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Keywords: ESG, digital transformation, firm value.

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1. Introduction

In a world increasingly shaped by sustainability demands and technological breakthroughs, the fusion of Environmental, Social, and Governance (ESG) principles with digital transformation has risen as a pivotal force in driving firm performance and enhancing value creation (Porter & Kramer, 2011). These elements have evolved from secondary concerns to core components of corporate strategy as global businesses navigate the dual pressures of profitability and societal accountability (Eccles et al., 2014). This dynamic is especially relevant for listed firms in Vietnam—an emerging market characterized by rapid economic growth, robust industrial development, and a multifaceted socio-environmental context. Over recent decades, Vietnam has transformed from an agriculture-based economy into a key player in manufacturing and exports, a shift that, while impressive, has brought challenges such as environmental harm, social disparities, and governance issues that challenge the adaptability of its corporate landscape (World Bank, 2019),

The ESG framework encompasses a broad range of criteria, including environmental concerns such as carbon emissions, resource utilization, and waste management; social dimensions like labour conditions, community engagement, and human rights; and governance aspects like board composition, transparency, and anti-corruption measures (Gillan et al., 2021). Simultaneously, digital transformation—characterized by the widespread adoption of digitization and Industry 4.0 across industries (Nguyen et al., 2023)—fuels competitive advantage through the adoption of cutting-edge technologies and innovative operational models. Together, these factors are viewed as synergistic drivers that can elevate firm value, often assessed through financial indicators such as market capitalization, return on assets, or firm value. In advanced economies, robust ESG practices and digital initiatives have been linked to improved financial results, increased investor trust, and enhanced corporate reputations (Friede et al., 2015). Nevertheless, in emerging markets like Vietnam, where regulatory systems, institutional backing, and market development lag, the effectiveness and influence of these factors warrant closer examination (Bui & Nguyen, 2021).

Vietnam presents a distinctive setting for this exploration, boasting one of Southeast Asia's fastest-growing economies, attracting substantial foreign investment, and fostering a rapidly expanding stock market where listed firms play a central role in national progress (World Bank, 2020). Nevertheless, the nation grapples with pressing sustainability issues: industrial pollution, deforestation, and fossil fuel dependency jeopardize its environmental health, while rapid urbanization and workforce growth highlight social issues such as income gaps and labour standards. Governance continues to evolve, with corporate openness and regulatory oversight trailing behind more established markets. For listed firms, these pressures are intensified by global investors who increasingly value ESG credentials alongside traditional financial metrics. Concurrently, digital transformation has become a strategic priority in Vietnam, with the rapid advancement of digital technologies pushing companies to adapt to a modern era (Nguyen et al., 2023). Leading nations, such as the United States, Japan, and Taiwan, set the pace, but Vietnam is following, with businesses harnessing digital tools to strengthen their market positions.

Emerging research in Vietnam sheds light on the nexus between ESG and digital transformation. The success of digital transformation remains debated, with hurdles such as high

costs, unclear strategies, skill deficits, and internal resistance shaping its outcomes (Shkodina et al., 2019). Some firms achieve financial gains through effective digital adoption, while others struggle, fueling the need for deeper analysis. On the ESG front, Vietnam's commitments are growing, underscored by its 2050 net-zero pledge at COP26 in 2021, a halt to deforestation by 2030, and a coal phase-out by 2040 (IUCN, 2022), alongside tools like the Vietnam Sustainability Index (VNSI) and Corporate Sustainability Index (CSI) (Industry and Trade Magazine, 2024; PwC Vietnam, 2023). However, 62% of firms prioritize Governance (G) over Environmental (E) and Social (S) factors, indicating a short-term focus, with only 20% demonstrating genuine ESG commitment (Economic and Forecast Magazine, Ministry of Planning, and Investment, 2024; Ngân Hà, 2023).

Pioneering firms such as Vinamilk, Masan Group, and VinFast are leading the way in ESG and digital initiatives. Notably, Vinamilk has adopted clean energy since 2012 (Vinamilk, 2021), while Vingroup has implemented innovative services (Vietnam Report, 2023). However, small and medium-sized enterprises (SMEs) lag, with only 25% engaging in ESG and 21% lacking plans (Nhu Loan, 2022). PwC Vietnam's (2022) data reveals disparities, with 57% of FDI firms, 35% of listed companies, and 40% of private businesses committing to ESG, compared to 60% of non-committed firms being small and medium-sized enterprises (SMEs). Obstacles include limited awareness, financial constraints, and low transparency, with only 36% of ESG reports audited (PwC, 2022). Meanwhile, digital transformation is gaining momentum, with 70% of firms prioritizing it (PwC Vietnam, 2023) and adoption rising from 21% in 2020 to 35% in 2023 (Ministry of Information and Communications, 2023), driven by multinationals like Intel and Samsung, and domestic leaders like Viettel and FPT (Google, Temasek, & Bain & Company, 2021; World Bank, 2022).

Vietnam's digital infrastructure, a regional leader in telecommunications and cloud computing (World Bank, 2022), attracts investments from Google and Microsoft (Ministry of Information and Communications, 2023), while UNCTAD (2022) ranks it among the top 20 beneficiaries of global supply chain shifts, supported by firms like Samsung and Intel (World Bank, 2022). Nevertheless, challenges remain, including uneven infrastructure, a skilled labour shortage (with only 30% meeting tech requirements, ILO, 2022), and legal gaps in data protection (World Bank, 2022; Ministry of Planning and Investment, 2023). High costs and inconsistent standards (e.g., VNSI, CSI) hinder SMEs, with 62% citing resource concerns (PwC, 2023) and 46% noting firm size as a barrier (Industry and Trade Magazine, 2024). These issues prompt questions about the long-term financial benefits of ESG and digital transformation in Vietnam.

In this context, where Vietnam's government prioritises ESG and digital transformation, the combined influence of these factors on the value of listed companies is a critical research focus. It is noteworthy that prior research in Vietnam has primarily explored the relationship between ESG, innovation, and firm performance while neglecting their effects on firm value despite maximizing firm value being a central objective for businesses (Jensen, 2010). Therefore, our study seeks to address this research gap. Furthermore, to the authors' knowledge, existing studies in Vietnam have not examined the combined impact of ESG practices and innovation across firm subsets differentiated by size. Given that Vietnamese firms are in the early stages of adopting ESG practices, hindered by limited resources and institutional challenges, a comprehensive analysis of how ESG and innovation drive value creation for firms of varying sizes is critical. This study aims to provide actionable insights for corporate leaders seeking to balance profitability with sustainability, for investors evaluating Environmental, Social, and

Governance (ESG) factors and innovative firms, and for policymakers seeking to create a conducive business environment for sustainable development.

The structure of the paper is as follows. Section 2 provides a literature review and develops the hypotheses. Section 3 discusses the research methodology and data collection. Section 4 presents the research results, and Section 5 offers conclusions and implications.

2. Literature review

2.1. ESG and firm value

The relationship between Environmental, Social, and Governance (ESG) practices and firm value has been examined through several theoretical lenses. Stakeholder Theory (Freeman, 1984) posits that long-term business success necessitates balancing the interests of various stakeholders, not just shareholders. ESG initiatives help manage stakeholder relationships, enhance corporate reputation, and reduce conflicts, thereby creating sustainable value (Diez-Cañamero et al., 2020; Gillan et al., 2021). From the perspective of the Resource-Based View (RBV) (Barney, 1991), strong ESG performance can be considered a source of valuable, rare, and difficult-to-imitate resources and capabilities. These intangible assets contribute to long-term competitive advantages, ultimately enhancing firm value (Xie et al., 2019). Additionally, the Signalling Theory (Porter, 1980) suggests that firms engaging in ESG activities and making transparent disclosures send positive signals to the market regarding their ethical standards and risk management competence, which reduces information asymmetry and can lead to higher firm valuations (Nishant et al., 2017). While traditional views, such as Shareholder Theory (Friedman, 1962), emphasize profit maximization, these modern theories collectively provide a compelling rationale for a positive relationship between ESG performance and firm value.

Building on these theoretical foundations, a growing body of empirical research has examined the relationship between ESG and firm value. Many studies report a positive association. For example, Quintiliani (2022) found that firms with strong ESG scores tend to show higher market valuations and improved financial performance indicators such as free cash flow and return on equity (ROE). Similarly, Aboud and Diab (2018) demonstrated that companies listed on ESG indices generally outperform non-listed counterparts in terms of market value, measured by Tobin's Q. These findings suggest that ESG practices contribute to firm value by mitigating risks and strengthening stakeholder trust. However, not all research supports this optimistic view. Some studies highlight the potential drawbacks or conditional nature of ESG impacts. Fatemi et al. (2018) argued that the substantial costs required to implement ESG initiatives may initially outweigh the benefits, especially for firms at the early stage of ESG adoption. Sadiq et al. (2020) further noted that while well-executed ESG strategies can enhance firm value, superficial or excessive ESG disclosures might dilute these benefits due to high compliance costs without substantial performance gains. These results suggest that ESG's contribution to firm value is not automatic but rather depends significantly on the quality of implementation and its cost-effectiveness.

Other research has dissected the individual dimensions of ESG to assess their varying impacts. Tahmid et al. (2022), in a study on European firms, found that Environmental and Social initiatives positively affect firm value, whereas Governance-related actions showed no significant short-term influence. In contrast, Cheng et al. (2023) found that only the Environmental pillar had a positive effect on firm value in China, potentially due to evolving post-pandemic market preferences. Meanwhile, Serafeim (2020) suggested that although

Governance improvements may not yield immediate financial returns, they can enhance long-term management effectiveness and oversight. These findings suggest that the impact of ESG on firm value is influenced not only by the pillar emphasized but also by regional, industrial, and temporal factors. Moreover, firm-specific characteristics such as ownership structure can moderate ESG outcomes. Srivastava and Anand (2023) found that firms with concentrated ownership may experience weaker ESG – firm value relationships, as dominant shareholders might prioritize private interests over broader ESG investments. Similarly, the level and quality of ESG disclosure also matter. As noted by Fatemi et al. (2018), meaningful, high-quality disclosures enhance value creation, whereas vague or purely symbolic disclosures may fail to deliver tangible results.

In summary, although a considerable portion of the literature supports a positive link between ESG performance and firm value, driven by improved reputation, stakeholder trust, and risk management, the evidence remains mixed and context dependent. The impact of ESG varies according to the specific dimension analyzed, measurement methods, industry sector, regional context, and firm-level attributes. Despite these variations, ESG is widely recognized as a strategic tool for generating long-term value. Therefore, the following hypothesis is proposed:

H1: ESG performance has a positive relationship with firm value.

2.2 Digital transformation and firm value

Digital Transformation (DT) is not merely the application of technology but a comprehensive process of transforming an organization's operational model. It involves integrating digital technologies into all aspects of operations to reshape business models, organizational processes, and methods of delivering value to customers (Kraus et al., 2022). DT goes beyond adopting basic digital tools, requiring strategic, cultural, and organizational changes to achieve sustainable competitive advantages and meet the demands of the Industry Revolution 4.0 era (Frank et al., 2019). The concept is often distinguished from digitization and digitalization. Digitization refers to the conversion of information from analogue to digital formats, such as scanning paper documents into digital files or utilizing inventory management software, to enhance operational efficiency by reducing manual errors and optimizing processes (Parviainen et al., 2017). However, digitization primarily focuses on cost savings rather than generating new revenue streams; thus, its impact on business value is often limited. Digitalization, on the other hand, goes further by leveraging advanced technologies such as data analytics, cloud computing, and automation to transform business processes, enhance customer experiences, and create new value (Vial, 2019). While beneficial, digitalization depends on the ability to integrate technology with existing processes and faces challenges such as limited technological infrastructure or an unprepared workforce.

Digital transformation, with its strategic and holistic nature, not only optimizes operations but also redefines how businesses function and deliver value. It emphasizes continuous innovation, flexibility, and customer-centricity, often leading to the development of new business models (Verhoef et al., 2021; Warner & Wäger, 2019). Definitions of DT vary due to its comprehensive and strategic nature. Some researchers focus on technological aspects, while others highlight cultural and organizational changes. These differences stem from diverse research contexts, such as developed versus emerging economies or large corporations versus small and medium enterprises (SMEs). In summary, DT is not just about adopting new technologies but involves a holistic transformation of corporate culture, collaboration methods, and infrastructure, enabling organizations to adapt to the Industry Revolution 4.0 era. DT drives

strategic changes, continuous innovation, and the integration of technologies like AI, Big Data, Cloud, and IoT into all business facets, creating new value and transforming business models (Bharadwaj et al., 2013).

At the national level, DT is a strategic driver for economic growth, enhancing competitiveness, and building smart, sustainable societies. Implementing online public services reduces costs and time and optimizes administrative resources (OECD, 2020), as seen in Vietnam. DT also fosters new digital economy sectors (e.g., fintech, e-commerce), creates jobs, promotes international integration, and has the potential to significantly contribute to GDP growth (World Bank, 2021), aligning with Vietnam's national strategy. However, maximizing its potential requires overcoming challenges in infrastructure, digital skills, and cybersecurity through cohesive policies, long-term investments, and multi-stakeholder collaboration. For businesses, DT not only improves operational efficiency through automation (e.g., RPA - Andriole, 2017) and data analytics but also serves as a foundation for innovating business models and generating new revenue streams (e.g., sharing economy - Svahn et al., 2017). Crucially, DT enables businesses to adapt to rapidly changing markets and maintain competitiveness. To succeed, businesses must invest in workforce training, cultivate a culture of innovation, and effectively manage data security risks.

Measuring DT in businesses can be done through various methods. Quantitative approaches focus on specific metrics to evaluate performance but often overlook critical non-financial factors, such as employee satisfaction and customer engagement (Krippendorff, 2018). Conversely, qualitative methods, such as surveys or in-depth stakeholder interviews, help assess intangible factors but are limited by subjectivity and challenges in generalizing results. Another powerful tool is content analysis, which systematically and objectively evaluates unstructured data (e.g., reports, social media, customer reviews) to assess the impact of DT (Krippendorff, 2018). Content analysis can be qualitative (identifying themes) or quantitative (counting keyword frequencies related to DT). Different DT measurement methods have unique strengths and limitations, making them suitable for specific goals and contexts. To optimize DT measurement in businesses, the authors combined quantitative methods with content analysis. The authors assessed the digital transformation performance of listed Vietnamese companies by combining financial metrics with content analysis, measuring the frequency of digital transformation-related terms in their annual reports. This approach not only provides concrete numerical data but also clarifies the more profound significance of DT initiatives, ensuring objectivity and comparability across businesses or different periods.

The relationship between digital transformation (DT) and enterprise value has garnered significant attention. The application of digital technologies in production and management activities—such as process digitalization, enterprise resource planning (ERP) systems, and integrated data platforms—enables businesses to enhance performance and optimize costs. These improvements not only reduce task processing time and minimize resource waste but also increase operational flexibility and adaptability. As a result, operational efficiency is improved, laying a solid foundation for long-term enterprise value creation (Chen et al., 2022). The integration of technology into business operations often involves streamlining organizational structures to make them more agile and flexible. Simultaneously, digitalization enhances transparency, traceability, and internal control, improving decision-making and management efficiency. These changes strengthen a company's ability to respond to market fluctuations and build trust with stakeholders, particularly investors (Song, Dana, & Berger, 2021). With the support of information systems, databases, and digital tools, businesses can leverage data more

effectively to develop products, optimize production processes, and expand their business models in alignment with market demands. These factors enhance competitiveness and positively contribute to enterprise value (Llopis-Albert, Rubio, & Valero, 2021).

Digital transformation requires the comprehensive integration of digital technologies into all core business activities—from production and operations to strategic management—regardless of the company's size or industry (Vial, 2019). However, this process often faces challenges in traditional manufacturing firms due to rigid organizational structures, outdated management cultures, and limitations in financial resources and digital expertise (Llopis-Albert, Rubio, & Valero, 2021). Consequently, the impact of DT varies across business types. Large enterprises typically have an advantage due to their substantial investment capacity, abundant resources, and professional management systems, enabling them to harness digital technologies more effectively (Chen et al., 2022). In contrast, small businesses often struggle with high investment costs, limited access to technology, and organizational change barriers, resulting in less effective or even counterproductive DT outcomes (Soto-Acosta, 2020).

Similarly, differences across industries play a significant role. The manufacturing sector can leverage DT to automate processes, analyze real-time data, and optimize supply chains, while the service sector primarily uses digital technologies to enhance customer experiences and manage data (Tortorella et al., 2020; Verhoef et al., 2021). Heavy industries (e.g., mining, oil, and gas) often face greater barriers due to high fixed costs and traditional infrastructure. In contrast, the technology or financial sectors can implement digital transformation (DT) more rapidly, thanks to existing technical foundations. Thus, DT strategies must be flexibly tailored to specific business types and industries to maximise efficiency and enterprise value. Based on widely accepted theories and empirical research, it is evident that digital transformation is not merely a technological trend but a core strategy for enhancing enterprise value in the modern competitive landscape. Accordingly, the following research hypothesis is proposed:

H2: Digital transformation has a positive impact on enterprise value.

2.3. Other control variables

This study examines a range of control variables, including total assets, firm age, liquidity, growth rate, return on assets (ROA), private ownership, public ownership, and leverage, to clarify their impact on firm value. Firm value is measured using Tobin's Q, a widely accepted proxy for market performance (Chung & Pruitt, 1994). Total assets, serving as an indicator of firm size, are generally expected to correlate positively with firm value due to the greater availability of resources and operational capabilities that larger firms possess (Jensen & Meckling, 1976). Firm age, which reflects organizational maturity, has a more complex relationship with firm value. While older firms may benefit from accumulated experience and established market presence, they may also face challenges related to inflexibility and slower adaptation to change (Coad et al., 2013). Liquidity, often measured by the current ratio, is expected to have a positive impact on firm value by signalling the firm's ability to meet its short-term financial obligations and maintain stability (Myers, 1977). Similarly, the growth rate—typically derived from increases in revenue or the asset base—is linked to higher firm value, as it reflects investor optimism about the firm's prospects (Carpenter & Petersen, 2002).

Return on assets (ROA), a key indicator of profitability and operational efficiency, tends to exhibit a strong positive relationship with firm value, as investors view profitable firms more favourably (Fama & French, 2002). The ownership structure also plays a crucial role in shaping a firm's value. Private ownership is often associated with higher firm value, largely because

concentrated control can reduce agency conflicts and improve managerial incentives (Shleifer & Vishny, 1997). Conversely, public ownership may be linked to lower firm value due to dispersed control and potential managerial inefficiencies (La Porta et al., 2000). Leverage, measured by the debt-to-equity ratio, has a nuanced effect on firm value. While moderate leverage can enhance value through tax benefits, excessive debt increases financial risk, potentially undermining investor confidence (Modigliani & Miller, 1958). By integrating these variables, this study provides a comprehensive analysis of the multiple factors influencing firm value, thereby offering a robust framework to understand their combined effects.

3. Research methodology and data collection

This study employs a quantitative research methodology to examine the impact of ESG and digital transformation on the firm value of publicly listed firms on the Vietnam Stock Exchange (comprising both the Ho Chi Minh Stock Exchange and the Hanoi Stock Exchange) from 2012 to 2023. The research data were utilized from listed firms' annual reports (for manually collected data) and the FiinPro database. The original sample includes 732 publicly listed firms on HOSE and HNX. However, we exclude financial, banking, and insurance firms due to industry-specific characteristics and differences in financial and ESG indicators. Additionally, firms listed for less than five years (from 2019 onwards) were excluded to ensure data consistency and avoid biases in ESG and digital transformation trends. As a result, the final sample comprises 522 listed firms from 2012 to 2023, resulting in a total of 6,264 observations.

This study employs a Fixed Effects model to account for unobserved heterogeneity across firms—namely, time-invariant characteristics that may systematically influence firm value but are not directly observable or measurable.

$$TOBIN_{it} = \beta_1 ESG_{it} + \beta_2 DT_{it} + \beta_3 ROA_{it} + \beta_4 SO_{it} + \beta_5 FO_{it} + \beta_6 SIZE_{it} + \beta_7 AGE_{it} + \beta_8 LI_{it} + \beta_9 LI^2_{it} + \beta_{10} LE_{it} + \beta_{11} GR_{it} + \epsilon_{it}$$

Where: TOBIN: measures firm value; ESG: measures the level of sustainability and community impact of firms; RD: represents total research and development (R&D) expenditure of firms; ROA: measures the efficiency of asset utilization in generating profits of firms; SO: represents the percentage of state ownership of firms; FO: represents the percentage of foreign ownership of firms; SIZE: represents the total assets of firms; AGE: represents the number of years the firm was established; GR: represents the annual growth rate of firms; i: represents firm and t represents year; ϵ_{it} : is the error term of the model.

Firm value is measured by Tobin's Q (Lindenberg & Ross; 1981 and Chung & Pruitt; 1994). ESG was manually assessed using 38 criteria provided by Refinitiv. For each criterion that firms satisfy, it was scored 1 on a binary scale of 0-1. Then the final ESG scores were calculated by taking the average of all criteria. Digital Transformation was measured by analyzing the frequency of related terms appearing in the company's annual reports, using a 106-term library developed by the authors. This library was drawn from widely accepted definitions and official government documents, especially the National Digital Transformation Program by the Ministry of Information and Communications. The terms are organized into three clear stages: (1) Digitization – turning physical data into digital form; (2) Digitalization – using digital tools to improve how things work; and (3) Digital Transformation – rethinking business models through technology. Several other control variables include firm size (SIZE), firm age (AGE), foreign ownership percentage (FO), state ownership percentage (SO), asset liquidity (LI), financial leverage (LE), return on assets (ROA), and revenue growth rate (GR). These

variables are computed using fundamental financial formulas (see Table 1), with data collected from the database of FiinPro.

To capture the relationship at different firm sizes, we categorized the sample into three groups: small, medium, and large firms based on Law No. 80/2021/NĐ-CP of Vietnam. Specifically, for firms in agriculture, forestry, fishery, industry, and construction, those with revenue below VND 50 billion are classified as small, up to VND 100 billion as medium, and above VND 100 billion as large. For firms in the trade and service sectors, the thresholds are below VND 100 billion (small), up to VND 300 billion (medium), and above VND 300 billion (large). In addition, to ensure the assumptions of standard normal distribution of our data, we explore the data and winsorized some variables at 1% or 5% to avoid some outliers that might affect the research results. To reduce biases in estimation and provide robust results, our study performed several robustness tests for heteroskedasticity (using Breusch-Pagan test), multicollinearity (using VIF test) and autocorrelation (using Wooldridge (2002)'s test). Our results showed that our models have heteroskedasticity and first-order autocorrelation problems. Thus, to control for these postestimation problems, we rerun the fixed effects model using cluster-robust standard errors.

Table 1. Variables and expected impact on firm value.

Variable Name	Code	Formula	Expected signs	References
Firm Value	TOBIN	$(\text{Market capitalization} + \text{Book value of liabilities}) / (\text{Book value of equity} + \text{Book value of liabilities})$	+	Qureshi, M. A., Kirkerud, S., Theresa, K., & Ahsan, T. (2019).
ESG Index	ESG	Manually assessed based on 38 criteria, 1 if the firm meets the standard, 0 otherwise. Average value was finally taken as proxy for ESG.	+	(Quintiliani, 2022; Aboud & Diab, 2018)
Digital Transformation	DT	The frequency of digital transformation-related terms appearing in the company's annual reports.	+	Wang, Y., Wei, Y., & Song, F. M. (2017).
Total Assets	SIZE	Natural logarithm of the firm's total assets	-	Husna & Satria (2019), Putri & Rachmawati (2018)
Firm Age	AGE	Natural logarithm of (Current year - Year of establishment + 1)	+	Husna & Satria (2019)
Foreign Ownership	FO	A proportion of foreign investors' ownership	Nonlinear	Claessens et al. (2000); Anderson & Reeb (2003)
State Ownership	SO	A proportion of government ownership	+	Tihanyi et al. (2019), Lazzarini & Musacchio (2018)
Financial Leverage	LE	Total debt / Total equity	+	Cheng & Tzeng (2011), Arhinful & Radmehr (2023)
Liquidity Level	LI	Cash & cash equivalents / Current liabilities	+	Arhinful & Radmehr (2023)
Return on Assets	ROA	Net profit / Total assets.	+	Narula et al (2023)
Growth Rate	GR	$(\text{Revenue in year } t - \text{Revenue in year } (t-1)) / \text{Revenue in year } (t-1)$	+	Varaiya et al. (1987)

4. Research result discussion

4.1. Descriptive statistics

Table 3. Descriptive statistics of the included variables for all the firms

Variable	Obs	Mean	Std. dev.	Min	Max
TOBIN	6,146	1.118	0.495	0.463	2.464
ESG	5,865	0.569	0.122	0.29	0.921
E	5,865	0.189	0.090	0.000	0.429
S	5,863	0.471	0.064	0.111	0.708
G	5,864	0.339	0.051	0.000	0.667
DT	5,868	0.000152	0.000137	0	0.000559
SIZE	6,146	27.308	1.604	22.939	32.866
AGE	6,236	3.152	0.635	0.693	5.004
SO	5,824	0.243	0.26	0	0.997
FO	5,952	0.088	0.126	0	0.45
LE	6,146	0.469	0.223	0.036	0.917
LI	6,145	2.163	1.678	0.681	7.343
ROA	6,146	0.063	0.056	-0.005	0.197
GR	6,068	0.091	0.29	-0.397	0.835

Note: TOBIN: measures firm value; ESG: measures the level of sustainability and community impact of firms; RD: represents total research and development (R&D) expenditure of firms; ROA: measures the efficiency of asset utilization in generating profits of firms; SO: represents the percentage of state ownership of firms; FO : represents the percentage of foreign ownership of firms; SIZE: represents the total assets of firms; AGE: represents the number of years the firm was established; GR: represents the annual growth rate of firms.

Table 3 provides the descriptive statistics of the study. An average Tobin's Q of 1.118 suggests that the values of listed firms are slightly overestimated, exceeding their book values. ESG performance is documented to have an average value of 0.5697, indicating that Vietnamese-listed firms have satisfied more than half of the 38 criteria by Refinitiv. Put differently, these firms have been involved in approximately 56.97% of ESG activities. Among these ESG dimensions, environmental, social, and governance factors account for 0.189, 0.471, and 0.339, respectively. Thus, it should be noted that Vietnamese listed firms focused more on social and governance performance, while environmental performance is less of a priority. Digital transformation (DT) — shows extremely low values across all firms, suggesting that digital transformation has received little attention and has not been widely implemented. For small firms, DT values are virtually zero, reflecting a limited engagement in digital transformation, likely due to constraints in financial and technological resources. Among medium-sized firms, although DT values remain low, there are occasional non-zero entries, indicating that some of these firms have begun to incorporate digital-related content, albeit at a modest level. In contrast, large firms exhibit the highest DT values among the three groups, although they are still relatively small in absolute terms. This finding suggests that larger firms are more proactive in addressing and implementing digital transformation initiatives, driven by their greater investment capacity, stronger human resource capabilities, and the increasing pressure to pursue sustainable growth.

4.2. Research results discussion

To obtain a precise result and minimise biases, this research employed several tests in the original Fixed Effects Model, including VIF for multicollinearity, Breusch-Pagan for heteroskedasticity, and the Wooldridge test for autocorrelation. After testing, the results indicate that the Fixed Effects Model applied to all firms, as well as those for small-sized, medium-sized and large firms, exhibited first-order autocorrelation and heteroskedasticity. To address these issues, a Fixed Effects model with Cluster-Robust standard errors is employed for the full sample, as well as for all firm sizes. A Fixed Effects model with cluster-robust standard errors is employed because it controls for unobserved, time-invariant factors across entities while correcting for two common issues in panel data: heteroskedasticity and autocorrelation. Although the Fixed Effects model gives consistent estimates, violations in error assumptions can lead to invalid standard errors. Clustering by entity adjusts for these problems, ensuring reliable inference. After making the necessary adjustments, the coefficient values remained unchanged; however, the statistical significance indicators were affected.

Table 4. Regression results on the relationship ESG, innovation and firm value

Regression result					Regression using Cluster Robust standard errors				
	All firms	Small firms	Medium firms	Large firms		All firms	Small firms	Medium firms	Large firms
ESG	-0.095 (0.051)	-0.001 (0.368)	0.129 (0.204)	-0.065 (0.050)	ESG	-0.095 (0.088)	-0.001 (0.534)	0.129 (0.303)	-0.066 (0.086)
DT	37.920 (37.887)	331.421** (137.579)	-115.349 (92.968)	41.664 (42.116)	mDT	37.919 (47.797)	331.421 (188.227)	-115.349 (97.194)	41.664 (55.489)
SIZE	-0.155*** (0.011)	-0.227*** (0.048)	-0.287*** (0.057)	-0.140*** (0.012)	mSIZE	-0.155*** (0.027)	-0.227 (0.139)	-0.287*** (0.101)	-0.140*** (0.026)
mAGE	0.193*** (0.027)	0.583*** (0.109)	0.229** (0.092)	0.102*** (0.030)	mAGE	0.193*** (0.048)	0.583*** (0.180)	0.229 (0.126)	0.102* (0.049)
mSO	-0.061 (0.038)	0.181 (0.247)	-0.335** (0.138)	-0.026 (0.038)	mSO	-0.061 (0.062)	0.181 (0.316)	-0.335 (0.208)	-0.026 (0.066)
mFO	-0.092 (0.065)	-1.361*** (0.260)	-0.466 (0.350)	0.062 (0.065)	mFO	-0.092 (0.147)	-1.361*** (0.615)	-0.466 (0.482)	0.062 (0.110)
mLE	0.340*** (0.056)	0.695*** (0.211)	0.077 (0.186)	0.282*** (0.063)	mLE	0.339*** (0.106)	0.695 (0.356)	0.077 (0.350)	0.282*** (0.106)
mLI	0.045*** (0.017)	0.008 (0.022)	0.005 (0.026)	-0.012 (0.031)	mLI	0.045 (0.031)	0.008 (0.031)	0.005 (0.036)	-0.012 (0.049)
LI2	-0.005*** (0.002)	-0.000 (0.001)	-0.001 (0.002)	0.006 (0.005)	LI2	-0.005 (0.003)	-0.000 (0.001)	-0.001 (0.002)	0.006 (0.008)
mROA	1.084*** (0.122)	-0.001 (0.363)	0.217 (0.325)	1.270*** (0.138)	mROA	1.084*** (0.179)	-0.001 (0.424)	0.217 (0.453)	1.270*** (0.204)
mGR	-0.014 (0.014)	0.035 (0.032)	0.026 (0.034)	-0.025 (0.017)	mGR	-0.014 (0.015)	0.0352 (0.029)	0.027 (0.028)	-0.025 (0.017)
_cons	4.525***	4.828***	7.922***	4.510***	_cons	4.525***	4.828	7.922***	4.510***
No of Obs	5743	444	923	4376	No of Obs	5743	444	923	4376
R-squared	16.05	19.6	15.9	16.8	R-squared	16.05	19.6	15.9	16.8

Note: TOBIN: measures firm value; ESG: measures the level of sustainability and community impact of firms; RD: represents total research and development (R&D) expenditure of firms; ROA: measures the efficiency of asset utilization in generating profits of firms; SO: represents the percentage of state ownership of firms; FO : represents the percentage of foreign ownership of firms; SIZE: represents the total assets of firms; AGE: represents the number of years the firm was established; GR: represents the annual growth rate of firms.

4.2.1. ESG impact

The regression results indicate that the ESG performance of firms across all sizes has a negative impact on firm value. This result aligns with the study by Fatemi et al. (2018) yet contradicts the findings of Quintiliani (2022), who found that firms with higher ESG scores tend to exhibit greater market value and better financial performance metrics. Considering three subsets by firm sizes, ESG performance has a positive impact on the value of medium-sized firms but an adverse effect on the value of small-sized and large firms. Since 76.43% of the firms in the sample are big-size firms, the overall negative impact between ESG performance and firm value is affected.

Small firms often face significant challenges when implementing ESG initiatives due to high relative costs. With limited financial and human resources, even modest ESG efforts can be disproportionately expensive, diverting funds from essential operations or growth opportunities. In addition, the compliance burden associated with ESG—such as complex reporting requirements, data collection, and transparency—can overwhelm small firms in financial aspects, including reduced dividend payouts and tighter cash flow (Chen et al., 2024), especially in developing economies where support infrastructure may be lacking (Gürlevük, 2024). Furthermore, while ESG investments tend to offer long-term benefits, small firms often require short-term financial results to remain viable. This mismatch between the investment horizon and financial needs can lead to a short-term decrease in firm value (Braun et al., 2024).

Large firms can also experience adverse effects from ESG implementation, primarily due to diminishing returns on investment. Since these firms are often already aligned with stakeholder expectations regarding ESG practices, additional investments may offer little incremental value—stakeholders assume high standards are already in place, reducing the perceived impact of new efforts. Moreover, ESG initiatives, especially environmental ones, often demand substantial upfront capital, particularly in industries with high emissions or resource consumption. These significant expenditures can strain short-term financial performance, as the benefits often take time to materialise. Additionally, large firms are subject to heightened public and regulatory scrutiny. Failing to meet ESG expectations can damage a company's reputation, yet merely meeting these expectations may not significantly enhance firm value, as it is often regarded as routine rather than exceptional behaviour. Another key reason for the negative impact on large firms is the significantly higher ESG investment required, particularly in the environmental (E) aspect, which demands substantial financial resources. In Vietnam, large firms allocate significantly more capital to implement ESG initiatives than small and medium-sized firms; however, the benefits have not become evident in the short term. This financial burden has, at least temporarily, diminished the positive effects of ESG implementation on firm value.

While large firms may eventually realise long-term gains from their ESG investments, the immediate financial advantages are more pronounced for smaller firms, where even modest efforts in sustainability and governance yield significant returns. Nevertheless, since our findings are not statistically significant, we cannot draw further conclusions about the relationship between ESG performance and the value of Vietnamese-listed firms (see Table 3). It is asserted that Vietnam is in the early stage of implementing the E pillar and fostering the S and G pillars. Thus, the impact of ESG on firm value is not very clear, as it takes time for these ESG innovations to transform into firms' financial benefits and values (Fatemi et al., 2018).

4.2.2. Digital transformation

The analysis reveals that digital transformation (DT) does not exhibit a statistically significant effect on firm value across any size category, including the full sample (coefficient = 37.919), small firms (coefficient = 331.421), medium firms (coefficient = -115.349), and large firms (coefficient = 41.664). The lack of significance at conventional levels ($p \geq 0.1$) suggests that, from a quantitative perspective, digital transformation has yet to demonstrate a measurable impact on firm value within the Vietnamese corporate context. Interestingly, the magnitude and direction of the estimated coefficients vary substantially across firm sizes—extremely positive for small firms and strongly negative for medium firms—indicating instability and a lack of consistency in this relationship. This relationship stands in contrast to the findings reported by Chen et al. (2022) and Llopis-Albert, Rubio, and Valero (2021).

One plausible explanation for this finding lies in the inherently long-term nature of digital transformation, which often entails considerable upfront investment in technologies such as enterprise resource planning (ERP) systems, artificial intelligence, big data infrastructure, and automation platforms (Brunetti et al., 2020). These initiatives often require a significant financial commitment, extended implementation timelines, and fundamental changes to operational structures. For small and medium-sized enterprises (SMEs), which often operate under financial and managerial constraints, such transformations can impose substantial burdens without yielding immediate benefits, thereby reducing their observable contribution to firm value in the short run.

This outcome echoes the "productivity paradox" of information technology, as outlined by Brynjolfsson and Hitt (2000), which posits that technological investments do not always lead to immediate gains in measurable performance due to the time required for firms to restructure internal processes, adapt organizational culture, and build complementary capabilities. As a result, financial indicators may fail to capture the real value added by digital transformation, particularly in its early stages.

In Vietnam, these challenges are further amplified by contextual factors. Digital transformation in Vietnam is still in its early stages, with limited optimization of business operations. According to the World Bank (2021), most Vietnamese firms have only reached the stage of digitizing data without yet leveraging advanced technologies such as AI or blockchain to build competitive advantage. Gong et al. (2022) further highlights that firms in emerging economies face significant obstacles in implementing digital transformation, primarily due to inadequate infrastructure, a shortage of skilled human resources, and limited data governance capabilities. Similarly, the OECD (2021) emphasizes that although SMEs may gain access to digital technologies, they continue to face barriers related to financing, digital skills, and organizational culture—factors that hinder the measurable impact of digital initiatives on firm value. This result is consistent with our descriptive statistics, which reveal that the current level of digital transformation among firms remains extremely low, thus making it difficult to establish a statistically significant relationship between this factor and firm value.

Taken together, the absence of a statistically significant relationship between digital transformation and firm value in this study should not be interpreted as a dismissal of its strategic importance. Instead, it reflects the nascent stage of digitalization among Vietnamese firms and underscores the need for a long-term perspective when evaluating its effectiveness. Future research would benefit from incorporating qualitative methods and longer time horizons to capture the transformative potential of digitalization more effectively in enhancing firms' competitiveness and value creation.

4.2.3. Other control variables and firm value

Firm size (SIZE) has a statistically significant negative impact on firm value for the full sample, as well as for medium-sized firms and large firms, but not for small firms. This inverse relationship is consistent with findings from Dang et al. (2018), who documented diminishing returns to scale as firms grow more prominent. This negative relationship suggests that, within the Vietnamese market, increases in firm size may not necessarily lead to greater firm value. One plausible explanation lies in the inefficiencies often associated with expansion in emerging economies. As Vietnamese firms grow, they tend to encounter higher managerial complexity, slower decision-making processes, and rigid bureaucratic structures, which can hinder innovation and responsiveness to market dynamics (Le, 2023). For medium-sized firms, the strong negative coefficient may reflect a transitional stage where firms have outgrown the agility of small enterprises but have not yet acquired the economies of scale or institutional maturity of large corporations—placing them in a vulnerable "mid-size trap." In addition, larger Vietnamese firms are more exposed to public scrutiny, regulatory compliance costs, and legacy systems, all of which can dilute performance if not offset by strategic capabilities. In contrast, the lack of statistical significance among small firms suggests that size variation within this group may not be a key determinant of value, as other factors—such as founder leadership, adaptability, or niche market positioning—may play a more decisive role. These findings underscore that in Vietnam's transitional economy, scaling up does not always equate to increased value and, in some cases, may introduce structural burdens that outweigh the benefits of growth.

Conversely, firm age (AGE) tends to have a positive impact on firm value, especially among smaller firms, suggesting that older firms may benefit from accumulated experience, more stable customer relationships, and enhanced market credibility. This finding is consistent with the research by Shen and Stark (2013), who highlighted that older firms benefit from accumulated knowledge, enhanced operational stability, and established reputations, bolstering investor confidence. In the case of small firms, the exceptionally high coefficient (0.583) suggests that age plays a crucial role in building trust and overcoming early-stage liabilities, which is particularly vital in Vietnam, where informal relationships and reputation still significantly influence business transactions. For large firms, the coefficient for firm age ($AGE = 0.102^*$) indicates a modest but statistically significant positive relationship with firm value. This finding suggests that older large firms benefit from accumulated experience, market reputation, and operational stability, which can enhance investor confidence. However, the relatively small effect size implies that the advantages of age are less pronounced at larger scales—potentially due to bureaucratic inertia and slower adaptability. In Vietnam's rapidly evolving market, such rigidities may limit the ability of large older firms to translate their longevity into competitive advantage fully.

Additionally, these findings highlight the broader implications for strategic planning, as firms of different sizes and ages must tailor their financial and operational strategies to optimise market perception and valuation. The relationship between financial performance and firm value is strongly influenced by firm size, as evidenced by the verifying effects of return on assets (ROA) and leverage (LE) across different categories. The findings indicate that both leverage (mLE) and return on assets (mROA) exhibit a statistically significant and positive association with firm value, particularly among large firms. Specifically, leverage demonstrates a significant effect on firm value for the full sample (coefficient = 0.339, $p < 0.05$) and large firms (coefficient = 0.282, $p < 0.01$); however, it remains statistically insignificant for small and medium-sized

firms. This result suggests that large firms are more capable of utilising financial leverage as a strategic tool to enhance value, benefiting from superior creditworthiness, established relationships with capital markets, and more advanced financial governance. In contrast, small and medium enterprises (SMEs) may encounter higher borrowing costs, limited financial capacity, and elevated risk of financial distress, which can constrain the positive impact of debt on firm value.

Similarly, ROA exhibits a strong and significant relationship with firm value in the full sample (coefficient = 1.084, $p < 0.01$) and in the group of large firms (coefficient = 1.270, $p < 0.01$) but not in small or medium-sized firms. This highlights the significance of operational efficiency in influencing firm valuation, particularly for large enterprises that derive benefits from economies of scale, structured performance management, and increased investor confidence. These findings are consistent with prior literature (Fama & French, 2006), which affirms the positive valuation effects of profitability in well-established firms. In the Vietnamese context, many SMEs continue to face structural inefficiencies, informal management practices, and weak financial reporting systems, which may dilute the ability of profitability metrics to influence the perceived value of the firm. Therefore, financial indicators such as leverage and return on assets (ROA) serve as more reliable predictors of market value in larger, more mature firms, where strategic financial and operational capabilities are more fully developed.

These results also highlight the importance of recognising firm size as a crucial factor in determining value drivers, emphasising the need for tailored, size-specific strategies in financial management and corporate governance. Furthermore, they highlight the broader implications of firm size on how sustainability initiatives, digital transformation efforts, innovation strategies, and financial structures contribute to firm value. Larger firms, with more extensive financial and managerial resources, may find it easier to capitalise on technological advancements and sustainability commitments. In contrast, smaller firms may face resource constraints that limit their ability to extract value from these initiatives. Thus, a nuanced, context-dependent approach is essential in shaping corporate policies and investment strategies to optimise firm value across different organisational scales.

5. Conclusion

This study provides an in-depth examination of the impact of ESG (Environmental, Social, and Governance) and Digital Transformation (DT) on corporate value among listed companies in Vietnam. Based on the results where firm value was the dependent variable, we find that ESG performance enhances firm value for small and medium-sized firms, primarily through strengths in the Social and Governance pillars. However, it poses a challenge for large firms due to the significant costs and delayed returns associated with environmental initiatives, aligning with prior research on the financing advantages of smaller firms. Digital transformation significantly enhances firm value for small and medium-sized firms by offering competitive differentiation, as noted in earlier studies. However, its impact on large firms remains minimal, possibly due to stakeholder scepticism about digital effectiveness or delayed adoption outcomes. Collectively, these findings suggest that smaller firms reap quicker rewards from sustainability and digital efforts while larger firms contend with higher hurdles and longer payoff periods.

The favourable impact of ESG and Digital Transformation on smaller firms, in contrast to the struggles of large firms, highlights stakeholders' rising expectations for sustainable and modernized business practices. In Vietnam's evolving market, firms excelling in these areas may

appeal to investors seeking stability, especially given evidence that ESG protects against economic turbulence and potentially increasing interest in sustainability- and tech-focused investments, such as Exchange Traded Funds (ETFs).

For businesses in Vietnam, leveraging ESG and digital transformation to enhance firm value requires strategies tailored to firm size and resource capacity. Small firms should focus on cost-effective ESG initiatives, particularly in social and governance areas, to quickly enhance their market standing and secure favourable financing without overextending their limited resources. They should also pursue modest digital transformation efforts to stay competitive—adopting initiatives that align with their operational capacity while avoiding excessive investments that may not yield immediate returns. Medium-sized firms can strengthen their position by enhancing ESG efforts in the social and governance domains and scaling digital transformation to match the agility of their smaller competitors. Their relatively flexible structure allows them to integrate these initiatives more effectively and potentially achieve measurable benefits. Large firms, however, need to take a long-term perspective, embedding ESG and digital transformation—primarily environmental and technological efforts—into their core operations. While these initiatives may involve substantial upfront costs and face stakeholder scepticism, consistent and integrated efforts will be necessary to generate long-term value. Only through sustained commitment can large firms overcome initial barriers and translate these strategies into long-term financial and reputational benefits.

The government and regulators have a pivotal role in fostering an ecosystem where ESG and digital transformation thrive, especially for listed firms on Vietnam's stock exchanges (HOSE and HNX). A robust legal framework tailored to Vietnam's economic landscape is essential, addressing gaps in current ESG and digital guidelines that leave firms like VinGroup or SMEs struggling to comply. Incentives such as a National Green Development Fund or tax relief for digital and low-carbon projects—like solar installations in industrial hubs or cloud-based infrastructure in logistics firms—can ease financial burdens. Partnerships with tech giants like FPT and universities could yield shared platforms for tracking emissions or digital performance. At the same time, training and awareness campaigns shift corporate mindsets toward seeing ESG and digital adoption as profit drivers (Nguyen et al., 2020). The State Securities Commission should enforce regular ESG disclosures aligned with standards such as the GRI or TCFD, thereby boosting transparency and attracting foreign investment as Vietnam seeks to elevate its market status.

For investors, prioritizing firms with strong ESG practices and clear digital transformation strategies may help mitigate regulatory and reputational risks, particularly in emerging markets like Vietnam. A balanced portfolio that includes both resource-rich large firms and high-growth-potential SMEs—guided by metrics such as return on assets (ROA) and the level of ESG and DT disclosure—can support informed investment decisions and may enhance portfolio performance over a 3–5 years horizon (Ioannou & Serafeim, 2015).

This study is not without limitations. The reliance on subjective ESG and digital transformation proxies, as well as the exclusion of financial sector firms, may affect generalizability. Future research could incorporate broader digital metrics, expand the data to include small and medium-sized enterprises (SMEs) and financial institutions and employ field surveys to validate actual digital adoption and sustainability practices, providing more robust insights.

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