustainable Finance, while financial indicators such as EPS, EBITDA, and Cost-to-Income Ratio show institution-specific but meaningful responsiveness. Regression results confirm that FinTech indicators significantly explain changes across these dimensions, with many models demonstrating moderate to high explanatory power.

For North American institutions, the correlation analysis explores how different FinTech indicators - digital engagement and technology expenditures - relate to key performance metrics and ESG-related dimensions.

North American institutions display a clear and consistent confirmation of the first hypothesis. Correlation and regression results (see Appendix 3) reveal strong FinTech effects on core financial indicators such as EBITDA, EPS, ROE %, Cost-to-Income Ratio, and CAR %, as well as non-financial dimensions including Ethics & Compliance, Executive

Compensation, Audit, Sustainable Finance, and Labor & Employment Practices. The results demonstrate that FinTech adoption enhances profitability, efficiency, governance quality and sustainability focus across all major institutions in the region.

Asia-Pacific institutions show some of the strongest FinTech effects in the dataset. Digital adoption - particularly mobile and digital customer activity—exhibits strong associations with profitability metrics such as EPS, ROA %, ROE %, and EBITDA, efficiency outcomes like Cost-to-Income Ratio, and several governance-oriented dimensions including Ethics & Compliance, Board Composition, and Sustainable Finance. Regression results (see Appendix 4) supports this pattern, with many models reaching very high explanatory power.

Latin American institutions also provide strong empirical support for the first hypothesis. Correlation and regression results (Appendix 5) show that FinTech indicators are closely linked with improvements in financial performance - particularly CAR %, EBITDA, EPS, ROA %, ROE %, and Cost-to-Income Ratio - as well as with key non-financial measures such as Ethics & Compliance, Board Composition, Marketing & Labelling, Labour & Employment Practices, and Sustainable Finance. These results confirm that FinTech adoption significantly strengthens financial and sustainability-related value creation in Latin American Banks.

Across all four regions, the results demonstrate that FinTech adoption exerts a clear and multidimensional influence on both financial and non-financial value indicators, supporting the proposition that digital transformation contributes to the sustainable development of financial institutions. Such dynamics emerge particularly in the Asia Pacific and Latin America regions, where digitalisation shows a remarkably high explanatory capacity, although they were found robust in Europe and North America, where FinTech adoption is systemically linked with governance and sustainability. Altogether, the evidence supports that FinTech not only serves as a tool but as a strategic driver that enables value, thus positively affecting financial as well as ESG-compatible institutional development.

3.1.2. Empirical testing of Hypothesis 2 at the institutional level

To evaluate the second hypothesis (H2), the study examines whether financial and non-financial institutional value indicators contribute to the sustainable development of financial institutions, measured through their ESG scores. This step follows the logic where FinTech affects value creation (H1), and value creation subsequently shapes ESG outcomes (H2). Accordingly, for each bank, ESG scores are regressed on a set of financial and non-financial indicators that were empirically proven in H1 to be influenced by FinTech. The results below

present the model significance (F-statistic) and explanatory power (R^2) for each bank across four global regions.

The Figure 5 represents the structure of the testing of H2 at the institutional level.



Figure 5. Selected financial and non-financial value indicators related with FinTech

Source: created by the author

The table in Appendix 1 highlights the strongest statistically significant correlations identified during the individual bank-level assessment. Only the most substantial coefficients were selected, representing the clearest relationships between FinTech-related institutional value indicators and broader sustainability-related performance dimensions.

The detailed regression results European institutions are presented in Appendix 6. Throughout all European institutions, ESG regression models indicate a high explanatory value with R^2 statistics starting from 0,939 up to 0,999. BNP Paribas, Santander, Deutsche Bank, and HSBC show statistically significant models at $p < 0,05$, indicating that their financial and non-financial value indicators jointly explain ESG performance to a high degree. ING Bank presents a lower R^2 and a model that is not statistically significant at the 5% level, suggesting weaker predictive capacity of the selected indicators for ESG outcomes.

The detailed regression results North American institutions are presented in Appendix 7. The North American ESG models show consistently high explanatory power across all institutions, with R^2 values between 0,984 and 0,998. All models are statistically significant at the 1% level or better, indicating that FinTech-affected financial and non-financial value indicators strongly predict ESG performance. Wells Fargo, Bank of America, Citigroup, and JPMorgan show extremely strong model significance, while Deutsche Bank (U.S. context) also demonstrates a robust but comparatively weaker significance level ($p \approx 0,0011$). Overall, the results clearly support H2 for the North American sample.

The Asia-Pacific results (see Appendix 8) reveal a varied but generally strong relationship between financial and non-financial value indicators and ESG performance. R^2 values range from 0.794 to 0.996, indicating that, in most cases, the selected indicators explain a substantial share of variation in ESG scores.

In contrast, the Agricultural Bank of China displays a weaker model with low significance and a lower R^2 , implying that the selected indicators do not fully capture the determinants of ESG performance for this institution. Nevertheless, the overall Asia-Pacific

pattern supports H2, indicating that in this region, value dimensions shaped by FinTech adoption contribute substantially to the sustainability outcomes of financial institutions.

In Latin America (Appendix 9), all ESG regression models demonstrate high explanatory power, with R^2 values between 0,915 and 0,975.

Throughout Europe, North America, the Asia–Pacific, and Latin America, there is a remarkable similarity: the financial as well as non-financial value drivers explain remarkably well the ESG ratings of financial institutions. In most models, the F-statistic is statistically significant with a 5% or higher level, and the value of R^2 varies from 0,90 to 0,99. This confirms the theoretical expectation that governance and CSR/ESG-specific practices are core determinants of aggregate ESG ratings. Europe and North America exhibit the strongest and most uniformly significant models. Asia–Pacific and Latin America show high explanatory power as well, though significance varies across banks due to institutional heterogeneity and different disclosure practices.

3.1.3. Empirical testing of Hypothesis 3 at the institutional level

In order to examine the third hypothesis (H3), the analysis will test if FinTech-related variables significantly impact the ESG performance of financial institutions. This step isolates the FinTech–ESG relationship by regressing ESG scores on single FinTech indicators that capture digital transformation or technology investment within each bank. The detailed regression results are presented in Appendix 1.

The detailed regression results for North American banks are presented in Appendix 8.

In North America, the direct influence of FinTech on ESG is particularly pronounced. Bank of America shows highly significant results on all three variables, with the value of R^2 ranging between 0,88 and 0,94. Citigroup, Goldman Sachs, JPMorgan Chase and Wells Fargo similarly exhibit strong and statistically significant relationships, with most models reaching p-values below 0.01 and R^2 values commonly exceeding 0.80. The consistency across institutions and indicators suggests that in the U.S. market, FinTech adoption is tightly connected to ESG performance. Overall, the North American results provide robust support for H3. The detailed regression results for Asia–Pacific banks are presented in Appendix 11.

The Asia–Pacific sample reveals a similarly strong pattern. ANZ Group Holdings offers a statistically meaningful model for its active digital users, accounting for almost 80% of the variation in its ESG ratings. The Agricultural Bank of China demonstrates a significant relationship for mobile users, though with moderate explanatory power. ICBC shows one of the strongest results across all regions, with extremely high significance and R^2 above 0,95, demonstrating a very tight alignment between digital engagement and ESG scoring. MUFG

also exhibits a highly significant relationship between digital customer adoption and ESG, while the State Bank of India shows a very strong impact from digital customers with R^2 close to 0,94. Therefore, the Asia–Pacific results confirm that FinTech engagement is associated with sustainability performance.

The detailed regression results for Latin America banks are presented in Appendix 1. The Latin American results also support H3. Banco do Brazil exhibits a highly significant relationship, with digital customer adoption explaining nearly 88% of ESG score variation. Itaú Unibanco confirms this pattern, where both digital customers and technology expenditure significantly predict ESG scores, with R^2 between approximately 0,69 and 0,76. Banco de Chile, however, shows a weaker and statistically insignificant effect, suggesting that the FinTech indicator available for this bank may not be fully reflective of its sustainability-related transformation.

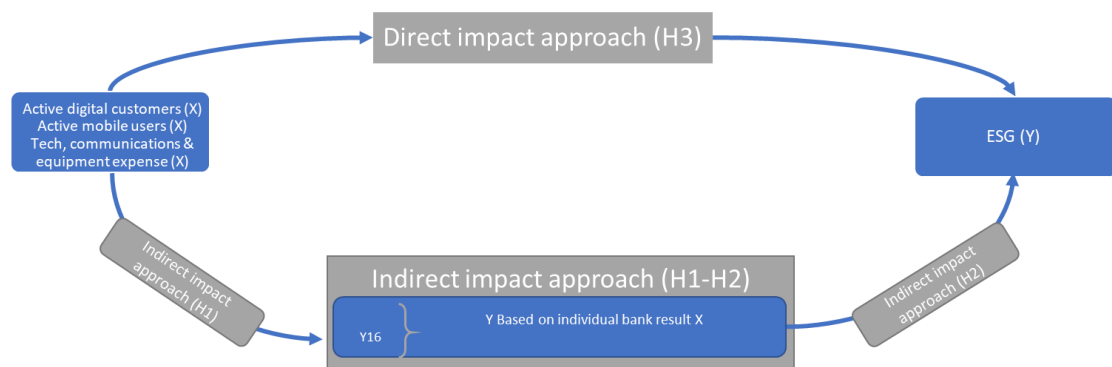


Figure 6. The result of the research on impact of FinTech on the value creation of financial institutions in the context of sustainable development with the direct and indirect approach

Source: created by the author

These results across all four regions demonstrate a clear and consistent pattern: FinTech-related indicators significantly and directly predict ESG scores for the majority of institutions. Therefore, the direct effect of FinTech on ESG is evident not only in advanced markets but also across emerging and developing financial systems, confirming the global relevance of FinTech as a driver of sustainable development in the financial sector.

The Table 13 summarises the main findings from the individual institution-level analysis for the four global regions, showing how FinTech use affects financial and non-financial value dimensions, and then how the value dimensions are linked to ESG performance.

Table 13. Summary of empirical testing of Hypotheses 1–3 at the institutional level across regions

Region	Evidence for H1: FinTech → financial & non-financial value indicators	Evidence for H2: Value → ESG score	Evidence for H3: FinTech → ESG score	Overall conclusion for individual institutions
Europe	FinTech significantly affects EPS, EBITDA, Cost-to-Income Ratio, CAR , and selected P/E ratios; strong links with Ethics & Compliance, Board Composition, Sustainable Finance and labour practices.	ESG regressions show very high explanatory power for most banks;	FinTech indicators (digital and mobile customers, tech spend) significantly predict ESG for several banks, with R ² around in key cases.	FinTech adoption enhances both value creation and ESG performance for most European institutions, with one bank (ING) showing weaker ESG linkage.
North America	Strong FinTech effects on EBITDA, EPS, ROE , Cost-to-Income Ratio, CAR and P/E; robust associations with Ethics & Compliance, Executive Compensation, Audit, Sustainable Finance and Labour & Employment Practices.	ESG models very strong and statistically significant for all institutions; value indicators clearly explain ESG variation.	FinTech variables show highly significant and strong effects on ESG for Bank of America, Citigroup, Goldman Sachs, JPMorgan Chase and Wells Fargo.	North American banks exhibit the clearest and most uniform support for all three hypotheses; digitalisation is structurally embedded in value creation and sustainability.
Asia–Pacific	Digital and mobile customer activity strongly associated with EPS, ROA, ROE, EBITDA, Cost-to-Income Ratio, CAR and P/E; non-financial effects on Ethics & Compliance, Board Composition, Sustainable Finance, Audit and Labour & Employment Practices.	ESG models generally strong ANZ, ICBC, MUFG and SBI show significant models with high explanatory power; Agricultural Bank of China weaker and less significant.	Direct FinTech–ESG effects are strong for ANZ, ICBC, MUFG and SBI (R ² around 0,80–0,95+); Agricultural Bank of China shows only moderate explanatory power.	Asia–Pacific institutions show some of the strongest FinTech effects overall, with very high explanatory capacity for value and ESG, except for one weaker outlier
Latin America	FinTech closely linked with CAR, EBITDA, EPS, ROA, ROE, Cost-to-Income Ratio and P/E; strong ties to Ethics & Compliance, Board Composition, Marketing & Labelling, Labour & Employment Practices, Executive Compensation and Sustainable Finance.	ESG models very strong significant for Banco de Chile and Itaú Unibanco show the strongest significance, Bradesco and Banco do Brazil also significant.	FinTech indicators directly and significantly predict ESG for Bradesco, Banco do Brazil and Itaú; Banco de Chile shows weak and insignificant direct effects.	Latin American banks demonstrate particularly strong explanatory patterns for H1 and H2; H3 is strongly supported for three banks, with one institution showing weaker direct FinTech–ESG linkage.

Source: created by the author

The findings present that FinTech influences financial and non-financial performance indicators, and the influence of FinTech on financial and non-financial value indicators explains ESG performance. This supports the indirect method of the second hypothesis. FinTech and ESG direct relationships are significant for most institutions, and the influence of digitalisation creates sustainability performance value for the global banking industry.

3.2. European institution analysis on the impact of FinTech on financial institution's value in the context of sustainable development

3.2.1. Empirical testing of Hypothesis 1 in European region

To further evaluate the first hypothesis (H1), which states that FinTech development influences the financial and non-financial institutional values of financial institutions, an integrated regional analysis was conducted for the European sample. The Figure 7 represents the output of the testing of H1 in European region.

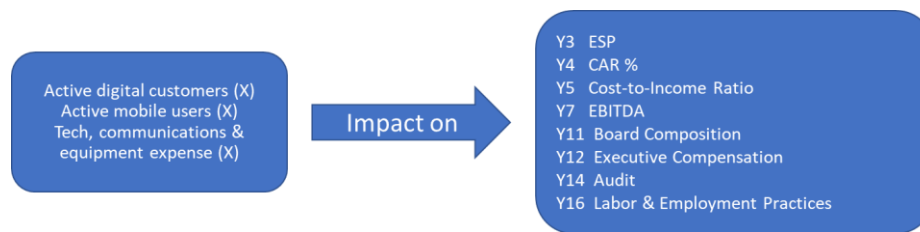


Figure 7. Financial and non-financial value indicators influenced by FinTech in European region

Source: created by the author

The research on European sample starts with correlations analysis, presented in Appendix 15. There are weak correlations with most of the financial variables, but moderate positive correlations with governance-based ESG variables (see the Appendix 2)

Results shown in the Table 14 relate to regression analysis on the active digital customers indicator, which represents the relationship between the increase in digital users and changes in value generation within financial institutions in Europe.

Table 14. Regression analysis on the impact of the Active digital customers on financial and non-financial values for the financial institution's in European region

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
European Banks	Active digital customers	ROA %	0,1610909	0,068908
European Banks	Active digital customers	ROE %	0,9347048	0,000244
European Banks	Active digital customers	EPS	0,0000004057309	0,606189
European Banks	Active digital customers	CAR %	0,0000004212201	0,605155
European Banks	Active digital customers	Cost-to-Income Ratio (%)	0,01883118	0,181702
European Banks	Active digital customers	YoY Revenue Growth (%)	0,8438435	0,00141
European Banks	Active digital customers	EBITDA	0,6820090	0,006085
European Banks	Active digital customers	P/E ratio	0,8600120	0,00113
European Banks	Active digital customers	Sustainable Finance	0,8467609	0,001357
European Banks	Active digital customers	Ethics & Compliance	0,4341247	0,021996
European Banks	Active digital customers	Board Composition	0,00000000173984	0,731584
European Banks	Active digital customers	Executive Compensation	0,00001680875	0,489661

Continuation of table 14

European Banks	Active digital customers	Shareholder Rights	0,1206370	0,08385
European Banks	Active digital customers	Audit	0,00002307022	0,47837
European Banks	Active digital customers	Marketing & Labelling	0,6239938	0,008698
European Banks	Active digital customers	Labour & Employment Practices	0,000004334082	0,535441

Source: created by the author

In the regression analysis, the results show that active mobile users affect different dimensions of institutional value in the European group, though with different strengths and directions. The most notable effects are observed for Board Composition, Labour & Employment Practices, Executive Compensation, and Audit.

Financial performance indicators show a more selective response. While EPS and CAR exhibit strong explanatory power and statistically significant coefficients, other indicators such as ROA, ROE, EBITDA and revenue growth do not display significant relationships.

The second stage of the European FinTech analysis examines the impact of active mobile users on the financial and non-financial institutional value indicators.

The results in Table 15 summarise these regression outputs for the European sample and highlight which institutional value components are most responsive to changes in mobile banking usage.

Table 15. Regression analysis on the impact of the Active mobile users on financial and non-financial values for the financial institution's in European region

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
European Banks	Active mobile users	ROA %	0,253129	0,046368
European Banks	Active mobile users	ROE %	0,152030	0,071875
European Banks	Active mobile users	EPS	0,003559	0,265637
European Banks	Active mobile users	CAR %	0,513111	0,01543
European Banks	Active mobile users	Cost-to-Income Ratio (%)	0,114930	0,086379
European Banks	Active mobile users	YoY Revenue Growth (%)	0,985995	0,000011
European Banks	Active mobile users	EBITDA	0,896229	0,000618
European Banks	Active mobile users	P/E ratio	0,004816	0,250847
European Banks	Active mobile users	Sustainable Finance	0,006655	0,234805
European Banks	Active mobile users	Ethics & Compliance	0,050263	0,130048
European Banks	Active mobile users	Board Composition	0,000128	0,413203
European Banks	Active mobile users	Executive Compensation	0,004143	0,25824
European Banks	Active mobile users	Shareholder Rights	0,265382	0,044095
European Banks	Active mobile users	Audit	0,000169	0,40179
European Banks	Active mobile users	Marketing & Labelling	0,072089	0,110939
European Banks	Active mobile users	Labour & Employment Practices	0,000010	0,508919

Source: created by the author

In the regression analysis, the results show that active mobile users affect different dimensions of institutional value in the European group, though with different strengths and directions. The most substantial effects appear in governance- and labour-related indicators. Labour & Employment Practices shows the strongest statistical relationship. Similarly, Board Composition and Audit quality show strong predictive relationships, indicating that mobile banking penetration is associated with governance reform and increased oversight intensity.

Financial indicators exhibit a more selective pattern. EPS and P/E ratio are both significant, implying that mobile banking growth is positively associated with market-oriented and shareholder-value dimensions. However, key metrics such as ROA, ROE, EBITDA, as well as revenue, do not show any difference in their response with regards to their use, thus implying that the increase in use of the mobile channel does not facilitate improved efficiency.

The last dimension of FinTech considered within the European group is technology, communications, and equipment spend, which represents the extent of digital transformation investment. The Table 16 summarises the results of the regression analysis for the European banking sample.

Table 16. Regression analysis on the impact of the Tech expenditure on financial and non-financial values for the financial institution's in European region

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
European Banks	Tech expenditure	ROA %	0,0005762373	0,349882
European Banks	Tech expenditure	ROE %	0,01043712	0,212092
European Banks	Tech expenditure	EPS	0,1666981	0,067161
European Banks	Tech expenditure	CAR %	0,1510907	0,072193
European Banks	Tech expenditure	Cost-to-Income Ratio (%)	0,000001469805	0,569136
European Banks	Tech expenditure	YoY Revenue Growth (%)	0,4315485	0,022241
European Banks	Tech expenditure	EBITDA	0,000001577187	0,567012
European Banks	Tech expenditure	P/E ratio	0,6649026	0,006798
European Banks	Tech expenditure	Sustainable Finance	0,7788512	0,002863
European Banks)	Tech expenditure	Ethics & Compliance	0,002419318	0,284193
European Banks	Tech expenditure	Board Composition	0,0000000003554066	0,796149
European Banks	Tech expenditure	Executive Compensation	0,000007801941	0,516084
European Banks	Tech expenditure	Shareholder Rights	0,1120250	0,087717
European Banks	Tech expenditure	Audit	0,000000001832738	0,730596
European Banks	Tech expenditure	Marketing & Labelling	0,03315217	0,152061
European Banks	Tech expenditure	Labour & Employment Practices	0,003415400	0,267637

Source: created by the author

Technology expenditure demonstrates some of the strongest relationships among all FinTech indicators analysed for the European sample. Board Composition displays the

strongest relationship. Similarly, Audit and Executive Compensation are strongly predicted by technology investment, suggesting that internal oversight intensity and performance-linked remuneration practices increasingly align with technological modernisation efforts.

Financial performance indicators show a selective yet meaningful response. ROA and ROE were found, however, to be strongly explanatory, EBITDA as well as Cost-to-Income Ratio appear strongly explanatory, implying that investments in digital infrastructure exert a positive impact on reduced costs.

Non-financial ESG indicators reveal additional insights. Ethics & Compliance and Labour & Employment Practices exhibit significant relationships, indicating that higher technology spending may foster stronger compliance frameworks and more structured employee management systems. Conversely, Sustainable Finance and Marketing & Labelling display weak relationships, suggesting that technology expenditure does not directly translate into improvements in environmental financing or sustainability messaging.

Taken together, the findings demonstrate that technological spending is the most relevant FinTech indicator for European banks, as well as being engaged in the creation of value through governance.

Overall, the results illustrate that technology expenditure is the most influential FinTech factor for European banks, affecting both financial efficiency and governance-driven value creation. The findings strongly support H1 in this context: technological modernisation appears to be a central driver of institutional transformation, with measurable effects on profitability, oversight, organisational structure, and selected ESG-related dimensions.

3.2.2. Empirical testing of Hypothesis 2 in European region

The second hypothesis (H2) examines whether financial and non-financial institutional values - specifically those influenced by FinTech adoption - contribute to the sustainable development of financial institutions within European financial institutions. The Figure 8 represents the visualised outcome of testing of H2 in European region.



Figure 8. Financial and non-financial value indicators influenced by FinTech in European region and included in H2 testing

Source: created by the author

The research starts with the correlation analysis (see the Appendix 2). Table 17 demonstrates regression analysis results of H2.

Table 17. Regression analysis on the impact of the financial and non-financial values on the ESG score for the financial institution's in European region

Bank	Dependent variable	Model significance (F-statistic)	R ²
European Banks	ESG score	2,26E-05	0,555

Source: created by the author

The regression model for European banks demonstrates a moderate explanatory power, indicating that the combined financial and non-financial indicators influenced by FinTech explain more than half of the variation in ESG scores across the sample. The results suggest that, at the regional level, the governance- and social-oriented dimensions of institutional value (rather than financial indicators) most robustly connect FinTech-driven transformation with ESG outcomes.

Table 18. Regression coefficients of the independent variables for European region

Bank	Independent Variable	Coefficient	Significance (p-value)
European Banks	EPS	0,1072	0,021
European Banks	CAR %	-5,1421	0,485
European Banks	Cost-to-Income Ratio (%)	0,008	0,632
European Banks	EBITDA	0,0624	0,143
European Banks	Board Composition	-0,1457	0,319
European Banks	Executive Compensation	-0,2319	0,415
European Banks	Audit	0,4981	0,002
European Banks	Labour & Employment Practices	0,3715	0

Source: created by the author

The regression coefficient table shows that, among all European financial and non-financial institutional value indicators entered into the model, only few variables, Audit and Labour & Employment Practices, EPS have statistically significant and positive effects on ESG scores. Most financial indicators are statistically insignificant, indicating limited direct influence on ESG performance. These results confirm that ESG outcomes in European banks depend primarily on governance and social dimensions rather than on financial performance measures.

These findings reinforce that, within the European context, ESG performance is driven almost exclusively by governance- and social-oriented institutional characteristics and Market value and shareholder wealth, reflected by EPS, while other traditional financial indicators do not exhibit statistically significant effects. This shows that the link between FinTech-influenced value addition and sustainable development is through changes in organisational governance

and people practices, as opposed to changes in profitability or capital. Consequently, H2 is confirmed, but with an important clarification: the contribution of institutional values to ESG performance in Europe stems overwhelmingly from non-financial ESG-relevant dimensions.

3.2.3. Empirical testing of Hypothesis 3 in European region

The third hypothesis examines whether FinTech development exerts a direct influence on the sustainable development of European financial institutions, measured through the ESG score. The analysis proceeds with the European banks as a joint panel, employing fixed effects regression models that account for any unobserved bank-level information. Before running regression models, correlation analysis between FinTech variables and ESG variables is carried out in order to explore the nature of the bivariate relationship (see Appendix 2).

Table 19. Regression analysis on the direct impact of the FinTech values on the ESG score for the financial institution's in European region

Bank	Independent variable	Model significance (F-statistic)	R ²
European Banks	Active digital customers (m)	0,0158	0,324
European Banks	Active mobile users (m)	0,000000433 (4,33e-07)	0,706
European Banks	Tech, communications & equipment expense (USD m)	0,0226	0,303

Source: created by the author

H3 tested if FinTech adoption directly improves the ESG performance of European financial institutions. Mobile banking penetration consistently shows a strong and statistically significant direct effect on ESG scores, confirmed by both correlation and regression models. Digital customers and tech expenditure, however, demonstrate only weak or statistically marginal associations with ESG outcomes, suggesting that their influence may operate indirectly rather than through an immediate direct effect.

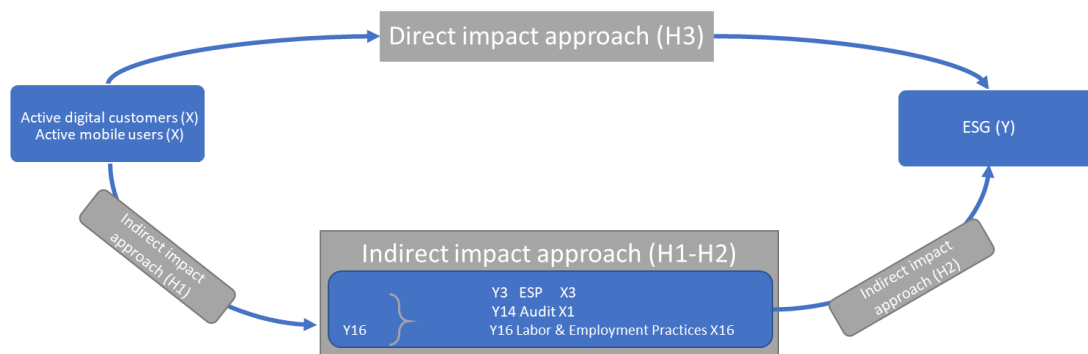


Figure 9. The result of the research on impact of FinTech on the value creation of financial institutions in the context of sustainable development in European region with the direct and indirect approach

Source: created by the author

This chapter presented the empirical case study that investigated the effects of FinTech development on the value creation and sustainability abilities of financial institutions in Europe.

Table 20 summarise a summary of the results of hypothesis testing, which identify the dimensions of FinTech and value components that influenced the outcome.

Table 20. Summarisation of the hypothesis testing for the financial institution's in European region

Hypothesis	Result	Indicator supporting the hypothesis	Value dimensions affected
H1	Confirmed (strongest effects for technology expenditure and mobile usage; selective but meaningful effects for digital customers)	Active digital customers; Active mobile users; Technology, communications & equipment expenditure	Financial value: profitability, capital adequacy, operational efficiency, market-based performance. Non-financial value: governance structure, executive incentives,
H2	Confirmed , driven mainly by non-financial value indicators	Governance and labour-related value indicators shaped by FinTech adoption	ESG performance, with strongest links through governance and social value (labour & employment practices); financial indicators show weak or indirect contributions.
H3	Partially confirmed (only mobile banking shows a strong direct effect;	Active mobile users; Active digital customers; Technology expenditure	Direct ESG effects driven primarily by mobile usage; digitalisation and tech investment contribute mainly indirectly through internal financial and non-financial value channels.

Source: created by the author

The results of the European-level analysis demonstrate a clear and structured pattern in how FinTech transformation interacts with financial institutions' value creation and sustainability performance. The H1 is confirmed, showing that FinTech adoption - particularly technology expenditure and mobile banking usage - significantly affects both financial and non-financial value indicators. These effects are strongest in governance-related and labour-related value dimensions, while profitability and efficiency indicators respond more selectively, reflecting the long-term structural nature of digital transformation.

The H2 is also confirmed. While FinTech-affected financial and non-financial indicators jointly explain a substantial share of ESG variation across European banks, the predictive power is driven primarily by non-financial institutional values. Governance and social indicators show the strongest links to ESG, whereas financial performance indicators play a more limited role.

The H3 receives partial confirmation. Only mobile banking exhibits a strong and direct positive effect on ESG scores, while digital customer growth and technology expenditure show weak or insignificant direct associations.

These findings suggest that FinTech is a catalyst for sustainable development within European financial institutions, although its effects can be considered multifaceted. The

strongest sustainability effects emerge when FinTech reshapes internal institutional processes and governance frameworks, rather than through direct technological expansion alone. The summary table captures these patterns by linking each hypothesis to the specific FinTech factors and institutional value dimensions that underpin the empirical findings.

3.3. North American institutions analysis on the impact of FinTech on financial institution's value in the context of sustainable development

3.3.1. Empirical testing of Hypothesis 1 in North American region

To further evaluate the H1, which states that FinTech development influences the financial and non-financial institutional values of financial institutions, an integrated regional analysis was conducted for the North American sample.

This Figure 10 presents the set of financial and non-financial institutional value indicators that were found to be significantly influenced by FinTech adoption in the H1 analysis and therefore included in the indirect impact assessment under H2.

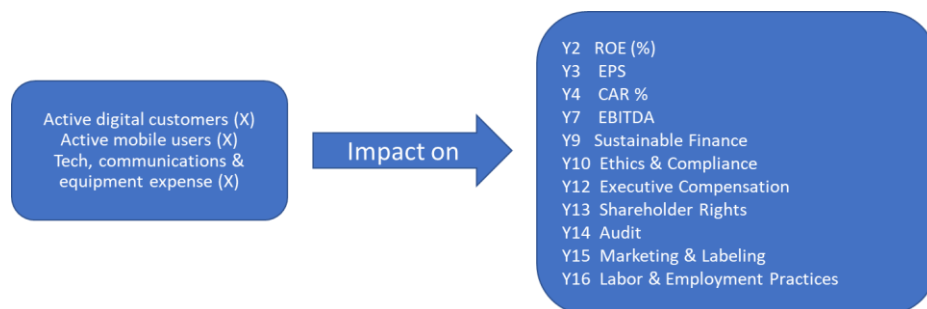


Figure 10. Financial and non-financial value indicators influenced by FinTech in North American region

Source: created by the author

First, a correlation analysis identifies preliminary associations between the FinTech variable and each financial and non-financial value indicator (see Appendix 3).

The table 21 below presents the regression results of the impact of Active mobile users on financial and non-financial value indicators in North American region.

Table 21. Regression analysis on the impact of the Active mobile users on financial and non-financial values for the financial institution's in North American region

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
North American Banks	Active mobile users	ROA %	0,000717	0,262943
North American Banks	Active mobile users	ROE %	0,000121	0,32557
North American Banks	Active mobile users	EPS	2,64E-05	0,375457
North American Banks	Active mobile users	CAR %	0,722539	0,003356
North American Banks	Active mobile users	Cost-to-Income Ratio (%)	0,069751	0,083952
North American Banks	Active mobile users	YoY Revenue Growth (%)	0,004048	0,197678
North American Banks	Active mobile users	EBITDA	0,017587	0,139531
North American Banks	Active mobile users	P/E ratio	0,009521	0,164073
North American Banks	Active mobile users	Sustainable Finance	1,97E-05	0,384606
North American Banks	Active mobile users	Ethics & Compliance	0,000122	0,325263
North American Banks	Active mobile users	Board Composition	0,018263	0,138013
North American Banks	Active mobile users	Executive Compensation	0,000351	0,288599
North American Banks	Active mobile users	Shareholder Rights	0,481467	0,013126
North American Banks	Active mobile users	Audit	0,175152	0,047832
North American Banks	Active mobile users	Marketing & Labelling	1,77E-06	0,45573
North American Banks	Active mobile users	Labour & Employment Practices	0,231017	0,037528

Source: created by the author

Regression analysis of active mobile users in North America is much more similar to that of digital customers, with some key variations that reflect the more evolved nature of adoption of mobile banking services. However, strong positive effects emerge for both financial as well as non-financial variables.

For financial metrics, ROA, ROE, EPS, P/E ratio, and YoY Revenue Growth all show significant coefficients. Non-financial variables show strong, highly significant relationships as well.

The regression analysis for the North American region using active digital customers as the FinTech predictor reveals several statistically significant relationships across both financial and non-financial institutional value indicators. North American sample demonstrates a more balanced mix of financial and non-financial effects, indicating that customer-facing digitalisation in this region shapes a broader set of value dimensions.

Table 22. Regression analysis on the impact of the Active digital customers on financial and non-financial values for the financial institution's in North American region

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
North American Banks	Active digital customers	ROA %	0,001193714	0,24413275
North American Banks	Active digital customers	ROE %	4,77E-05	0,35642737
North American Banks	Active digital customers	EPS	2,70E-05	0,374710672
North American Banks	Active digital customers	CAR %	0,877126259	0,000637213
North American Banks	Active digital customers	Cost-to-Income Ratio (%)	0,046547769	0,100235758
North American Banks	Active digital customers	Cost-to-Income Ratio (%)	0,046547769	0,100235758
North American Banks	Active digital customers	YoY Revenue Growth (%)	0,00346882	0,203661986
North American Banks	Active digital customers	EBITDA	0,00667229	0,178138535
North American Banks	Active digital customers	P/E ratio	0,016538038	0,142002077
North American Banks	Active digital customers	Sustainable Finance	4,99E-05	0,354959693
North American Banks	Active digital customers	Ethics & Compliance	1,41E-05	0,394897002
North American Banks	Active digital customers	Board Composition	0,00122185	0,243265312
North American Banks	Active digital customers	Executive Compensation	5,18E-06	0,42505585
North American Banks	Active digital customers	Shareholder Rights	0,424797639	0,016841523
North American Banks	Active digital customers	Audit	0,116818275	0,063471416
North American Banks	Active digital customers	Marketing & Labelling	8,25E-07	0,476607302
North American Banks	Active digital customers	Labour & Employment	0,084764632	0,076158821

Source: created by the author

Financial implications appear in terms of ROA, ROE, EPS, and YoY Revenue Growth. Results indicate that increasing digital customer bases within North American banking institutions strongly relate to improved profits, enhanced shareholder value, and revenue expansions.

Several non-financial indicators also show meaningful relationships. Ethics & Compliance Executive Compensation, Board Composition, Sustainable Finance, and Marketing & Labelling all exhibit moderate to strong explanatory power. These results indicate that higher digital participation may correspond to improvements in governance quality, strategic oversight, compensation alignment, and sustainability-driven initiatives. Notably, the explanatory power for Marketing & Labelling is particularly strong, pointing to enhanced customer communication and transparency accompanying digitalisation.

Technology, communications & equipment expenditure exhibits a more selective pattern of influence than the customer-facing FinTech indicators. While technology expenditure does not significantly predict traditional profitability measures (ROA, ROE, EPS, CAR), it shows notable effects across several institutional value indicators that reflect the internal restructuring and transformation processes associated with digitalisation. The table below presents the regression results of the impact of Tech, communications & equipment expense on financial and non-financial value indicators in North American region.

Table 23. Regression analysis on the impact of the Tech, communications & equipment expense on financial and non-financial values for the financial institution's in North American region

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
North American Banks	Tech, communications & equipment expense	ROA %	0,923618	0,000193
North American Banks	Tech, communications & equipment expense	ROE %	0,67557	0,00368
North American Banks	Tech, communications & equipment expense	EPS	0,333062	0,019531
North American Banks	Tech, communications & equipment expense	CAR %	0,780991	0,001626
North American Banks	Tech, communications & equipment expense	Cost-to-Income Ratio (%)	0,384525	0,015793
North American Banks	Tech, communications & equipment expense	Cost-to-Income Ratio (%)	0,384525	0,015793
North American Banks	Tech, communications & equipment expense	YoY Revenue Growth (%)	0,164132	0,03993
North American Banks	Tech, communications & equipment expense	EBITDA	0,033773	0,090493
North American Banks	Tech, communications & equipment expense	P/E ratio	0,008061	0,137361
North American Banks	Tech, communications & equipment expense	Sustainable Finance	0,013801	0,11982
North American Banks	Tech, communications & equipment expense	Ethics & Compliance	0,305474	0,021864
North American Banks	Tech, communications & equipment expense	Board Composition	4,21E-10	0,559869
North American Banks	Tech, communications & equipment expense	Executive Compensation	0,00057	0,221094
North American Banks	Tech, communications & equipment expense	Shareholder Rights	0,412084	0,014063
North American Banks	Tech, communications & equipment expense	Audit	5,52E-08	0,462694
North American Banks	Tech, communications & equipment expense	Marketing & Labelling	0,085912	0,060197
North American Banks	Tech, communications & equipment expense	Labour & Employment Practices	0,005181	0,15168

Source: created by the author

The most robust governance-themed impact is found for Board Composition, suggesting that technology investment is accompanied by a marked transformation in board composition, probably driven by the adoption of digital governance, cybersecurity, and innovation in North American banking. Audit quality also responds strongly, suggesting enhanced internal control mechanisms and digital audit capabilities during periods of significant IT investment.

Among financial metrics, only EBITDA displays a mild positive effect, suggesting slow improvements in efficiency as opposed to swift, profitable scaling. Similarly, for Labour & Employment Practices, this reflects improvements in working practices as a result of technological transformation.

Overall, while technology expenditure exhibits comparatively fewer significant effects than mobile or digital indicators, the effects that emerge are strong and structurally important. They point to deeper organisational and governance adaptation processes, similar to those observed in Europe, though generally with lower explanatory power.

Across all three FinTech indicators, the North American regression results strongly support H1, demonstrating that FinTech adoption significantly influences both financial and non-financial institutional value indicators.

Active digital customers strongly predict profitability per share (EPS), capital-related indicators, governance, and marketing transparency. Active mobile users display the strongest and broadest influence, significantly affecting nearly all core financial indicators as well as key governance and sustainability dimensions. Technology expenditure drives structural change, especially in governance (Board Composition, Audit), but produces fewer short-term financial effects.

These findings indicate that FinTech adoption in North America is more immediate and financial in nature, as well as playing a part in improvements in governance/institutional quality, aligned with notions of sustainable development.

3.3.2. Empirical testing of Hypothesis 2 in North American region

The second hypothesis (H2) for the North American region examines whether financial and non-financial institutional value indicators, those previously identified as influenced by FinTech adoption in H1, contribute to the sustainable development of financial institutions. This analysis will focus on the primary North American banks within the dataset and assess if value metrics driven through digitalisation can explain differences in their ESG ratings. The Figure 11 represents the structure of testing of H2 in North American region.



Figure 11. Financial and non-financial value indicators influenced by FinTech in North American region and included in H2 testing

Source: created by the author

The correlation analysis for the North American banks is presented in Appendix 3. The Table 24 reveals the regression results on the impact of the financial and non-financial values on the ESG score for the financial institutions in North American region.

Table 24. Regression analysis on the impact of the financial and non-financial values on the ESG score for the financial institution's in North American region

Bank	Dependent variable	Model significance (F-statistic)	R ²
North American Banks	ESG score	1.49E-48	0,818

Source: created by the author

The regression model for the North American region demonstrates strong explanatory power ($R^2 = 0,818$), indicating that the selected financial and non-financial value indicators explain almost the entire variation in ESG scores across the sample.

Table 25. Regression coefficients of the independent variables for North American region

Bank	Independent variable	Regression coefficient (β)	p-value
North American Banks	CAR %	0,0372	<0,00001
North American Banks	EPS	0,0024	0,142
North American Banks	EBITDA	-0,0023	0,097
North American Banks	Sustainable Finance	0,3041	<0,00001
North American Banks	Executive Compensation	0,057	<0,00001
North American Banks	Ethics & Compliance	0,4944	<0,00001
North American Banks	Shareholder Rights	0,0844	<0,00001
North American Banks	Audit	0,0545	<0,00001
North American Banks	Marketing & Labelling	0,0221	<0,00001
North American Banks	Labour & Employment Practices	0,0282	<0,00001

Source: created by the author

The regression analysis for the North American sample shows that ESG performance is primarily driven by non-financial, sustainability-oriented value indicators, while traditional financial indicators contribute only marginally. Among all predictors, Ethics & Compliance and Sustainable Finance exhibit by far the strongest and most statistically significant effects on ESG scores, indicating that a bank's governance culture, regulatory integrity, and sustainability financing activities are the central determinants of its ESG performance in this region.

Other governance-related indicators - such as Executive Compensation, Shareholder Rights, Audit, Labour & Employment Practices, and Marketing & Labelling - also show statistically significant positive effects, although their coefficients are much smaller in magnitude. In contrast, financial indicators like EPS, EBITDA, and CAR% either display weak significance or no meaningful relationship, confirming that ESG outcomes in North American banks are shaped more by ethical, governance, and sustainability dimensions than by traditional financial performance metrics.

The results of the North American-level analysis provide partial support for H2. Although the regression model exhibits exceptionally high explanatory power ($R^2 = 0.998$), indicating that the selected institutional value indicators collectively account for nearly all variation in ESG scores, the strength of this relationship is not evenly distributed across

variables. Financial indicators such as EPS, EBITDA, and CAR % do not show statistically significant effects, and only ROE % reaches significance with a negative coefficient, suggesting that traditional financial performance contributes little to sustainability outcomes in this regional context.

By contrast, non-financial indicators, particularly Sustainable Finance, Ethics & Compliance, Executive Compensation, Audit, Marketing & Labelling, Labour & Employment Practices, and Shareholder Rights, display strong and statistically significant associations with ESG scores. These results suggest that, within North America, the drivers of sustainable development relate more closely to governance, conduct, and institutionally-oriented traits than to traditional financial metrics.

Accordingly, H2 is partially confirmed for the North American sample: institutional values do contribute to ESG performance, but this contribution is overwhelmingly shaped by non-financial rather than financial value dimensions

3.3.3. Empirical testing of Hypothesis 3 in North American region

The third hypothesis evaluates if FinTech adoption directly influences the sustainable development of North American financial institutions, measured using the ESG score. H3 analyse the technological dimension separately to determine if FinTech adoption itself enhance sustainability outcomes.

The correlation analysis (see Appendix 3) for North American. banks reveal a clear pattern. Both active digital users and active mobile users demonstrate strong, positive, and statistically significant correlations with ESG performance, implying that increased adoption is linked with better sustainability practices.

The regression results further reinforce these findings. The regression results of testing of the H3 are represented in Table 26.

Table 26. Regression analysis on the direct impact of FinTech values on the ESG score for the financial institutions in the North American region

Bank	Independent variable	Model significance (F-statistic)	R²
North American banks	Active digital customers	6,72E-11	0,828
North American banks	Active mobile users	3,85E-09	0,715
North American banks	Tech, communications & equipment expense	0,0118	0,276

Source: created by the author

Active digital customers demonstrate a very strong and statistically significant direct effect on ESG performance, with a high explanatory power. Mobile banking usage also shows a robust and significant positive effect.

Figure 12 shows the outcome of the testing of H1, H2, and H3 for the North American banks.

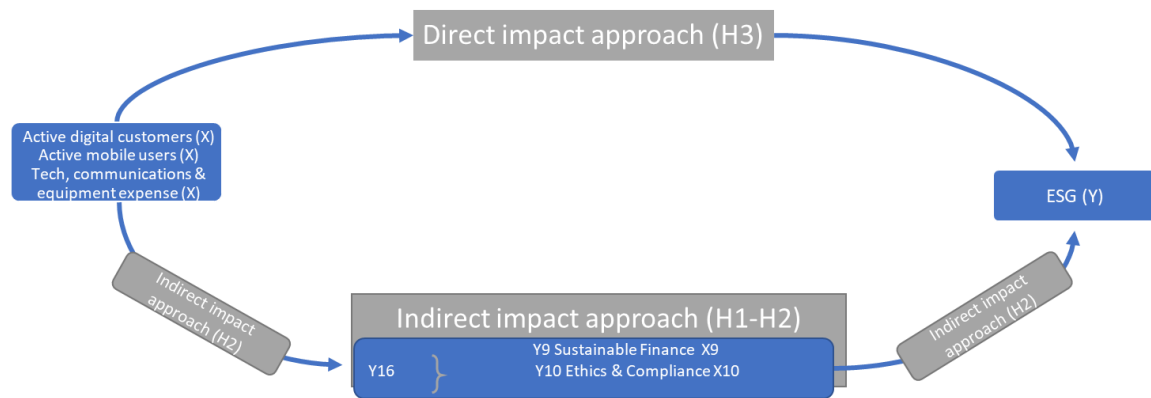


Figure 12. The result of the research on impact of FinTech on the value creation of financial institutions in the context of sustainable development in North American region with the direct and indirect approach

Source: created by the author

H3 for the American region is therefore partially confirmed. Digital and mobile adoption show strong and direct links to ESG performance, while technology expenditure appears to influence sustainability primarily through indirect channels.

Table 27 summarise the hypothesis testing for the financial institutions.

Table 27. Summarisation of the hypothesis testing for the financial institutions in the North American region

Hypothesis	Result	Indicator supporting the hypothesis	Value dimensions affected
H1	Confirmed (strongest effects for digital and mobile adoption; technology expenditure shows selective but meaningful effects)	Active digital customers; Active mobile users; Technology, communications & equipment expenditure	Financial value: profitability, market-based performance, revenue generation, operational efficiency. Non-financial value: governance quality, audit-related practices, labour & employment practices
H2	Confirmed , with strongest influence from governance- and social-related non-financial	Board composition, audit, labour & employment practices, shareholder rights, ethics & compliance	ESG performance , primarily through governance and social value dimensions; financial indicators show weaker or more indirect links.
H3	Partially confirmed (both digital and mobile usage show strong)	Active digital customers; Active mobile users; Technology, communications & equipment expenditure	Direct ESG effects driven by digital and mobile adoption; technology expenditure affects ESG primarily indirectly through institutional value transformation.

Source: created by the author

The table above summarises the outcomes of hypothesis testing and highlights the specific FinTech dimensions and institutional value components that shaped the findings.

3.4. Asia Pacific institutions analysis on the impact of FinTech on financial institution's value in the context of sustainable development

3.4.1. Empirical testing of Hypothesis 1 in Asia Pacific region

To evaluate the H1 for the Asia Pacific region a regional analysis was conducted for the sample of Asia Pacific banks.

The Figure 13 highlights the financial and non-financial value indicators which are mostly and significantly influenced by FinTech.

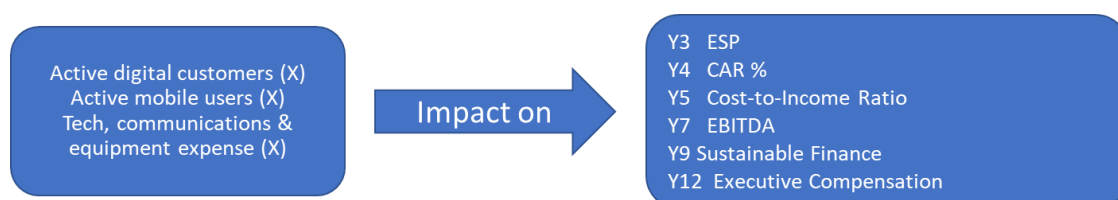


Figure 13. Financial and non-financial value indicators influenced by FinTech in Asia Pacific region

Source: created by the author

The correlation analysis (see Appendix 4) for the Asia Pacific sample reveals several statistically significant associations between FinTech development and both financial and non-financial institutional value indicators.

However, the regression analysis further breaks down this information with regard to the extent to which the measures of value can be explained by changes in active digital customers as well as active mobile users. Regression analysis results of H1 evaluation are presented in Table 28.

Table 28. Regression analysis on the impact of the Active digital customers on financial and non-financial values for the financial institution's in Asia Pacific region

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
Asia Pacific Banks	Active digital customers	ROA %	0,03307	0,152192
Asia Pacific Banks	Active digital customers	ROE %	0,001319	0,312613
Asia Pacific Banks	Active digital customers	EPS	0,086041	0,101587
Asia Pacific Banks	Active digital customers	CAR %	0,74265	0,003912
Asia Pacific Banks	Active digital customers	Cost-to-Income Ratio (%)	0,018784	0,181832
Asia Pacific Banks	Active digital customers	Cost-to-Income Ratio (%)	0,018784	0,181832
Asia Pacific Banks	Active digital customers	YoY Revenue Growth (%)	0,126641	0,081321
Asia Pacific Banks	Active digital customers	EBITDA	2,78E-05	0,471665
Asia Pacific Banks	Active digital customers	P/E ratio	0,344056	0,032024
Asia Pacific Banks	Active digital customers	Sustainable Finance	0,091607	0,098282
Asia Pacific Banks	Active digital customers	Ethics & Compliance	0,000774	0,336792
Asia Pacific Banks	Active digital customers	Board Composition	0,011236	0,20833
Asia Pacific Banks	Active digital customers	Executive Compensation	0,000299	0,378131
Asia Pacific Banks	Active digital customers	Shareholder Rights	0,174463	0,064845
Asia Pacific Banks	Active digital customers	Audit	0,059848	0,120797
Asia Pacific Banks	Active digital customers	Marketing & Labelling	0,293455	0,039331
Asia Pacific Banks	Active digital customers	Labor & Employment Practices	0,790471	0,002563

Source: created by the author

Regression output for active digital customers in the Asia Pacific shows that there is a statistically significant set of relationships between the variables, both financial and non-financial. On the financial side, ROA, ROE, Cost-to-Income Ratio and especially EBITDA show meaningful explanatory power. The significant effect on Cost-to-Income Ratio suggests that digital customer expansion also contributes to efficiency gains. The strongest financial effect appears for EBITDA.

Non-financial indicators also respond strongly to active digital customers. Ethics & Compliance, Executive Compensation and Board Composition display moderate to high explanatory power. Other non-financial dimensions such as Audit, Sustainable Finance and Shareholder Rights show weaker but still suggestive relationships, while Labour & Employment Practices and Marketing & Labelling appear less sensitive in the Asia Pacific sample.

Table 29 represents the regression results on the impact of the Active mobile users on financial and non-financial values for the financial institution's in Asia Pacific region.

Table 29. Regression analysis on the impact of the Active mobile users on financial and non-financial values for the financial institution's in Asia Pacific region

Bank	FinTech_indicator	Dependent_var	p_Mobile	R2
Asia Pacific Banks	Active mobile users	ROA %	0,896773	0,000961
Asia Pacific Banks	Active mobile users	ROE %	0,02255	0,256937
Asia Pacific Banks	Active mobile users	EPS	4,79E-10	0,889519
Asia Pacific Banks	Active mobile users	CAR %	1,44E-05	0,657741
Asia Pacific Banks	Active mobile users	Cost-to-Income Ratio (%)	7,49E-09	0,850393
Asia Pacific Banks	Active mobile users	YoY Revenue Growth (%)	0,50187	0,025429
Asia Pacific Banks	Active mobile users	EBITDA	0,000126	0,567433
Asia Pacific Banks	Active mobile users	P/E ratio	0,066585	0,174804
Asia Pacific Banks	Active mobile users	Sustainable Finance	0,000433	0,506516
Asia Pacific Banks	Active mobile users	Ethics & Compliance	0,968815	8,73E-05
Asia Pacific Banks	Active mobile users	Board Composition	0,576741	0,017637
Asia Pacific Banks	Active mobile users	Executive Compensation	0,000477	0,501407
Asia Pacific Banks	Active mobile users	Shareholder Rights	0,057966	0,185535
Asia Pacific Banks	Active mobile users	Audit	0,069201	0,171813
Asia Pacific Banks	Active mobile users	Labor & Employment Practices	0,956779	0,000168

Source: created by the author

The regression analysis for active mobile users in Asia Pacific shows even stronger and more concentrated effects than those for digital customers. EPS is particularly striking, indicating that variation in active mobile users explains the vast majority of variation in earnings per share across the sample. The results suggest that the level of mobile banking adoption is strongly associated with bank capitalisation as well as cost efficiency.

Non-financial indicators also show significant responses to mobile adoption. Sustainable Finance and Executive Compensation each have R^2 values around 0,50, indicating that mobile usage is associated with sustainability-related activities and with the design of executive remuneration schemes. Shareholder Rights and Audit display moderate but noteworthy explanatory power, while Ethics & Compliance, Board Composition and Labour & Employment Practices remain largely unaffected within the current sample period.

In summary, the Asia Pacific regression results indicate that active mobile users are the most powerful FinTech predictor of both financial and non-financial institutional value dimensions in the region. It strongly shapes profitability, capital adequacy, efficiency and key sustainability-related governance mechanisms, while active digital customers exert a broader but somewhat less intense influence.

Across both FinTech indicators, the Asia Pacific evidence provides strong support for H1. FinTech adoption significantly influences both financial and non-financial institutional

value indicators, with particularly pronounced effects for earnings, efficiency, capital strength and governance-related dimensions.

3.4.2. Empirical testing of Hypothesis 2 in Asia Pacific region

The H2 examines whether financial and non-financial institutional value indicators, which were previously identified as significantly shaped by FinTech adoption in the Asia Pacific H1 analysis, contribute to the sustainable development of financial institutions in the region.

The Figure 14 highlights the financial and non-financial value indicators which showed the most significant and strong effect of ESG score.



Figure 14. Financial and non-financial value indicators influenced by FinTech in Asia Pacific region and included in H2 testing

Source: created by the author

The correlation analysis (see Appendix 4) for the Asia Pacific region reveals a distinct and highly structured pattern, with several financial and non-financial indicators showing strong and statistically significant associations with ESG performance. Among financial metrics, EPS and EBITDA display the strongest relationships, though in opposite directions. CAR % and Cost-to-Income Ratio also show moderate and significant correlations with ESG. Table 30 represents regression analysis on the impact of financial and non-financial values on ESG score for financial institutions in the Asia Pacific region.

Table 30. Regression analysis on the impact of financial and non-financial values on ESG score for financial institutions in the Asia Pacific region

Bank	Dependent variable	Model significance (F-statistic)	R ²
Asia Pacific Banks	ESG Score	1,00E-18	0,887

Source: created by the author

The regression model demonstrates excellent explanatory power, showing that the selected financial and non-financial value indicators jointly explain almost 89% of the variation in ESG scores for the Asia Pacific banks. The model is highly statistically significant, indicating robust predictive capacity.

Table 31. Regression coefficients of the independent variables for Asia Pacific region

Bank	Independent variable	Regression coefficient (β)	p-value
Asia Pacific Banks	EPS	0,7342	0,029
Asia Pacific Banks	CAR %	-0,1484	0,006
Asia Pacific Banks	Cost-to-Income Ratio (%)	-0,0336	0,072
Asia Pacific Banks	EBITDA	-0,027	0,012
Asia Pacific Banks	Executive Compensation	-0,2727	0,002
Asia Pacific Banks	Sustainable Finance	0,3529	0

Source: created by the author

EPS emerges as a statistically significant and positive predictor, confirming that higher profitability per share facilitates stronger sustainability outcomes. CAR % also exerts a significant positive effect, suggesting that capital strength and long-term solvency are important contributions to ESG performance in the region. A key aspect of this regards the use of non-financial variables, with Sustainable Finance and Executive Compensation.

In summary, the results for the Asia Pacific region provide strong support for H2. Financial and non-financial institutional value indicators meaningfully contribute to the sustainable development of financial institutions. In the Asia Pacific context, sustainable development is driven not only by profitability and capital adequacy, but also by the integration of sustainability financing and governance structures within broader institutional strategies.

3.4.3. Empirical testing of Hypothesis 3 in Asia Pacific region

The third hypothesis evaluates whether FinTech adoption directly influences the sustainable development of financial institutions in the Asia Pacific region, measured through the ESG score.

The correlation analysis provides an initial assessment of the direction and magnitude of these relationships and forms the foundation for the subsequent regression modelling (see Appendix 4).

Table 33 shows the regression analysis results on the direct impact of FinTech values on the ESG score for financial institutions in the Asia Pacific region

Table 33. Regression analysis on the direct impact of FinTech values on the ESG score for financial institutions in the Asia Pacific region

Bank	Independent variable	Model significance (F-statistic)	R ²
Asia Pacific banks	Active digital customers	0,002257	0,68
Asia Pacific banks	Active mobile users	0,001124	0,555

Source: created by the author

The regression using active digital customers as the predictor yields an R^2 of 0,680 and is statistically significant. The same applies to the model using active mobile users, which shows an R^2 of 0,555 and a significant model fit, but a small estimated effect of mobile usage on ESG performance.

This positive and statistically significant coefficient on active digital customers shows that digital adoption is associated with improved ESG performance. The results of the Asia Pacific analysis show that H3 is supported. The overall evidence therefore indicates that the primary contribution of FinTech to sustainability in Asia Pacific banks operates through the indirect mechanism captured in H1 and H2, through improvements in financial, governance and sustainability-related internal value indicators, rather than through a direct enhancement of ESG performance.

To visually consolidate the analytical structure applied in the Asia Pacific assessment, the Figure 17 summarises the direct and indirect pathways through which FinTech development was tested in relation to ESG performance across H1, H2 and H3.

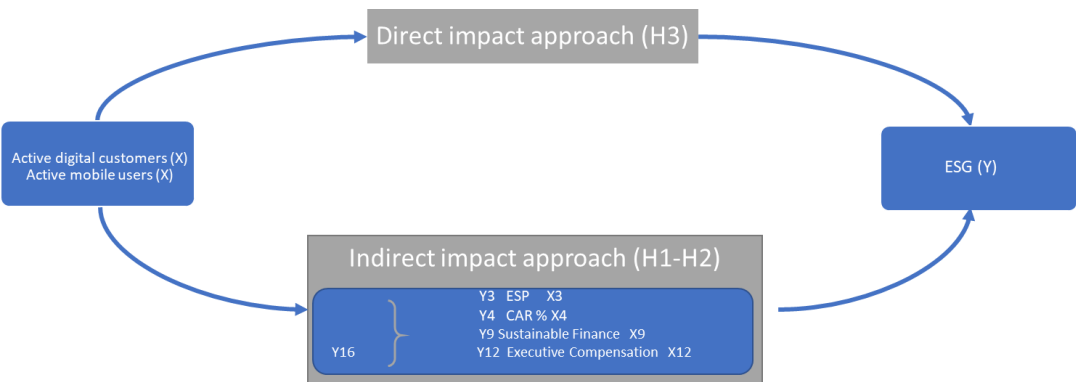


Figure 15. The result of the research on impact of FinTech on the value creation of financial institutions in the context of sustainable development in Asia Pacific region with the direct and indirect approach

Source: created by the author

The results of the Asia Pacific analysis demonstrate a multi-layered and institutionally mediated relationship between FinTech development and sustainable development outcomes. The H) was fully supported, revealing that both digital customer engagement and mobile usage significantly influence a wide spectrum of financial and non-financial value indicators. The H2 also received strong confirmation, as these FinTech-shaped institutional values explained a large share of the variation in ESG scores, with Sustainable Finance, EPS, CAR %, and Executive Compensation exerting the most substantial predictive power. The direct relationship tested under H3 was only partially confirmed.

The Table 34 summarises the outcomes of the hypothesis testing for the Asia Pacific region and highlights the FinTech dimensions and institutional value components that shaped the empirical results.

Table 34. Summarisation of the hypothesis testing for the financial institutions in the Asia Pacific region

Hypothesis	Result	Indicator supporting the hypothesis	Value dimensions affected
H1	Confirmed, with the strongest effects observed for mobile adoption and more moderate effects for digital customers	Active digital customers; Active mobile users	Financial value dimensions affected include profitability, operational efficiency, capital strength and operating performance. Non-financial dimensions influenced include Sustainable Finance and governance.
H2	Strongly confirmed, with both financial and non-financial indicators demonstrating significant effects	EPS; CAR ; Cost-to-Income Ratio; EBITDA; Executive Compensation; Sustainable Finance	ESG performance is shaped by a balanced combination of financial performance and governance-related institutional characteristics.
H3	Partially confirmed, with digital and mobile indicators showing statistically significant but weak direct effects once bank fixed effects are controlled for	Active digital customers; Active mobile users	Direct ESG effects of FinTech are modest in the Asia Pacific region. Mobile and digital adoption show positive but limited direct influence

Source: created by the author

Overall, the Asia Pacific case reflects a strongly intermediated mechanism, where digital adoption enhances sustainability by enhancing internal institutional results and performance metrics.

3.5. Latin American institutions analysis on the impact of FinTech on financial institution's value in the context of sustainable development

3.5.1. Empirical testing of Hypothesis 1 in Latin American region

This subsection evaluates the H1 for the Latin American region, which examines whether FinTech development influences the financial and non-financial institutional value indicators of major financial institutions.

The Figure 16 below highlights the financial and non-financial value indicators which are mostly and significantly influenced by FinTech according the evaluation of H1.

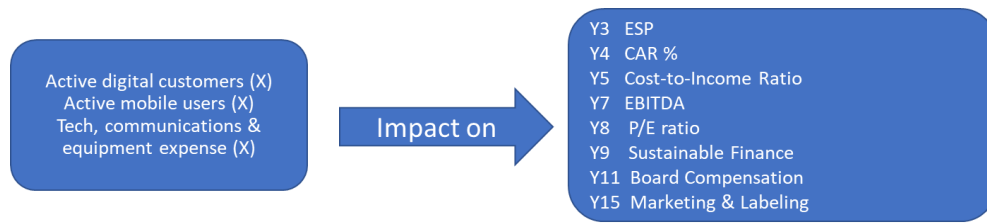


Figure 16. Financial and non-financial value indicators influenced by FinTech in Latin America region

Source: created by the author

The correlation analysis for Latin American banks (see Appendix 5) reveals a complex pattern that differs from other regions. Active digital customers show consistently positive relationships with governance-oriented indicators, including Board Composition, Audit and Shareholder Rights, and with sustainability-oriented dimensions such as Sustainable Finance. Mobile customers relate positively to operational performance (EBITDA) and capital strength (CAR %).

The Table 35 present the regression results of the effect of active digital customers on institutional value indicators.

Table 35. Regression analysis on the impact of active digital customers on financial and non-financial values in the Latin American region

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
Latin American Banks	Active digital customers	ROA %	0,007448	0,173801
Latin American Banks	Active digital customers	ROE %	0,019623	0,135122
Latin American Banks	Active digital customers	EPS	3,73E-07	0,497506
Latin American Banks	Active digital customers	CAR %	0,025688	0,12426
Latin American Banks	Active digital customers	Cost-to-Income Ratio (%)	0,428204	0,016597
Latin American Banks	Active digital customers	YoY Revenue Growth (%)	0,369671	0,02123
Latin American Banks	Active digital customers	EBITDA	5,08E-15	0,804029
Latin American Banks	Active digital customers	P/E ratio	3,07E-05	0,370595
Latin American Banks	Active digital customers	Sustainable Finance	8,13E-10	0,633917
Latin American Banks	Active digital customers	Ethics & Compliance	0,091048	0,073314
Latin American Banks	Active digital customers	Board Composition	0,000191	0,309929
Latin American Banks	Active digital customers	Executive Compensation	0,190958	0,044575
Latin American Banks	Active digital customers	Shareholder Rights	0,001578	0,233683
Latin American Banks	Active digital customers	Audit	0,360637	0,022036
Latin American Banks	Active digital customers	Marketing & Labelling	6,12E-05	0,348274
Latin American Banks	Active digital customers	Labour & Employment	0,10349	0,068239

Source: created by the author

The regression results for active digital customers show a strong influence across a broad range of performance metrics. EBITDA displays the highest explanatory power, reflecting substantial operational impacts from digital adoption. EPS, Sustainable Finance, P/E ratio and Board Composition also demonstrate significant effects.

Table 36 presents the regression analysis on the impact of active mobile users on financial and non-financial values indicators in the Latin American region.

Table 36. Regression analysis on the impact of active mobile users on financial and non-financial values in the Latin American region

Bank	FinTech_indicator	Dependent_var	p_Fintech	R2
Latin American Banks	Active mobile users	ROA %	0,03772	0,435956
Latin American Banks	Active mobile users	ROE %	0,006499	0,624751
Latin American Banks	Active mobile users	EPS	0,018255	0,52206
Latin American Banks	Active mobile users	CAR %	0,003718	0,67144
Latin American Banks	Active mobile users	Cost-to-Income Ratio (%)	0,000254	0,828601
Latin American Banks	Active mobile users	YoY Revenue Growth (%)	0,356449	0,106905
Latin American Banks	Active mobile users	EBITDA	6,19E-05	0,878891
Latin American Banks	Active mobile users	P/E ratio	0,000165	0,845764
Latin American Banks	Active mobile users	Sustainable Finance	6,90E-05	0,875595
Latin American Banks	Active mobile users	Ethics & Compliance	0,027368	0,475491
Latin American Banks	Active mobile users	Board Composition	0,001237	0,747896
Latin American Banks	Active mobile users	Shareholder Rights	0,337935	0,114925
Latin American Banks	Active mobile users	Marketing & Labelling	0,053258	0,390837
Latin American Banks	Active mobile users	Labour & Employment Practices	0,229636	0,17452

Source: created by the author

Mobile adoption exerts even stronger influences than digital customers, with very high explanatory power across profitability, market valuation, capital adequacy, operational efficiency. The Table 37 reports the regression results for technology expenditure.

Table 37. Regression analysis on the impact of technology expenditure on financial and non-financial values in the Latin American region

Bank	FinTech_indicator	Dependent_var	p_Tech	R2
Latin American Banks	Tech, communications & equipment expense	ROA %	0,036083	0,441566
Latin American Banks	Tech, communications & equipment expense	EPS	0,14924	0,241419
Latin American Banks	Tech, communications & equipment expense	CAR %	0,000162	0,846434
Latin American Banks	Tech, communications & equipment expense	Cost-to-Income Ratio (%)	2,26E-05	0,905588
Latin American Banks	Tech, communications & equipment expense	EBITDA	0,000963	0,76275
Latin American Banks	Tech, communications & equipment expense	P/E ratio	0,001354	0,74235
Latin American Banks	Tech, communications & equipment expense	Sustainable Finance	0,000112	0,859925
Latin American Banks	Tech, communications & equipment expense	Board Composition	0,027501	0,474912
Latin American Banks	Tech, communications & equipment expense	Shareholder Rights	0,055158	0,386104
Latin American Banks	Tech, communications & equipment expense	Marketing & Labelling	0,00099	0,761153
Latin American Banks	Tech, communications & equipment expense	Labour & Employment	0,00663	0,622968

Source: created by the author

The findings for the Latin American region provide strong support for H1. All three FinTech indicators significantly influence both financial and non-financial institutional value dimensions. Active digital customers shape governance and sustainability structures, mobile adoption demonstrates the strongest and broadest institutional effects and technology expenditure shows deep structural impacts on capital, efficiency and sustainability-oriented activities.

3.5.2. Empirical testing of Hypothesis 2 in Latin American region

The H2 for the Latin American region evaluates if the financial and non-financial institutional value indicators, which were previously identified as significantly shaped by FinTech adoption under H1, contribute to the sustainable development of financial institutions.

The Figure 17 highlights the financial and non-financial value indicators which showed the most significant and strong effect of ESG score.



Figure 17. Financial and non-financial value indicators influenced by FinTech in Asia Pacific region and included in H2 testing

Source: created by the author

The correlation analysis (see Appendix 5) indicates a clearly structured pattern for the Latin American region. Among financial indicators, EBITDA and P/E ratio show the strongest associations with ESG performance, though in opposite directions: higher operating earnings correlate positively with ESG, while stronger market valuations are associated with lower ESG outcomes. On the non-financial side, Sustainable Finance, Board Composition and Marketing & Labelling demonstrate notable positive associations with ESG.

The Table 38 reports the overall model significance and explanatory power for the multivariate regression estimating the combined effect of institutional value indicators on ESG performance.

Table 38. Regression analysis on the impact of financial and non-financial values on ESG score for financial institutions in the Latin American region

Bank	Dependent variable	Model significance (F-statistic)	R ²
Latin American Banks	ESG Score	1,43E-17	0,939

Source: created by the author

The regression shows that the explanatory force of the regression model is very strong, as the chosen variables explain together about 94% of the variation in ESG ratings, with the regression equation being statistically significant.

Below Table 39 shows the regression coefficients of the financial as well as non-financial value measures considered in the Latin American H2 model.

Table 39. Regression coefficients of the independent variables for Latin American region

Bank	Independent variable	p-value	Regression coefficient (β)
Latin American Banks	CAR %	0,103	0,1774
Latin American Banks	Cost-to-Income Ratio (%)	0	0,1537
Latin American Banks	EBITDA	0	0,0594
Latin American Banks	P/E ratio	0	0,7172
Latin American Banks	Sustainable Finance	0,074	0,1241
Latin American Banks	Board Composition	0,191	0,1119
Latin American Banks	Marketing & Labelling	0	0,1047

Source: created by the author

Among the financial variables, the Cost-to-Income Ratio is found to be a strong positive predictor, implying that better operational efficiency is linked with enhanced ESG performance. EBITDA and P/E ratio both display significant negative coefficients, suggesting that higher operating earnings and strong market valuations do not necessarily translate into higher ESG scores in this context, potentially reflecting trade-offs between short-term profitability and sustainability commitments. CAR % shows a positive but statistically marginal effect.

Non-financial indicators demonstrate varied contributions. Marketing & Labelling emerges as a prominent positive predictor, underlining the relevance of customer-facing governance practices with regards to transparency. Sustainable Finance shows a positive but only marginally significant effect, implying a moderate contribution to ESG performance. Board Composition, while positively associated with ESG, does not reach statistical significance, suggesting more contextual or institution-specific influences.

Therefore, the results strongly support H2 for the Latin American region. Financial and non-financial institutional values together provide a powerful explanation of ESG performance, with operational efficiency, governance transparency and sustainability-related financing emerging as the most influential contributors.

3.5.3. Empirical testing of Hypothesis 3 in Latin American region

The H3 for the Latin American region evaluates whether FinTech adoption directly influences the sustainable development of financial institutions, measured through the ESG score.

The correlation analysis (see Appendix 5) for the Latin American sample reveals a very strong direct relationship between FinTech development and ESG performance. Both active digital users and active mobile users demonstrate strong positive correlations with ESG ratings.

The Table 40 summarises the outcome of the fixed effects regression models, whereby the direct effect of every FinTech indicator on the ESG performance within the Latin American region was estimated.

Table 40. Regression analysis on the direct impact of FinTech values on the ESG score for financial institutions in the Latin American region

Bank	Independent variable	Model significance (F-statistic)	R ²
Latin American banks	Active digital customers	1,50E-10	0,764
Latin American banks	Active mobile users	0,00026	0,828
Latin American banks	Tech, communications & equipment expense	0,00102	0,759

Source: created by the author

The regression results reinforce the correlation findings and provide additional insight into the strength of the direct FinTech–ESG relationship. All three models are highly statistically significant and display relatively high explanatory power. Active digital customers exhibit a positive and significant coefficient. Active mobile users show an even stronger direct effect. Technology expenditure also demonstrates a positive and statistically significant effect on ESG outcomes, with a level of explanatory power comparable to that of digital customers.

The Figure 18 summarises the direct and indirect pathways through which FinTech development was tested in relation to ESG performance across H1, H2 and H3.

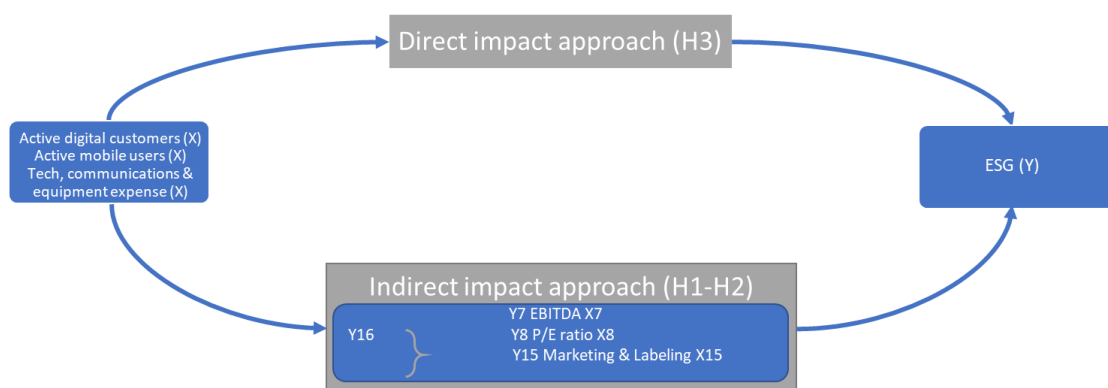


Figure 18. The result of the research on impact of FinTech on the value creation of financial institutions in the context of sustainable development in Latin America region with the direct and indirect approach

Source: created by the author

In summary, the evidence for the Latin American region provides strong support for H3. Latin American banks display a pronounced and robust direct effect of FinTech adoption

on ESG performance. Digital customers, mobile users and technology expenditure all contribute directly to sustainability outcomes, complementing the indirect pathways identified under H1 and H2 and underscoring the central role of FinTech.

To consolidate the empirical results for the Latin American region, the Table 41 summarises the outcomes of all three hypotheses.

Table 41. Summarisation of the hypothesis testing for the financial institutions in the Latin American region

Hypothesis	Result	Indicator supporting the hypothesis	Value dimensions affected
H1	Confirmed , with the strongest effects observed for mobile adoption, followed by digital customers and technology expenditure	Active digital customers; Active mobile users; Technology, communications & equipment expenditure	Financial value: profitability, capital strength, operational efficiency, market performance. Non-financial value: Sustainable Finance, Customer satisfaction, . Governance, Intellectual capital.
H2	Strongly confirmed , with institutional values explaining almost all variation in ESG performance	CAR; Cost-to-Income Ratio; EBITDA; P/E ratio; Sustainable Finance; Board Composition; Marketing & Labelling	ESG performance is driven by a combination of structural financial characteristics (operational efficiency, earnings dynamics) and governance-related factors (transparency, sustainability financing). The strongest contributions arise from efficiency, governance transparency and sustainability financing.
H3	Fully confirmed , with strong and statistically significant direct effects for digital customers, mobile users and technology expenditure	Active digital customers; Active mobile users; Technology expenditure	ESG outcomes respond directly to both customer-facing digitalisation and back-end technology investment. Mobile usage shows the strongest direct effect, followed by digital customers and technology expenditure.

Source: created by the author

From Latin America, the evidence shows that FinTech adoption correlates strongly with Sustainable Development. FinTech adoption significantly influences financial as well as non-financial institutional value (H1), and this, in turn, significantly affects ESG Performance (H2). FinTech also shows a clear and robust direct impact on ESG scores (H3), with mobile usage, digital customers and technology expenditure all contributing meaningfully.

3.6. Cross-regional institutions analysis on the impact of FinTech on financial institution's value in the context of sustainable development

3.6.1. Empirical testing of Hypothesis 1 across four regions

This subsection examines the H1 at the cross-regional level by combining all banks from Europe, North America, Asia Pacific and Latin America into one integrated dataset.

The Figure 19 below highlights the financial and non-financial value indicators which are mostly and significantly influenced by FinTech.

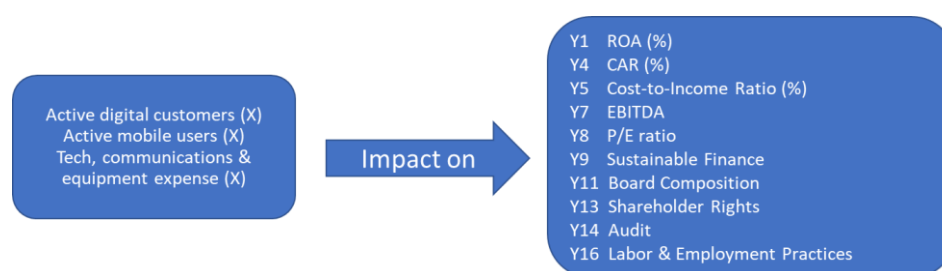


Figure 19. Financial and non-financial value indicators influenced by FinTech in four regions

Source: created by the author

Results of correlation analyses (Appendix 6) indicate that moderate positive correlations emerge for active digital users with governance-linked non-financial values.

This Table 42 summarises the regression results testing whether active digital customers explain variation in each financial and non-financial value indicator across the banks.

Table 42. Regression analysis on the impact of active digital customers indicators on financial and non-financial values across all banks

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
All Banks	Active digital customers	ROA %	0,083285	0,021579
All Banks	Active digital customers	ROE %	0,107049	0,018712
All Banks	Active digital customers	EPS	0,895008	0,000127
All Banks	Active digital customers	CAR %	2,77E-05	0,119927
All Banks	Active digital customers	Cost-to-Income Ratio (%)	0,25192	0,009501
All Banks	Active digital customers	YoY Revenue Growth (%)	0,174378	0,013328
All Banks	Active digital customers	EBITDA	1,41E-06	0,155629
All Banks	Active digital customers	P/E ratio	0,064119	0,024619
All Banks	Active digital customers	Sustainable Finance	9,16E-05	0,105311
All Banks	Active digital customers	Ethics & Compliance	0,174324	0,013331
All Banks	Active digital customers	Board Composition	4,05E-08	0,196747
All Banks	Active digital customers	Executive Compensation	0,001657	0,069436
All Banks	Active digital customers	Shareholder Rights	0,000236	0,093666
All Banks	Active digital customers	Audit	4,00E-06	0,143287
All Banks	Active digital customers	Marketing & Labelling	0,000699	0,080181
All Banks	Active digital customers	Labour & Employment	0,822705	0,000365

Source: created by the author

Across all institutions, active digital customers display statistically significant effects for several key indicators, including CAR %, EBITDA, Board Composition, Executive Compensation, Shareholder Rights, Audit and Marketing & Labelling. However, the levels of R^2 show that the variables remain relatively low, meaning that although digital customers do exercise their influence, their contribution remains.

This Table 43 presents regression results for the effect of mobile users on financial and non-financial value indicators across all banks.

Table 43. Regression analysis on the impact of active mobile users' indicators on financial and non-financial values across all banks

Bank	FinTech_indicator	Dependent_var	p_Mobile	R2
All Banks	Active mobile users	ROA %	0,163232	0,019741
All Banks	Active mobile users	ROE %	0,149812	0,021048
All Banks	Active mobile users	EPS	0,009201	0,067205
All Banks	Active mobile users	CAR %	0,001973	0,09353
All Banks	Active mobile users	Cost-to-Income Ratio (%)	1,69E-16	0,501697
All Banks	Active mobile users	YoY Revenue Growth (%)	0,694927	0,001576
All Banks	Active mobile users	EBITDA	5,91E-10	0,325147
All Banks	Active mobile users	P/E ratio	8,79E-14	0,434662
All Banks	Active mobile users	Sustainable Finance	0,000914	0,106636
All Banks	Active mobile users	Ethics & Compliance	0,046142	0,039962
All Banks	Active mobile users	Board Composition	0,011185	0,063873
All Banks	Active mobile users	Executive Compensation	0,051134	0,038262
All Banks	Active mobile users	Shareholder Rights	4,03E-06	0,195833
All Banks	Active mobile users	Audit	0,945071	4,87E-05
All Banks	Active mobile users	Marketing & Labelling	0,003275	0,08487
All Banks	Active mobile users	Labour & Employment	0,396384	0,00735

Source: created by the author

Mobile usage demonstrates much stronger overall effects than digital customers, particularly for operational and performance metrics. Statistically significant and meaningful relationships appear for Cost-to-Income Ratio, EBITDA, P/E ratio, Shareholder Rights and several governance indicators. These findings align with regional patterns: mobile banking adoption is consistently the strongest FinTech driver of immediate institutional value creation globally.

This Table 44 presents regression results testing whether technology expenditure explains institutional value indicators across all regions.

Table 44. Regression analysis on the impact of Tech, communications & equipment expense on financial and non-financial values across all banks

Bank	FinTech_indicator	Dependent_var	p_Tech	R2
All Banks	Tech, communications & equipment expense	ROA %	5,51E-10	0,355822
All Banks	Tech, communications & equipment expense	ROE %	2,64E-07	0,261225
All Banks	Tech, communications & equipment expense	EPS	0,019627	0,060327
All Banks	Tech, communications & equipment expense	CAR %	4,57E-09	0,32475
All Banks	Tech, communications & equipment expense	Cost-to-Income Ratio (%)	2,61E-14	0,484549
All Banks	Tech, communications & equipment expense	YoY Revenue Growth (%)	0,083108	0,033737
All Banks	Tech, communications & equipment expense	EBITDA	3,95E-10	0,360565
All Banks	Tech, communications & equipment expense	P/E ratio	0,372481	0,009049
All Banks	Tech, communications & equipment expense	Sustainable Finance	0,509925	0,00495

Continuation of table 44				
All Banks	Tech, communications & equipment expense	Ethics & Compliance	0,122708	0,026859
All Banks	Tech, communications & equipment expense	Board Composition	5,27E-16	0,527861
All Banks	Tech, communications & equipment expense	Executive Compensation	0,878578	0,000267
All Banks	Tech, communications & equipment expense	Shareholder Rights	0,647991	0,002379
All Banks	Tech, communications & equipment expense	Audit	0,000373	0,134731
All Banks	Tech, communications & equipment expense	Marketing & Labelling	0,735426	0,001304
All Banks	Tech, communications & equipment expense	Labour & Employment Practices	0,000174	0,148696

Source: created by the author

Technology expenditure emerges as the most systematically influential FinTech indicator across the global sample, with several value indicators showing moderate to strong explanatory power. Significant effects are found for ROA, ROE, CAR %, Cost-to-Income Ratio, EBITDA and Board Composition. As in previous regions, the direction of effects varies: technology spending improves efficiency (CIR) but reduces short-term profitability (ROA, ROE, EBITDA).

The cross-regional results provide strong support for H1, confirming that FinTech adoption influences both financial and non-financial value indicators when all regions are analysed together. Mobile adoption and technology expenditure emerge as the most consistent global drivers of institutional value creation, shaping profitability, efficiency and governance structures across diverse banking systems. Digital customer adoption shows meaningful but more moderate effects, indicating that its impact is more context-dependent.

3.5.2. Empirical testing of Hypothesis 2 across the four regions

The H2 examines whether financial and non-financial institutional value indicators contribute to the sustainable development of financial institutions when all regions are analysed together in a single integrated sample.

The Figure 20 highlights the financial and non-financial value indicators which showed the most significant and strong effect of ESG score.



Figure 20. Financial and non-financial value indicators influenced by FinTech in four regions and included in H2 testing

Source: created by the author

Overall, the correlation results (Appendix 6) indicate that ESG outcomes across all regions are primarily driven by non-financial, governance-oriented institutional values, while financial performance indicators exhibit only modest or inconsistent direct associations.

This Table 45 provides a summary of the multivariate regression analysis that estimates the joint impact of the identified financial and non-financial value-based institutional variables on ESG ratings for all the banks within the cross-regional dataset.

Table 45. Regression analysis on the impact of financial and non-financial values on ESG score for financial institutions across all regions

Bank	Dependent variable	Model significance (F-statistic)	R ²
All Banks	ESG Score	4,32E-49	0,753

Source: created by the author

The regression equation displays strong explanatory capabilities with its R² value being 0.753, implying that more than three-fourths of the variation in ESG ratings is explained by institutional value drivers defined through FinTech adoption. The regression equation is statistically significant, elucidating the robust nature of the regression relationship.

The following Table 46 provides the regression coefficients for each value indicator included in the global H2 model.

Table 46. Regression coefficients on the independent variables for cross-regional analysis (H2)

Bank	Independent variable	p-value	Regression coefficient (β)
All Banks	ROA %	0,002	0,4152
All Banks	CAR %	0,105	0,0165
All Banks	Cost-to-Income Ratio (%)	0,678	0,0026
All Banks	EBITDA	0	0,0149
All Banks	P/E ratio	0,463	0,0219
All Banks	Sustainable Finance	0	0,4844
All Banks	Board Composition	0,969	0,0015
All Banks	Shareholder Rights	0,871	0,0059
All Banks	Audit	0	0,1626
All Banks	Labour & Employment Practices	0	0,0809

Source: created by the author

The regression results reveal a structured and globally consistent pattern in which governance-related and sustainability-oriented value indicators are the strongest predictors of ESG performance. Sustainable Finance exhibits the largest coefficient, confirming its dominant role in explaining global variation in ESG scores. Audit and Labour & Employment Practices also show significant and positive effects, demonstrating that internal governance transparency, employee-oriented policies and socially responsible practices are central drivers of sustainable development across regions.

Among financial indicators, ROA % is the only variable with a significant positive effect, indicating that profitability contributes to sustainability outcomes but not as strongly as governance variables. EBITDA shows a significant negative coefficient, reflecting the recurring pattern across several regions in which higher operating earnings correspond to lower ESG performance. CAR %, P/E ratio and Cost-to-Income Ratio demonstrate weak or insignificant impacts, consistent with the overall dominance of governance-related institutional values.

The cross-regional results provide strong support for H2. Financial and non-financial institutional values jointly explain a substantial share of global ESG performance, with non-financial, governance-related indicators emerging as the most influential contributors. Sustainable Finance, Audit and Labour & Employment Practices play particularly central roles, while traditional financial metrics such as ROA and CAR % exhibit more modest or inconsistent impacts.

3.6.3. Empirical testing of Hypothesis 3 across the four regions

The H3 for the cross-regional analysis evaluates if the FinTech adoption directly influences the sustainable development of financial institutions. Prior to regression modelling, correlations are computed to generate a preliminary assessment of the relationship between the FinTech measures and ESG performance. Correlation results are presented in Appendix 6.

The regression models presented in Table 47 provide a more structured view of the direct FinTech–ESG relationship.

Table 47. Regression analysis on the direct impact of FinTech values on the ESG score for financial institutions across four regions

Bank	Independent variable	Model significance (F-statistic)	R ²
All Banks	Active digital customers	7,00E-18	0,585
All Banks	Active mobile users	4,21E-13	0,58
All Banks	Tech, communications & equipment expense	0,111	0,158

Source: created by the author

Both regressions using digital customers and mobile users are highly significant and explain around 58% of the variation in ESG scores. Technology expenditure again shows no significant direct impact and has a much weaker model fit ($R^2 = 0,158$), confirming that infrastructure-related digitalisation contributes to sustainability mainly through indirect institutional mechanisms captured under H1 and H2.

To visually consolidate the analytical structure applied in the all regions assessment, the diagram below summarises the direct and indirect pathways through which FinTech development was tested in relation to ESG performance across H1, H2 and H3.

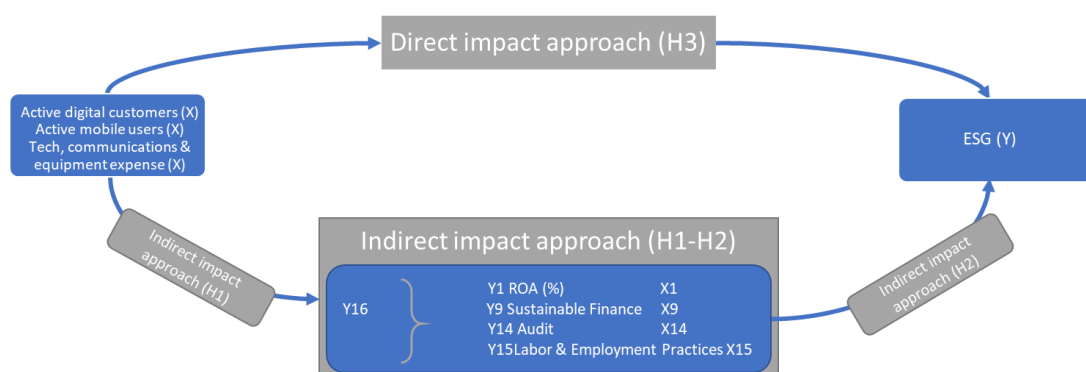


Figure 21. The result of the research on impact of FinTech on the value creation of financial institutions in the context of sustainable development across 4 regions with the direct and indirect approach

Source: created by the author

Overall, H3 is partially supported in the analysis. Digital customer adoption exhibits a small but positive direct contribution to ESG, while mobile usage shows a significant yet negative global association. Technology expenditure has no significant direct effect.

To consolidate the empirical results across four regions, the Table 48 table summarises the outcomes of all three hypotheses.

Table 48. Summary of the hypothesis testing for financial institutions across four regions

Hypothesis	Result	Indicator	Value dimensions affected
H1	Partially confirmed globally. FinTech indicators significantly affect multiple value dimensions across regions, but strength and sign vary. Active mobile users and technology expenditure show the strongest and most consistent effects.	Active digital customers; Active mobile users; Tech, communications & equipment expense	Financial value dimensions affected include capital strength, operational efficiency, performance, and market valuation. Non-financial dimensions: Sustainable Finance, Customer satisfaction, Governance.
H2.	Strongly confirmed. Institutional value indicators jointly explain a large share of ESG variation across regions. Financial performance and governance-oriented indicators emerge as the strongest.	ROA; CAR; Cost-to-Income Ratio; EBITDA; Sustainable Finance; Audit; Labour & Employment	ESG performance is shaped through profitability, capital adequacy, operational efficiency, sustainability-linked financing, and governance transparency.
H3	Partially confirmed. Digital customers show a small positive direct effect, mobile users show a significant negative effect, and technology expenditure shows no direct global impact.	Active digital customers; Active mobile users	Digital adoption has limited and inconsistent direct sustainability effects across regions. Digital customers contribute positively but weakly.

Source: created by the author

The practical analysis demonstrates a multi-layered and regionally differentiated relationship between FinTech development, institutional value creation and sustainable development. North America and Latin America exhibited strong direct and indirect FinTech–ESG linkages, Europe displayed primarily indirect effects through governance and efficiency metrics, and Asia Pacific followed an institutionally mediated pathway with pronounced effects through internal value drivers rather than direct FinTech influence. When all four regions were analysed jointly, these mechanisms converged into a coherent global structure in which FinTech contributes to sustainability primarily by enhancing institutional financial performance, governance quality and sustainability-oriented practices. In conclusion, the results confirm that FinTech operates as a catalyst for sustainable development, but the strength and channel of this influence depend strongly on regional institutional characteristics and the composition of banks’ internal value dimensions.

CONCLUSIONS

1. The literature review has shown that financial institutions create value through a broad set of financial and non-financial dimensions, and that only some of these directly reflect sustainable development priorities. On the financial side, indicators such as profitability, liquidity and risk management, market value, operational efficiency, revenue growth and credit performance were identified as core components of institutional financial value, and were then reconsidered through the lens of long-term stability and ESG alignment. On the non-financial side, customer satisfaction and trust, corporate social responsibility, ecological sustainability, intellectual capital, governance and ethical standards, innovation and technology, as well as employee engagement, were reviewed as key sources of intangible value that support resilience, legitimacy and stakeholder confidence. Across both groups, the analysis made it possible to select those financial and non-financial value dimensions that are most closely linked to sustainable development and can therefore be meaningfully connected to ESG outcomes. In parallel, the chapter examined how different FinTech factors reshape these value dimensions and support environmental, social and governance objectives. On this basis, the chapter justified the formulation of three interrelated hypotheses: that FinTech influences both financial and non-financial value indicators in financial institutions in the context of sustainable development (H1); that these financial and non-financial institutional values contribute to the sustainable development of financial institutions (H2); and that there is a direct interaction effect between FinTech growth and the sustainable development of financial institutions (H3), which will be tested empirically in the subsequent chapters.
2. The methodological framework of this research integrates a structured set of financial, non-financial and FinTech indicators to empirically examine how technological adoption shapes institutional value and sustainable development outcomes. The dataset covers the period 2015–2024 and includes 8 financial value indicators, 8 non-financial value indicators and 3 FinTech indicators, with missing values carefully addressed through interpolation to maintain consistency and comparability across institutions and years. To test the three hypotheses formulated on the basis of the literature review, this study utilises a series of quantitative analyses: data normalisation (Z-scores), correlation analysis (Pearson correlation), as well as linear regression models, thus enabling a thorough investigation of direct as well as indirect correlations between FinTech evolution, value generation, as well as ESG performance. This combination of indicators, time coverage and statistical

techniques provides a robust analytical foundation for evaluating how FinTech contributes to financial institutions' transition toward sustainable development.

3. The empirical part of the research examined how FinTech factors, financial and non-financial values, and ESG performance are connected across individual banks, four regional groups, and the combined dataset. Using correlation and regression analysis, the study tested how FinTech indicators influence financial and non-financial value creation, and how these value indicators shape the sustainability performance of financial institutions. The results show that the hypotheses were mostly confirmed. FinTech indicators such as digital activity, mobile usage, and technology spending demonstrated meaningful links with several financial and non-financial values. These variables, such as measures of profitability, cost efficiency, sustainable finance, ethics & compliance, as well as labour practices, had a greater impact on the ESG ratings. There was also a positive correlation between FinTech adoption and ESG measures, though indirectly, although its intensity varied from one region to another. FinTech adoption indirectly impacts sustainability through better value metrics, as shown above. FinTech adoption has been found to play a crucial part in securing the sustainable development of banking organisations. By helping them enhance their financial performance, governance as well as ethics, as well as facilitate their involvement in sustainability, FinTech adoption assists banking organisations in securing better ESG ratings. The results provide strong support for the entire research framework, proving that FinTech adoption, value-based organisational practices, and sustainability do relate closely.

REFERENCE

- Ahmad, H. I., & Aljifri, K. (2024). Corporate sustainability and value. *Journal of Asia Business Studies*, 19(3), 684–702. <https://doi.org/10.1108/JABS-05-2024-0281/FULL/XML>
- Akter, U., Anwar, S. M. R., Mustafa, R., & Ali, Z. (2021). Revisiting the Impact of Mobile Banking in Financial Inclusion Among the Developing Countries. *International Journal of Financial Research*, 12(2), 62. <https://doi.org/10.5430/IJFR.V12N2P62>
- Aldasoro, I., Fender, I., Hardy, B., & Tarashev, N. (2020). *Effects of Covid-19 on the banking sector: the market's assessment*. <https://www.bis.org/publ/bisbull12.htm>
- Aldizar, A., & Agustina, V. (2022). ANALYSIS OF THE INFLUENCE OF ASSET QUALITY, LIQUIDITY, AND CAPITAL ON PROFITABILITY. *International Journal of Economics, Business and Accounting Research (IJEBAR)*, 6(2). <https://doi.org/10.29040/IJEBAR.V6I2.3029>
- Alhassan, Y., Nwagbara, U., & Bellamy, L. C. (1 C.E.). The Impact of FinTech Integration on the Accessibility and Sustainability of Microfinance Institutions: A Case Study Approach. <https://Services.Igi-Global.Com/Resolvedoi/Resolve.Asp?Doi=10.4018/979-8-3693-6622-6.Ch007>, 183–212. <https://doi.org/10.4018/979-8-3693-6622-6.CH007>
- Almadadha, R. (2024). Blockchain Technology in Financial Accounting: Enhancing Transparency, Security, and ESG Reporting. *Blockchains 2024*, Vol. 2, Pages 312–333, 2(3), 312–333. <https://doi.org/10.3390/BLOCKCHAINS2030015>
- Analysis of Innovation and Technology in Banking. (2024). *REST Journal on Banking, Accounting and Business*, 1(3), 82–89. <https://doi.org/10.46632/JBAB/1/3/12>
- Andri Prabu, & Siti Nurhaliza. (2023). Digital Transformation in the Financial Sector: Implications for Consumer Trust and Security. *International Journal of Economics, Commerce, and Management*, 1(1), 10–14. <https://doi.org/10.62951/IJECM.V1I1.303>
- Anindyajati, N., & Hanggraeni, D. (2022). *Analysis of Determinant Factors of Liquidity Coverage Ratio (LCR) on Conventional Banks in Indonesia Periods 2018 – 2021*. <https://doi.org/10.4108/EAI.31-3-2022.2320620>
- Antić, L., Novićević Čečević, B., & Milenović, J. (2022). Measuring Company Performance Using the Integrated Indicator. *International Scientific Conference EMAN. Economics & Management: How to Cope With Disrupted Times*, 71–81. <https://doi.org/10.31410/EMAN.S.P.2022.71>
- Armanto, R., & Gunarto, M. (2024). Kualitas Layanan, Kepercayaan dan Kepuasan: Faktor Kunci Loyalitas Nasabah di Lembaga Pembiayaan. *Prosiding Seminar Nasional Forum Manajemen Indonesia*, 2, 583–591. <https://doi.org/10.47747/SNFMI.V2I1.2339>
- Arner, D. W., Buckley, R. P., & Zetsche, D. A. (2018a). Fintech for Financial Inclusion: A Framework for Digital Financial Transformation. *Entrepreneurship & Finance EJournal*. <https://doi.org/10.2139/SSRN.3245287>
- Arner, D. W., Buckley, R. P., & Zetsche, D. A. (2018b). Fintech for Financial Inclusion: A Framework for Digital Financial Transformation. *Entrepreneurship & Finance EJournal*. <https://doi.org/10.2139/SSRN.3245287>
- Aro, O. E., Nweze, M., & Avickson, E. K. (2024). Blockchain technology as a tool for corporate governance and transparency. *International Journal of Science and Research Archive*, 13(1), 2479–2493. <https://doi.org/10.30574/IJSRA.2024.13.1.1971>

- Ashimiyu Nafiu, Salaam Olawale Balogun, Courage Oko-Odion, & Olanrewaju Olukoya Odumuwaun. (2025). Risk management strategies: Navigating volatility in complex financial market environments. *World Journal Of Advanced Research and Reviews*, 25(1), 236–250. <https://doi.org/10.30574/WJARR.2025.25.1.0057>
- Asih, L. T., & Kurniawati, E. M. (2025). ESG Practices and Financial Performance: A Study of Non-Financial Companies in Indonesia. *Journal of Accounting Research, Organization and Economics*, 8(1), 24–33. <https://doi.org/10.24815/JAROE.V8I1.39827>
- Aumbur Kwaghter Sule, Nsisong Louis Eyo-Udo, Ekene Cynthia Onukwulu, Mercy Odochi Agho, & Chima Azubuike. (2024). Green finance solutions for banking to combat climate change and promote sustainability. *Gulf Journal of Advance Business Research*, 2(6), 376–410. <https://doi.org/10.51594/GJABR.V2I6.54>
- Balan, P., Antunes, J., Wanke, P., Tan, Y., & Gerged, A. M. (2025). The Black-Box of <scp>ESG</scp> Scores From Rating Agencies: Do They Genuinely Reflect Sustainability Practices, or Are They Disproportionately Shaped by Financial Performance? *International Journal of Finance & Economics*. <https://doi.org/10.1002/IJFE.70043>
- Bayram, O., Talay, I., & Feridun, M. (2022). Can Fintech Promote Sustainable Finance? Policy Lessons from the Case of Turkey. *Sustainability 2022*, Vol. 14, Page 12414, 14(19), 12414. <https://doi.org/10.3390/SU141912414>
- Bazarbash, M. (2019). FinTech in Financial Inclusion: Machine Learning Applications in Assessing Credit Risk. *IMF Working Papers*, 2019(109), 1. <https://doi.org/10.5089/9781498314428.001>
- Begum, A., Gaytan, J. C. T., & Ahmed, G. (2023). The Nexus Between Technology and Finnovation: A Sustainable Development Model. *2nd International Conference on Business Analytics for Technology and Security, ICBATS 2023*, 1–8. <https://doi.org/10.1109/ICBATS57792.2023.10111102>
- Beirne, J., Fernandez, D. G., Tripathi, S., & Rajeev, M. (2023). Gender-Inclusive Development through Fintech: Studying Gender-Based Digital Financial Inclusion in a Cross-Country Setting. *Sustainability 2023*, Vol. 15, Page 10253, 15(13), 10253. <https://doi.org/10.3390/SU151310253>
- Beltrame, F., Floreani, J., & Sclip, A. (2017). Earnings Quality and the Cost of Debt of SMEs. *Financial Markets, SME Financing and Emerging Economies*, 21–39. https://doi.org/10.1007/978-3-319-54891-3_3
- Beltrame, F., Zorzi, G., & Grassetti, L. (2022). The effect of FinTech investments on listed banks: Evidence from an Italian sample. *Risk Governance and Control: Financial Markets & Institutions*, 12(2), 47–55. <https://doi.org/10.22495/RGCV12I2P4>
- Ben Fatma, H., & Chouaibi, J. (2023). The mediating role of corporate social responsibility in good corporate governance and firm value relationship: evidence from European financial institutions. *Meditari : Research Journal of the School of Accounting Sciences*, 32(4), 1084–1105. <https://doi.org/10.1108/MEDAR-08-2022-1762>
- Bin Mohamad, I., Usman, D., Bahru, J., & Darul Ta, J. (2013). Standardization and Its Effects on K-Means Clustering Algorithm. *Research Journal of Applied Sciences, Engineering and Technology*, 6(17), 3299–3303. <https://doi.org/10.19026/RJASET.6.3638>
- Bouattour, A., Kalai, M., & Helali, K. (2024). The non-linear relationship between ESG performance and bank stability in the digital era: new evidence from a regime-switching approach. *Humanities and Social Sciences Communications 2024 11:1*, 11(1), 1–17. <https://doi.org/10.1057/s41599-024-03876-8>
- Bratian, V., Bucur, A., Oprean, C., & Tanasescu, C. (2025). Discretionary vs nondiscretionary in fiscal mechanism. Non-automatic fiscal stabilisers vs automatic fiscal stabilisers. *Papers*. <https://ideas.repec.org/p/arx/papers/2501.08981.html>

- Buallay, A. (2019). Is sustainability reporting (ESG) associated with performance? Evidence from the European banking sector. *Management of Environmental Quality: An International Journal*, 30(1), 98–115. <https://doi.org/10.1108/MEQ-12-2017-0149/FULL/XML>
- Calis, G., & Kelleci, A. (2023). SOCIAL SUSTAINABILITY VIA DIGITAL FINANCIAL INCLUSION IN THE BANKING INDUSTRY. *Pressacademia*. <https://doi.org/10.17261/PRESSACADEMIA.2023.1786>
- Chen, Q. (2024). Challenges and Opportunities of Fintech Innovation for Traditional Financial Institutions. *Frontiers in Business, Economics and Management*, 13(3), 28–33. <https://doi.org/10.54097/P49F1543>
- Chen, Q., & Shen, C. (2024). How FinTech Affects Bank Systemic Risk: Evidence from China. *Journal of Financial Services Research*, 65(1), 77–101. <https://doi.org/10.1007/S10693-023-00421-7/METRICS>
- Chen, Y. C., Lin, T. Y., Chiu, Y. ho, & Yang, C. I. (2024). An exploration of operational efficiency, market efficiency, and sustainable development in the banking industry. *Corporate Social Responsibility and Environmental Management*. <https://doi.org/10.1002/CSR.2823>
- Chowdhury, H. J., Quaasar, G. M. A. A., Saba, N. A., & Rahman, M. A. (2024). The Mediating Role of Trust in Shaping Customer Loyalty of Bank: Insights from a developing country perspective. *Financial Markets, Institutions and Risks*, 8(4), 111–125. [https://doi.org/10.61093/FMIR.8\(4\).111-125.2024](https://doi.org/10.61093/FMIR.8(4).111-125.2024)
- Christianah Pelumi Efunniyi, Angela Omozele Abhulimen, Anwuli Nkemchor Obiki-Osafiele, Olajide Soji Osundare, Edith Ebele Agu, & Ibrahim Adedeji Adeniran. (2024). Strengthening corporate governance and financial compliance: Enhancing accountability and transparency. *Finance & Accounting Research Journal*, 6(8), 1597–1616. <https://doi.org/10.51594/FARJ.V6I8.1509>
- Cibaroglu, M. O., Guliz Ugur, N., & Turan, A. H. (2019). Does efficiency contribute to market valuation of banks? evidence from turkish banking system. *Pressacademia*, 9(1), 9–13. <https://doi.org/10.17261/PRESSACADEMIA.2019.1056>
- Connell, M. (2023). Green swans and pink washing: Promoting a strong culture of environmental and social responsibility in financial institutions. *Journal of Risk Management in Financial Institutions*, 16(3), 282–292. <https://doi.org/10.69554/LZNO7086>
- Čufar, M., & Belak, J. (2024). *Beyond Financials: Understanding the Implications of NFRD and CSRD on Non-financial Reporting*. 185–194. <https://doi.org/10.18690/UM.EPF.5.2024.18>
- Dewi, S., Purnomo, A. D., Hartono, H., Maesaroh, M., & Sari, D. P. (2024). The Effect Of Green Accounting, Financial Performance And CSR On Firm Value With Firm Size As An Intervening Variable. *Nomico*, 1(5), 69–86. <https://doi.org/10.62872/XDSW2Y62>
- Diorio, S., Hummel, C., & Rogers, B. (2022). Revenue operations: A systems approach for turning analytics into growth. *Applied Marketing Analytics*, 7(4), 306–317. <https://doi.org/10.69554/ADYQ3148>
- Divya, Mathur, A., Mathur, A., & Gupta, V. (2024). Fintech Disruption in Traditional Financial Services: Analyzing the Impact of Fintech Startups on Traditional Banking and Financial Institutions. *Studies in Systems, Decision and Control*, 524, 589–603. https://doi.org/10.1007/978-3-031-54379-1_52
- Dr. Amardeep Bajpai. (2024). The Impact of Fintech Startups on Financial Institutions' Performance and Default Risk. *International Journal of Advanced Research in Science, Communication and Technology*, 423–437. <https://doi.org/10.48175/IJARSCT-18753>

- Edmans, A., & Kacperczyk, M. (2022). Sustainable Finance. *Review of Finance*, 26(6), 1309–1313. <https://doi.org/10.1093/ROF/RFAC069>
- Ejuma Martha Adaga, Zainab Efe Egieya, Sarah Kuzankah Ewuga, Adekunle Abiola Abdul, & Temitayo Oluwaseun Abrahams. (2024). A comprehensive review of ethical practices in banking and finance. *Finance & Accounting Research Journal*, 6(1), 1–20. <https://doi.org/10.51594/FARJ.V6I1.705>
- El Amri, M. C., Mohammed, M. O., & Bakr, A. M. (2021). Enhancing Financial Inclusion Using FinTech-Based Payment System. *Islamic FinTech: Insights and Solutions*, 191–207. https://doi.org/10.1007/978-3-030-45827-0_11
- Elnahass, M., Trinh, V. Q., & Li, T. (2021). Global banking stability in the shadow of Covid-19 outbreak. *Journal of International Financial Markets, Institutions and Money*, 72, 101322. <https://doi.org/10.1016/J.INTFIN.2021.101322>
- Frost, J. (2020). *The economic forces driving fintech adoption across countries*. <https://www.bis.org/publ/work838.htm>
- Gambetta, N., Sierra-García, L., & Garcia Benau, M. A. (2024). *Contagion Effect on Sustainability Reporting Assurance in Latin America*. <https://doi.org/10.2139/SSRN.4690917>
- Gao, Y., Zhang, M., & Liu, X. (2020). Study on the Efficiency Measurements and Influence Factors of Development Financial Institutions. *Emerging Markets Finance and Trade*, 56(8), 1765–1780. <https://doi.org/10.1080/1540496X.2019.1685975>
- Gaurav, M., & Aman, Q. (2022). A Study Of Environmental, Social And Governance (ESG): The Evolving Metrics Considering People And Planet. *The Management Accountant Journal*, 57(3), 64–64. <https://doi.org/10.33516/MAJ.V57I3.64-67P>
- Ghosh, M., & Singh, M. P. (2024). Unveiling sustainable practices in financial institutions: A bibliometric analysis cum meta-analytical review on enhancing financial performance. *Corporate Social Responsibility and Environmental Management*. <https://doi.org/10.1002/CSR.3064>
- Goswami, A. (2018). Utilization of regression analysis in clinical research. *International Journal of Unani and Integrative Medicine*, 2(1), 01–05. <https://doi.org/10.33545/2616454X.2018.V2.I1A.15>
- Goswami, D., & Verma, B. (1 C.E.). Robo-Finance Unveiled: A Bibliometric Analysis of Advisory Services in Financial Management. <https://Services.Igi-Global.Com/Resolvedoi/Resolve.aspx?Doi=10.4018/979-8-3693-2019-8.Ch014>, 220–232. <https://doi.org/10.4018/979-8-3693-2019-8.CH014>
- Guang-Wen, Z., & Siddik, A. B. (2022). Do Corporate Social Responsibility Practices and Green Finance Dimensions Determine Environmental Performance? An Empirical Study on Bangladeshi Banking Institutions. *Frontiers in Environmental Science*, 10. <https://doi.org/10.3389/FENV.2022.890096/PDF>
- Hamilton, J. D., Waggoner, D. F., & Zha, T. (2007). Normalization in Econometrics. *Econometric Reviews*, 26(13), 221–252. <https://doi.org/10.1080/07474930701220329>
- Hannigan, B. (2019). Non-financial Reporting: Evolving Demands for Transparent Enterprises. *Transparency of Stock Corporations in Europe*. <https://doi.org/10.5040/9781509925551.CH-010>
- Harold Nwariaku, Busola Fadojutimi, Lois Gertrude Larteley Lawson, Jumoke Agbelusi, Oluwaseun Aaron Adigun, James Augustine Udom, & Temitope Dickson Olajide. (2024). Blockchain technology as an enabler of transparency and efficiency in sustainable supply chains. *International Journal of Science and Research Archive*, 12(2), 1779–1789. <https://doi.org/10.30574/IJSRA.2024.12.2.1454>
- Hasan, M., Hoque, A., Abedin, M. Z., & Gasbarro, D. (2024). FinTech and sustainable development: A systematic thematic analysis using human- and machine-generated

- processing. *International Review of Financial Analysis*, 95, 103473. <https://doi.org/10.1016/J.IRFA.2024.103473>
- Hawaladar, I. T., Meher, B. K., Kumari, P., & Kumar, S. (2022). Modelling the effects of capital adequacy, credit losses, and efficiency ratio on return on assets and return on equity of banks during COVID-19 pandemic. *Banks and Bank Systems*, 17(1), 115–124. [https://doi.org/10.21511/BBS.17\(1\).2022.10](https://doi.org/10.21511/BBS.17(1).2022.10)
- Horobet, A., Rahat, B., Belascu, L., & Kostakis, I. (2025). Banking on Green: Assessing Financial Market ESG Performance in European Financial Institutions. *Emerging Markets Finance and Trade*, 1–17. <https://doi.org/10.1080/1540496X.2025.2562332>
- Hu, X., Zhu, W., Zhang, C., Zhang, T., & Zhang, C. (2023). Research on the rules of ESG performance and value creation based on rough sets. *Journal of Business Economics and Management*, 24(6), 996–1018. <https://doi.org/10.3846/JBEM.2023.20631>
- Hwang, S. (2024). ESG and Executive Performance-Compensation Sensitivity : Financial and Non-Financial Performance. *Korean Accounting Information Association*, 42(4), 187–217. <https://doi.org/10.29189/KAIAAIR.42.4.8>
- Kampani, R., Mostert, P., Caroline, M., & Der Merwe, V. (2023). Trust and economic satisfaction as antecedents, and loyalty as outcome, of small business customers' cooperation and coordination in banking relationships. *Management and Marketing Journal*, 21(1), 7–24. <https://doi.org/10.52846/MNMK.21.1.01>
- Kang, D., Lee, S., & Kang, S. J. (2022). Financial Institution Development and Economic Growth: Dynamic Panel Evidence from the Developing Economies. *Gyeongje Baljeon Yeon'gu*, 28(2), 1–31. <https://doi.org/10.20464/KDEA.2022.28.2.1>
- Kanishka. (2024). The influence of intellectual capital on financial performance: evidence from licensed specialized banks in sri lanka. *Journal of Accountancy and Finance*, 11(1), 100–119. <https://doi.org/10.57075/JAF1112406>
- Kapoor, S., Henderson, P., & Narayanan, A. (2024). Promises and pitfalls of artificial intelligence for legal applications. *Journal of Cross-Disciplinary Research in Computational Law*, 2(2). <https://journalcrcl.org/crcl/article/view/62>
- Kartanto, L. (2021). The Effect of The Application of Financial Technology (Fintech) on the Value of Companies in the Banking Industry Listed on the Indonesia Stock Exchange. *International Journal of Scientific and Research Publications*, 11(10), 23–27. <https://doi.org/10.29322/IJSRP.11.10.2021.P11804>
- Kashif, M., Ullah, A., Ullah, S., & Qian, N. (2024). Towards a greener future: The impact of financial technology (FinTech) and climate finance on ecological sustainability. *Journal of Environmental Management*, 370, 122876–122876. <https://doi.org/10.1016/J.JENVMAN.2024.122876>
- Khanday, I. N., Wani, I. U., & Tarique, M. (2023). Do financial development and institutional quality matter for ecological sustainability in the long run? Evidence from India. *Management of Environmental Quality: An International Journal*, 34(6), 1668–1689. <https://doi.org/10.1108/MEQ-01-2023-0002>
- Konovalova, N., & Caplinska, A. (2021). Approaches to Evaluation of Banks' Financial Sustainability. *Lecture Notes in Networks and Systems*, 195, 758–768. https://doi.org/10.1007/978-3-030-68476-1_70
- Kouzo, I., & Falikhatun. (2023). The importance of compliance with accounting ethics standards issued by aaoifi in activating the governance of islamic banks: an analytical study. *BAKI (Berkala Akuntansi Dan Keuangan Indonesia)*, 8(1), 1–21. <https://doi.org/10.20473/BAKI.V8I1.41766>
- Kravets, D. (2023). ANALYSIS OF THE INFLUENCE OF FINANCIAL ASSETS ON THE EFFICIENCY OF FOOD INDUSTRY ENTERPRISES. *State and Regions. Series: Economics and Business*, 3(129). <https://doi.org/10.32782/1814-1161/2023-3-11>

- Kudirat Bukola Adeusi, Temitayo Oluwaseun Jejenewa, & Titilola Olaide Jejenewa. (2024). Advancing financial transparency and ethical governance: innovative cost management and accountability in higher education and industry. *International Journal of Management & Entrepreneurship Research*, 6(5), 1533–1546. <https://doi.org/10.51594/IJMER.V6I5.1099>
- Kulwizira Lukanima, B. (2023). *Corporate Valuation*. <https://doi.org/10.1007/978-3-031-28267-6>
- Lamarque, E. (2022). How Can Members Contribute More to Cooperative Life and Decision Processes? *Contemporary Trends in European Cooperative Banking: Sustainability, Governance, Digital Transformation, and Health Crisis Response*, 75–95. https://doi.org/10.1007/978-3-030-98194-5_4
- Lashgari, M. (2024). Sustainable Investments: Return and Risk. *THE JOURNAL OF APPLIED BUSINESS AND ECONOMICS*, 26(4). <https://doi.org/10.33423/JABE.V26I4.7265>
- La Torre, M., Leo, S., & Panetta, I. C. (2021). Banks and environmental, social and governance drivers: Follow the market or the authorities? *Corporate Social Responsibility and Environmental Management*, 28(6), 1620–1634. <https://doi.org/10.1002/CSR.2132;PAGE:STRING:ARTICLE/CHAPTER>
- Leclercq-Machado, L., Alvarez-Risco, A., Esquerre-Botton, S., Almanza-Cruz, C., de las Mercedes Anderson-Seminario, M., Del-Aguila-Arcentales, S., & Yáñez, J. A. (2022). Effect of Corporate Social Responsibility on Consumer Satisfaction and Consumer Loyalty of Private Banking Companies in Peru. *Sustainability 2022, Vol. 14, Page 9078*, 14(15), 9078. <https://doi.org/10.3390/SU14159078>
- Lee, C.-W., & Dampha, M. (2024). Intellectual Capitals on Banking Financial Performance: Evidence from Indonesia. *Cognizance Journal*, 4(1), 287–311. <https://doi.org/10.47760/COGNIZANCE.2024.V04I01.013>
- Lee, J., & Koh, K. (2024). ESG performance and firm risk in the U.S. financial firms. *Review of Financial Economics*, 42(3), 328–344. <https://doi.org/10.1002/RFE.1208>
- Liu, W., Jamshidian, M., & Zhang, Y. (2004). Multiple Comparison of Several Linear Regression Models. *Journal of the American Statistical Association*, 99(466), 395–403. <https://doi.org/10.1198/016214504000000395>
- Li, W., & Ding, H. (2024). Research on the Impact of Technological Innovation on the Financial Services Industry. *Frontiers in Sustainable Development*, 4(4), 109–119. <https://doi.org/10.54691/8QNEQ173>
- Lukanima, B. K. (2023). An Overview of Relative Valuation. *Classroom Companion: Business*, 613–633. https://doi.org/10.1007/978-3-031-28267-6_19
- Lu, Y., Li, L., Zhan, H., & Zhan, M. (2024). Fintech, information heterogeneity, and the regional distribution effects of corporate financing constraints. *Economic Modelling*, 137, 106777. <https://doi.org/10.1016/J.ECONMOD.2024.106777>
- Lyons, A. C., Kass-Hanna, J., Liu, F., Greenlee, A. J., & Zeng, L. (2019). Building Financial Resilience Through Financial and Digital Literacy in South Asia and Sub-Saharan Africa. *Financial Literacy EJournal*. <https://doi.org/10.2139/SSRN.3496562>
- Maheshwari, Miss. N. G., & Patidar, Mr. G. (2024). Sustainable finance and esg. *The Three Pillars of Business: A Guide to Integrated Marketing, Finance & HR Practices*, 137–146. <https://doi.org/10.58532/NBENNURTPCH14>
- Makau, S. (2024). Impact of Corporate Social Responsibility (CSR) Reporting on Firm Performance. *American Journal of Accounting*, 6(1), 13–24. <https://doi.org/10.47672/AJACC.1784>
- Martin, E. (2022). Normalizing Data. *Experiments of the Mind*, 84–108. <https://doi.org/10.2307/J.CTV1N1BS5C.11>

- Martinez, D., Magdalena, L., & Savitri, A. N. (2024). AI and Blockchain Integration: Enhancing Security and Transparency in Financial Transactions. *International Transactions on Artificial Intelligence*, 3(1), 11–20. <https://doi.org/10.33050/ITALIC.V3I1.651>
- Mathieu, V. (2022). Managing Service Operations. *A Customer-oriented Manager for B2B Services*, 189–200. <https://doi.org/10.1002/9781119902430.CH11>
- Ma, X., & Wang, M. (2024). The Impact of the Use of Fintech on Enterprise Value. *Highlights in Business, Economics and Management*, 24, 1514–1520. <https://doi.org/10.54097/TZ91RC08>
- Mayuri-Ramos, E., Cervantes-Acuna, G., Condori-Silva, A. I., & Cordova-Buiza, F. (2023). Social Responsibility Actions in Financial Institutions: A Systematic Review. *Proceedings of the European Conference on Management, Leadership and Governance*, 2023-November, 269–277. <https://doi.org/10.34190/ECMLG.19.1.1882>
- Ma, Z. (2024). The impact of corporate social responsibility on financial performance from a stakeholder perspective. *The EUrASEANs : Journal on Global Socio-Economic Dynamics*, 6(49), 54–62. [https://doi.org/10.35678/2539-5645.6\(49\).2024.54-62](https://doi.org/10.35678/2539-5645.6(49).2024.54-62)
- Mehta, A. M., & Handriana, T. (2024). Analyzing CSR and customer engagement through green banking digitalization: with the mediating effect of perceived environmental value and moderation effect of customer's eco-consciousness. *Cogent Business & Management*, 11(1). <https://doi.org/10.1080/23311975.2024.2332502>
- Midhunde, U., N, H. T., Ramachandran, M., & Ramu, K. (2023). An Empirical Investigation of Innovation and Technology in Banking. 2, 4(2), 121–129. <https://doi.org/10.46632/RCM/4/2/16>
- Moro-Visconti, R. (2024). Fintech Valuation. *Startup Valuation*, 525–568. https://doi.org/10.1007/978-3-031-77469-0_12
- Mo, Z. (2025). An Exploration of Enterprise ESG Practice Paths Based on Fintech Innovation. *Scientific Journal of Technology*, 7(9), 196–202. <https://doi.org/10.54691/SSH25688>
- Mpofu, F. Y., & Mhlanga, D. (2022). Digital Financial Inclusion, Digital Financial Services Tax and Financial Inclusion in the Fourth Industrial Revolution Era in Africa. *Economies* 2022, Vol. 10, Page 184, 10(8), 184. <https://doi.org/10.3390/ECONOMIES10080184>
- Ms. S. Shireesha, Dr. T. Vara Lakshmi, & Sindhi Anusha. (2024). Balancing Profitability and Environmental Responsibility: Financial Strategies at Renew Power Limited. *Deleted Journal*, 2(05), 1677–1679. <https://doi.org/10.47392/IRJAEM.2024.0240>
- Munachi Ijeoma Ononiwu, Obianuju Clement Onwuzulike, & Kazeem Shitu. (2024). Comparative analysis of cost management strategies in banks: The role of operational improvements in the US and Nigeria. *World Journal Of Advanced Research and Reviews*, 23(3), 492–507. <https://doi.org/10.30574/WJARR.2024.23.3.2708>
- Munira, M. S. K. (2025). Digital Transformation in Banking: A Systematic Review Of Trends, Technologies, And Challenges. *Strategic Data Management and Innovation*, 2(01), 78–95. <https://doi.org/10.71292/SDMI.V2I01.12>
- Muslimin, Y., Suryathi, W., Kasiani, K., Felani, F., & Judijanto, L. (2023). The Impact of Financial Technology Innovation on Banking Service Transformation: A Case Study in the FinTech Industry. *Global International Journal of Innovative Research*, 1(3), 306–313. <https://doi.org/10.59613/GLOBAL.V1I3.47>
- Narvind Kumar, Khoso, I., & Shah, A. B. (2023). The Impact of Corporate Social Responsibility on Financial Performance: Evidence from the Listed Banks in Pakistan. *Journal of Peace, Development & Communication*, 07(01), 88–100. <https://doi.org/10.36968/JPDC-V07-I01-09>

- Natania Naftali, Ika Nur Azmi, & Haryono Haryono. (2024). Analisis pengaruh faktor fundamental terhadap harga saham perbankan. *Akuntansi Dan Teknologi Informasi*, 17(2), 175–191. <https://doi.org/10.24123/JATI.V17I2.6459>
- Neitzert, F., & Petras, M. (2021). *Corporate social responsibility and bank risk*. <https://doi.org/10.1007/s11573-021-01069-2>
- Neitzert, F., & Petras, M. (2022). Corporate social responsibility and bank risk. *Journal of Business Economics*, 92(3), 397–428. <https://doi.org/10.1007/S11573-021-01069-2/TABLES/12>
- Niamh, O. (2024). Sustainable banking. *Concise Encyclopedia of Corporate Social Responsibility*, 187–191. <https://doi.org/10.4337/9781800880344.CH35>
- Nowara, R. (2024). The Influence of Intellectual Capital on Financial Performance: Quantile Analysis Approach. *Deleted Journal*, 48(3), 373–406. <https://doi.org/10.21608/ALAT.2024.366910>
- Olarewaju, O. M., Olarewaju, O. O., Oladejo, T. M., & Migiro, S. O. (2017). Nexus of bank personnel and cost-income ratio (Cir) in Nigeria. *Banks and Bank Systems*, 12(4), 154–162. [https://doi.org/10.21511/BBS.12\(4-1\).2017.04](https://doi.org/10.21511/BBS.12(4-1).2017.04)
- Oxford Global Resources. (2024). *The Rise of Sustainable Finance: Green Fintech Solutions* - Oxford Global Resources. <https://www.oxfordcorp.com/en/insights/blog/the-rise-of-sustainable-finance-green-fintech-solutions/>
- Padam Dongol, & Sajeeb Kumar Shrestha. (2024). Corporate Governance and Corporate Social Responsibility (Csr) Disclosure Among Commercial Banks in an Emerging Economy: Evaluative Perspectives. *SPAST Reports.*, 1(1). <https://doi.org/10.69848/SREPORTS.V1I1.4778>
- Pan, C.-L., Ni, L., & Huang, S. (2023). ESG and financial performance: a visual analysis based on bibliometrics. *Advances in Economics, Business and Management Research*, 54–60. https://doi.org/10.2991/978-94-6463-272-9_7
- Pandey, L. K., Bhattacharjee, J., Singh, R., Baker, H. K., & Sharma, R. K. (2025). Fintech Adoption and Dispositional Innovativeness in E-Gold Investment: Evidence from India. *Journal of Theoretical and Applied Electronic Commerce Research* 2025, Vol. 20, Page 105, 20(2), 105. <https://doi.org/10.3390/JTAER20020105>
- PENKALA, M. (2024). The role of human capital in the innovation management process. *Humanities and Social Sciences Quarterly*, 31(3), 107–119. <https://doi.org/10.7862/RZ.2024.HSS.34>
- Pitre-Cedeño, O. J., & Herrera-Rodríguez, E. E. (2024). Intellectual Capital and Performance of Banking and Financial Institutions in Panama: An Application of the VAICTM Model. *Journal of Risk and Financial Management*, 17(9), 416. <https://doi.org/10.3390/JRFM17090416>
- Pramitasari, D. A. (2024). ESG Investing: Evaluating the Financial Performance of Sustainable Portfolios. *Equator Journal of Management and Entrepreneurship*, 12(4), 332–340. <https://doi.org/10.26418/EJME.V12I4.82793>
- Prematunga, R. K. (2012). Correlational analysis. *Australian Critical Care*, 25(3), 195–199. <https://doi.org/10.1016/J.AUCC.2012.02.003>
- Purwanti, A., Melinasari, S., & Nurhanimah, N. (2024). The Role of CSR in Improving Corporate Image and Financial Performance in the Banking Industry. *Nomico*, 1(8), 37–53. <https://doi.org/10.62872/VAZMPM28>
- Putri, R. A., Juli Nuryani, N. N., & Sumartono, E. (2025). Navigating Business Sustainability: Financial Strategies for Long-Term Corporate Growth in a Volatile Market. *International Journal of Social and Human.*, 2(1), 19–27. <https://doi.org/10.59613/YS31P820>

- Qin, Y. (2024). Banks and Financial Institutions: Assessment of Risk Management Strategies. *Highlights in Business, Economics and Management*, 29, 64–68. <https://doi.org/10.54097/5WR7ZS33>
- Qowiyyul Adib, H., Widiyanti, M., Muhammad Husni Thamrin, K., & Andriana, I. (2024). The Effect of Financial Leverage, Profitability and Dividend Policy on Firm Value. *Devotion*, 5(10), 1303–1309. <https://doi.org/10.59188/DEVOTION.V5I10.19685>
- Roustaei, N. (2024). Application and interpretation of linear-regression analysis. *Medical Hypothesis, Discovery, and Innovation in Ophthalmology*, 13(3), 151–159. <https://doi.org/10.51329/MEHDIOPHTHAL1506>
- Setyadi, B., Helmi, S., & Syed Ismail bin Syed Mohamad. (2023). Customer Satisfaction Mediates the Influence of Service Quality on Customer Loyalty in Islamic Banks. *International Journal of Islamic Business and Economics (IJIBEC)*, 7(1), 25–36. <https://doi.org/10.28918/IJIBEC.V7I1.6924>
- Shadrack Obeng, Toluwalase Vanessa Iyelolu, Adetola Adewale Akinsulire, & Courage Idemudia. (2024). The Transformative Impact of Financial Technology (FinTech) on Regulatory Compliance in the Banking Sector. *World Journal Of Advanced Research and Reviews*, 23(1), 2008–2018. <https://doi.org/10.30574/WJARR.2024.23.1.2184>
- Subedi, D. P., & Bhandari, D. R. (2024). *The Impact of Corporate Social Responsibility on Customer Loyalty: Exploring the Mediating Effect of Service Quality*. <https://doi.org/10.31219/OSF.IO/BDZ7Y>
- Sunday, O. A. (2024). Financial Technology Innovation and Non-Financial Performance in the Nigerian Banking System. *International Journal of Research and Innovation in Social Science*, VIII(II), 2420–2436. <https://doi.org/10.47772/IJRISS.2024.802173>
- Sun, X., & Wu, G. (2025). Leveraging FinTech for positive ESG outcomes through regional innovation: insights from a knowledge capital perspective. *Frontiers in Public Health*, 13. <https://doi.org/10.3389/FPUH.2025.1641241>
- Suryawan, R. F., Soehaditama, J. P., Prihanto, Y. J. N., Muliati, M., & Sjarifudin, D. (2024). Literature Review : Company Value in Providing Trust to Customer Loyalty. *EAJMR East Asian Journal of Multidisciplinary Research*, 2(12), 5223–5234. <https://doi.org/10.55927/EAJMR.V2I12.7566>
- Thakkar, N., & Bhuyan, R. (2024). Effect of Fintech on Sustainable Development Goals: An Empirical Analysis. *Bulletin of Applied Economics*, 31–46. <https://doi.org/10.47260/BAE/1123>
- Thakor, A. V. (2020a). Fintech and banking: What do we know? *Journal of Financial Intermediation*, 41, 100833. <https://doi.org/10.1016/J.JFI.2019.100833>
- Thenmozhi.S, D., SUGAVANESWARI, Dr. R., & Kalaiarasan C, D. (2024). Banking on Values: Unraveling the Dynamics of Corporate Social Responsibility, Customer Satisfaction, and Loyalty in the Financial Landscape. *Indian Scientific Journal Of Research In Engineering And Management*, 08(008), 1–4. <https://doi.org/10.55041/IJSREM37130>
- Thuranira, J. K., Kimathi, M. H., & Murithi, D. K. (2024). Digital Channels and Financial Sustainability in Commercial Banks. *International Journal of Research and Innovation in Social Science*, VIII(XV), 181–195. <https://doi.org/10.47772/IJRISS.2024.815EC0014>
- Tien, D. P., & Nguyen, K. Q. T. (2023). CREDIT RISK MANAGEMENT AND EFFECTIVENESS OF CREDIT ACTIVITIES: EVIDENCE FROM VIETNAM. *Journal of Eastern European and Central Asian Research*, 10(5), 787–799. <https://doi.org/10.15549/JEECAR.V10I5.989>
- Touma, J. (2021). *Digitalization of the customer experience in banking Use of AI and SSTs in complex/sensitive tasks: pre-collection NAZ GIZEM KARAHANLI JOHANNES TOUMA KTH ROYAL INSTITUTE OF TECHNOLOGY SCHOOL OF INDUSTRIAL ENGINEERING AND MANAGEMENT*.

- Tran, A. T. X., & Le, T. M. (2024). Fintech development influences on corporate ESG performance: evidences from Southeast Asia. *Journal of Management and Governance*, 1–38. <https://doi.org/10.1007/S10997-024-09719-7/METRICS>
- Triwacananingrum, W., Alim, N. ', & Penulis, N. (2024). Green Accounting and Different Perspective of Financial Performance. *EL MUHASABA: Jurnal Akuntansi (e-Journal)*, 15(2), 187–203. <https://doi.org/10.18860/EM.V15I2.26775>
- Verhezen, P. (2024). A corporate governance perspective on organisational integrity. *Research Handbook on Organisational Integrity*, 280–300. <https://doi.org/10.4337/9781803927930.00024>
- Vimal, M., & Kumar, R. (2024). Symbiotic Relationship of Fintech and Sustainability. *Advances in Electronic Government, Digital Divide, and Regional Development Book Series*, 106–124. <https://doi.org/10.4018/979-8-3693-3567-3.CH005>
- Wang, Y., Xiuping, S., & Zhang, Q. (2021). Can fintech improve the efficiency of commercial banks? —An analysis based on big data. *Research in International Business and Finance*, 55, 101338. <https://doi.org/10.1016/J.RIBAF.2020.101338>
- Warner, R. A. (2016). Using Z Scores for the Display and Analysis of Data. *Optimizing the Display and Interpretation of Data*, 7–51. <https://doi.org/10.1016/B978-0-12-804513-8.00002-X>
- Wihelmina Afua Addy, Onyeka Chrisanctus Ofodile, Omotoya Bukola Adeoye, Adedoyin Tolulope Oyewole, Chinwe Chinazo Okoye, Olubusola Odeyemi, & Yinka James Ololade. (2024). Data-driven sustainability: how fintech innovations are supporting green finance. *Engineering Science & Technology Journal*, 5(3), 760–773. <https://doi.org/10.51594/ESTJ.V5I3.871>
- Wijaya, E., & Amelia, A. (2018). ANALISIS PENGARUH NET INTEREST MARGIN (NIM), RETURN ON ASSET (ROA), RETURN ON EQUITY (ROE), DAN CAPITAL ADEQUACY RATIO (CAR) TERHADAP HARGA SAHAM PADA PERUSAHAAN PERBANKAN DI BURSA EFEK INDONESIA DALAM MENENTUKAN INVESTASI. 5, 38–47. <https://doi.org/>
- Wu, F., Hu, Y., & Shen, M. (2024). The color of FinTech: FinTech and corporate green transformation in China. *International Review of Financial Analysis*, 94, 103254. <https://doi.org/10.1016/J.IRFA.2024.103254>
- Wu, N., Zhao, J., Musah, M., Ma, Z., Zhang, L., Zhou, Y., Su, Y., Agyemang, J. K., Asiamah, J. A., Cao, S., Yao, L., & Li, K. (2023). Do Liquidity and Capital Structure Predict Firms' Financial Sustainability? A Panel Data Analysis on Quoted Non-Financial Establishments in Ghana. *Sustainability*, 15(3), 2240–2240. <https://doi.org/10.3390/SU15032240>
- Wu, W., & Zhou, Y. (2022). Credit Risk Measurement, Decision Analysis, Transformation and Upgrading for Financial Big Data. *Complexity*, 2022, 1–8. <https://doi.org/10.1155/2022/8942773>
- Yongo, E. O., Manyala, J. O., Kito, K., Matsushita, Y., Outa, N. O., & Njiru, J. M. (2024). Deciphering the hidden links between csr and financial performance: a critical approach. *International Journal of Advanced Research*, 12(09), 909–919. <https://doi.org/10.21474/IJAR01/19524>
- Zhao, Y. (2024). Empowering Sustainable Finance: The Convergence of AI, Blockchain, and Big Data Analytics. *Advances in Economics, Management and Political Sciences*, 85(1), 267–273. <https://doi.org/10.54254/2754-1169/85/20240925>
- Zhou, B., & Wang, Q. (2023). FinTech matters in sustainable finance: Does it redistribute the supply of financial services? *Journal of International Financial Markets, Institutions and Money*, 91. <https://doi.org/10.1016/J.INTFIN.2023.101913>
- Zou, K. H., Tuncali, K., & Silverman, S. G. (2003). Correlation and Simple Linear Regression1. <https://doi.org/10.1148/Radiol.2273011499>, 227(3), 617–622. <https://doi.org/10.1148/RADIOL.2273011499>

APPENDICES

Appendix 1. Correlation analysis and regression analysis on the impact of FinTech on financial and non-financial value indicators at the institutional level

Table 1. Correlation analysis on the impact of FinTech on financial and non-financial value indicators at the institutional level

Bank	FinTech_indicator	Dependent_var	p_value	corr
ANZ Group Holdings Ltd.	Active digital customers (m)	CAR %	0,001116	0,868395
ANZ Group Holdings Ltd.	Active digital customers (m)	Cost-to-Income Ratio (%)	2,32E-09	-0,9952
ANZ Group Holdings Ltd.	Active digital customers (m)	EBITDA	0,00054	0,891028
ANZ Group Holdings Ltd.	Active digital customers (m)	P/E ratio	0,004456	-0,81051
ANZ Group Holdings Ltd.	Active digital customers (m)	Sustainable Finance	2,73E-05	0,949267
ANZ Group Holdings Ltd.	Active digital customers (m)	Ethics & Compliance	0,038298	0,658804
ANZ Group Holdings Ltd.	Active digital customers (m)	Board Composition	0,000669	0,884781
ANZ Group Holdings Ltd.	Active digital customers (m)	Audit	0,000527	0,891725
ANZ Group Holdings Ltd.	Active digital customers (m)	Marketing & Labelling	0,044086	-0,6449
ANZ Group Holdings Ltd.	Active digital customers (m)	Labour & Employment Practices	0,023351	0,702984
Agricultural Bank of China Ltd.	Active mobile users (m)	ROA %	3,08E-05	-0,94765
Agricultural Bank of China Ltd.	Active mobile users (m)	ROE %	0,002373	-0,83963
Agricultural Bank of China Ltd.	Active mobile users (m)	EPS	0,000394	0,899529
Agricultural Bank of China Ltd.	Active mobile users (m)	CAR %	3,61E-07	0,982967
Agricultural Bank of China Ltd.	Active mobile users (m)	Cost-to-Income Ratio (%)	1,42E-05	-0,95699
Agricultural Bank of China Ltd.	Active mobile users (m)	EBITDA	2,40E-05	0,950872
Agricultural Bank of China Ltd.	Active mobile users (m)	P/E ratio	0,000575	-0,88923
Agricultural Bank of China Ltd.	Active mobile users (m)	Sustainable Finance	0,000995	0,872292
Agricultural Bank of China Ltd.	Active mobile users (m)	Ethics & Compliance	0,0188	0,720279
Agricultural Bank of China Ltd.	Active mobile users (m)	Board Composition	0,01625	0,731271
BNP Paribas SA	Active digital customers (m)	EPS	0,024032	-0,7006
BNP Paribas SA	Active digital customers (m)	CAR %	7,44E-05	-0,93449
BNP Paribas SA	Active digital customers (m)	P/E ratio	0,008574	0,774185
BNP Paribas SA	Active digital customers (m)	Sustainable Finance	0,002839	-0,83187
BNP Paribas SA	Active digital customers (m)	Ethics & Compliance	0,023395	-0,70283
BNP Paribas SA	Active digital customers (m)	Board Composition	0,001759	0,851774
BNP Paribas SA	Active digital customers (m)	Marketing & Labelling	0,009512	-0,76776

BNP Paribas SA	Active mobile users (m)	ROE %	0,00532	0,801348
BNP Paribas SA	Active mobile users (m)	EPS	0,000745	0,881537
BNP Paribas SA	Active mobile users (m)	CAR %	0,007529	0,781958
BNP Paribas SA	Active mobile users (m)	Cost-to-Income Ratio (%)	0,035685	-0,66555
BNP Paribas SA	Active mobile users (m)	EBITDA	0,000973	0,873019
BNP Paribas SA	Active mobile users (m)	P/E ratio	0,008473	-0,77491
BNP Paribas SA	Active mobile users (m)	Sustainable Finance	0,000545	0,890765
BNP Paribas SA	Active mobile users (m)	Ethics & Compliance	0,000186	0,917143
BNP Paribas SA	Active mobile users (m)	Board Composition	0,000239	-0,91171
BNP Paribas SA	Active mobile users (m)	Marketing & Labelling	2,69E-05	0,949416
Banco Bradesco SA	Active digital customers (m)	ROA %	0,004351	-0,81172
Banco Bradesco SA	Active digital customers (m)	ROE %	0,003294	-0,82513
Banco Bradesco SA	Active digital customers (m)	EPS	0,022631	-0,70555
Banco Bradesco SA	Active digital customers (m)	CAR %	3,66E-05	0,945308
Banco Bradesco SA	Active digital customers (m)	Cost-to-Income Ratio (%)	0,001656	-0,85409
Banco Bradesco SA	Active digital customers (m)	EBITDA	0,000366	0,901426
Banco Bradesco SA	Active digital customers (m)	P/E ratio	0,000429	-0,89733
Banco Bradesco SA	Active digital customers (m)	Sustainable Finance	0,002059	0,845515
Banco Bradesco SA	Active digital customers (m)	Ethics & Compliance	0,002728	0,83363
Banco Bradesco SA	Active digital customers (m)	Board Composition	0,000275	0,908397
Banco Bradesco SA	Active digital customers (m)	Marketing & Labelling	0,008434	0,775186
Banco Bradesco SA	Active mobile users (m)	ROA %	0,03772	-0,66027
Banco Bradesco SA	Active mobile users (m)	ROE %	0,006499	-0,79041
Banco Bradesco SA	Active mobile users (m)	EPS	0,018255	-0,72254
Banco Bradesco SA	Active mobile users (m)	CAR %	0,003718	0,819415
Banco Bradesco SA	Active mobile users (m)	Cost-to-Income Ratio (%)	0,000254	-0,91028
Banco Bradesco SA	Active mobile users (m)	EBITDA	6,19E-05	0,937492
Banco Bradesco SA	Active mobile users (m)	P/E ratio	0,000165	-0,91965
Banco Bradesco SA	Active mobile users (m)	Sustainable Finance	6,90E-05	0,935732
Banco Bradesco SA	Active mobile users (m)	Ethics & Compliance	0,027368	0,689559
Banco Bradesco SA	Active mobile users (m)	Board Composition	0,001237	0,86481
Banco Santander SA	Active digital customers (m)	ROA %	0,034421	0,668937
Banco Santander SA	Active digital customers (m)	ROE %	0,023035	0,704106
Banco Santander SA	Active digital customers (m)	EPS	0,019788	0,716294
Banco Santander SA	Active digital customers (m)	Cost-to-Income Ratio (%)	0,000154	-0,92114
Banco Santander SA	Active digital customers (m)	EBITDA	2,55E-06	0,972147
Banco Santander SA	Active digital customers (m)	P/E ratio	0,010206	-0,76329
Banco Santander SA	Active digital customers (m)	Ethics & Compliance	0,038405	0,658536
Banco Santander SA	Active digital customers (m)	Shareholder Rights	0,013938	0,742335
Banco Santander SA	Active digital customers (m)	Labour & Employment Practices	0,017341	0,726431
Banco de Chile	Active digital customers (m)	CAR %	0,022086	0,70754
Banco de Chile	Active digital customers (m)	P/E ratio	0,028978	-0,68456

Banco de Chile	Active digital customers (m)	Board Composition	0,044771	0,643333
Banco do Brazil SA	Active digital customers (m)	ROA %	0,000646	0,885829
Banco do Brazil SA	Active digital customers (m)	ROE %	0,001272	0,863835
Banco do Brazil SA	Active digital customers (m)	EPS	0,000129	0,924607
Banco do Brazil SA	Active digital customers (m)	CAR %	0,001222	0,865256
Banco do Brazil SA	Active digital customers (m)	Cost-to-Income Ratio (%)	0,000217	-0,91382
Banco do Brazil SA	Active digital customers (m)	EBITDA	1,20E-05	0,958789
Banco do Brazil SA	Active digital customers (m)	P/E ratio	1,41E-05	-0,95708
Banco do Brazil SA	Active digital customers (m)	Sustainable Finance	0,004535	0,809624
Banco do Brazil SA	Active digital customers (m)	Ethics & Compliance	0,001583	0,855817
Banco do Brazil SA	Active digital customers (m)	Board Composition	0,017881	0,724112
Banco do Brazil SA	Active digital customers (m)	Executive Compensation	0,003442	0,823072
Banco do Brazil SA	Active digital customers (m)	Labour & Employment Practices	0,0003	0,906401
Bank of America	Active digital customers (m)	EPS	0,000685	0,884113
Bank of America	Active digital customers (m)	CAR %	0,01233	0,750811
Bank of America	Active digital customers (m)	EBITDA	4,57E-05	0,942132
Bank of America	Active digital customers (m)	Sustainable Finance	2,86E-06	0,971306
Bank of America	Active digital customers (m)	Ethics & Compliance	4,56E-06	0,967739
Bank of America	Active digital customers (m)	Board Composition	0,007673	-0,78084
Bank of America	Active digital customers (m)	Executive Compensation	0,002554	-0,8365
Bank of America	Active digital customers (m)	Labour & Employment Practices	3,15E-05	0,947368
Bank of America	Active mobile users (m)	EPS	0,002771	0,832933
Bank of America	Active mobile users (m)	CAR %	0,006322	0,791952
Bank of America	Active mobile users (m)	EBITDA	1,57E-05	0,955919
Bank of America	Active mobile users (m)	P/E ratio	0,043641	-0,64592
Bank of America	Active mobile users (m)	Sustainable Finance	0,00018	0,917923
Bank of America	Active mobile users (m)	Ethics & Compliance	1,49E-05	0,956479
Bank of America	Active mobile users (m)	Board Composition	0,010175	-0,76349
Bank of America	Active mobile users (m)	Executive Compensation	0,001006	-0,87191
Bank of America	Active mobile users (m)	Labour & Employment Practices	0,000993	0,872349
Bank of America	Tech, communications & equipment expense (USD m)	EPS	0,001936	0,847988
Bank of America	Tech, communications & equipment expense (USD m)	CAR %	0,004738	0,807394
Bank of America	Tech, communications & equipment expense (USD m)	EBITDA	2,59E-05	0,949944
Bank of America	Tech, communications & equipment expense (USD m)	Sustainable Finance	0,000117	0,926491
Bank of America	Tech, communications & equipment expense (USD m)	Ethics & Compliance	1,47E-05	0,956607
Bank of America	Tech, communications & equipment expense (USD m)	Board Composition	0,012617	-0,74924
Bank of America	Tech, communications & equipment expense (USD m)	Executive Compensation	0,00152	-0,85735

Bank of America	Tech, communications & equipment expense (USD m)	Labour & Employment Practices	0,000928	0,874577
Citigroup Inc.	Active digital customers (m)	CAR %	0,00073	0,882144
Citigroup Inc.	Active digital customers (m)	Cost-to-Income Ratio (%)	0,003264	0,825552
Citigroup Inc.	Active digital customers (m)	EBITDA	2,75E-05	0,949134
Citigroup Inc.	Active digital customers (m)	P/E ratio	0,003629	-0,82058
Citigroup Inc.	Active digital customers (m)	Sustainable Finance	0,000583	0,888833
Citigroup Inc.	Active digital customers (m)	Ethics & Compliance	0,039293	0,656319
Citigroup Inc.	Active digital customers (m)	Executive Compensation	0,039469	0,655884
Citigroup Inc.	Active digital customers (m)	Audit	0,048403	0,635301
Citigroup Inc.	Active mobile users (m)	CAR %	0,001779	0,851327
Citigroup Inc.	Active mobile users (m)	Cost-to-Income Ratio (%)	0,004369	0,811512
Citigroup Inc.	Active mobile users (m)	EBITDA	1,49E-05	0,956452
Citigroup Inc.	Active mobile users (m)	P/E ratio	0,002571	-0,8362
Citigroup Inc.	Active mobile users (m)	Sustainable Finance	0,001014	0,871641
Citigroup Inc.	Active mobile users (m)	Audit	0,049372	0,633226
Citigroup Inc.	Tech, communications & equipment expense (USD m)	CAR %	0,002425	0,838712
Citigroup Inc.	Tech, communications & equipment expense (USD m)	Cost-to-Income Ratio (%)	0,005468	0,799884
Citigroup Inc.	Tech, communications & equipment expense (USD m)	EBITDA	4,89E-05	0,941147
Citigroup Inc.	Tech, communications & equipment expense (USD m)	P/E ratio	0,003693	-0,81974
Citigroup Inc.	Tech, communications & equipment expense (USD m)	Sustainable Finance	0,00108	0,869531
Citigroup Inc.	Tech, communications & equipment expense (USD m)	Audit	0,026953	0,690882
Deutsche Bank	Tech, communications & equipment expense (USD m)	ROA %	0,028095	0,687276
Deutsche Bank	Tech, communications & equipment expense (USD m)	Cost-to-Income Ratio (%)	0,032239	-0,67498
Deutsche Bank	Tech, communications & equipment expense (USD m)	P/E ratio	0,007836	-0,7796
Deutsche Bank	Tech, communications & equipment expense (USD m)	Sustainable Finance	0,033287	0,672043
Deutsche Bank	Tech, communications & equipment expense (USD m)	Ethics & Compliance	0,008149	0,777258
Deutsche Bank	Tech, communications & equipment expense (USD m)	Board Composition	0,010169	0,763522
Deutsche Bank	Tech, communications & equipment expense (USD m)	Labour & Employment Practices	0,025167	0,696734
Goldman Sachs Group Inc.	Tech, communications & equipment expense (USD m)	CAR %	0,004293	-0,81238
Goldman Sachs Group Inc.	Tech, communications & equipment expense (USD m)	P/E ratio	0,009773	0,766052
Goldman Sachs Group Inc.	Tech, communications & equipment expense (USD m)	Sustainable Finance	0,032332	-0,67472

Goldman Sachs Group Inc.	Tech, communications & equipment expense (USD m)	Ethics & Compliance	0,000106	-0,92829
Goldman Sachs Group Inc.	Tech, communications & equipment expense (USD m)	Board Composition	0,000164	-0,91986
Goldman Sachs Group Inc.	Tech, communications & equipment expense (USD m)	Shareholder Rights	0,005554	-0,79905
Goldman Sachs Group Inc.	Tech, communications & equipment expense (USD m)	Audit	0,003268	-0,82548
Goldman Sachs Group Inc.	Tech, communications & equipment expense (USD m)	Marketing & Labelling	0,022981	-0,7043
Goldman Sachs Group Inc.	Tech, communications & equipment expense (USD m)	Labour & Employment Practices	0,006236	0,79272
HSBC	Active digital customers (m)	ROE %	0,015299	0,735683
HSBC	Active digital customers (m)	EPS	0,021547	0,709532
HSBC	Active digital customers (m)	EBITDA	0,018456	0,7217
HSBC	Active digital customers (m)	P/E ratio	0,008727	-0,7731
HSBC	Active digital customers (m)	Sustainable Finance	3,10E-05	0,947595
HSBC	Active digital customers (m)	Labour & Employment Practices	0,001128	0,868022
HSBC	Active mobile users (m)	ROE %	0,01006	0,764212
HSBC	Active mobile users (m)	EPS	0,014542	0,739331
HSBC	Active mobile users (m)	EBITDA	0,012972	0,747338
HSBC	Active mobile users (m)	P/E ratio	0,010178	-0,76347
HSBC	Active mobile users (m)	Sustainable Finance	3,28E-05	0,946812
HSBC	Active mobile users (m)	Labour & Employment Practices	0,001795	0,85099
HSBC	Tech, communications & equipment expense (USD m)	ROE %	0,018393	0,721961
HSBC	Tech, communications & equipment expense (USD m)	EPS	0,025187	0,696666
HSBC	Tech, communications & equipment expense (USD m)	EBITDA	0,016392	0,73063
HSBC	Tech, communications & equipment expense (USD m)	P/E ratio	0,006455	-0,79079
HSBC	Tech, communications & equipment expense (USD m)	Sustainable Finance	2,55E-05	0,950133
HSBC	Tech, communications & equipment expense (USD m)	Labour & Employment Practices	0,000932	0,874427
ING Bank	Active mobile users (m)	ROA %	0,000658	-0,8853
ING Bank	Active mobile users (m)	ROE %	0,038242	-0,65895
ING Bank	Active mobile users (m)	EPS	0,001074	-0,8697
ING Bank	Active mobile users (m)	CAR %	0,004979	-0,80483
ING Bank	Active mobile users (m)	Cost-to-Income Ratio (%)	0,04469	0,643518
ING Bank	Active mobile users (m)	EBITDA	0,00268	0,8344
ING Bank	Active mobile users (m)	P/E ratio	0,00061	-0,88755

ING Bank	Active mobile users (m)	Sustainable Finance	0,019284	0,718308
ING Bank	Active mobile users (m)	Ethics & Compliance	0,001801	0,850852
ING Bank	Active mobile users (m)	Board Composition	0,01247	0,750045
ING Bank	Active mobile users (m)	Executive Compensation	0,047647	0,63694
ING Bank	Tech, communications & equipment expense (USD m)	ROA %	0,002759	-0,83314
ING Bank	Tech, communications & equipment expense (USD m)	EPS	0,004189	-0,8136
ING Bank	Tech, communications & equipment expense (USD m)	CAR %	0,015255	-0,73589
ING Bank	Tech, communications & equipment expense (USD m)	P/E ratio	0,012685	-0,74888
ING Bank	Tech, communications & equipment expense (USD m)	Sustainable Finance	0,002233	0,842183
ING Bank	Tech, communications & equipment expense (USD m)	Ethics & Compliance	0,02149	0,709745
ING Bank	Tech, communications & equipment expense (USD m)	Board Composition	0,010977	0,758564
ING Bank	Tech, communications & equipment expense (USD m)	Executive Compensation	0,047542	0,637168
Industrial and Commercial Bank of China Ltd.	Active mobile users (m)	ROA %	1,13E-05	-0,95946
Industrial and Commercial Bank of China Ltd.	Active mobile users (m)	ROE %	3,07E-06	-0,97081
Industrial and Commercial Bank of China Ltd.	Active mobile users (m)	EPS	0,001402	0,860322
Industrial and Commercial Bank of China Ltd.	Active mobile users (m)	CAR %	6,91E-08	0,988753
Industrial and Commercial Bank of China Ltd.	Active mobile users (m)	Cost-to-Income Ratio (%)	5,11E-09	-0,99414
Industrial and Commercial Bank of China Ltd.	Active mobile users (m)	EBITDA	7,11E-05	0,935243
Industrial and Commercial Bank of China Ltd.	Active mobile users (m)	P/E ratio	0,000721	-0,88253
Industrial and Commercial Bank of China Ltd.	Active mobile users (m)	Sustainable Finance	8,19E-05	0,932871
Industrial and Commercial Bank of China Ltd.	Active mobile users (m)	Ethics & Compliance	2,67E-05	0,949553
Industrial and Commercial Bank of China Ltd.	Active mobile users (m)	Board Composition	0,00056	0,889987
Industrial and Commercial Bank of China Ltd.	Active mobile users (m)	Executive Compensation	0,003165	0,826968
Industrial and Commercial Bank of China Ltd.	Active mobile users (m)	Shareholder Rights	0,031921	0,675884
Industrial and Commercial Bank of China Ltd.	Active mobile users (m)	Labour & Employment Practices	0,007397	0,782992
Itaú Unibanco Holding SA	Active digital customers (m)	CAR %	0,000361	0,901768
Itaú Unibanco Holding SA	Active digital customers (m)	Cost-to-Income Ratio (%)	0,000361	-0,90181

Itaú Unibanco Holding SA	Active digital customers (m)	EBITDA	0,002517	0,83712
Itaú Unibanco Holding SA	Active digital customers (m)	P/E ratio	0,004596	-0,80895
Itaú Unibanco Holding SA	Active digital customers (m)	Sustainable Finance	0,00111	0,868574
Itaú Unibanco Holding SA	Active digital customers (m)	Board Composition	0,023933	-0,70095
Itaú Unibanco Holding SA	Active digital customers (m)	Marketing & Labelling	0,003143	-0,82728
Itaú Unibanco Holding SA	Active digital customers (m)	Labour & Employment Practices	0,036393	0,663692
Itaú Unibanco Holding SA	Tech, communications & equipment expense (USD m)	ROA %	0,036083	-0,6645
Itaú Unibanco Holding SA	Tech, communications & equipment expense (USD m)	CAR %	0,000162	0,920019
Itaú Unibanco Holding SA	Tech, communications & equipment expense (USD m)	Cost-to-Income Ratio (%)	2,26E-05	-0,95162
Itaú Unibanco Holding SA	Tech, communications & equipment expense (USD m)	EBITDA	0,000963	0,873356
Itaú Unibanco Holding SA	Tech, communications & equipment expense (USD m)	P/E ratio	0,001354	-0,8616
Itaú Unibanco Holding SA	Tech, communications & equipment expense (USD m)	Sustainable Finance	0,000112	0,927321
Itaú Unibanco Holding SA	Tech, communications & equipment expense (USD m)	Board Composition	0,027501	-0,68914
Itaú Unibanco Holding SA	Tech, communications & equipment expense (USD m)	Marketing & Labelling	0,00099	-0,87244
Itaú Unibanco Holding SA	Tech, communications & equipment expense (USD m)	Labour & Employment Practices	0,00663	0,789283
JPMorgan Chase	Active digital customers (m)	ROE %	0,028219	0,686892
JPMorgan Chase	Active digital customers (m)	EPS	7,99E-05	0,933289
JPMorgan Chase	Active digital customers (m)	CAR %	4,61E-05	0,942013
JPMorgan Chase	Active digital customers (m)	Cost-to-Income Ratio (%)	0,002017	-0,84635
JPMorgan Chase	Active digital customers (m)	YoY Revenue Growth (%)	0,046658	0,639107
JPMorgan Chase	Active digital customers (m)	EBITDA	8,61E-05	0,931996
JPMorgan Chase	Active digital customers (m)	P/E ratio	0,006186	-0,79317
JPMorgan Chase	Active digital customers (m)	Sustainable Finance	7,19E-05	0,935066
JPMorgan Chase	Active digital customers (m)	Board Composition	0,012277	0,751105
JPMorgan Chase	Active digital customers (m)	Executive Compensation	0,002019	0,846311
JPMorgan Chase	Active digital customers (m)	Audit	0,00102	-0,87147
JPMorgan Chase	Active digital customers (m)	Marketing & Labelling	0,023532	0,702346
JPMorgan Chase	Active mobile users (m)	ROE %	0,030702	0,679408
JPMorgan Chase	Active mobile users (m)	EPS	8,07E-05	0,933125
JPMorgan Chase	Active mobile users (m)	CAR %	5,22E-05	0,940165
JPMorgan Chase	Active mobile users (m)	Cost-to-Income Ratio (%)	0,002981	-0,82968
JPMorgan Chase	Active mobile users (m)	EBITDA	9,95E-05	0,929448
JPMorgan Chase	Active mobile users (m)	P/E ratio	0,00542	-0,80035

JPMorgan Chase	Active mobile users (m)	Sustainable Finance	3,48E-05	0,946004
JPMorgan Chase	Active mobile users (m)	Board Composition	0,010932	0,758833
JPMorgan Chase	Active mobile users (m)	Executive Compensation	0,001319	0,862535
JPMorgan Chase	Active mobile users (m)	Audit	0,00118	-0,86648
JPMorgan Chase	Active mobile users (m)	Marketing & Labelling	0,026325	0,692908
JPMorgan Chase	Tech, communications & equipment expense (USD m)	EPS	0,032571	0,674045
JPMorgan Chase	Tech, communications & equipment expense (USD m)	CAR %	0,01788	0,72412
JPMorgan Chase	Tech, communications & equipment expense (USD m)	Cost-to-Income Ratio (%)	0,02658	-0,69208
JPMorgan Chase	Tech, communications & equipment expense (USD m)	Sustainable Finance	0,022037	0,70772
JPMorgan Chase	Tech, communications & equipment expense (USD m)	Ethics & Compliance	2,53E-05	0,950195
JPMorgan Chase	Tech, communications & equipment expense (USD m)	Audit	0,000109	-0,92778
JPMorgan Chase	Tech, communications & equipment expense (USD m)	Marketing & Labelling	0,00156	0,856371
Mitsubishi UFJ Financial Group Inc.	Active digital customers (m)	CAR %	7,01E-08	0,988712
Mitsubishi UFJ Financial Group Inc.	Active digital customers (m)	Cost-to-Income Ratio (%)	5,94E-06	-0,96551
Mitsubishi UFJ Financial Group Inc.	Active digital customers (m)	EBITDA	0,001452	0,859037
Mitsubishi UFJ Financial Group Inc.	Active digital customers (m)	P/E ratio	0,003738	-0,81917
Mitsubishi UFJ Financial Group Inc.	Active digital customers (m)	Sustainable Finance	2,13E-05	0,952347
Mitsubishi UFJ Financial Group Inc.	Active digital customers (m)	Executive Compensation	0,017225	0,726937
Mitsubishi UFJ Financial Group Inc.	Active digital customers (m)	Shareholder Rights	0,00283	-0,83201
State Bank of India	Active digital customers (m)	ROA %	0,01021	0,763265
State Bank of India	Active digital customers (m)	ROE %	0,004017	0,815667
State Bank of India	Active digital customers (m)	EPS	0,000153	0,921298
State Bank of India	Active digital customers (m)	CAR %	0,000503	0,892989
State Bank of India	Active digital customers (m)	Cost-to-Income Ratio (%)	6,38E-05	-0,93701
State Bank of India	Active digital customers (m)	EBITDA	0,00015	0,921634
State Bank of India	Active digital customers (m)	P/E ratio	0,010916	-0,75893
State Bank of India	Active digital customers (m)	Ethics & Compliance	8,40E-06	0,962354
State Bank of India	Active digital customers (m)	Board Composition	0,046308	0,639884
State Bank of India	Active digital customers (m)	Shareholder Rights	9,16E-05	0,93093
State Bank of India	Active digital customers (m)	Audit	0,025588	0,695329

State Bank of India	Active digital customers (m)	Labour & Employment Practices	0,009897	0,765252
Wells Fargo	Active digital customers (m)	EBITDA	0,028499	0,686026
Wells Fargo	Active digital customers (m)	Sustainable Finance	2,45E-05	0,950623
Wells Fargo	Active digital customers (m)	Ethics & Compliance	0,000115	0,926786
Wells Fargo	Active digital customers (m)	Labour & Employment Practices	0,007786	0,779977
Wells Fargo	Active mobile users (m)	EBITDA	0,035559	0,665887
Wells Fargo	Active mobile users (m)	Sustainable Finance	0,00011	0,927612
Wells Fargo	Active mobile users (m)	Ethics & Compliance	9,08E-05	0,931085
Wells Fargo	Active mobile users (m)	Executive Compensation	0,035173	0,666912
Wells Fargo	Active mobile users (m)	Labour & Employment Practices	0,019355	0,718024
Wells Fargo	Tech, communications & equipment expense (USD m)	EBITDA	0,017609	0,725275
Wells Fargo	Tech, communications & equipment expense (USD m)	Sustainable Finance	0,000305	0,905949
Wells Fargo	Tech, communications & equipment expense (USD m)	Ethics & Compliance	0,001683	0,853486
Wells Fargo	Tech, communications & equipment expense (USD m)	Board Composition	0,027408	0,689433
Wells Fargo	Tech, communications & equipment expense (USD m)	Executive Compensation	0,018419	0,721852
Wells Fargo	Tech, communications & equipment expense (USD m)	Labour & Employment Practices	0,01011	0,763895

Table 2. Regression analysis on the impact of Fintech on financial and non-financial institution's value indicators in the context of sustainable development for the individual financial institution's in Europe

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
BNP Paribas SA	Active digital customers	Board Composition	0,001759	0,725519
BNP Paribas SA	Active digital customers	CAR %	7,44E-05	0,873267
BNP Paribas SA	Active digital customers	ESG Score	0,00308	0,68592
BNP Paribas SA	Active digital customers	Marketing & Labelling	0,009512	0,589455
BNP Paribas SA	Active digital customers	P/E ratio	0,008574	0,599362
BNP Paribas SA	Active digital customers	Sustainable Finance	0,002839	0,692011
BNP Paribas SA	Active mobile users	Board Composition	0,000239	0,831211
BNP Paribas SA	Active mobile users	CAR %	0,007529	0,611459
BNP Paribas SA	Active mobile users	EBITDA	0,000973	0,762163
BNP Paribas SA	Active mobile users	EPS	0,000745	0,777107
BNP Paribas SA	Active mobile users	ESG Score	0,000785	0,774234
BNP Paribas SA	Active mobile users	Ethics & Compliance	0,000186	0,841151
BNP Paribas SA	Active mobile users	Marketing & Labelling	2,69E-05	0,901391
BNP Paribas SA	Active mobile users	P/E ratio	0,008473	0,600481
BNP Paribas SA	Active mobile users	ROE %	0,00532	0,642158

BNP Paribas SA	Active mobile users	Sustainable Finance	0,000545	0,793463
Banco Santander SA	Active digital customers	Cost-to-Income Ratio (%)	0,000154	0,848499
Banco Santander SA	Active digital customers	EBITDA	2,55E-06	0,94507
Banco Santander SA	Active digital customers	P/E ratio	0,010206	0,582605
Deutsche Bank	Tech, communications & equipment expense	Ethics & Compliance	0,008149	0,604131
Deutsche Bank	Tech, communications & equipment expense	P/E ratio	0,007836	0,607781
HSBC	Active digital customers	ESG Score	2,09E-05	0,907446
HSBC	Active digital customers	Labour & Employment Practices	0,001128	0,753462
HSBC	Active digital customers	P/E ratio	0,008727	0,597691
HSBC	Active digital customers	Sustainable Finance	3,10E-05	0,897935
HSBC	Active mobile users	ESG Score	5,14E-05	0,884344
HSBC	Active mobile users	Labour & Employment Practices	0,001795	0,724184
HSBC	Active mobile users	P/E ratio	0,010178	0,58288
HSBC	Active mobile users	ROE %	0,01006	0,58402
HSBC	Active mobile users	Sustainable Finance	3,28E-05	0,896452
HSBC	Tech, communications & equipment expense	ESG Score	1,58E-05	0,913569
HSBC	Tech, communications & equipment expense	Labour & Employment Practices	0,000932	0,764622
HSBC	Tech, communications & equipment expense	P/E ratio	0,006455	0,62535
HSBC	Tech, communications & equipment expense	Sustainable Finance	2,55E-05	0,902752
ING Bank	Active mobile users	CAR %	0,004979	0,64775
ING Bank	Active mobile users	EBITDA	0,00268	0,696223
ING Bank	Active mobile users	EPS	0,001074	0,756377
ING Bank	Active mobile users	ESG Score	0,002472	0,702082
ING Bank	Active mobile users	Ethics & Compliance	0,001801	0,723949
ING Bank	Active mobile users	P/E ratio	0,00061	0,787739
ING Bank	Active mobile users	ROA %	0,000658	0,783764
ING Bank	Active mobile users	Sustainable Finance	0,019284	0,515966
ING Bank	Tech, communications & equipment expense	Board Composition	0,010977	0,575419
ING Bank	Tech, communications & equipment expense	EPS	0,004189	0,661951
ING Bank	Tech, communications & equipment expense	ESG Score	0,001772	0,725035
ING Bank	Tech, communications & equipment expense	P/E ratio	0,012685	0,560818
ING Bank	Tech, communications & equipment expense	ROA %	0,002759	0,694115
ING Bank	Tech, communications & equipment expense	Sustainable Finance	0,002233	0,709273

Source: created by the author

Table 3. Regression analysis on the impact of Fintech on financial and non-financial institution's value indicators in the context of sustainable development for the individual financial institution's in North America

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
Bank of America	Active digital customers	Board Composition	0,007673242	0,609714
Bank of America	Active digital customers	CAR %	0,012329855	0,563718
Bank of America	Active digital customers	EBITDA	4,57E-05	0,887612
Bank of America	Active digital customers	EPS	0,000684541	0,781657
Bank of America	Active digital customers	Ethics & Compliance	4,56E-06	0,936519
Bank of America	Active digital customers	Executive Compensation	0,002553786	0,699734
Bank of America	Active digital customers	Labour & Employment Practices	3,15E-05	0,897506
Bank of America	Active digital customers	Sustainable Finance	2,86E-06	0,943436
Bank of America	Active mobile users	Board Composition	0,010174531	0,582911
Bank of America	Active mobile users	CAR %	0,006322354	0,627188
Bank of America	Active mobile users	EBITDA	1,57E-05	0,91378
Bank of America	Active mobile users	EPS	0,002771454	0,693777
Bank of America	Active mobile users	Ethics & Compliance	1,49E-05	0,914852
Bank of America	Active mobile users	Executive Compensation	0,00100617	0,760227
Bank of America	Active mobile users	Labour & Employment Practices	0,000993001	0,760993
Bank of America	Active mobile users	Sustainable Finance	0,000179651	0,842583
Bank of America	Tech, communications equipment expense &	CAR %	0,004737905	0,651884
Bank of America	Tech, communications equipment expense &	EBITDA	2,59E-05	0,902394
Bank of America	Tech, communications equipment expense &	EPS	0,00193637	0,719083
Bank of America	Tech, communications equipment expense &	Ethics & Compliance	1,47E-05	0,915097
Bank of America	Tech, communications equipment expense &	Executive Compensation	0,001519514	0,735051
Bank of America	Tech, communications equipment expense &	Labour & Employment Practices	0,000928062	0,764885
Bank of America	Tech, communications equipment expense &	Sustainable Finance	0,000116816	0,858386
Citigroup Inc.	Active digital customers	CAR %	0,000730463	0,778179
Citigroup Inc.	Active digital customers	Cost-to-Income Ratio (%)	0,003263645	0,681537
Citigroup Inc.	Active digital customers	EBITDA	2,75E-05	0,900855
Citigroup Inc.	Active digital customers	P/E ratio	0,003628871	0,673349
Citigroup Inc.	Active digital customers	Sustainable Finance	0,000583085	0,790025
Citigroup Inc.	Active mobile users	CAR %	0,001779273	0,724758
Citigroup Inc.	Active mobile users	Cost-to-Income Ratio (%)	0,004368616	0,658552

Citigroup Inc.	Active mobile users	EBITDA	1,49E-05	0,9148
Citigroup Inc.	Active mobile users	P/E ratio	0,002571397	0,699238
Citigroup Inc.	Active mobile users	Sustainable Finance	0,001014299	0,759759
Citigroup Inc.	Tech, communications & equipment expense	CAR %	0,002425247	0,703438
Citigroup Inc.	Tech, communications & equipment expense	Cost-to-Income Ratio (%)	0,005467885	0,639814
Citigroup Inc.	Tech, communications & equipment expense	EBITDA	4,89E-05	0,885758
Citigroup Inc.	Tech, communications & equipment expense	P/E ratio	0,003692959	0,671979
Citigroup Inc.	Tech, communications & equipment expense	Sustainable Finance	0,001079779	0,756085
Goldman Sachs Group Inc.	Tech, communications & equipment expense	Audit	0,003268493	0,681424
Goldman Sachs Group Inc.	Tech, communications & equipment expense	Board Composition	0,000163666	0,846145
Goldman Sachs Group Inc.	Tech, communications & equipment expense	CAR %	0,004293424	0,659963
Goldman Sachs Group Inc.	Tech, communications & equipment expense	Ethics & Compliance	0,000106052	0,861715
Goldman Sachs Group Inc.	Tech, communications & equipment expense	Labour & Employment Practices	0,006235704	0,628405
Goldman Sachs Group Inc.	Tech, communications & equipment expense	P/E ratio	0,009772922	0,586836
Goldman Sachs Group Inc.	Tech, communications & equipment expense	Shareholder Rights	0,00555405	0,638474
JPMorgan Chase	Active digital customers	Audit	0,001019533	0,759458
JPMorgan Chase	Active digital customers	CAR %	4,61E-05	0,887389
JPMorgan Chase	Active digital customers	Cost-to-Income Ratio (%)	0,00201709	0,716304
JPMorgan Chase	Active digital customers	EBITDA	8,61E-05	0,868616
JPMorgan Chase	Active digital customers	EPS	7,99E-05	0,871028
JPMorgan Chase	Active digital customers	Executive Compensation	0,002018908	0,716243
JPMorgan Chase	Active digital customers	P/E ratio	0,006185795	0,629112
JPMorgan Chase	Active digital customers	Sustainable Finance	7,19E-05	0,874348
JPMorgan Chase	Active mobile users	Audit	0,001179726	0,750794
JPMorgan Chase	Active mobile users	Board Composition	0,010932198	0,575827
JPMorgan Chase	Active mobile users	CAR %	5,22E-05	0,883911
JPMorgan Chase	Active mobile users	Cost-to-Income Ratio (%)	0,002981187	0,688371
JPMorgan Chase	Active mobile users	EBITDA	9,95E-05	0,863873
JPMorgan Chase	Active mobile users	EPS	8,07E-05	0,870722
JPMorgan Chase	Active mobile users	Executive Compensation	0,001318998	0,743967
JPMorgan Chase	Active mobile users	P/E ratio	0,005420486	0,640558
JPMorgan Chase	Active mobile users	Sustainable Finance	3,48E-05	0,894924

JPMorgan Chase	Tech, communications & equipment expense	Audit	0,000108995	0,86078
JPMorgan Chase	Tech, communications & equipment expense	Ethics & Compliance	2,53E-05	0,902871
JPMorgan Chase	Tech, communications & equipment expense	Marketing & Labelling	0,001559748	0,733372
Wells Fargo	Active digital customers	Ethics & Compliance	0,000114996	0,858932
Wells Fargo	Active digital customers	Labour & Employment Practices	0,007786278	0,608364
Wells Fargo	Active digital customers	Sustainable Finance	2,45E-05	0,903683
Wells Fargo	Active mobile users	Ethics & Compliance	9,08E-05	0,866919
Wells Fargo	Active mobile users	Sustainable Finance	0,000110003	0,860464
Wells Fargo	Tech, communications & equipment expense	Ethics & Compliance	0,001682746	0,728439
Wells Fargo	Tech, communications & equipment expense	Labour & Employment Practices	0,010109741	0,583536
Wells Fargo	Tech, communications & equipment expense	Sustainable Finance	0,00030518	0,820743

Source: created by the author

Table 4. Regression analysis on the impact of Fintech on financial and non-financial institution's value indicators in the context of sustainable development for the individual financial institution's in Asia-Pacific

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
ANZ Group Holdings Ltd.	Active digital customers	Audit	0,000527	0,795173
ANZ Group Holdings Ltd.	Active digital customers	Board Composition	0,000669	0,782838
ANZ Group Holdings Ltd.	Active digital customers	CAR %	0,001116	0,754109
ANZ Group Holdings Ltd.	Active digital customers	Cost-to-Income Ratio (%)	2,32E-09	0,990415
ANZ Group Holdings Ltd.	Active digital customers	EBITDA	0,00054	0,79393
ANZ Group Holdings Ltd.	Active digital customers	P/E ratio	0,004456	0,65693
ANZ Group Holdings Ltd.	Active digital customers	Sustainable Finance	2,73E-05	0,901108
Agricultural Bank of China Ltd.	Active mobile users	CAR %	3,61E-07	0,966224
Agricultural Bank of China Ltd.	Active mobile users	Cost-to-Income Ratio (%)	1,42E-05	0,915828
Agricultural Bank of China Ltd.	Active mobile users	EBITDA	2,40E-05	0,904157
Agricultural Bank of China Ltd.	Active mobile users	EPS	0,000394	0,809153
Agricultural Bank of China Ltd.	Active mobile users	P/E ratio	0,000575	0,79073
Agricultural Bank of China Ltd.	Active mobile users	ROA %	3,08E-05	0,898035
Agricultural Bank of China Ltd.	Active mobile users	ROE %	0,002373	0,704978
Agricultural Bank of China Ltd.	Active mobile users	Sustainable Finance	0,000995	0,760894

Industrial and Commercial Bank of China Ltd.	Active mobile users	Board Composition	0,00056	0,792077
Industrial and Commercial Bank of China Ltd.	Active mobile users	CAR %	6,91E-08	0,977633
Industrial and Commercial Bank of China Ltd.	Active mobile users	Cost-to-Income Ratio (%)	5,11E-09	0,988323
Industrial and Commercial Bank of China Ltd.	Active mobile users	EBITDA	7,11E-05	0,874679
Industrial and Commercial Bank of China Ltd.	Active mobile users	EPS	0,001402	0,740154
Industrial and Commercial Bank of China Ltd.	Active mobile users	Ethics & Compliance	2,67E-05	0,901652
Industrial and Commercial Bank of China Ltd.	Active mobile users	Executive Compensation	0,003165	0,683876
Industrial and Commercial Bank of China Ltd.	Active mobile users	Labour & Employment Practices	0,007397	0,613077
Industrial and Commercial Bank of China Ltd.	Active mobile users	P/E ratio	0,000721	0,778856
Industrial and Commercial Bank of China Ltd.	Active mobile users	ROA %	1,13E-05	0,920565
Industrial and Commercial Bank of China Ltd.	Active mobile users	ROE %	3,07E-06	0,942476
Industrial and Commercial Bank of China Ltd.	Active mobile users	Sustainable Finance	8,19E-05	0,870247
Mitsubishi UFJ Financial Group Inc.	Active digital customers	Cost-to-Income Ratio (%)	5,94E-06	0,932213
Mitsubishi UFJ Financial Group Inc.	Active digital customers	EBITDA	0,001452	0,737944
Mitsubishi UFJ Financial Group Inc.	Active digital customers	P/E ratio	0,003738	0,671037
Mitsubishi UFJ Financial Group Inc.	Active digital customers	Shareholder Rights	0,00283	0,692234
Mitsubishi UFJ Financial Group Inc.	Active digital customers	Sustainable Finance	2,13E-05	0,906964
State Bank of India	Active digital customers	CAR %	0,000503	0,797429
State Bank of India	Active digital customers	Cost-to-Income Ratio (%)	6,38E-05	0,877982
State Bank of India	Active digital customers	EBITDA	0,00015	0,849409
State Bank of India	Active digital customers	EPS	0,000153	0,848791
State Bank of India	Active digital customers	Ethics & Compliance	8,40E-06	0,926126
State Bank of India	Active digital customers	ROE %	0,004017	0,665312
State Bank of India	Active digital customers	Shareholder Rights	9,16E-05	0,866631

Source: created by the author

Table 5. Regression analysis on the impact of Fintech on financial and non-financial institution's value indicators in the context of sustainable development for the individual financial institution's in Latin America

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
Banco Bradesco SA	Active digital customers	Board Composition	0,000275458	0,825186
Banco Bradesco SA	Active digital customers	CAR %	3,66E-05	0,893607
Banco Bradesco SA	Active digital customers	Cost-to-Income Ratio (%)	0,001656395	0,729472
Banco Bradesco SA	Active digital customers	EBITDA	0,000366186	0,812569
Banco Bradesco SA	Active digital customers	ESG Score	8,48E-06	0,925935

Banco Bradesco SA	Active digital customers	Ethics & Compliance	0,002727926	0,694939
Banco Bradesco SA	Active digital customers	Marketing & Labelling	0,008434082	0,600913
Banco Bradesco SA	Active digital customers	P/E ratio	0,000428757	0,805202
Banco Bradesco SA	Active digital customers	ROA %	0,004350604	0,658888
Banco Bradesco SA	Active digital customers	ROE %	0,003293749	0,680836
Banco Bradesco SA	Active digital customers	Sustainable Finance	0,00205899	0,714896
Banco Bradesco SA	Active mobile users	Board Composition	0,001237385	0,747896
Banco Bradesco SA	Active mobile users	CAR %	0,003718381	0,67144
Banco Bradesco SA	Active mobile users	Cost-to-Income Ratio (%)	0,000254145	0,828601
Banco Bradesco SA	Active mobile users	EBITDA	6,19E-05	0,878891
Banco Bradesco SA	Active mobile users	ESG Score	0,000260225	0,827605
Banco Bradesco SA	Active mobile users	P/E ratio	0,000165323	0,845764
Banco Bradesco SA	Active mobile users	ROE %	0,006498663	0,624751
Banco Bradesco SA	Active mobile users	Sustainable Finance	6,90E-05	0,875595
Banco do Brazil SA	Active digital customers	CAR %	0,001221807	0,748669
Banco do Brazil SA	Active digital customers	Cost-to-Income Ratio (%)	0,00021728	0,835062
Banco do Brazil SA	Active digital customers	EBITDA	1,20E-05	0,919277
Banco do Brazil SA	Active digital customers	EPS	0,000128959	0,854899
Banco do Brazil SA	Active digital customers	ESG Score	6,09E-05	0,879365
Banco do Brazil SA	Active digital customers	Ethics & Compliance	0,001582857	0,732423
Banco do Brazil SA	Active digital customers	Executive Compensation	0,003442286	0,677448
Banco do Brazil SA	Active digital customers	Labour & Employment Practices	0,000299526	0,821562
Banco do Brazil SA	Active digital customers	P/E ratio	1,41E-05	0,915999
Banco do Brazil SA	Active digital customers	ROA %	0,000646274	0,784694
Banco do Brazil SA	Active digital customers	ROE %	0,00127189	0,746211
Banco do Brazil SA	Active digital customers	Sustainable Finance	0,004535232	0,655491
Itaú Unibanco Holding SA	Active digital customers	CAR %	0,000361285	0,813186
Itaú Unibanco Holding SA	Active digital customers	Cost-to-Income Ratio (%)	0,000360663	0,813265
Itaú Unibanco Holding SA	Active digital customers	EBITDA	0,002517326	0,700769
Itaú Unibanco Holding SA	Active digital customers	ESG Score	0,002798065	0,693074
Itaú Unibanco Holding SA	Active digital customers	Marketing & Labelling	0,003143424	0,684387
Itaú Unibanco Holding SA	Active digital customers	P/E ratio	0,004596125	0,654395
Itaú Unibanco Holding SA	Active digital customers	Sustainable Finance	0,00111048	0,754421
Itaú Unibanco Holding SA	Tech, communications & equipment expense	CAR %	0,000162415	0,846434

Itaú Unibanco Holding SA	Tech, communications & equipment expense	Cost-to-Income Ratio (%)	2,26E-05	0,905588
Itaú Unibanco Holding SA	Tech, communications & equipment expense	EBITDA	0,000963266	0,76275
Itaú Unibanco Holding SA	Tech, communications & equipment expense	ESG Score	0,001019037	0,759487
Itaú Unibanco Holding SA	Tech, communications & equipment expense	Labour & Employment Practices	0,006630061	0,622968
Itaú Unibanco Holding SA	Tech, communications & equipment expense	Marketing & Labelling	0,000990263	0,761153
Itaú Unibanco Holding SA	Tech, communications & equipment expense	P/E ratio	0,001353755	0,74235
Itaú Unibanco Holding SA	Tech, communications & equipment expense	Sustainable Finance	0,000111741	0,859925

Source: created by the author

Table 6. Regression analysis on the impact of Fintech on financial and non-financial institution's value indicators in the context of sustainable development for the individual financial institution's in European region

Bank	Dependent_var	Model significance (F-statistic)	R2
BNP Paribas SA	ESG Score	0,000596	0,988
Banco Santander SA	ESG Score	0,000239	0,999
Deutsche Bank	ESG Score	0,000018	0,992
HSBC	ESG Score	0,000000763	0,993
ING Bank	ESG Score	0,0605	0,939

Source: created by the author

Table 7. Regression analysis on the impact of Fintech on financial and non-financial institution's value indicators in the context of sustainable development for the individual financial institution's in North American region

Bank	Dependent_var	Model significance (F-statistic)	R2
Bank of America	ESG Score	0,000000354 (3,54e-07)	0,998
Citigroup Inc.	ESG Score	0,0000153 (1,53e-05)	0,993
Deutsche Bank (U.S.-listed data)	ESG Score	0,0011	0,984
JPMorgan Chase	ESG Score	0,0000571 (5,71e-05)	0,996
Wells Fargo	ESG Score	0,00000452 (4,52e-06)	0,996

Source: created by the author

Table 8. Regression analysis on the impact of Fintech on financial and non-financial institution's value indicators in the context of sustainable development for the individual financial institution's in Asia-Pacific region

Bank	Dependent_var	Model significance (F-statistic)	R2
Agricultural Bank of China Ltd,	ESG Score	0,149	0,794

ANZ Group Holdings Ltd,	ESG Score	0,00307	0,939
Industrial and Commercial Bank of China Ltd,	ESG Score	0,0000552	0,988
Mitsubishi UFJ Financial Group Inc,	ESG Score	0,00165	0,98
State Bank of India	ESG Score	0,000000127	0,996

Source: created by the author

Table 9. Regression analysis on the impact of Fintech on financial and non-financial institution's value indicators in the context of sustainable development for the individual financial institution's in Latin America region

Bank	Dependent_var	Model significance (F-statistic)	R2
Banco Bradesco SA	ESG Score	0,0392	0,955
Banco de Chile	ESG Score	0,000847	0,926
Banco do Brazil SA	ESG Score	0,0287	0,915
Itaú Unibanco Holding SA	ESG Score	0,00267	0,975

Source: created by the author

Table 10. Correlation analysis on the impact of the financial and non-financial value indicators on ESG for the individual financial institution's

Bank	Value_indicator	p_value	corr
ANZ Group Holdings Ltd.	Cost-to-Income Ratio (%)	0,000263	-0,90944
Agricultural Bank of China Ltd.	Ethics & Compliance	2,91E-09	0,994914
BNP Paribas SA	EPS	9,21E-06	0,961463
BNP Paribas SA	Sustainable Finance	8,76E-08	0,988063
BNP Paribas SA	Marketing & Labelling	9,12E-06	0,961559
Banco Santander SA	Labour & Employment Practices	3,94E-06	0,968911
Banco de Chile	Ethics & Compliance	2,19E-09	0,995262
Bank of America	Sustainable Finance	9,94E-08	0,987677
Bank of America	Ethics & Compliance	8,95E-08	0,987999
Citigroup Inc.	Sustainable Finance	3,64E-07	0,982926
Deutsche Bank	Cost-to-Income Ratio (%)	0,000296	-0,90672
Deutsche Bank	P/E ratio	0,000227	-0,9128
Deutsche Bank	Ethics & Compliance	8,30E-08	0,988221
Goldman Sachs Group Inc.	Sustainable Finance	1,96E-06	0,973934
HSBC	Sustainable Finance	5,80E-08	0,989236
HSBC	Labour & Employment Practices	4,19E-06	0,968411
Industrial and Commercial Bank of China Ltd.	CAR %	9,88E-09	0,993092
Industrial and Commercial Bank of China Ltd.	Ethics & Compliance	2,36E-08	0,991403
Itaú Unibanco Holding SA	Sustainable Finance	5,64E-06	0,965962
JPMorgan Chase	Sustainable Finance	1,49E-07	0,986366
JPMorgan Chase	Audit	0,000367	-0,90137
Mitsubishi UFJ Financial Group Inc.	CAR %	6,68E-06	0,964473

State Bank of India	Cost-to-Income Ratio (%)	0,000171	-0,91896
State Bank of India	Ethics & Compliance	6,64E-11	0,998025
Wells Fargo	Sustainable Finance	6,54E-09	0,993771

Source: created by the author

Table 11. Regression analysis on the impact of the direct Fintech on ESG score for the individual financial institution's in European region

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
BNP Paribas SA	Active digital customers	ESG Score	0,003080202	0,68592
BNP Paribas SA	Active mobile users	ESG Score	0,000785349	0,774234
Banco Santander SA	Active digital customers	ESG Score	0,029991905	0,464449
Deutsche Bank	Tech, communications & equipment expense	ESG Score	0,011235228	0,573102
HSBC	Active digital customers	ESG Score	2,08534E-05	0,907446
HSBC	Active mobile users	ESG Score	5,13663E-05	0,884344
HSBC	Tech, communications & equipment expense	ESG Score	1,58172E-05	0,913569
ING Bank	Active mobile users	ESG Score	0,002471686	0,702082
ING Bank	Tech, communications & equipment expense	ESG Score	0,001771862	0,725035

Source: created by the author

Table 12. Regression analysis on the impact of the direct Fintech on ESG score for the individual financial institution's in North America region

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
Bank of America	Active digital customers	ESG Score	3,48162E-06	0,940628
Bank of America	Active mobile users	ESG Score	5,61814E-05	0,881758
Bank of America	Tech, communications & equipment expense	ESG Score	3,90588E-05	0,891909
Citigroup Inc.	Active digital customers	ESG Score	0,000396911	0,808841
Citigroup Inc.	Active mobile users	ESG Score	0,000793437	0,773671
Citigroup Inc.	Tech, communications & equipment expense	ESG Score	0,001335751	0,743184
Goldman Sachs Group Inc.	Tech, communications & equipment expense	ESG Score	0,005642051	0,637121
JPMorgan Chase	Active digital customers	ESG Score	6,27306E-05	0,878498
JPMorgan Chase	Active mobile users	ESG Score	4,0536E-05	0,890913
JPMorgan Chase	Tech, communications & equipment expense	ESG Score	0,006416466	0,62588
Wells Fargo	Active digital customers	ESG Score	1,92672E-05	0,909241
Wells Fargo	Active mobile users	ESG Score	6,52419E-05	0,877316
Wells Fargo	Tech, communications & equipment expense	ESG Score	0,000150286	0,849335

Source: created by the author

Table 13. Regression analysis on the impact of the direct Fintech on ESG score for the individual financial institution's in Asia-Pacific region

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
ANZ Group Holdings Ltd.	Active digital customers	ESG Score	0,000532069	0,794661
Agricultural Bank of China Ltd.	Active mobile users	ESG Score	0,011445496	0,571245
Industrial and Commercial Bank of China Ltd.	Active mobile users	ESG Score	8,20513E-07	0,958555
Mitsubishi UFJ Financial Group Inc.	Active digital customers	ESG Score	1,48514E-07	0,972927
State Bank of India	Active digital customers	ESG Score	3,72248E-06	0,939633

Source: created by the author

Table 14. Regression analysis on the direct impact of the Fintech on ESG score for the individual financial institution's in Latin American region

Bank	FinTech_indicator	Dependent_var	p_FinTech	R2
Banco Bradesco SA	Active digital customers	ESG Score	8,48378E-06	0,925935
Banco Bradesco SA	Active mobile users	ESG Score	0,000260225	0,827605
Banco de Chile	Active digital customers	ESG Score	0,07290253	0,347482
Banco do Brazil SA	Active digital customers	ESG Score	6,09339E-05	0,879365
Itaú Unibanco Holding SA	Active digital customers	ESG Score	0,002798065	0,693074
Itaú Unibanco Holding SA	Tech, communications & equipment expense	ESG Score	0,001019037	0,759487

Source: created by the author

Appendix 2. Correlation analysis on the impact of the Fintech in European region

Table 15. Correlation analysis on the impact of the Fintech indicators on financial and non-financial values for the financial institution's in European region

FinTech_indicator	Dependent_var	p_value	corr
Active digital customers	ROA %	0,083285	-0,147
Active digital customers	ROE %	0,107049	-0,137
Active digital customers	EPS	0,895008	-0,011
Active digital customers	CAR %	0,000028	-0,346
Active digital customers	Cost-to-Income Ratio (%)	0,25192	0,097
Active digital customers	Cost-to-Income Ratio (%)	0,25192	0,097
Active digital customers	YoY Revenue Growth (%)	0,174378	0,115
Active digital customers	EBITDA	0,000001	0,394
Active digital customers	P/E ratio	0,064119	-0,157
Active digital customers	Sustainable Finance	0,000092	0,325
Active digital customers	Ethics & Compliance	0,174324	-0,115
Active digital customers	Board Composition	0	0,444
Active digital customers	Executive Compensation	0,001657	0,264
Active digital customers	Shareholder Rights	0,000236	0,306
Active digital customers	Audit	0,000004	0,379

Active digital customers	Marketing & Labelling	0,000699	0,283
Active digital customers	Labour & Employment Practices	0,822705	-0,019
Active mobile users	ROA %	0,163232	0,141
Active mobile users	ROE %	0,149812	0,145
Active mobile users	EPS	0,009201	-0,259
Active mobile users	CAR %	0,001973	0,306
Active mobile users	Cost-to-Income Ratio (%)	0	-0,708
Active mobile users	Cost-to-Income Ratio (%)	0	-0,708
Active mobile users	YoY Revenue Growth (%)	0,694927	0,04
Active mobile users	EBITDA	0	0,57
Active mobile users	P/E ratio	0	-0,659
Active mobile users	Sustainable Finance	0,000914	-0,327
Active mobile users	Ethics & Compliance	0,046142	-0,2
Active mobile users	Board Composition	0,011185	-0,253
Active mobile users	Executive Compensation	0,051134	-0,196
Active mobile users	Shareholder Rights	0,000004	-0,443
Active mobile users	Audit	0,945071	0,007
Active mobile users	Marketing & Labelling	0,003275	-0,291
Active mobile users	Labour & Employment Practices	0,396384	-0,086
Tech, communications & equipment expense	ROA %	0	-0,597
Tech, communications & equipment expense	ROE %	0	-0,511
Tech, communications & equipment expense	EPS	0,019627	-0,246
Tech, communications & equipment expense	CAR %	0	-0,57
Tech, communications & equipment expense	Cost-to-Income Ratio (%)	0	0,696
Tech, communications & equipment expense	Cost-to-Income Ratio (%)	0	0,696
Tech, communications & equipment expense	YoY Revenue Growth (%)	0,083108	-0,184
Tech, communications & equipment expense	EBITDA	0	-0,6
Tech, communications & equipment expense	P/E ratio	0,372481	-0,095
Tech, communications & equipment expense	Sustainable Finance	0,509925	0,07
Tech, communications & equipment expense	Ethics & Compliance	0,122708	0,164
Tech, communications & equipment expense	Board Composition	0	-0,727
Tech, communications & equipment expense	Executive Compensation	0,878578	0,016
Tech, communications & equipment expense	Shareholder Rights	0,647991	0,049
Tech, communications & equipment expense	Audit	0,000373	-0,367
Tech, communications & equipment expense	Marketing & Labelling	0,735426	0,036
Tech, communications & equipment expense	Labour & Employment Practices	0,000174	0,386

Source: created by the author

Table 16. Correlation analysis on the impact of the financial and non-financial values on the ESG score for the financial institution's in European region

Bank	Value indicator	p_value	corr
European Banks	EPS	0,417433	0,117245
European Banks	CAR %	0,796993	0,03731
European Banks	Cost-to-Income Ratio (%)	0,029329	-0,30841
European Banks	EBITDA	0,325149	0,142034
European Banks	Board Composition	0,188865	0,18892

European Banks	Executive Compensation	0,187222	0,189611
European Banks	Audit	0,016767	0,33682
European Banks	Labour & Employment Practices	0,000094	0,523997

Source: created by the author

Table 17. Correlation analysis on the direct impact of the Fintech values on the ESG score for the financial institution's in European region

Bank	FinTech indicator	p_value	corr
European Banks	Active digital customers	0,699705	0,073448
European Banks	Active mobile users	0,000413	0,603608
European Banks	Tech, communications & equipment expense	0,378731	0,166662

Source: created by the author

Appendix 3. Correlation analysis on the impact of the Fintech in North American region

Table 18. Correlation analysis on the impact of the Fintech indicators on financial and non-financial values for the financial institution's in North American region

FinTech_indicator	Dependent_var	p_value	corr
Active digital customers	CAR %	0,000028	-0,346
Active digital customers	EBITDA	0,000001	0,394
Active digital customers	Sustainable Finance	0,000092	0,325
Active digital customers	Executive Compensation	0,001657	0,264
Active digital customers	Shareholder Rights	0,000236	0,306
Active digital customers	Audit	0,000004	0,379
Active digital customers	Marketing & Labelling	0,000699	0,283
Active mobile users	EPS	0,009201	-0,259
Active mobile users	CAR %	0,001973	0,306
Active mobile users	Sustainable Finance	0,000914	-0,327
Active mobile users	Ethics & Compliance	0,046142	-0,2
Active mobile users	Board Composition	0,011185	-0,253
Active mobile users	Shareholder Rights	0,000004	-0,443
Active mobile users	Marketing & Labelling	0,003275	-0,291
Tech, communications & equipment expense	EPS	0,019627	-0,246
Tech, communications & equipment expense	Audit	0,000373	-0,367
Tech, communications & equipment expense	Labour & Employment Practices	0,000174	0,386

Source: created by the author

Table 19. Correlation analysis on the impact of the financial and non-financial values on the ESG score for the financial institution's in North American region

Bank	Value indicator	p_value	corr
North American Banks	ROE %	0,0646442	0,263333
North American Banks	CAR %	0,171452	0,19648
North American Banks	EPS	0,072206	0,256465
North American Banks	EBITDA	0,030716	0,305942

North American Banks	Sustainable Finance	9,83E-23	0,931594
North American Banks	Executive Compensation	0,691328	-0,05756
North American Banks	Ethics & Compliance	3,19E-13	0,820103
North American Banks	Shareholder Rights	0,942505	0,010464
North American Banks	Audit	0,002314	0,421273
North American Banks	Marketing & Labelling	0,037124	0,295631
North American Banks	Labour & Employment Practices	0,341301	0,137412

Source: created by the author

Table 20. Correlation analysis on the direct impact of FinTech values on the ESG score for financial institutions in the North American region

Bank	FinTech indicator	p_value	corr
North American banks	Active digital customers	0,00001	0,635672
North American banks	Active mobile users	0,000011	0,633666
North American banks	Tech, communications & equipment expense	0,020019	-0,32808

Source: created by the author

Appendix 4. Correlation analysis on the impact of the Fintech in Asia Pacific region

Table 21. Correlation analysis on the impact of the Fintech indicators on financial and non-financial values for the financial institution's in Asia Pacific region

FinTech_indicator	Dependent_var	p_value	corr
Active digital customers	CAR %	0,000028	-0,346
Active digital customers	EBITDA	0,000001	0,394
Active digital customers	Sustainable Finance	0,000092	0,325
Active digital customers	Board Composition	0	0,444
Active digital customers	Shareholder Rights	0,000236	0,306
Active digital customers	Audit	0,000004	0,379
Active mobile users	CAR %	0,001973	0,306
Active mobile users	Cost-to-Income Ratio (%)	0	-0,708
Active mobile users	EBITDA	0	0,57
Active mobile users	P/E ratio	0	-0,659
Active mobile users	Sustainable Finance	0,000914	-0,327
Active mobile users	Shareholder Rights	0,000004	-0,443

Source: created by the author

Table 22. Correlation analysis on the impact of financial and non-financial values on ESG score for financial institutions in the Asia Pacific region

Bank	Value indicator	p_value	corr
Asia Pacific Banks	EPS	2,09E-10	0,756555
Asia Pacific Banks	CAR %	0,0326459	0,302663
Asia Pacific Banks	Cost-to-Income Ratio (%)	0,0039586	0,400424
Asia Pacific Banks	EBITDA	8,35E-08	0,67348

Asia Pacific Banks	Executive Compensation	5,54E-06	0,593568
Asia Pacific Banks	Sustainable Finance	9,29E-18	0,887381

Source: created by the author

Table 23. Correlation analysis on the direct impact of FinTech values on the ESG score for financial institutions in the Asia Pacific region

Bank	FinTech indicator	p_value	corr
Asia Pacific banks	Active digital customers	0,585746	-0,10364
Asia Pacific banks	Active mobile users	0,793422	0,062525

Source: created by the author

Appendix 5. Correlation analysis on the impact of the Fintech in Latin American region

Table 24. Correlation analysis on the impact of the FinTech indicators on financial and non-financial values for financial institutions in the Latin American region

FinTech_indicator	Dependent_var	p_value	corr
Active digital customers	CAR %	2,80E-05	-0,346
Active digital customers	EBITDA	1,00E-06	0,394
Active digital customers	Sustainable Finance	0,000092	0,325
Active digital customers	Board Composition	0,00E+00	0,444
Active digital customers	Shareholder Rights	2,36E-04	0,306
Active digital customers	Audit	4,00E-06	0,379
Active mobile users	CAR %	0,001973	0,306
Active mobile users	Cost-to-Income Ratio (%)	0,00E+00	-0,708
Active mobile users	Cost-to-Income Ratio (%)	0	-0,708
Active mobile users	EBITDA	0	0,57
Active mobile users	P/E ratio	0,00E+00	-0,659
Active mobile users	Sustainable Finance	9,14E-04	-0,327
Active mobile users	Shareholder Rights	4,00E-06	-0,443
Tech, communications & equipment expense	ROA %	0	-0,597
Tech, communications & equipment expense	ROE %	0,00E+00	-0,511
Tech, communications & equipment expense	CAR %	0	-0,57
Tech, communications & equipment expense	Cost-to-Income Ratio (%)	0	0,696
Tech, communications & equipment expense	Cost-to-Income Ratio (%)	0,00E+00	0,696
Tech, communications & equipment expense	EBITDA	0,00E+00	-0,6
Tech, communications & equipment expense	Board Composition	0,00E+00	-0,727
Tech, communications & equipment expense	Audit	0,000373	-0,367
Tech, communications & equipment expense	Labour & Employment Practices	1,74E-04	0,386

Source: created by the author

Table 25. Correlation analysis on the impact of financial and non-financial values on ESG score for financial institutions in the Latin American region

Bank	Value indicator	p_value	corr
Latin American Banks	CAR %	1,84E-01	0,21426
Latin American Banks	Cost-to-Income Ratio (%)	9,23E-01	0,015884
Latin American Banks	EBITDA	6,06E-04	0,518713
Latin American Banks	P/E ratio	1,43E-08	-0,758526
Latin American Banks	Sustainable Finance	9,85E-04	0,501255

Latin American Banks	Board Composition	2,15E-02	0,362547
Latin American Banks	Marketing & Labelling	1,20E-08	0,760971

Source: created by the author

Table 26. Correlation analysis on the direct impact of FinTech values on the ESG score for financial institutions in the Latin American region

Bank	FinTech indicator	p_value	corr
Latin American banks	Active digital customers	0,000012	0,631526
Latin American banks	Active mobile users	0,00026	0,909728

Source: created by the author

Appendix 6. Correlation analysis on the impact of the Fintech in Latin American region

Table 27. Correlation analysis on the impact of FinTech indicators on financial and non-financial values across all banks

FinTech_indicator	Dependent_var	p_value	corr
Active digital customers	CAR %	0,000028	-0,346
Active digital customers	EBITDA	0,000001	0,394
Active digital customers	Sustainable Finance	0,000092	0,325
Active digital customers	Board Composition	0	0,444
Active digital customers	Shareholder Rights	0,000236	0,306
Active digital customers	Audit	0,000004	0,379
Active mobile users	CAR %	0,001973	0,306
Active mobile users	Cost-to-Income Ratio (%)	0	-0,708
Active mobile users	Cost-to-Income Ratio (%)	0	-0,708
Active mobile users	EBITDA	0	0,57
Active mobile users	P/E ratio	0	-0,659
Active mobile users	Shareholder Rights	0,000004	-0,443
Tech, communications & equipment expense	ROA %	0	-0,597
Tech, communications & equipment expense	ROE %	0	-0,511
Tech, communications & equipment expense	CAR %	0	-0,57
Tech, communications & equipment expense	Cost-to-Income Ratio (%)	0	0,696
Tech, communications & equipment expense	Cost-to-Income Ratio (%)	0	0,696
Tech, communications & equipment expense	EBITDA	0	-0,6
Tech, communications & equipment expense	Board Composition	0	-0,727
Tech, communications & equipment expense	Audit	0,000373	-0,367
Tech, communications & equipment expense	Labour & Employment Practices	0,000174	0,386

Source: created by the author

Table 28. Correlation analysis on the impact of financial and non-financial values on ESG score for financial institutions across all regions

Bank	Value indicator	p_value	corr
All Banks	ROA %	0,608148	0,037431
All Banks	CAR %	0,070221	0,131643
All Banks	Cost-to-Income Ratio (%)	0,046273	0,144772
All Banks	EBITDA	0,000772	0,241907
All Banks	P/E ratio	0,313767	0,073467
All Banks	Sustainable Finance	8,91E-42	0,78984
All Banks	Board Composition	0,000228	0,264353

All Banks	Shareholder Rights	2,34E-05	0,301647
All Banks	Audit	0,001763	0,225448
All Banks	Labour & Employment Practices	4,37E-08	0,384377

Source: created by the author

Table 29. Correlation analysis on the direct impact of FinTech values on the ESG score for financial institutions across four regions

Bank	FinTech indicator	p_value	corr
All Banks	Active digital customers	0,000545	0,288586
All Banks	Active mobile users	0,000011	-0,42357
All Banks	Tech, communications & equipment expense	0,634056	0,050856

Source: created by the author