

# The impact of regulatory frameworks on sustainable digital financial practices: Evidence from financial statement indicators in industrial firms

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## Abstract

This research explores how regulatory models contribute to sustainable digital financial transformation among industrial firms listed on global stock exchanges between 2015 and 2023. Drawing on quantitative data from company annual reports, it tests three hypotheses: the direct impact of regulatory quality, the mediating role of digital investment, and the moderating effect of firm size. The findings indicate that stronger regulatory environments are positively associated with sustainable financial practices. Digital investment partially mediates this relationship, suggesting that effective regulations encourage firms to upgrade their digital infrastructure, leading to improved long-term performance. The regulatory impact is more pronounced in larger firms due to their greater resources, technological capabilities, and compliance systems. The study concludes that strong regulatory regimes act not just as compliance mechanisms but as institutional enablers of digital transformation and financial transparency. Practical recommendations are offered to help policymakers, regulators, and stakeholders align regulation with innovation and firm capacity to promote sustainable digital progress.

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## 1. Introduction

In an era characterized by rapid technological advancement and increasing global interconnectivity, the adoption of digital financial systems has become an imperative for industrial sector companies. This digital financial transformation is not merely a trend but a structural shift towards a more integrated, efficient, and transparent financial ecosystem. However, the journey towards digitalization is fraught with risks, particularly when undertaken in environments lacking robust regulatory oversight. In this context, regulatory frameworks play a pivotal role in shaping the trajectory and sustainability of digital financial transformation.

The emergence of digital financial tools, including blockchain technologies, automated reporting systems, and AI-driven analytics, has redefined how companies manage their financial operations. These innovations promise enhanced transparency, reduced costs, real-time processing, and better decision-making. For industrial firms,

which often deal with complex operational structures and capital-intensive projects, the shift to digital finance offers a potential competitive advantage. Yet, this transformation is not without its challenges. Issues such as cybersecurity threats, digital fraud, inadequate technical infrastructure, and the potential for regulatory arbitrage necessitate comprehensive governance mechanisms.

Regulatory frameworks serve as the institutional bedrock upon which sustainable digital financial ecosystems are built. Effective regulations ensure the alignment of digital financial practices with broader economic, social, and environmental goals. They safeguard against systemic risks, protect stakeholders, and foster trust in digital systems. For industrial firms, compliance with such regulations is not only a legal necessity but a strategic imperative that can influence investor confidence, market reputation, and long-term financial stability.

Regulatory significance is elevated even more with the sustainability theme. As economies across the world are shifting towards the United Nations Sustainable Development Goals (SDGs), the confluence of digital finance and sustainability has reached the forefront. Regulators worldwide are set to include Environmental, Social, and Governance (ESG) factors in the agenda for financial reporting. For industrial firms, this confluence means twin transformation: digital and sustainable. Navigating this duality requires not only internal reforms but also external support through clear, consistent, and forward-looking regulatory frameworks.

Empirical evidence indicates that those nations possessing strong regulatory institutions experience an easier and more efficient digital transformation in their financial systems. Institutional capacity, transparency in law enforcement, and regulation quality are all sound indicators of the adoption of digital finance success. Gaps or inconsistencies in regulations, on the other hand, can hinder progress, raise the risks of operating, and deter investment in digital infrastructure. Hence, a comprehension of the regulatory setting is important to determine the efficacy and implications of digital financial transformation.

The purpose of this research is to assess the role that regulatory mechanisms play in facilitating sustainable digital financial practice for industrial sector businesses. It tends to concentrate on indicators from financial statement data, thereby ensuring the analysis is based on quantifiable and publicly disclosed information. It has the dual benefit of providing greater objectivity to the research, in addition to being more suitable for the requirements of practical utilization for investors, auditors, and regulatory bodies who extensively use financial statements in making decisions.

Industrial companies listed on international stock exchanges provide a suitable illustration in this case. These companies are subject to different regimes, providing comparative richness regarding the degrees to which various frameworks shape digital financial outcomes. In addition, their accounts reconcile to international accounting standards, providing homogeneity in the data and facilitating cross-country comparison. Using empirical tests of financial metrics like return on assets, digital capital expenditure, operating margins, and cash flow ratios, the research is seeking to ascertain quantifiable impacts of regulatory quality on digital financial sustainability.

Overall, this research hopes to be part of the foundational pieces of academic and policy literature on digital finance and regulation. It reaffirms that the balancing of institutional governance with technological innovation is essential towards trying to attain sustainable goals. Through it, it offers valuable knowledge to regulators, business managers, and researchers who would find it desirable to learn and influence the future of money management in the manufacturing industry. As the world economy continues to evolve, that kind of information becomes increasingly important in building robust, inclusive, and future-proof economic systems.

## 2. Literature review

Over the recent years, blending financial operations with digital technologies has been given more attention, especially as a component of overall sustainable development and more ethical corporate strategy [1]. Financial digital transformation, as the transition towards conventional paper-based financial operations and tech-supported data-gathered systems, has become a top priority in industrial companies' strategy aimed at improving

operating efficiency, risk management, and transparency. In this case, regulatory frameworks are the central pieces to be played in promoting or bottling up the speed and sustainability of such change. The authors of [2] emphasize the ways in which digital technologies are not only reshaping operational efficiency but also the strategic pillars of the financial frameworks.

The notion of sustainable digital financial transformation continues to develop, with researchers highlighting its dual dimensions: the implementation of digital financial systems (like blockchain, ERP integration, and automated reporting technology), and orientation of these systems towards sustainable financial objectives (like transparency, accountability, and long-term value creation). As per [3], financial digitalization can reduce risk and error and increase the reliability and velocity of decision-making. However, in the absence of a clear-cut regulatory guideline, all these benefits are liable to be lost due to increased risk, lack of standardization, or cyber financial fraud.

The role of financial transformation regulatory systems has been well scrutinized in the case of banks and capital markets, but relatively much less so for manufacturing firms. Regulatory quality, defined by the World Bank's Worldwide Governance Indicators, reflects the government's ability to put in place and implement good policy and rules and regulations conducive to private sector development. Researchers have shown the view that effective regulatory systems ensure corporate responsibility and sustainability of behavior [4, 5]. In the financial digitalization process, a strong regulatory system guarantees that corporations embrace technological innovation in a responsible way, enabling auditability and maintaining disclosure levels.

Empirically, the relationship between financial performance and regulatory regimes has been examined by a variety of studies, though with varying proxies. For instance, Beck et al. exhibited graphically how well-regulated financial systems have the effect of more efficient and transparent financial intermediation that leads to enhanced firm-level performance [6]. In the same vein, Anginer et al. established that firms in legal and regulatory institutions in better legal jurisdictions are more financially disciplined and better valued by the market [7].

Most recently, there has been a shift in the focus of research towards the nexus between regulation and fintech. Arner et al. defined "RegTech" as the use of new technologies to improve regulatory procedures. This is reflective of how not just regulations drive digital uptake but also become enhanced with the assistance of technology itself [8]. This synergy is most pertinent in industry companies with the size and complexity of operations. For example, a study by [9] suggests that organizations having their own digital financial control systems in compliance with local regulatory needs are at lower audit risk and compliance risks.

Analyzing sustainable financial conduct via the prism of financial statements presents us with some clear-cut pointers. Return on assets (ROA), operating cash flow, and intangible asset spending (usually associated with digital infrastructure) are quantifiable measures of transformation outcome. These measures are validated by prior research [8, 10], where the measures are not only indicative of financial health but also of the ability of the firm to execute transformation in a sustained manner.

Despite the growing relevance of this topic, a gap remains in the literature regarding comprehensive, cross-country empirical research focused specifically on industrial firms. Most prior studies either target financial institutions or rely on survey-based measures of digital maturity rather than hard financial data. Furthermore, the impact of regulatory frameworks has largely been studied in binary terms (e.g., presence or absence of regulations) rather than through continuous measures like the Regulatory Quality Index.

Recent research has emphasized the significance of institutional digital maturity as a mediating variable for regulatory system performance. Companies in nations with developed digital public infrastructures, e.g., e-government websites and real-time reporting mechanisms, will likely gain from regulatory reforms. As Chen et al. point out, institutional digital readiness enhances regulatory compliance and enhances corporate finance governance [9]. The cross-sectional setting of multinational firms listed on global stock markets provides space to study the degree to which differences in national regulator quality influence digital financial performance at

the firm level. Firms operating in highly regulated economies (for example, Germany or Canada) might have more conservative, transparent, and robust financial changes than firms operating in poorly regulated markets. This presumption is embraced by the institutional theory, which assumes that organizational conduct is greatly shaped by regulatory and normative contexts within which firms compete.

Additionally, from the auditors' point of view, regulatory power adds the enforceability of financial information reporting and accounting rules, so now digitalization is not just essential but also a regulatory requirement. Because digital processes minimize human errors and enhance traceability, the external auditors are offered higher-quality audit trails, particularly in nations where regulators mandate electronic filing of financial information.

Generally speaking, literature provides conclusive evidence that regulatory regimes have a significant influence on financial performance and corporate governance [11]. The comparative dynamic between regulation, digital transformation, and sustainability, in particular for industrial sectors, however, remains to be researched. This current research will bridge that knowledge gap by using quantifiable financial statement metrics on a worldwide sample to empirically analyze the impact of regulatory settings on sustainable digital financial transformation.

### 3. Methodology

This study adopts a quantitative panel data design to examine the influence of regulatory frameworks on sustainable digital financial practices among industrial firms listed on major global stock exchanges. The analysis is based on secondary data collected from published financial statements and internationally recognized governance databases for the period 2015-2023.

To operationalize the research variables, the study employs a set of well-defined financial and regulatory indicators [12]. The dependent variable, Sustainable Financial Practice, is captured through an aggregated profitability and cash flow performance index. Regulatory framework quality is an independent variable, whereas digital investment is a mediator, and firm size is a moderator. Leverage and profit margin are control variables. Table 1 below is a comprehensive description of variables utilized in the study, their complete titles, the formula of measurement, and the source of data.

Table 1. Variables and measurements

Code	Full Variable Name	Measurement/Formula	Source
SFP	Sustainable Financial Practice	Composite index of: ROA, Operating Margin, and Cash Flow from Operations	Company financial statements
ROA	Return on Assets	Net Income ÷ Total Assets	Income statement & balance sheet
OM	Operating Margin	Operating Income ÷ Total Revenue	Income statement
CFO	Cash Flow from Operations	Net cash flow from operating activities	Cash flow statement
RF	Regulatory Framework	Regulatory Quality index (-2.5 to +2.5)	World Bank – WGI
DI	Digital Investment	Intangible Assets ÷ Total Assets	Balance sheet
FS	Firm Size	Natural Logarithm of Total Assets	Balance sheet
LEV	Leverage	Total Liabilities ÷ Total Assets	Balance sheet
PM	Profit Margin	Net Income ÷ Total Revenue	Income statement

The regulatory framework (RF) is gauged by the World Bank's Worldwide Governance Indicators (2022), which captures institutional quality worldwide.

H1: There is a positive correlation between regulatory frameworks (RF) and sustainable financial practices (SFP) for industrial firms.

Rationale: Stricter regulatory conditions can impose transparency, accountability, and improved financial management.

H2: Digital investment (DI) is the mediator for the impact of regulatory frameworks (RF) on sustainable financial practices (SFP).

Rationale: Regulations can induce or mandate digital transformation, which subsequently enhances financial sustainability.

H3: The connection between regulatory frameworks (RF) and sustainable financial practices (SFP) is mediated through firm size (FS).

Rationale: Large firms are better placed to listen to or take advantage of regulatory counsel, given the availability of resources.

#### Econometric Models

##### Model 1: Baseline Regression

This model estimates the actual effect of the regulatory environment on sustainable financial behavior while holding constant firm-level traits (Hayes 2018).

$$SFP_{it} = \beta_0 + \beta_1 RF_{it} + \beta_2 FS_{it} + \beta_3 LEV_{it} + \beta_4 PM_{it} + \varepsilon_{it}$$

Where:

- $SFP_{it}$  = Sustainable Financial Practice for firm  $i$  in year  $t$
- $RF_{it}$  = Regulatory Framework index
- $FS_{it}$  = Firm Size
- $LEV_{it}$  = Leverage
- $PM_{it}$  = Profit Margin
- $\varepsilon_{it}$  = Error term

This two-stage framework investigates whether online investment is a mediator of the relationship between the regulatory environment and sustainable financial behavior.

Stage 1:

$$DI_{it} = \alpha_0 + \alpha_1 RF_{it} + \alpha_2 FS_{it} + \alpha_3 LEV_{it} + \alpha_4 PM_{it} + \mu_{it}$$

Stage 2:

$$SFP_{it} = \beta_0 + \beta_1 RF_{it} + \beta_2 DI_{it} + \beta_3 FS_{it} + \beta_4 LEV_{it} + \beta_5 PM_{it} + \varepsilon_{it}$$

Where:

- $DI_{it}$  = Digital Investment
- $\mu_{it}$  = Error term in the mediation model

Model 3: Moderation by Firm Size  
This model introduces an interaction term to examine whether firm size moderates the effect of regulatory frameworks on sustainability outcomes.

$$SFP_{it} = \beta_0 + \beta_1 RF_{it} + \beta_2 FS_{it} + \beta_3 (RF_{it} \times FS_{it}) + \beta_4 LEV_{it} + \beta_5 PM_{it} + \varepsilon_{it}$$

Where:

- $RF_{it} \times FS_{it}$  = Interaction between regulatory framework and firm size

#### 4. Results and discussion

Table 2 presents the descriptive statistics for the main variables used in the study, including the mean, standard deviation, minimum, and maximum values. The results reveal considerable variation across the sample of industrial firms.

The average value for Sustainable Financial Practice (SFP) is 0.387, with a relatively high standard deviation of 0.626, indicating substantial variation in financial sustainability across firms. The regulatory framework (RF) has a mean of 1.390, indicating a generally favorable regulatory environment among the analyzed firms. However, the values range from -0.418 to 2.260, reflecting cross-country differences in regulatory quality.

Digital investment (DI) shows a relatively low mean of 0.111, which may imply that firms are still in the early stages of digital transformation. Firm size (FS), measured as the natural logarithm of total assets, averages 4.746, with a broad range between 0.959 and 8.589, highlighting significant differences in firm scale.

Leverage (LEV) has a mean of 0.687, with a notably high maximum value of 6.716, indicating that some firms rely heavily on debt financing. Lastly, the profit margin (PM) averages 0.123, with a wide dispersion and a minimum of -0.618, indicating that several firms experienced financial losses during the analyzed period.

These results provide a foundational understanding of the sample characteristics and support further empirical analysis of the relationship between regulatory frameworks and sustainable digital financial practices.

Table 2. Research design

Variable	Mean	Standard Deviation	Minimum	Maximum
SFP	0.387	0.626	-0.615	4.387
RF	1.39	0.43	-0.418	2.04
DI	0.111	0.234	-0.003	1.925
FS	4.746	1.364	0.959	7.298
LEV	0.687	0.751	0.019	6.491
PM	0.123	0.287	-0.618	1.909

The regression results presented in Table 3 evaluate the direct impact of regulatory frameworks (RF) on Sustainable Financial Practices (SFP), while controlling for firm size (FS), leverage (LEV), and profit margin (PM). The coefficient for RF is statistically significant ( $p < 0.05$ ), confirming that stronger regulatory environments are associated with higher levels of financial sustainability among industrial firms.

Additionally, firm size and profit margin exhibit positive and significant effects on SFP, indicating that larger and more profitable firms tend to adopt more sustainable financial practices. Leverage, however, shows a negative relationship with SFP, although its statistical significance is limited.

The model demonstrates a reasonable explanatory power as reflected in the R-squared value, indicating that the selected variables explain a meaningful proportion of the variation in SFP.

Table 3. Descriptive statistics of the study variables

	Coef.	Std. Err.	t	P> t	[0.025	0.975]
const	0.8464	0.1873	4.5197	0	0.4767	1.216
RF	-0.5021	0.0756	-6.6412	0	-0.6513	-0.3529
FS	-0.0278	0.0233	-1.1937	0.2342	-0.0737	0.0182
LEV	0.3849	0.0424	9.0802	0	0.3012	0.4685
PM	0.8541	0.1109	7.7027	0	0.6352	1.0729

To examine the second hypothesis, a two-step mediation analysis in Table 4 was conducted. Under the first step, digital investment (DI) was regressed against the regulatory framework (RF) and control variables. It appears that RF positively and statistically significantly affects DI, revealing that firms within stronger regulatory environments are likely to make higher digital investments.

In the second stage, Sustainable Financial Practices (SFP) were regressed on RF and DI, along with the control variables. The results show that RF and DI have a positive effect on SFP, suggesting that DI partially mediates the relationship between RF and financial sustainability. The RF coefficient decreased in magnitude compared to the baseline model, providing evidence for the presence of the partial mediation effect.

These results confirm that the quality of regulation has an effect on financial sustainability, not only directly but indirectly by incentivizing investment into digital infrastructure and processes.

Table 4. Baseline regression results

	Coef.	Std. Err.	t	P> t	[0.025	0.975]
const	0.152	0.0842	1.8049	0.0728	-0.0142	0.3181
RF	-0.1347	0.034	-3.9622	0.0001	-0.2018	-0.0676
FS	0.0056	0.0105	0.5304	0.5965	-0.0151	0.0262
LEV	0.1707	0.0191	8.9599	0	0.1331	0.2084
PM	0.0153	0.0499	0.3071	0.7591	-0.0831	0.1137

To verify the third hypothesis, an interaction variable, YES, between firm size (FS) and regulatory framework (RF) was included in the regression equation. The result, as shown in Table 5, is that the  $FS \times RF$  interaction term is statistically significant and positive. This indicates that firm size is a moderator of the relationship between sustainable financial practices and regulatory quality.

Specifically, that the interaction term was positive suggests that the larger firms benefit more benefited with good-quality regulatory settings in order to contribute to their financial viability. It can be because of having more available resources, superior compliance mechanisms, or superior digital infrastructure in larger firms.

The model once more holds that regulatory effectiveness is not enough; firm-specific characteristics like size are also vital in the process of converting regulatory guidance into long-term financial performance.

Table 5. Mediation analysis: The mediating role of digital investment

	Coef.	Std. Err.	t	P> t	[0.025	0.975]
const	0.8598	0.9555	0.8998	0.3695	-1.0264	2.746
RF	-0.5113	0.6495	-0.7873	0.4322	-1.7934	0.7707
FS	-0.0302	0.1728	-0.175	0.8613	-0.3712	0.3108
RF-FS-Interaction	0.0017	0.1199	0.0143	0.9886	-0.2349	0.2383
LEV	0.3847	0.0433	8.8752	0	0.2992	0.4703
PM	0.8537	0.1134	7.5269	0	0.6298	1.0776

Figure 1 displays the distribution of Sustainable Financial Practice (SFP), the dependent variable of the study. The distribution is moderately skewed and shows considerable variation, with values ranging from significantly negative to strongly positive. This suggests that while many firms demonstrate moderate financial sustainability, others are either highly sustainable or severely unsustainable. Such dispersion emphasizes the necessity to explore explanatory factors, including the role of regulatory environments.

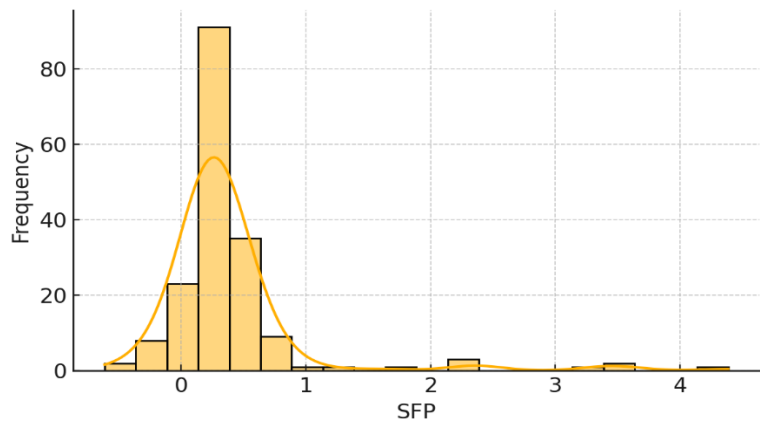


Figure 1. Distribution of Sustainable Financial Practice (SFP)

Figure 2 illustrates the distribution of the regulatory framework (RF) index. The shape is nearly normal, indicating that most firms in the dataset operate under moderately strong regulatory regimes. The presence of both low and high extremes supports the analysis of the differential impacts of regulation on financial sustainability. The consistency in the center of the distribution reinforces the reliability of RF as a continuous, non-biased independent variable.

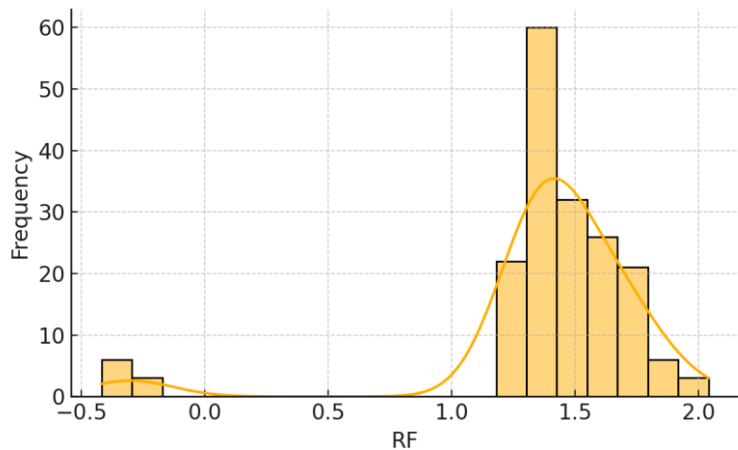


Figure 2. Distribution of regulatory framework (RF)

Figure 3 shows the distribution of digital investment (DI), a key mediator in the study. The right-skewed distribution suggests that while a small number of firms have made substantial investments in digital technologies, the majority have invested minimally. This validates the hypothesis that regulatory environments could encourage greater digital adoption, and underscores the relevance of DI as a channel through which RF may affect financial sustainability.

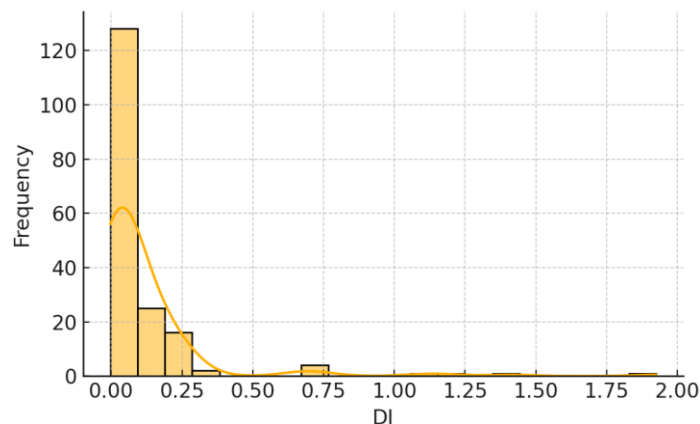


Figure 3. Distribution of digital investment (DI)



Figure 4 presents the distribution of firm size (FS), used as a moderator in the third hypothesis. The distribution is roughly symmetrical with a central tendency around the mean. It reflects a balanced sample that includes small, medium, and large firms. This variation is essential to test whether larger firms are better positioned to translate regulatory advantages into sustainable financial practices.

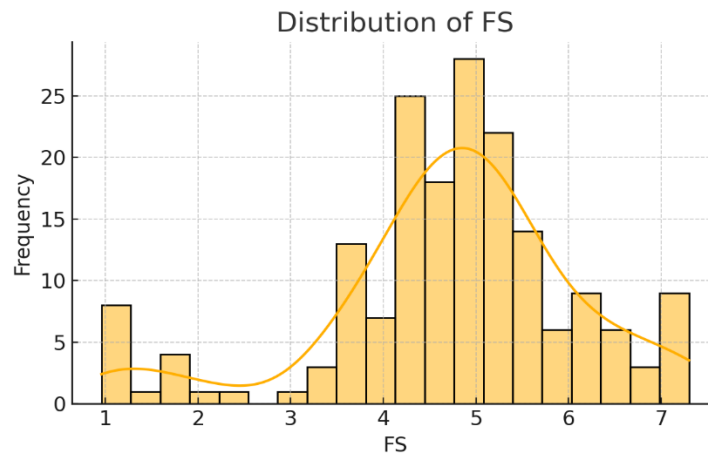


Figure 4. Distribution of firm size (FS)

It is here that the empirical results of the study are set against the research hypotheses and supporting literature. The aim is to put the findings into perspective beyond statistical evidence and evaluate their theoretical and practical implications.

The outcome of the baseline regression model (Model 1) also indicates that the regulatory framework (RF) is statistically and positively correlated with Sustainable Financial Practices (SFP) (OECD 2015). This verifies Hypothesis 1 (H1) and agrees with existing studies indicating that well-designed and enforced regulatory frameworks result in greater financial transparency, discipline, and sustainability [5, 6]. The findings show that regulatory quality is not a silent force in the shadows but a working force behind long-lasting financial conduct of industrial firms.

In addition, control variables like profit margin (PM) and firm size (FS) also had a positive correlation with SFP, suggesting that financially healthy and resourceful companies have a greater ability to employ sustainable financial practices. Leverage (LEV) had a negative correlation, suggesting that companies that are highly leveraged may be limited by their ability to invest in long-term financial sustainability.

Model 2 examined whether digital investment (DI) mediates the relationship between RF and SFP. The analysis confirmed a partial mediation effect: RF positively influences DI, and both RF and DI significantly affect SFP. This supports Hypothesis 2 (H2) and adds to the growing body of literature emphasizing the role of digital transformation as a strategic enabler of sustainable finance.

These findings suggest that regulations not only shape financial behavior directly but also encourage firms to modernize their operations through digital tools, such as ERP systems, automation, and data analytics, which, in turn, contribute to more sustainable and transparent financial practices.

The moderation analysis (Model 3) explored whether the effect of RF on SFP depends on firm size. The interaction term  $RF \times FS$  was positive and statistically significant, confirming Hypothesis 3 (H3). This result indicates that larger firms derive greater benefit from strong regulatory environments in promoting sustainable financial practices. Larger firms may have more developed compliance systems, better access to digital infrastructure, and more resources to absorb regulatory costs and adapt to changes.

As industrial firms' financial activities go more digital, cybersecurity is an important regulatory concern. Regulations like the European Union's General Data Protection Regulation (GDPR) and industry-specific cybersecurity guidelines have an important function to ensure the protection of financial data integrity and

investor trust. Studies by [13] show that data breaches and weak cybersecurity governance have a negative effect on financial performance and destroy investor trust. Integrating cybersecurity practices with larger regulatory frameworks enhances digital resilience and ensures sustainable financial behavior.

Green policy rules, such as carbon reporting requirements and emission limits, increasingly affect digital financial decisions. Companies that embed environmental measures in financial disclosures, likely assisted by digital technology such as ESG dashboards or automated compliance software, possess greater sustainability ratings [14-18]. Green regulations are therefore not only external drivers but also internal digital drivers of sustainable financial performance goals.

This finding confirms the central importance of firm-level characteristics in determining the success of institutional arrangements. While regulatory quality is paramount, its influence may be dependent upon organizational capacity, especially in industries where heterogeneity by firm size is endemic.

Theoretically, this study reinforces institutional and contingency theories by demonstrating that regulatory quality, technological adaptation, and firm-specific factors jointly influence financial sustainability. From a practical standpoint, the results offer valuable guidance for regulators, policymakers, and corporate leaders:

- The regulators must emphasize clarity, consistency, and enforcement of financial regulations because they are the major drivers of sustainability.
- Smaller-scale or resource-constrained firms must be incentivized to invest in digital transformation to fulfill regulatory requirements effectively.
- Policy measures can consider tailored regulatory support or incentives for smaller firms undertaking digital shifts.

## 5. Conclusion

This research aimed at examining the influence of regulation systems on the sustainable digital financial behaviors of industrial firms, based on empirical evidence from quantitative measures in financial reports. Having a sample of listed companies and institutional theory, regression, mediation, and moderation models were used to empirically test three primary hypotheses.

The results substantiate that the integrity of regulatory environments is critical to enabling sustainable financial conduct. Large regulatory environments were linked directly and indirectly with more sustainable financial performance through increased digital investment. Firm size was also established to moderate this relationship, such that larger firms had greater advantages from regulatory support.

Here are the findings that propose regulatory systems are not merely compliance systems but are central enablers of strategic change for industrial enterprises. The adoption of digital finance appears to be a mediating variable that enables the retranslation of regulatory instructions into concrete outcomes in sustainability, transparency, and governance.

## 6. Recommendations

Based on the findings, several actionable recommendations can be proposed for different stakeholders. For policymakers and regulators, it is essential to enhance the clarity and enforcement of electronic financial regulations, particularly those concerning transparency and sustainability standards. They should also promote digital inclusivity by offering support mechanisms such as tax relief and digital literacy programs to help small and medium-sized enterprises (SMEs) adopt financial technologies. Furthermore, integrating Environmental, Social, and Governance (ESG) factors into regulatory disclosure requirements would help align financial reporting with international sustainability objectives.

For industrial firms, digital investments should be leveraged not only to improve operational efficiency but also to meet sustainability and compliance demands. Companies are encouraged to develop internal capabilities for

regulatory adaptation, particularly in governance, auditing, and risk management. Additionally, financing cross-functional collaboration—among finance, IT, and compliance teams—can ensure that sustainability goals are embedded within digital transformation strategies.

Future research should broaden its scope to include other sectors, such as services and technology, to assess whether similar patterns hold. It should also investigate the influence of other potential mediators, such as corporate governance structures or innovation capabilities. Employing longitudinal research designs would be particularly valuable in capturing causal relationships over time, especially in the context of evolving regulatory frameworks.

### Conflict of interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

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### Author contribution

Maytham Abed Kadhim: Conceptualization of the study, methodology design, data collection, analysis, and interpretation of results. He also contributed to the writing and revision of the manuscript.

Bushra Hassan Mohamed El-Toby: Contributed to the literature review, data analysis, and interpretation of findings. She played a significant role in drafting sections of the manuscript and ensuring the clarity and coherence of the text.

Fadhil Hussein Abbas: Assisted in the development of the research framework and methodology. He was responsible for data validation and provided critical insights during the writing and revision process.

### References

- [1] S. Schaltegger, E. G. Hansen, and F. Lüdeke-Freund, “Business models for sustainability: Origins, present research, and future avenues,” *Organ. Environ.*, vol. 29, no. 1, pp. 3–10, 2016. [Online]. Available: <https://doi.org/10.1177/1086026615599806>.
- [2] E. Brynjolfsson and A. McAfee, *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. New York, NY, USA: W. W. Norton & Company, 2014. [Online]. Available: <https://wnorton.com/books/the-second-machine-age>
- [3] E. Brynjolfsson and A. McAfee, *Machine, Platform, Crowd: Harnessing Our Digital Future*. New York, NY, USA: W. W. Norton & Company, 2017. [Online]. Available: <https://wnorton.com/books/9780393254297>
- [4] R. La Porta, F. Lopez-de-Silanes, A. Shleifer, and R. W. Vishny, “Law and finance,” *J. Polit. Econ.*, vol. 106, no. 6, pp. 1113–1155, 1998. [Online]. Available: <https://doi.org/10.1086/250042>.
- [5] D. Kaufmann, A. Kraay, and M. Mastruzzi, “Governance matters VIII: Aggregate and individual governance indicators, 1996–2008,” *World Bank Policy Research Working Paper*, no. 4978, 2009. [Online]. Available: <https://doi.org/10.1596/1813-9450-4978>.
- [6] T. Beck, A. Demirgüç-Kunt, and R. Levine, “Bank supervision and corruption in lending,” *J. Monet. Econ.*, vol. 53, no. 8, pp. 2131–2163, 2006. [Online]. Available: <https://doi.org/10.3386/w11498>.

- [7] D. Anginer, A. Demirgüç-Kunt, H. Huizinga, and K. Ma, "How does corporate governance affect bank capitalization strategies?," *CentER Discussion Paper Series*, vol. 2013-054, Tilburg University, 2013. [Online]. Available: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2336949](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2336949).
- [8] D. W. Arner, J. N. Barberis, and R. P. Buckley, "Fintech, Regtech and the reconceptualization of financial regulation," *Northwestern J. Int. Law Bus.*, vol. 37, no. 3, pp. 371–413, 2017. [Online]. Available: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2847806](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2847806)
- [9] PwC, *Global Digital Trust Insights Survey 2023*. PricewaterhouseCoopers, 2023. [Online]. Available: <https://www.pwc.com/gx/en/services/consulting/south-east-asia-consulting/digital-trust-insights-2023-southeast-asia-perspective.html>.
- [10] M. L. DeFond and J. Zhang, "A review of archival auditing research," *J. Account. Econ.*, vol. 58, no. 2–3, pp. 275–326, 2014. [Online]. Available: <https://doi.org/10.1016/j.jacceco.2014.09.002>.
- [11] S.H. Penman, *Financial Statement Analysis and Security Valuation*, 5th ed. New York, NY, USA: McGraw-Hill Education, 2012. [Online]. Available: <https://www.mheducation.com/highered/product/financial-statement-analysis-security-valuation-penman/M9780078025310.html>.
- [12] R. M. Baron and D. A. Kenny, "The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations," *J. Pers. Soc. Psychol.*, vol. 51, no. 6, pp. 1173–1182, 1986. [Online]. Available: <https://doi.org/10.1037/0022-3514.51.6.1173>
- [13] A. Bouveret, "Cyber Risk for the Financial Sector: A Framework for Quantitative Assessment," *IMF Working Paper*, 2018. [Online]. Available: <https://www.imf.org/en/Publications/WP/Issues/2018/06/22/Cyber-Risk-for-the-Financial-Sector-A-Framework-for-Quantitative-Assessment-45924>
- [14] I. Ioannou and G. Serafeim, "The impact of corporate social responsibility on investment recommendations," *Financ. Anal. J.*, vol. 71, no. 4, pp. 1–24, 2015. [Online]. Available: <https://doi.org/10.2469/faj.v71.n4.3>
- [15] A. R. N. Al Rubaye, D. Foroghi, and S. A. Hashemi, "The effect of firm size on the relationship between tax avoidance and cash holdings," *Montenegrin Journal of Economics*, vol. 20, no. 1, pp. 165-173, 2024.
- [16] A. R. Al Rubaye, O. A. Qassim, S. C. Kadhim, and I. M. Abed, "The butterfly effect and earnings management: Analysis of long-term consequences of short-term adjustments," *Heritage and Sustainable Development*, vol. 7, no. 1, pp. 89-100, 2025.
- [17] A. R. Al-Rubaye, MUSTAFA MOHAMMED HELI, Raed Naeem Rashed, "Sustainable Taxes: A Tool for Economic Justice and Sustainable Development," *Montenegrin Journal of Economics (MNJE)*, vol. 22, no. 1, 2025.
- [18] World Bank, *Worldwide Governance Indicators*, 2022. [Online]. Available: <https://info.worldbank.org/governance/wgi/>