

Financial Value through ESG Compliance: Unpacking the RegTech Advantage in the Finance Sector

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Abstract:

This study explores the impact of Regulatory Technology (RegTech) adoption on ESG compliance and financial performance within financial institutions, in the context of growing regulatory demands for standardized sustainability reporting.

Using a panel dataset of 250 firms from 2018 to 2025, the research employs a difference-in-differences (DiD) approach and panel regression models to assess how digital compliance tools, such as AI-powered analytics and blockchain-based reporting systems, enhance regulatory adherence. The results show that RegTech adoption significantly improves ESG compliance efficiency, increases reporting transparency, and contributes to higher financial performance.

The findings also reveal that firm size moderates these outcomes, with larger institutions experiencing stronger benefits. The study offers actionable insights for financial institutions, policymakers, and RegTech providers seeking to support the sustainability transition through digital innovation and regulatory standardization.

Keywords: RegTech, sustainable finance, ESG compliance, digitalization, financial regulations.

Classification JEL: B41, G32, Q56, O33

Paper type: Empirical Research

Résumé :

Cette étude examine l'impact de l'adoption des technologies de régulation (RegTech) sur la conformité ESG et la performance financière des institutions financières, dans un contexte marqué par des exigences réglementaires croissantes en matière de reporting en développement durable standardisé.

En s'appuyant sur un panel de 250 entreprises observées entre 2018 et 2025, la recherche mobilise une approche en différences de différences (DiD) ainsi que des modèles de régression sur données de panel, afin d'évaluer dans quelle mesure les outils de conformité numérique, tels que les systèmes d'analyse alimentés par l'IA ou les plateformes de reporting basées sur la blockchain, renforcent l'alignement réglementaire.

Les résultats montrent que l'adoption des solutions RegTech améliore significativement l'efficacité de la conformité ESG, accroît la transparence des rapports, et contribue à une meilleure performance financière. Ils révèlent également que la taille des entreprises modère ces effets, les institutions de grande envergure bénéficiant davantage de ces technologies.

Cette étude fournit des pistes concrètes pour les institutions financières, les décideurs publics et les fournisseurs de solutions RegTech désireux de soutenir la transition durable à travers l'innovation numérique et l'harmonisation réglementaire.

Mots clés : RegTech, finance durable, conformité ESG, digitalisation, régulation financière.

JEL Classification : B41, G32, Q56, O33

Type du papier : Recherche empirique

1. Introduction

The growing emphasis on environmental, social, and governance (ESG) factors has significantly transformed financial markets, urging institutions to integrate sustainable practices while adhering to evolving regulatory frameworks. Key directives such as the EU's Sustainable Finance Disclosure Regulation (SFDR), the Task Force on Climate-related Financial Disclosures (TCFD), and the Principles for Responsible Investment (PRI) have intensified demands for transparency, accountability, and standardization in ESG reporting. Yet, aligning with these frameworks poses challenges, including regulatory fragmentation, data complexity, and cross-border discrepancies (Fatemi et al., 2018; Busch et al., 2021; European Commission, 2021).

In response, Regulatory Technology (RegTech) has emerged as a powerful enabler of sustainable finance. Leveraging artificial intelligence (AI), blockchain, and big data analytics, RegTech solutions streamline compliance processes, automate reporting, and enhance data integrity (Arner et al., 2017; Zetzsche et al., 2017; Charoenwong et al., 2024). These technologies allow institutions to monitor ESG risks in real time, improve disclosure accuracy, and reduce compliance costs, making RegTech a strategic asset in navigating increasingly complex sustainability regulations (Gomber et al., 2017; Chao et al., 2022).

Existing literature highlights how digitalization, through both FinTech and RegTech, drives efficiency and transparency in financial services (Basole & Patel, 2018; Campanella et al., 2022; Kraus et al., 2021). AI-based tools improve ESG disclosures by automating risk assessments and identifying reporting inconsistencies (Bousrih, 2023; Deloitte, 2021), while blockchain reinforces traceability and combats greenwashing, thus strengthening investor confidence (Cumming et al., 2022; European Banking Authority, 2021).

However, several limitations remain. The absence of standardized ESG data frameworks, regulatory divergence across jurisdictions, and concerns over data privacy and cybersecurity hinder RegTech's universal application (Ghiotto et al., 2023; McCarthy, 2022; Grassi & Lanfranchi, 2022). Additionally, rapid regulatory evolution demands continuous updates, and implementation costs may burden smaller institutions (PwC, 2022; Benmoussa, 2019; Muganyi et al., 2022).

This study investigates the following research question: To what extent does RegTech adoption improve ESG compliance and financial performance within sustainability-focused financial institutions? By examining this intersection, the paper aims to assess the role of digital compliance tools in enhancing regulatory efficiency and standardizing ESG reporting.

This study makes three key contributions to the literature and practice of sustainable finance. First, it provides robust empirical evidence, using a difference-in-differences (DiD) approach, on the causal impact of RegTech adoption on ESG compliance and financial performance. Second, it bridges the gap between financial digitalization and sustainability disclosure by positioning RegTech as a harmonizing force in ESG reporting practices. Third, it offers actionable insights for financial institutions, regulators, and RegTech providers navigating the sustainability transition.

To our knowledge, this is one of the first empirical studies to jointly examine RegTech, ESG compliance, and financial outcomes using longitudinal panel data from financial institutions across North America, Europe, and Asia-Pacific. By integrating regulatory technology with sustainable finance analytics, the study reveals how digital compliance infrastructure can both meet regulatory demands and support long-term value creation in a global context.

The remainder of this paper is organized as follows: Section 2 outlines the methodology and data sources. Section 3 details the conceptual and theoretical frameworks and formulates the research hypotheses. Section 4 presents the empirical results. Section 5 provides a discussion of

the findings in relation to existing literature and theoretical models. Finally, Section 6 concludes the study by highlighting its key implications and directions for future research.

2. Literature Review

2.1. RegTech and Financial Regulation

Early studies conceptualized RegTech as a technological response to increasing regulatory complexity in financial services (Arner et al., 2017; Zetsche et al., 2017). Research highlights its potential in automating compliance, enhancing monitoring, and reducing regulatory costs (Gomber et al., 2017; Chao et al., 2022). Recent contributions emphasize the role of RegTech in preventing misconduct and strengthening financial stability (Jeyasingh, 2023; Charoenwong et al., 2024).

2.2. ESG Compliance and Disclosure Challenges

The literature shows a growing demand for standardized ESG reporting, driven by frameworks such as SFDR, TCFD, GRI, and SASB (European Commission, 2021; Busch et al., 2021). However, compliance is hindered by fragmented regulations, data inconsistency, and high implementation costs (Ghiotto et al., 2023; McCarthy, 2022). These challenges raise concerns over greenwashing and disclosure quality (Cumming et al., 2022).

2.3. Digitalization and ESG Reporting

Digital tools, particularly AI and blockchain, are found to improve ESG disclosure accuracy, mitigate information asymmetry, and strengthen investor trust (Deloitte, 2021; Bousrih, 2023). Blockchain enhances traceability and accountability, while AI-based analytics automate risk assessment and reporting (Cumming et al., 2022; European Banking Authority, 2021). Still, cybersecurity and privacy risks remain barriers to large-scale adoption (Grassi & Lanfranchi, 2022; PwC, 2022).

2.4. RegTech, ESG, and Financial Performance

Empirical studies suggest that ESG compliance contributes positively to firm value (Fatemi et al., 2018; Liang & Renneboog, 2021), while digitalization supports efficiency and competitiveness (Kraus et al., 2021). Yet, research directly linking RegTech adoption to ESG compliance and financial performance remains scarce. Few works, such as Muganyi et al. (2022) and Charoenwong et al. (2024), provide preliminary evidence of profitability and operational benefits, but large-scale empirical validation is lacking.

3. Hypothesis Development

This section develops the study's hypotheses by integrating a conceptual framework and several theoretical perspectives. The conceptual model outlines the relationships between RegTech adoption, ESG compliance, and financial performance, while the theoretical framework draws from Institutional Theory, TAM, Stakeholder Theory, and the Resource-Based View to explain firm behavior.

3.1. Conceptual Framework

The conceptual framework posits that RegTech adoption, through tools such as AI-driven monitoring, blockchain, and automated reporting, enhances ESG disclosure accuracy, reduces compliance costs, and supports financial outcomes. Firms leveraging these technologies are expected to align more effectively with global frameworks like SFDR and TCFD, thereby improving transparency and meeting stakeholder expectations.

In turn, enhanced ESG compliance may lead to stronger financial performance, measured by indicators such as ROA, ROE, and stock returns. These outcomes are amplified in firms with adequate infrastructure, digital readiness, and exposure to stringent regulatory environments. Although the framework assumes a positive linkage, it also considers possible barriers, including regulatory complexity, interoperability issues, and implementation costs, especially for small and mid-sized institutions. A summary of the most relevant regulations and their implications for RegTech adoption is presented in Table 1.

Table 1: Summary of Key Regulations Relevant to ESG Compliance and RegTech

Regulation	Jurisdiction	Description	Implications for RegTech
Sustainable Finance Disclosure Regulation (SFDR)	European Union	Mandates disclosure of ESG risks and the sustainability impact of investments.	RegTech streamlines data collection, risk evaluation, and compliance tracking.
Task Force on Climate-related Financial Disclosures (TCFD)	Global (voluntary)	Recommends reporting on climate-related risks and opportunities.	Enables automated reporting and analytics to support climate disclosures.
Global Reporting Initiative (GRI)	Global (voluntary)	Offers a universal framework for sustainability reporting.	Facilitates standardized data collection and efficient report generation.
Sustainability Accounting Standards Board (SASB)	Global (voluntary)	Provides industry-specific ESG disclosure standards.	Supports customized reporting templates and compliance monitoring.
EU Taxonomy Regulation	European Union	Defines criteria for environmentally sustainable economic activities.	Assists in evaluating taxonomy alignment and tracking sustainable activities.
Non-Financial Reporting Directive (NFRD)	European Union	Requires large companies to report on ESG and diversity metrics.	Automates data aggregation and supports traceable audit trails.
Corporate Sustainability Reporting Directive (CSRD)	European Union	Expands the scope and detail of ESG reporting requirements.	Manages complex data integration and facilitates regulatory compliance.
SEC Climate Disclosure Rules	United States	Requires climate risk disclosures from listed companies.	Supports risk modeling and disclosure preparation aligned with SEC guidelines.
Principles for Responsible Banking (PRB)	Global (voluntary)	Encourages alignment of banking strategies with SDGs and the Paris Agreement.	Enables monitoring and reporting on ESG commitments.
FCA ESG Guidelines	United Kingdom	Provides ESG risk management and disclosure guidance.	Offers real-time tracking and automated compliance documentation.

Source: Authors

This table provides an overview of major regulatory frameworks and reporting standards that shape ESG compliance obligations for financial institutions, along with the corresponding role of RegTech in facilitating adherence. Understanding these regulations is critical for evaluating the effectiveness of digital compliance tools in advancing standardization and sustainability. Following selection, the 83 studies were subjected to a structured thematic analysis to uncover dominant trends, application domains, and conceptual patterns. A detailed data extraction matrix was developed to capture key attributes from each study, including publication year, geographical focus, AI techniques employed, sustainability dimensions addressed, research design, and theoretical framework applied.

This analytical process enabled the classification of findings into coherent thematic areas, such as ESG reporting automation, sustainability risk management, resource and capital

optimization, and predictive analytics. It also facilitated the identification of recurring benefits, such as improved transparency, operational efficiency, and stakeholder trust, as well as persistent challenges, including ethical concerns, fragmented data, and regulatory ambiguity.

Data extraction and analysis were facilitated using Microsoft Excel for coding and classification, and The R Project for Statistical Computing for bibliometric mapping and cooccurrence analysis of keywords. This enhanced the systematic identification of dominant themes and theoretical frameworks across the reviewed literature, ensuring analytical rigor and replicability.

Through this synthesis, the review not only provides a comprehensive understanding of how AI is transforming sustainable financial governance, but also highlights critical theoretical and empirical gaps, offering valuable direction for future research.

While the conceptual framework posits a positive link between RegTech adoption and ESG compliance, it also acknowledges potential challenges such as the complexity of regulatory requirements, resource constraints, and uncertainties in the regulatory environment. These factors may moderate the relationship and influence the degree of success achieved through RegTech adoption.

3.2. Theoretical Framework

The theoretical framework of this study is built upon several well-established theories that explain the adoption of regulatory technology and its potential impact on ESG compliance and financial performance. These theories provide valuable insights into why firms adopt RegTech solutions and how they can leverage them for competitive advantage.

Institutional Theory posits that financial institutions adopt RegTech solutions in response to external pressures from regulatory bodies, investors, and society at large to conform to evolving sustainability norms (DiMaggio & Powell, 1983). The increasing regulatory scrutiny and demand for greater transparency in ESG disclosures drive firms to implement technology solutions that ensure compliance and align their operations with industry standards. Firms that fail to comply may face reputational risks and financial penalties, making RegTech adoption a strategic necessity.

The Technology Acceptance Model (TAM), developed by Davis (1989), suggests that organizations are more likely to adopt new technologies based on their perceived usefulness and ease of use. Financial institutions that recognize RegTech as an efficient and user-friendly solution to compliance challenges are more inclined to integrate it into their operations. The model highlights that successful adoption depends on how well RegTech solutions address the practical needs of firms in terms of automation, cost reduction, and regulatory adherence.

Stakeholder Theory, proposed by Freeman (1984), emphasizes the importance of balancing the interests of multiple stakeholders, including investors, regulators, customers, and employees. Firms that adopt RegTech solutions can demonstrate their commitment to transparency, accountability, and sustainability, thereby enhancing stakeholder trust and improving their market reputation. Compliance with ESG standards is increasingly becoming a key determinant of investment decisions, making RegTech a strategic enabler of long-term stakeholder engagement.

The Resource-Based View (RBV), introduced by Barney (1991), argues that firms that leverage advanced technological capabilities can achieve a sustainable competitive advantage. RegTech solutions, when effectively integrated, provide firms with a unique capability to manage compliance more efficiently than their competitors. By optimizing compliance operations, reducing costs, and improving risk management, firms can enhance their financial performance and position themselves as leaders in sustainable finance.

By combining insights from these theoretical perspectives, this study establishes a comprehensive foundation for understanding the relationship between RegTech adoption, ESG compliance, and financial performance. These frameworks help in explaining the rationale

behind firms' decisions to adopt RegTech solutions and the potential outcomes they can achieve through the effective implementation.

3.3. Research Hypotheses

Drawing from the existing literature, this study explores the relationship between regulatory technology (RegTech) and ESG compliance, focusing on the potential positive, negative, and neutral impacts on firms' ability to meet disclosure requirements, reporting accuracy, and financial performance. The following hypotheses are proposed:

H1: RegTech solutions significantly enhance firms' ability to meet ESG disclosure requirements.

Automation and real-time analytics improve compliance accuracy and reduce costs. However, effectiveness may vary based on firms' digital maturity and the complexity of ESG criteria. Misalignment with evolving standards and lack of governance can diminish outcomes (Zetzsche et al., 2017; Busch et al., 2021; Aizawa et al., 2021).

H2: Digital compliance tools improve the accuracy and transparency of ESG reporting.

AI and blockchain increase reporting reliability and traceability, aligning firms with global standards (e.g., GRI, SASB). Yet, fragmented regulations and over-reliance on automated systems may undermine consistency and contextual interpretation (Gomber et al., 2017; Liang & Renneboog, 2021).

H3: The adoption of RegTech correlates positively with improved financial performance in sustainability-focused firms.

RegTech-driven ESG credibility attracts responsible investors, reduces penalties, and enhances operational efficiency. However, SMEs may face delayed benefits due to high adoption costs, while tech failures or poor integration may introduce financial risks (Fatemi et al., 2018; Fu et al., 2024).

4. Method

4.1. Research Design

This study adopts a quantitative and longitudinal research design to assess the impact of RegTech adoption on ESG compliance and financial performance among sustainability-focused financial institutions. Covering the period from 2018 to 2025, the analysis examines trends over time using a panel dataset of 250 firms from the banking, insurance, and asset management sectors.

To capture the causal effect of RegTech, the study employs a difference-in-differences (DiD) approach within a quasi-experimental framework. This method compares firms that adopted RegTech between 2020 and 2021 (treatment group) with similar firms that did not adopt such tools (control group). Comparability is ensured by matching firms based on size, leverage, and geographic region. The year 2020 is treated as the intervention point, reflecting major regulatory shifts such as the SFDR and TCFD.

The DiD specification is as follows:

$$Y_{it} = \alpha + \beta_1(\text{RegTech}_i \times \text{Post}_t) + \beta_2 X_{it} + \gamma_i + \delta_t + \epsilon_{it}$$

Where:

- Y_{it} is the ESG compliance score or financial indicator (ROA, ROE) for firm i at time t
- RegTech_i is a binary indicator (1 if the firm adopted RegTech)
- Post_t equals 1 for years after 2020

- X_{it} includes firm-level controls (e.g., size, leverage, market conditions)
- γ_i and δ_t represent firm and year fixed effects
- ε_{it} is the error term

The parallel trends assumption is tested both visually (pre-treatment trends) and statistically (placebo regressions) to ensure robustness. The model isolates the average treatment effect of RegTech implementation on ESG and financial outcomes.

Additionally, sector-level comparisons are conducted to explore differences in RegTech impact across financial subsectors. This enables a more nuanced understanding of how institutional context influences the effectiveness of digital compliance tools.

4.2. Data Collection

This study relies exclusively on secondary data sources to ensure objectivity, comparability, and methodological consistency. The dataset spans from 2018 to 2025 and includes 250 financial institutions, banks, insurance companies, and asset managers, selected based on the availability of ESG disclosures and documented RegTech adoption.

Primary data were extracted from corporate sustainability reports aligned with recognized frameworks such as the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB), and the Task Force on Climate-related Financial Disclosures (TCFD). These sources provided standardized metrics on environmental, social, and governance practices. Additional compliance data were obtained from regulatory filings submitted to bodies such as the European Securities and Markets Authority (ESMA) and the U.S. Securities and Exchange Commission (SEC), particularly in relation to SFDR and climate-related disclosure mandates.

To enhance the robustness of the analysis, the study integrated ESG ratings and financial indicators from proprietary databases including Bloomberg ESG, Refinitiv ESG, and MSCI ESG Ratings. These sources enabled the construction of consistent ESG compliance and performance measures. Reports from RegTech solution providers further supplemented the dataset by offering insights into adoption timelines and implementation challenges.

Firms were matched across data sources using unique identifiers such as ISIN codes and standardized company names. Observations with non-critical missing values were imputed using sectoral medians, while cases affecting dependent variables were excluded via listwise deletion. The final balanced panel includes institutions from North America, Europe, and Asia-Pacific, enabling comparative analysis across regulatory environments and market structures.

4.3. Variable Measurement

To empirically assess the impact of RegTech adoption on ESG compliance and financial performance, this study considers three categories of variables: independent, dependent, and control variables. These variables are selected based on their relevance in measuring the effectiveness of RegTech solutions in improving ESG reporting and financial outcomes.

The independent variable in this study is RegTech Adoption (RTA), which serves as the primary factor influencing ESG compliance and financial performance. RegTech adoption is measured as a binary variable, where firms that have implemented RegTech solutions for ESG compliance receive a value of 1, and those that have not are assigned a value of 0. This binary classification enables a straightforward comparison between adopters and non-adopters, facilitating the identification of differences in compliance effectiveness and financial performance across firms. The dependent variables focus on two critical aspects: ESG compliance and financial performance. ESG Compliance (ESGC) is measured using an ESG compliance index that evaluates firms based on their disclosure accuracy, timeliness, and alignment with regulatory frameworks such as the Sustainable Finance Disclosure Regulation (SFDR) and the Task Force

on Climate-related Financial Disclosures (TCFD). This index aggregates compliance scores from publicly available ESG reports and regulatory filings to quantify the extent to which firms meet sustainability reporting requirements. A higher ESGC score indicates better compliance with regulatory expectations and greater transparency in sustainability reporting.

Financial performance is another key dependent variable, assessed through widely recognized financial ratios such as Return on Assets (ROA), Return on Equity (ROE), and stock performance. These indicators provide a comprehensive evaluation of a firm’s financial health and profitability. ROA measures how efficiently a firm utilizes its assets to generate earnings, while ROE reflects the profitability relative to shareholders' equity. Stock performance is analyzed over the study period to capture market perceptions of firms’ sustainability efforts and regulatory compliance.

To control for potential confounding factors that may influence the relationship between RegTech adoption, ESG compliance, and financial performance, the study incorporates several control variables.

Table 2: Control Variables and Their Measurement

Control Variable	Measurement
Firm size	Measured as the natural logarithm of total assets, to account for differences in resource availability and capacity to invest in RegTech solutions.
Leverage ratio	Calculated as total debt divided by total assets, to control for financial risk and capital structure differences that may affect compliance capabilities.
Market conditions	Represented by macroeconomic indicators such as GDP growth and inflation, which can influence firms’ financial performance and regulatory priorities.
Industry type	Categorized into banking, insurance, and asset management sectors, to capture sector-specific dynamics and regulatory variations that may impact ESG compliance and financial outcomes.

Source: Authors

By incorporating these carefully selected variables, the study ensures a robust analytical framework that captures the multidimensional impact of RegTech adoption on ESG compliance and financial performance. The inclusion of control variables further enhances the validity of the findings by mitigating potential biases arising from firm-specific and external factors.

5. Results

This section presents the results of the empirical analysis assessing the impact of RegTech adoption on ESG compliance and financial performance. The findings are organized around the study’s three hypotheses and are supported by descriptive statistics, regression analysis, and robustness checks.

5.1 Descriptive Statistics

Table 3 presents the summary statistics of the main variables used in the analysis. Additional details on the distribution, variability, and sample characteristics are provided in Appendix 1. On average, 65% of firms in the sample adopted RegTech solutions between 2020 and 2021. RegTech adopters exhibit a higher mean ESG compliance score (78 vs. 62 for non-adopters) and stronger financial performance metrics : Return on Assets (ROA) of 5.2% and Return on Equity (ROE) of 12.4%, compared to 3.8% and 9.7%, respectively.

This table presents summary statistics for the main variables used in the empirical analysis. The descriptive measures help assess the distribution, central tendencies, and variability of the dataset, supporting the robustness of the econometric model.

The descriptive statistics reveal several important trends within the sample. The average ESG compliance score is 72.35, with a standard deviation of 12.68, indicating a moderate degree of

variability in reporting quality across firms. RegTech adoption is observed in 65% of the institutions, reflecting a growing shift toward digital compliance solutions in the financial sector. Financial performance, measured by ROA and ROE, appears relatively stable, with slightly higher values reported among RegTech adopters. Firm size shows considerable variation, highlighting differences in institutional capacity and resource availability for implementing technological solutions. Meanwhile, leverage ratios are moderately concentrated around the mean, and GDP growth exhibits limited variation, suggesting relatively consistent macroeconomic conditions across the observation period.

Table 3: Descriptive Statistics of Key Variables

Variables	Mean	Standard Deviation	Minimum	Maximum	Observations
ESG Compliance Score	72.35	12.68	45.00	95.00	250
Return on Assets (ROA)	4.72%	1.56%	1.50%	8.30%	250
Return on Equity (ROE)	11.28%	3.21%	5.00%	18.40%	250
RegTech Adoption (Binary)	0.65	0.48	0	1	250
Firm Size (Total Assets, in billion USD)	58.40	22.90	10.20	150.30	250
Leverage Ratio	0.41	0.12	0.10	0.72	250
Market Conditions (GDP Growth %)	2.80	0.92	0.50	5.40	250

Source: Authors

5.2 Regression Results

Before conducting the regression analysis, we examined the relationships between key variables. The correlation matrix, presented in Appendix 2, confirms the expected positive associations between RegTech adoption, ESG compliance, and financial performance.

The table below displays Pearson correlation coefficients between the main variables included in the analysis. The matrix helps identify potential relationships between RegTech adoption, ESG compliance, financial performance, and firm characteristics.

Table 4: Correlation Matrix

Variables	ESG Compliance	ROA	ROE	RegTech Adoption	Firm Size	Leverage Ratio	Market Conditions
ESG Compliance	1.000	0.425	0.398	0.611	0.509	-0.312	0.278
ROA	0.425	1.000	0.743	0.432	0.320	-0.210	0.190
ROE	0.398	0.743	1.000	0.469	0.337	-0.195	0.217
RegTech Adoption	0.611	0.432	0.469	1.000	0.578	-0.289	0.300
Firm Size	0.509	0.320	0.337	0.578	1.000	-0.251	0.360
Leverage Ratio	-0.312	-	-	-0.289	-0.251	1.000	-0.120
Market Conditions	0.278	0.190	0.217	0.300	0.360	-0.120	1.000

Source: Authors

The correlation analysis provides valuable insights into the relationships between RegTech adoption, ESG compliance, and firm characteristics. RegTech adoption exhibits a strong positive correlation with ESG compliance (0.611), indicating that firms utilizing digital compliance tools tend to achieve higher reporting quality. ESG compliance is also moderately correlated with financial performance indicators, ROA and ROE, suggesting that stronger compliance practices may contribute to improved profitability. Additionally, firm size shows a positive association with

both RegTech adoption and ESG scores, highlighting the role of organizational capacity in enabling digital transformation and sustainability efforts. In contrast, leverage ratios are negatively correlated with both financial performance and ESG compliance, implying that highly leveraged firms may face resource constraints that limit their ability to invest in advanced compliance technologies and sustainability initiatives.

Table 5 also summarizes the main regression results from the difference-in-differences (DiD) model. The coefficient for the interaction term RegTech × Post is positive and statistically significant across all dependent variables:

Table 5 summarizes the main regression results from the difference-in-differences (DiD) model.

Dependent Variable	Coefficient (β)	p-value
ESG Compliance Score	0.42	< 0.01
Return on Assets (ROA)	0.27	< 0.05
Return on Equity (ROE)	0.33	< 0.01

Source: Authors

These findings provide strong empirical support for:

- Hypothesis 1 (H1): RegTech solutions significantly enhance firms' ability to meet ESG disclosure requirements.
- Hypothesis 2 (H2): Digital compliance tools improve the accuracy and transparency of ESG reporting.
- Hypothesis 3 (H3): The adoption of RegTech correlates positively with improved financial performance.

The results also align with the Resource-Based View (RBV), which suggests that the ability to deploy RegTech can offer a competitive advantage by improving internal capabilities and reducing compliance-related inefficiencies. Moreover, improvements in ESG compliance align with Institutional Theory, as firms respond to regulatory and normative pressures for standardization. The significant financial gains observed further support the Technology Acceptance Model (TAM), as firms clearly perceive RegTech tools as useful and performance-enhancing.

Additionally, interaction terms indicate that firm size moderates the relationship between RegTech adoption and compliance outcomes. Larger institutions benefit more significantly from RegTech, likely due to superior infrastructure, data management capacity, and digital readiness.

5.3 Robustness Checks

To ensure the validity of the results, a series of robustness tests were conducted:

Alternative model specifications using both fixed-effects and random-effects yielded consistent results across models.

Placebo tests using pre-treatment years confirmed the parallel trends assumption, reinforcing the causal interpretation of the DiD estimates.

Subsample analysis by firm size revealed that larger firms benefit more significantly from RegTech adoption, while smaller firms may experience more implementation challenges. These findings are consistent with previous research (e.g., Aizawa et al., 2021).

Table 6 summarizes the robustness results and confirms the stability of the coefficients under various specifications.

Specification	ESG Compliance	ROA	ROE
Fixed Effects	0.41 (***)	0.26*	0.32**
Random Effects	0.43 (***)	0.27*	0.33**
Placebo (pre-treatment)	Not significant	N/A	N/A
Large Firms Only	0.48 (***)	0.31*	0.36**

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$;

Source: Authors

These robust results confirm the study's central claim: RegTech plays a significant role in enhancing ESG disclosure quality, supporting the standardization of sustainability practices, and improving financial performance within the financial sector.

5.4. Summary of Findings

The results confirm that Regulatory Technology (RegTech) plays a transformative role in advancing ESG compliance and financial performance. Firms adopting RegTech report significantly higher ESG scores and improved profitability, highlighting the value of digital tools in streamlining sustainability reporting and enhancing transparency.

These benefits, however, are unevenly distributed. Larger firms and those in heavily regulated sectors like banking and asset management gain the most, reflecting their greater capacity to integrate complex compliance technologies. Nonetheless, challenges remain, particularly for smaller institutions, such as high implementation costs, fragmented regulations, and data integration risks. Addressing these barriers is essential to fully realizing RegTech's potential in supporting sustainable finance.

In sum, RegTech emerges as a strategic enabler of resilience, efficiency, and long-term value creation in an increasingly ESG-driven financial landscape.

6. Discussion

This study provides empirical evidence on the role of Regulatory Technology (RegTech) in advancing ESG compliance and financial performance. The results confirm that RegTech adoption significantly improves firms' ability to meet sustainability disclosure requirements and boosts profitability, particularly through enhanced ROA and ROE, supporting Hypotheses H1 and H2.

Firms using RegTech tools demonstrate higher ESG compliance scores (78 vs. 62), reflecting better data accuracy, timeliness, and alignment with standards like SFDR and TCFD. These findings align with Institutional Theory, which emphasizes regulatory pressure as a catalyst for technological adoption (DiMaggio & Powell, 1983), and TAM, which underlines perceived usefulness and ease of integration (Davis, 1989).

On the financial side, adopters report stronger returns, ROA at 5.2% and ROE at 12.4%, compared to non-adopters. This supports the Resource-Based View (RBV) (Barney, 1991), as RegTech capabilities appear to offer competitive advantages through improved efficiency and compliance cost reduction. By embedding these technologies, firms not only mitigate risks but also signal credibility to ESG-conscious investors.

However, the impact is not uniform across all institutions. The benefits are more pronounced among larger firms, which typically have the infrastructure and resources needed for successful implementation. Smaller firms, in contrast, face barriers such as cost constraints, fragmented regulations, and limited internal capacity, partially limiting support for H3. These asymmetries mirror prior findings (Aizawa et al., 2021) and highlight the importance of digital readiness in realizing RegTech's full value. The findings also reinforce Stakeholder Theory (Freeman, 1984): enhanced ESG transparency fosters trust, strengthens market reputation, and meets rising investor expectations.

Despite these promising outcomes, several systemic challenges remain: regulatory misalignment across jurisdictions, data integration difficulties, and cybersecurity risks. These issues may hinder RegTech scalability and adoption, especially for SMEs. To address this, regulators should harmonize ESG disclosure frameworks, while RegTech providers must offer adaptable, user-friendly solutions.

In practical terms, a phased and modular approach to RegTech adoption is recommended. Firms should align implementation with internal capacity and ensure collaboration between

compliance, IT, and risk teams. Cross-sector partnerships, with regulators, tech developers, and industry groups, will also be essential to promote interoperability and reduce deployment friction.

In summary, RegTech is a strategic enabler of both regulatory efficiency and financial resilience. Yet, to fully unlock its potential, the ecosystem must overcome fragmentation and ensure inclusive, scalable innovation. Future research should explore emerging technologies, such as generative AI, predictive analytics, and decentralized architectures, as drivers of the next phase in ESG compliance evolution.

6.1. Practical Implications

The findings of this study have several practical implications for financial institutions, policymakers, and RegTech providers engaged in the sustainability transition. For financial institutions, RegTech emerges as a strategic investment to improve ESG compliance, reduce operational risks, and strengthen financial performance. Large organizations, benefiting from more robust digital infrastructure, are better positioned to implement fully integrated solutions that automate reporting, enhance data accuracy, and streamline governance processes. Conversely, smaller institutions should consider phased implementation strategies that balance costs with internal capability development, allowing them to progressively adopt RegTech without overwhelming financial or technical resources.

For policymakers and regulatory authorities, the study underscores the urgency of harmonizing ESG disclosure frameworks across jurisdictions and financial sectors. Clear, consistent, and aligned regulatory standards, particularly regarding ESG metrics and reporting formats, are essential to facilitate broader adoption of RegTech solutions. Additionally, public policy initiatives such as fiscal incentives, technical support programs, or regulatory sandboxes could help remove barriers for small and medium-sized enterprises (SMEs), enabling more inclusive participation in the digital compliance ecosystem.

RegTech providers, for their part, must respond to the growing demand for solutions that are both scalable and adaptable. Platforms should be designed to integrate seamlessly with existing financial systems, offering modular features that allow institutions to tailor tools according to their specific compliance needs and sectoral requirements. User experience, interoperability, and data security will be critical success factors for widespread adoption. Providers that prioritize customization, onboarding support, and regulatory adaptability will be better positioned to serve a diverse client base navigating ESG complexity.

6.2 Theoretical Contributions

This research also makes important theoretical contributions to the literature at the intersection of digital transformation and sustainable finance. First, it reinforces the relevance of Institutional Theory by showing that RegTech adoption is largely a response to growing external pressures from regulators, investors, and civil society. The findings demonstrate how firms use digital tools to meet emerging expectations around ESG transparency, legitimacy, and compliance (DiMaggio & Powell, 1983). Second, the study extends the Technology Acceptance Model (TAM) by highlighting the central role of perceived usefulness and ease of use in driving RegTech adoption. Financial institutions that view RegTech solutions as efficient, cost-reducing, and operationally manageable are more likely to implement them, especially in environments marked by regulatory volatility (Davis, 1989). Third, the results lend further support to Stakeholder Theory, illustrating how improved ESG disclosure enabled by RegTech can foster trust among investors, regulators, customers, and employees. Transparency and accountability, facilitated by digital tools, enhance corporate reputation and stakeholder engagement (Freeman, 1984).

Finally, this research strengthens the application of the Resource-Based View (RBV) by positioning RegTech as a strategic capability. When effectively integrated, RegTech becomes a valuable and hard-to-replicate resource that contributes to compliance efficiency, risk mitigation, and competitive advantage (Barney, 1991). Collectively, these theoretical insights provide a multidimensional framework to understand how digital compliance infrastructure enables firms to align with ESG standards while improving strategic and financial outcomes.

6.3. Limitations and Future Research Directions

This study, while offering valuable insights into the impact of RegTech on ESG compliance and financial performance, presents certain limitations. Relying solely on secondary data may introduce self-reporting biases and limit the depth of organizational insights; future research could integrate qualitative methods to explore user experiences and implementation challenges. The focus on financial institutions, although justified by their regulatory exposure, restricts generalizability; examining non-financial sectors would broaden understanding. Additionally, while the DiD approach ensures causal robustness, more advanced techniques, such as machine learning, could refine risk prediction and long-term impact analysis. Finally, future studies should investigate how global frameworks like the EU taxonomy or ISSB influence RegTech adoption across regulatory systems, emphasizing the role of legal harmonization and cross-border interoperability.

7. Conclusion

This study investigated the impact of Regulatory Technology (RegTech) adoption on ESG compliance and financial performance within the financial sector. The empirical findings offer strong support for the positive role of RegTech in enhancing the efficiency, accuracy, and transparency of sustainability-related disclosures. Firms that implement RegTech solutions report significantly higher ESG compliance scores and improved financial performance, as measured by Return on Assets (ROA) and Return on Equity (ROE). These outcomes demonstrate that digital compliance tools are not only instrumental in meeting evolving regulatory requirements but also in driving competitive advantage.

RegTech enables financial institutions to streamline ESG reporting through automated data management, AI-powered monitoring, and real-time analytics. These tools help ensure consistency, reduce operational costs, and improve firms' capacity to respond to complex and dynamic regulatory demands. As a result, RegTech adopters are better positioned to align with global disclosure standards and appeal to ESG-conscious investors.

However, the study also highlights critical challenges that could limit the broader adoption of RegTech, particularly among smaller firms. High implementation costs, regulatory fragmentation across jurisdictions, and technical integration complexities remain persistent barriers. Overcoming these challenges will require coordinated efforts among financial institutions, policymakers, and RegTech developers to design scalable, cost-effective, and interoperable solutions.

From a policy perspective, regulatory harmonization is essential to facilitate adoption and maximize the benefits of digital compliance. Financial institutions should adopt phased implementation strategies that align with their internal capacities and regulatory obligations. Meanwhile, RegTech providers must continue innovating to deliver user-friendly platforms that can be tailored to different firm sizes and industry needs.

In conclusion, this study underscores the transformative potential of RegTech in supporting the standardization and sustainability transition of financial systems. By improving ESG compliance and operational performance, RegTech represents a strategic tool for institutions seeking to navigate the future of responsible finance. Future research should further examine

the long-term strategic impacts of RegTech and explore the integration of emerging technologies, such as blockchain, predictive analytics, and generative AI, in the ESG regulatory landscape

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