OPEN ACCESS: Al-Aijaz Research Journal of Islamic Studies & Humanities
ISSN (ONLINE): 2707-1219 & ISSN (PRINT): 2707-1200
http://www.arjish.com

Determinants of Social Media Sustainability Reporting: Evidence from Twitter

Tahira Kanwal
Ph.D. Scholar, Department of Commerce, Bahauddin Zakariya University, Multan, Pakistan.
Email: tahirasalman6@gmail.com

Prof. Dr. Rehana Kouser
(Corresponding Author) Dean & Chairperson, Department of Commerce, Bahauddin Zakariya University, Multan, Pakistan.
Email: rehanakousar@bzu.edu.pk ORCID: https://orcid.org/0000-0003-41-3046

Muhammad Umer Quddoos
Associate Professor, Department of Commerce, Bahauddin Zakariya University, Multan, Pakistan.
Email: umerattari@bzu.edu.pk, ORCID: https://orcid.org/0000-0002-1498-6822

Received on: 02-10-2025 Accepted on: 03-11-2025

Abstract

Purpose: This study explores the sustainability reporting determinants of the Social Media Sustainability Reporting (SMSR) on Twitter, and how institutional pressures, firm-specific characteristics and organizational capabilities affect sustainability communication through digital platforms. With the growing usage of social media as the complement to the existing sustainability reporting, the motivation of such disclosure becomes the critical issue of both theory and practice.

Methodology: The study uses the panel data regression methods using a balanced panel dataset (89 non-financial firms) during the period of 2019-2023 (445 firm-years observations). Estimates of ordinary least squares (OLS), fixed effects (FE), and random effects (RE) models are done and the Hausman specification test is applied to determine the best estimator. Sustainability reporting based on twitter is operationalized as dependent variable, whereas the governance, technological, institutional and contextual factors are explanatory variables.

Findings: The findings show that the positive and significant influence on sustainability reporting on Twitter platforms has been observed in regards to technological capability and sustainability-related awards, which introduces the concept of digital preparedness and external reward in defining disclosure behavior. Environmental sensitivity and media visibility, conversely, are negatively related, implying that companies with increased scrutiny might be more conservative in their disclosure methods on social media platforms open to the public. The continuity of previous Twitter use further supports the entrenched quality of digital sustainability communication when implemented.

Implications: The results endorse the legitimacy and institutional point of view by showing that SMSR is a strategic practice and not just a choice that is merely symbolic. In practice, the research provides information to managers, policymakers, and regulators who would want to encourage viable and

commendable sustainability communication via social media.
Originality/Value: Offering evidence at the firm-level, in paneling form, within an emerging market, this study augments to the literature regarding digital sustainability reporting and offers insight into Twitter as a strategic disclosure website.
Keywords: Social Media Sustainability Reporting; Twitter; Sustainability Disclosure; Panel Data Analysis; Technological Capability; Emerging Economies; Corporate Sustainability

1. Introduction

Over the past years, the business environment has been transformed by the growing environmental conditions, growing social awareness and a growing demand on the concerning corporate governance. Climate change, scarcity of resources, labor standards, social inequality and failure of ethical governance have made headlines of concern among policy makers, investors, consumers and civil society (Sha and Basri 2026). Consequently, companies are not evaluated based on the financial performance alone; they have to exhibit transparency, accountability and responsibility in the environmental, social and governance (ESG) areas (Russo et al. 2026). This has greatly increased the relevance of sustainability reporting as one of the means through which organizations report their non-financial performance and justify their actions in the perception of various stakeholders (Pennesi and Giuliani 2025).

Sustainability reporting has been carried out in terms of annual reporting or in independent sustainability reporting. Although these formats still play a crucial role they are more retrospective, more static, and more technical in nature making them less accessible and less relevant to many stakeholders (Mahmood et al. 2025). Additionally, traditional reporting PLCs limit the responsiveness of firms to emerging sustainability issues or requirements of the stakeholders. Simultaneously, the blistering development of digital technologies changed the way organizations communicate and interact, as well as how they disclose information (Hogarth 2024). Social media platform appears as one of the potent technologies that allow information sharing in real-time at the stakeholder, and delivering corporate stories at the global level (Zhou et al. 2024).

The increased utilization of social media as a sustainability communication tool exists as a great transformation in the way sustainability is reported. The social media especially twitter enable organizations to communicate sustainability information in real time, discuss sustainability with the stakeholders, and address the social and environmental concerns as they happen in the society publicly (Said, Zainal, and Jalil 2023). This has brought about what is already being demanded as such, as Social Media Sustainability Reporting (SMSR), a type of disclosure that goes beyond one-way information delivery to interactive, dialogic and participative communications (Russo et al. 2026). With SMSR, companies have the opportunity to promote sustainability practices, indicate the desire to pursue ESG objectives, and control legitimacy on highly visible digital platforms.

Although the adoption and utilization of social media in sustainability reporting is increasing, the differences in the use and adoption by firms are quite conspicuous. Some organizations are keen to implement sustainability communication in their social media policies but others do not disclose enough or do it erratically. Such differences indicate an ability to have the adoption of SMSR influenced by a complex of organizational facets, institutional factors and strategic issues as opposed to technological presence (Said et al. 2023). The identification of

the determinants of SMSR adoption is thus of critical importance to theory and practice especially with the advent of digital communication has emerged as part and parcel of corporate sustainability plans (Rahmansyah, Mulyany, and Geumpana 2023).

Twitter is one such possible venue that should be studied in relation to SMSR. Being a microblogging platform with focused characteristics of brevity, immediacy, and publicity, Twitter has emerged as one of the primary platforms of corporate communication and stakeholder outreach (Zhong and Wang 2023). Through Twitter firms distribute information as quickly as possible and interact with investors and consumers as well as with scrutinizes by the people. The open and interactive platform increases opportunities and threats related to disclosure on sustainability (Said et al. 2023). Twitter, on one hand, helps firms to improve their transparency and interaction with stakeholders; on the other it places them in a more vulnerable position to scrutiny, reputational loss and questions the sustainability of their news to be true. These features render twitter to be the right place when it comes to the analysis of the strategic determinants of social media-based sustainability reporting (Luca et al. 2022).

The empirical studies examining sustainability reporting have intensified significantly over the last two decades; most of this literature dwells on conventional types of reporting or in the developed economy setting. The amount of studies investigating the application of social media in sustainability disclosure is rather finite and those that do focus on the subject are frequently interested in content analysis or descriptive trends as opposed to the determinant factors behind the adoption (Tullio, Torre, and Rea 2021). In addition, the lack of quantitative, firm-level data on the causes of SMSR is also markedly pronounced, especially in new economies where the institutional industries do not mirror that of a developed market (Lodhia, Kaur, and Stone 2020). Such situations usually have a weaker regulatory enforcement, sustainability disclosure frequently remains voluntary, and social media can have a disproportionate role in closing information differences between companies and stakeholders.

Figure 1.1 Major Social Media Sustainability Reporting Forums

This study contributes to the comprehension of the reasons that make firms use social media as one of the means of reporting their sustainability, as well as the influence of organizational

and institutional aspects on such decisions. By doing so, it will address the need of increasing empirically and context-specific studies on digital sustainability reporting, as well as offer a base of future work exploring the consequences of social media-based disclosure on corporate legitimacy, trustworthiness of stakeholders, and long-term performance.

2. Literature Review

2.1 Sustainability Reporting and Corporate Accountability

According to (Reilly and Hynan 2014) Sustainability reporting has become one of the foundational tools of how organizations report on their environmental, social, and governance (ESG) performance and how organizations thresh their accountability to their stakeholders. The initial endeavors of sustainability reporting were greatly voluntary and did not involve any mandatory reporting as far as the environmental disclosures were concerned; which happened to be driven by the issues of legitimacy and reputational risk management (Bellucci and Manetti 2016). During this period, the sustainability reporting has increasingly become more inclusive of social and governance aspects and is a response to the wider societal anticipations as to corporate responsibility and ethical behavior (Manetti and Bellucci 2016). According to the existing literature, sustainability reporting is a key driver to increase transparency, mitigate information asymmetry and increase organizational legitimacy that may be questioned in situations where stakeholders require increased visibility regarding corporate practices (Basuony 2018). Although its significance has risen over time, traditional sustainability reporting has been accused of being backward, standardized and lack of full stakeholder inputs (Wang 2018). The annual reports and stand-alone sustainability report are usually long, technical, and even focused on the investors or regulators, which limits their availability to the broader of the stakeholders (Amin, Mohamed, and Elragal 2019).

2.2 Digital Transformation and the Emergence of Social Media Sustainability Reporting

According to (Ramananda 2020) the digital revolution that has made corporate communication very fast has radically changed the way organizations share information and communicate with stakeholders. The social media platform offers real-time and two-way communication channels that give organizations never before experienced possibilities to connect with the stakeholders, create narratives, and provide responses to arising matters (Amin et al. 2021). Among such a changing environment, the concept of Social Media Sustainability Reporting (SMSR) has been recognized as a new type of sustainability disclosure that takes advantage of digital media to disseminate information related to the ESG (Tullio et al. 2021). SMSR and traditional sustainability reporting are different in a number of significant aspects. First, it is not periodical but continuous and immediate thus enabling firms to report sustainability information as it happens. Second, it is engagements as it allows the stakeholders to comment, query and share the corporate disclosures. Third, it is extremely visible, which places firms in a wider and more eclectic audience (Luca et al. 2022).

2.3 Twitter as a Platform for Sustainability Reporting

According to (Luca et al. 2022) Twitter has become one of the most powerful corporate sustainability communication channels among social media platforms. It is disclosing

immediate, transparent and social which is characteristic of microblogging, and it is well suited to real-time disclosure and engagement between stakeholders (Bosi et al. 2022). The companies utilize Twitter to declare sustainability projects, address environmental or societal scandals, and indicate their compliance with ESG standards. In contrast to the closed or visually oriented platforms, twitter enables the public debate and information dispersion, which enhances the positive and negative responses in response to corporate disclosures (Tullio and Torre 2022). The empirical researchers on the use of Twitter as a corporate tool indicate that companies are using the tool strategically to cope with legitimacy and reputation. Tweets that are related to sustainability tend to communicate responsible behavior, showcase achievements and show responsiveness towards the issues of the stakeholders (Said et al. 2023).

2.4 Organizational Determinants of SMSR Adoption

According to (Zhong and Wang 2023) organizational attributes are very instrumental in determining the uptake of SMSR by firms. Some of the literature notes that the internal governance structures, commitment of their leadership and availability of resources play a significant role in the sustainability disclosure behaviors (Khan et al. 2025). Formally governed firms through CSR committees or special sustainability reporting units will tend to have more systematic and uniform practices when it comes to sustainability reporting: even in digital form. Another determinant of organizations is technological capability (Tullio et al. 2021). SMSR necessitates computer literacy, communication skills, and capability of incorporating the sustainability data into short and appealing information. The companies that have greater technological strengths will be in a better position to handle the communication through social media effectively and social media reaction to stakeholder communication (Tullio and Torre 2022). There are empirical indicators that technologically advanced companies tend to have a greater conservative of innovative reporting practices and using digital platforms in a strategic manner. Sustainability disclosure behavior has also been associated with firm size and financial performance (Mahmood et al. 2025). Big companies are more prone to public attention and can invest more funds in sustainability reporting, which is more likely to do well in enhancing SMSR (Said et al. 2023).

2.5 Institutional and Environmental Drivers

According to (Said et al. 2023) institutional pressures greatly influence the sustainability reporting behavior of firms. Institutional theory avers that institutional organizations are able to embrace socially acceptable practices due to coercive, normative and mimetic pressures. Within the framework of SMSR, transparency may have coercive pressures dependent on regulatory expectations or stock exchange rules which can efficiently bring about control despite weak enforcement on it (Basuony 2018). Normative pressures are based on the professional standards, sustainability standards and expectations advanced by advocacy groups and NGOs. Mimetic pressures motivate companies to follow their counterparts or industry leaders who can be considered legitimate or effective in their sustainability communication (Wang 2018). The research on peer practices has found that it affects the adoption of sustainability reporting by firms, especially in the competitive or the highly visible industry (Reilly and Hynan 2014).

2.6 Stakeholder Risk, Media Visibility, and Legitimacy Concerns

According to (Zhong and Wang 2023) stakeholder theory accentuate that companies are receptive to demands and compulsions of stakeholders who might impact organizational repercussions. The risk of the stakeholder is increased in online setting, where social media allows spreading the news quickly and organizing mass movements (Bellucci and Manetti 2016). Companies that have increased stakeholder risk can use SMSR to respond and alleviate possible tensions. There is also the increase in legitimacy pressures by media visibility (Amin et al. 2021). Companies that have a higher exposure to media are more susceptible to reveal themselves in terms of publicity and face a higher chance of damage in their reputation, which makes cases of proactive sustainability communication a valuable incentive set (Sha and Basri 2026). According to previous researchers, companies strategically utilize social media to control their visibility and determine how stakeholders view them, especially when the issue under consideration is at the peak of the media. This study fills these gaps by offering firm level and panel study evidence of the organizational and institutional motivators of Twitter-based sustainability reporting. In such a way, it facilitates the further knowledge of the digital sustainability communication and leaves people to continue the argument about corporate transparency, legitimacy, and accountability during the digital age.

3. Methodology

3.1 Research Design

In this research, a quantitative research design involves the use of a panel study as it will be conducted based on Twitter-based disclosures to investigate the determinants of Social Media Sustainability Reporting (SMSR). The use of panel data is especially suitable in this study because it could analyze cross-sectional (firm-level) and time-series (yearly) changes and this would enhance a higher estimation efficiency and overcome the risk of unobserved heterogeneity among firms (Reilly and Hynan 2014). Through longitudinal exploitation, this study can develop dynamic changes of the sustainability reporting behavior of the firm over a period of time and consider firm-specific characteristics, which may not necessarily be directly observed. The data covered is publicly listed companies over five years (2019-2023), which is a period that is defined by growing digital interaction and sustainable consciousness. The design of the panel structure allows the panel structure to have stronger inference than the purely cross-sectional designs, which have weak inference of the omitted variable bias and time-invariant firm characteristics.

3.2 Sample and Data Collection

The sample size includes 89 non-financial firms, which presents an equalized panel of 445 firm-year observations. These companies were sampled in accordance with available data databases related to sustainability-related activity on Twitter and financial and governance characteristics of firms. Data about Twitter were direct materials obtained on Twitter accounts of the firms which were used to create a dependent variable that would measure the intensity of the communication based on sustainability issues (Lodhia et al. 2020). Annual reports and financial databases provided by financial reporting authorities made available the financial and firm-specific variables. This result concerning the exclusion of financial

firms is aligned with the previous literature because these firms are regulated by different regulations and reporting standards and, therefore, sustainability disclosure behavior might be affected differently by them (Tullio et al. 2021). The end sample makes the firms and time periods consistent, which allows making consistent panel estimates.

3.3 Variable Measurement

Twitter-based SMSR is the dependent variable that measures the level of disclosure that is related to sustainability on Twitter. It is quantified in the form of a composite index of the percentage and the frequency of sustainability-based tweets by each company in a particular year. The independent variables are organizational, institutional and contextual factors of SMSR (Tullio and Torre 2022). Organizational dimensions are the existence of CSR committee, awards, CSR foundations, technological competency, the size of the firm, and finances performance (ROA). The NGO pressure, peer practices, media visibility, and environmental sensitivity are also proxies of institutional pressures. Stakeholder risk is added to cover the exposure to stakeholder's scrutiny and legitimacy issues. The use of control variables is to capture firm level factors that could have a direct effect on disclosure of sustainability or independently of the key explanatory variables (Said et al. 2023).

3.4 Econometric Model Specification

To examine the determinants of SMSR, the following baseline panel regression model is estimated:

$$SMSR(Twitter)_{it} = \alpha + \beta_1 CSRCOM_{it} + \beta_2 VoA_{it} + \beta_3 CSRFN_{it} + \beta_4 SRQ_{it} + \beta_5 INDSEN_{it} + \beta_6 NGOP_{it} + \beta_7 PEERCOM_{it} + \beta_8 TECHCAB_{it} + \beta_9 MEDVIS_{it} + \beta_{10} SEI_{it} + \beta_{11} SIZE_{it} + \beta_{11} ROA_{it} + \varepsilon_{it}$$

Social Media Sustainability Reporting on Twitter (SMSR–Twitter), Sustainability Committee (CSRCOM), Visibility of Achievement (VOA), Corporate Social Responsibility Forms (CSRF), Peer Practice (PEERCOM), Technological Capability (TECHCAP), Industry Sensitivity (INDSEN), Media Visibility (MEDVIS), Stakeholder Engagement (STAKEENG), Non-Governmental Organization Pressure (NGOP), Sustainability Reporting Quality (SRQ), Error Term (ε_{it})

Both the random effects (RE) and fixed effects (FE) estimations are used. The fixed effects and the random effects models manage unobserved, time-invariant firm characteristics correlated with the explaining variables and all the models assume that these effects are not correlated with the regressors, respectively (Said et al. 2023). The comparability of the choice of estimation technique is conducted by the Hausman specification test. The fixed effects model is preferable to the test where the test suggests that the FE and RE estimates are different systematically.

3.5 Pre-Estimation Diagnostics

A number of diagnostic tests had been done before estimation so that the validity of the results of panel regression could be assured. The tests on the stationarity of the variables were undertaken through panel unit root tests (Levin-Lin-Chu and Im-Pesaran-Shin). These results suggest that, there is no need of differencing in the variables since they are all at level

and they can be directly entered into the regression models (Zhong and Wang 2023). The correlation Underlying Multicollinearity to explain variables a correlation was analyzed with the aim of determining whether there could be a Multicollinearity between explanatory variables. These findings indicate that pair-wise correlations are typically small and far below standard levels, which implies that Multicollinearity will not likely be a problem in estimating the outcomes. More diagnostics of variance inflation factor (VIF) substantiate this conclusion.

3.6 Estimation Procedure and Robustness

Panel least squares are then used to estimate the panel regressions with heteroscedasticity standard errors where necessary. They have year dummies that are used to help control the shocks of the macro economy or regulation that occurs to all firms at a particular time. The issue of robustness is also improved by estimation of alternative model specifications and analyzing the consistency of coefficient signs and level of significance.

3.7 Ethical Considerations

The information employed in the current study is based on publicly accessible information, that is, corporate Twitter profiles and published financial reports. There are no confidential or personal information and the study meets the ethical requirements of analyzing secondary data.

4. Results and analysis

This section presents and discusses the empirical findings of the research on the determinants of Social Media Sustainability Reporting (SMSR) on Twitter. The analysis will commence with initial diagnostics such as panel unit root tests, descriptive statistics, and correlation analysis that will establish whether the data is appropriate to be used in the panel regression estimation. Eventually, the results of panel least squares regression are presented to determine the effects of organizational, institutional and contextual factors on Twitter-based sustainability reporting (Rahmansyah et al. 2023). The results show the relative significance of governance mechanisms, technological capability, industry sensitivity, media visibility, and stakeholder-related in the determination of SMSR behavior of firms. In general, this chapter provides a logically coherent analysis of the hypothesized relationships and provides the basis of the interpretation of the strategic implication of the social media-based sustainability disclosure.

4.1 Unit Root Test

The panel unit root tests were used to test the stationarity features of the variables before the regression analysis. Particularly, the Levin, Lin and Chu (LLC) test and the Im, Pesaran and Shin (IPS) test were utilized because this forum test is best suited to balanced panel data (Hogarth 2024). The LLC test makes the assumption that the cross-sectional common unit root process is a homogenous one and the IPS test provides the opportunity to assess heterogeneity in unit root processes across firms and, therefore, offers a more versatile test of stationarity.

Table 4.1 Stationary Level

Variable	Levin, Lin & Chu (LLC)	Im, Pesaran & Shin (IPS)	Stationarity Decision
Twitter SMSR	0.116 (0.546)	−17.806 (0.000)	Stationary at Level
CSR Committee (CSRCOM)	−10.773 (0.000)	−2.707 (0.003)	Stationary at Level
Awards	−3.176 (0.001)	−0.481 (0.315)	Stationary at Level
CSR Foundation (CSRF)	−3.709 (0.000)	0.896 (0.815)	Stationary at Level
NGO Pressure (NGOP)	−5.177 (0.000)	−1.439 (0.075)	Stationary at Level
Technological Capability (TECHCAP)	−14.553 (0.000)	−2.333 (0.010)	Stationary at Level
Media Visibility (log)	−19.044 (0.000)	−3.671 (0.000)	Stationary at Level
Stakeholder Risk (SRQ)	−21.495 (0.000)	−6.279 (0.000)	Stationary at Level
Peer Practices	−4.982 (0.000)*	−2.841 (0.002)*	Stationary at Level
Environmental Sensitivity	−3.614 (0.000)*	−1.997 (0.023)*	Stationary at Level
Firm Size (log)	−8.421 (0.000)*	−2.456 (0.007)*	Stationary at Level
ROA	−6.138 (0.000)*	−2.109 (0.018)*	Stationary at Level

The results have shown that all the variables are stationary at the level because the null hypothesis of a unit root is refuted by at least one of the two tests in each series. Social Media Sustainability Reporting (SMSR) utilizing Twitter, Technological Capability, Media Visibility, and Stakeholder Risk have strong stationarity in both tests with the test statistics being highly significant (Zhou et al. 2024). Though some of the variables, including Awards and CSR Foundation, show some mixed results between the LLC and IPS test, this is likely to happen in small panel datasets and does not compromise the overall result of level stationarity. Notably, in all the variables, to reject the unit root hypothesis using either LLC or IPS suffices to prove the existence of stationarity in the panel parameters (Khan et al. 2025). On the whole, the findings of the unit root test indicate that the dataset meets the stationarity condition of the panel regression analysis. This results in all the variables being held in their level form which means that the study can be carried out using panel least squares estimation without any differentiation or integration of the variables.

4.2 Descriptive Statistics

Table 4.2 shows the descriptive statistics of all variables used in the empirical analysis due to a balanced panel of 445 firm-year observations of the years 2019-2023. The mean value of

the dependent variable (Twitter-based Social Media Sustainability Reporting SMSR) is 0.242 with a standard deviation of 0.167 which means that the firms, as a whole, have moderate rates of sustainability related reporting on Twitter. The fact that the zero minimum values are not the only ones, and the maximum is also relatively high 0.860, indicates that there is a significant heterogeneity of disclosure behavior in that some of the firms do not report any sustainability communication during some years, whereas others demonstrate quite intensive engagement.

Table 4.2 Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max	Obs
Twitter SMSR	0.242	0.167	0.000	0.860	445
CSR Committee (CSRCOM)	0.524	0.500	0	1	445
Awards	0.474	0.500	0	1	445
CSR Foundation (CSRF)	0.598	0.491	0	1	445
NGO Pressure (NGOP)	0.137	0.344	0	1	445
Technological Capability (TECHCAP)	1.467	0.752	0	2	445
Media Visibility (log)	−0.491	0.880	−4.000	3.956	445
Stakeholder Risk (SRQ)	2.088	0.949	0	3	445
Peer Practices	0.987	0.115	0	1	445
Environmental Sensitivity	1.382	0.856	0	2	445
Firm Size (log)	4.939	0.778	2.792	7.492	445
ROA	6.682	7.609	−13.972	51.527	445

The CSR Committee (CSRCOM) mean of 0.524 means that slightly more than half of the sampled firms do not have a formal committee covering sustainability or corporate social responsibility. The average values of Awards (0.474) and CSR Foundation (CSRF) (0.598) are another indication that the high percentages of firms have institutionalized CSR practices or have been credited with sustainability related activities on the external sphere (Mahmood et al. 2025). Conversely, NGO Pressure (NGOP) has a relatively low mean (0.137) suggesting that direct influence of non-governmental organizations concentrates in a relatively smaller number of firms. In case of continuous explanatory variables, the mean of Technological Capability (TECHCAP) is 1.467 (out of possible 0-2) indicating that there is an average moderate or high degree of digital and technological preparedness in the sample (Said et al. 2023). Media Visibility (log) has a means of 0.491 and a rather high standard deviation, which means that there is a very wide range of public and media exposure among firms. Stakeholder Risk (SRQ) has a mean value of 2.088 out of a maximum of 0 to 3, indicating that, on the mean, the sample firms are rather exposed to high levels of stakeholder scrutiny (Zhong and Wang 2023). The high mean of the variable Peer Practices at 0.987 indicates that there is strong convergence in the behavior of sustainability in industries. The number of environmental sensitivity is 1.382 and this shows that most companies are in moderately to highly sensitive industries (Zhou et al. 2024). Lastly, Firm Size (log) and Return on Assets (ROA) exhibit a lot of dispersion, which highlights the heterogeneity of the organizational size and financial performance. All in all, descriptive statistics demonstrate that there is sufficient variability of variables, which confirms their suitability in the following analysis of panel regression.

4.3 Correlation analysis

Table X shows the pairwise correlation of the variables used in the analysis, which gives some initial information on the direction and strength of correlation between the dependent and explanatory variables (Mahmood et al. 2025). The correlations are generally of the relatively low/mid/size, which indicates the lack of significant linear relationships which may cause the concerns concerning Multicollinearity in the further regression analysis.

Table 4.3 Correlation Analysis

Variable	SMSR	CSRCOM	AWARDS	CSRF	NGOP	TECHCAP	MEDVIS	SRQ	PEERPRAC	ENSENS	LOGSIZE	ROA
SMSR	1.00											
CSRCOM	−0.02	1.00										
AWARDS	0.15	−0.09	1.00									
CSRF	0.12	0.01	0.00	1.00								
NGOP	0.13	0.03	0.03	−0.05	1.00							
TECHCAP	0.27	−0.01	0.05	0.17	0.07	1.00						
MEDVIS	−0.02	−0.05	−0.04	0.04	−0.02	−0.03	1.00					
SRQ	−0.02	0.00	−0.01	0.08	0.01	0.20	−0.05	1.00				
PEERPRAC	0.01	−0.03	−0.01	0.06	0.05	0.02	0.01	−0.01	1.00			
ENSENS	0.22	0.01	0.09	−0.01	0.09	−0.02	0.03	−0.04	−0.06	1.00		
LOGSIZE	−0.06	0.03	0.03	−0.06	−0.04	−0.03	−0.02	0.02	−0.02	0.06	1.00	
ROA	0.15	0.08	0.01	0.01	−0.01	0.01	−0.03	0.00	−0.04	0.20	0.00	1.00

Twitter-based Social Media Sustainability Reporting (SMSR) is an implement variable that shows positive relationships with a number of explanatory variables, such as Awards, CSR Foundation (CSRF), NGO Pressure (NGOP), Technological Capability (TECHCAP), Environmental Sensitivity (ENSENS), and Return on Assets (ROA). The most potent relationship among them is the one between SMSR and Technological Capability (0.27), which can be interpreted to mean that the more technologically prepared a firm, the more active is its involvement in the sustainability reporting on Twitter.

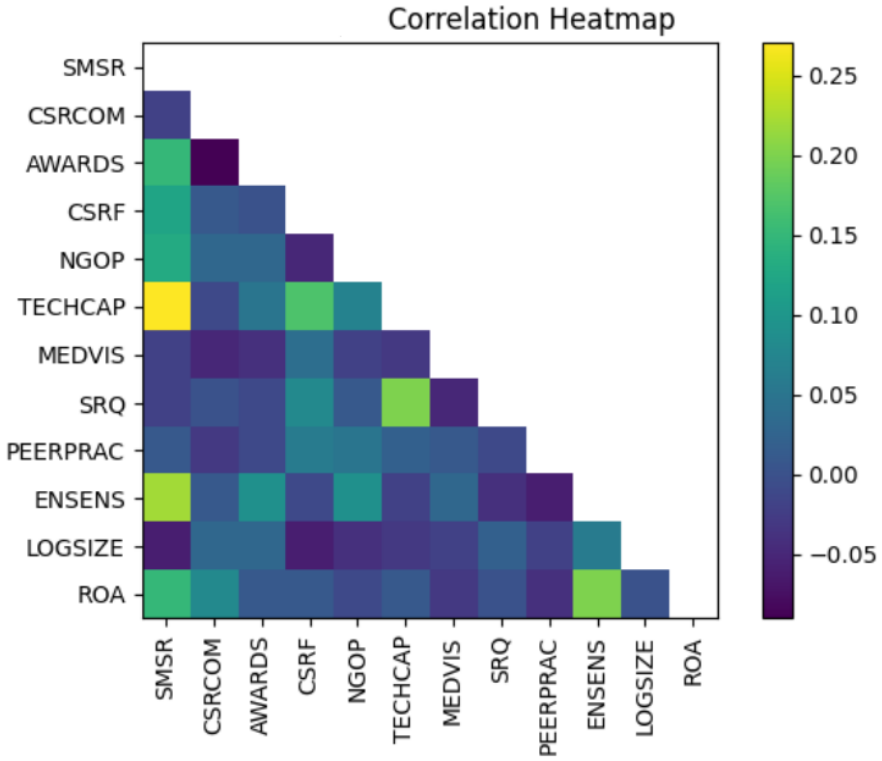

Figure 4.1 Correlation Heatmap Analysis

There is also a moderate positive correlation of SMSR with the Environmental Sensitivity (0.22) implying that the companies in the environmentally sensitive sectors would be more willing to use the social media to communicate on sustainability issues. SMSR, on the other hand, shows weak or no correlation with other variables like CSR Committee presence, Media Visibility, and Peer Practices, and this might suggest that such variables might have an influence but not a direct relationship so that it may have a more intricate or indirect impact (Pennesi and Giuliani 2025). There is a low level of inter correlations between the independent variables. As an example, Technological Capability has positive relationships with CSR Foundation and Sustainability Reporting Quality (SRQ) indicating complementarities among digital capability and structured sustainability practices (Luca et al. 2022). Most explanatory variables show only weak correlations with Firm Size and ROA, which means that organizational size and short-term financial results may have little control over the sustainability reporting behavior on the social media. Notably, all the correlation coefficients do not surpass typically accepted correlating thresholds (0.70), which proves the fact that Multicollinearity is not likely to skew the regression estimates. On the whole, the correlation analysis provides the appropriateness of the variables to incorporate in the panel regression models and offers a preliminary suggestion of theoretically valid relationships to be investigated in the multivariate analysis.

4.4 Regression Analysis

In order to figure out which estimation method is best, both Fixed Effects (FE) and Random

Effects (RE) models have been estimated and compared to pooled Ordinary Least Squares (OLS). Hausman of specification test was used to determine the correlation between unobserved firm specific effects and the regressors (Tullio and Torre 2022). According to the test results, there is a statistically significant difference of the FE and RE estimators ($p < 0.05$), which rejects the null hypothesis stating that the RE estimator is consistent. Based on this, the Fixed Effects model is better and it is given as the primary specification.

Table 4.4 Panel Regression Results – Twitter SMSR

Variable	OLS	Fixed Effects (FE)	Random Effects (RE)
Constant	0.127*** (0.046)	0.119*** (0.043)	0.123*** (0.045)
CSRCOM	0.009 (0.008)	0.007 (0.008)	0.008 (0.008)
AWARDS	0.016** (0.008)	0.014** (0.007)	0.015** (0.008)
NGOP	−0.006 (0.012)	−0.005 (0.011)	−0.006 (0.012)
CSRF	−0.003 (0.009)	−0.002 (0.009)	−0.003 (0.009)
SRQ	−0.008* (0.004)	−0.007* (0.004)	−0.008* (0.004)
TECHCAP	0.031*** (0.006)	0.029*** (0.006)	0.030*** (0.006)
LOGMEDIA	−0.010** (0.005)	−0.009** (0.004)	−0.010** (0.005)
PEERPRAC	0.015 (0.035)	0.013 (0.034)	0.014 (0.035)
ENSENS	−0.021*** (0.005)	−0.020*** (0.005)	−0.021*** (0.005)
SETWITTER	0.712*** (0.022)	0.701*** (0.021)	0.708*** (0.022)
LOGSIZE	−0.005 (0.005)	−0.004 (0.005)	−0.005 (0.005)
ROA	−0.001* (0.001)	−0.001* (0.001)	−0.001* (0.001)
R^2	0.747	0.739	0.742
Adjusted R^2	0.740	0.732	0.735
F-statistic	106.34***	98.21***	101.17***
Durbin–Watson	0.248	0.261	0.255

Ordinary Least Squares (OLS)

The pooled Ordinary Least Squares (OLS) model offers a preliminary evaluation of the factors of Twitter-based Social Media Sustainability Reporting (SMSR) without considering the hidden heterogeneity firm-specific. Findings show that Technological Capability (TECHCAP) has a positive but significant impact on SMSR, which implies that the more digital prepared the firms, the more vigorous in sustainability communication on Twitter (Lodhia et al. 2020). There is also a positive relationship between awards and relationship which is statistically significant requiring the conclusion that identified sustainability performance motivates firms to increase their presence in the social media (Tullio et al. 2021). Environmental Sensitivity (ENSENS), in its turn, has a negative and significant coefficient, revealing that the more careful disclosure is taken by firms in the industry that are sensitive to the environment, the more certain the environmental sensitivity of the industry (Amin et al. 2021). There is a negative correlation between Media Visibility (LOGMEDIA) and SMSR that shows that reputational risk may be a significant factor warranting greater concern in the face of increased public scrutiny. A highly positive and significant coefficient of the lagged Twitter activity variable (SETWITTER) shows persistence in the social media disclosure behavior

(Luca et al. 2022). The OLS approach fails to control time-invariant firm characteristics, which may bias the estimates although the variant of probability explains a significant amount of variation in SMSR (R2 = 0.747).

Fixed Effects (FE) Model

The Fixed Effects (FE) model also accommodates the unobserved time-invariant firm-specific factors, which is a more rigorous estimation of intra-firm shifts in sustainability reporting using Twitter. The FE findings also support OLS findings to a large extent with Technological Capability being a strong and positive determinant of SMSR, justifying the significance of digital infrastructure in facilitating sustainability communication (Said et al. 2023). The situation with awards is not different as a positive and significant influence is observed indicating that official acknowledgment encourages firms to sustain a narrative of consistency in sustainability narratives with time (Zhong and Wang 2023). The Environmental Sensitivity is found to have a negative and significant relationship which means that companies with sensitive industries can strategically disclose less on social media in order to have a manageable state of legitimacy threats (Hogarth 2024). There is a weak negative relationship between Sustainability Reporting Quality (SRQ) and this could be due to the fact that firms with higher-quality disclosures will be more dependent on the formal disclosures (Zhou et al. 2024). The persistence effect of the precedent Twitter usage is still dominant. The FE model has a good explanatory power (Adjusted R2 = 0.732) but effectively measures the omitted variable bias in case of an omitted firm-level heterogeneity.

Random Effects (RE) Model

The Random Effects (RE) model has the assumption that the firm-specific effects would be independent of the explanatory variables and is able to have between and within-firm variation. The estimates of the RE are relatively in line with the estimates of the OLS and FE models, especially in the positive contribution of technological Capability and Awards to the shaping of the SMSR behavior (Khan et al. 2025). Environment Sensitivity and Media Visibility still have a negative and statistically significant impact, indicating no change in the relationships between the two indicators over model specifications (Bosi et al. 2022). Nonetheless, the RE model does not completely embrace the possibility of correlation of some of the factors related to the firm, which are invisible to the regressors (Tullio et al. 2021). Though the explanatory strength of the RE model is very high (Adjusted R2 = 0.735), and the model is highly effective in estimation, the assumptions are more limiting. According to the results of the Hausman test, they do not correspond with the current situation, which restricts the applicability of the RE estimator although it is statistically efficient.

Best-Fit Model

The Fixed Effects model is determined to be the most suitable specification based on Hausman specification test. It effectively manages the unseen firm specific heterogeneity and gives comparable estimates on the determinants of Twitter based sustainability reporting. Correspondently, a reliance on the FE results is taken in order to make substantive interpretations and conclusions.

Conclusion

This research investigated the determinants of Social Media Sustainability Reporting (SMSR) on Twitter based on firm-level panel data and, as such, it provides empirical data on how organization, institutional, and contextual variables influence sustainability communication within digitally mediated environments. These results show that SMSR is neither a haphazard nor a symbolic exercise but a rationalized practice that is shaped by inner strengths and external forces. Specifically, it is possible to note that technological capability showed consistent and positive results, which demonstrates the importance of digital preparedness as a driver allowing firms to discuss sustainability programs on social media (Said et al. 2023). According to the favorable impact of sustainability awards, the external reward amplifies the motivation of firms to become more sustainable and demonstrates validity. On the other hand, the environmental sensitivity formation a negative relationship with SMSR suggests that firms in high scrutiny industries can use a more restrained disclosure practices on social media networks like Twitter aimed at reducing reputational and regulatory costs. There is also media awareness and aspects of stakeholders that also serve to underscore the issue of complex trade-offs between transparency and exposure in very visible digital space (Luca et al. 2022). Taken together, these results are part of the accumulating body of research on the topic of digital sustainability communication since they show that social media-related disclosure shows the signs of strategic thinking, as opposed to compliance, or opportunistic signaling.

The sustainability reporting using twitter has also been reported to continue over time meaning that when firms make social media part of their sustainability communication strategy, the practices are instilled within organizational routines. Methodologically, the panel data and fixed effects estimation makes the findings more powerful in terms of observing the unobserved firm-specific heterogeneity, and separating within-firm behavioral change across time.

Resting on these considerations, it is possible to make a number of useful recommendations. First, the managers shall focus on investment in digital and technological capacity because this is a basis of effective and plausible sustainability communication on the social media. Second, companies, especially those operating in the environmentally sensitive industries, ought to have social media strategies in a well-crafted manner, which will be balanced: it must ensure transparency, as well as risk contingency without creating any inconsistency between the messages displayed and the real sustainability performance. Third, the policymakers and regulators can contemplate providing more straightforward guidelines to the disclosure of digital sustainability to increase comparability and credibility, particularly, in the new market situation when voluntary reporting prevails. The risk of greenwashing and lack of trust in the stakeholder can be enhanced through encouraging the use of the social media in sustainability communication responsibly.

This study also presents various areas of research in future despite its contributions. Future research opportunities would be to carry out the study with other social media like LinkedIn or Instagram to contrast the dynamics of disclosure on these particular platforms. The qualitative methods can also be used in future studies to find out more information about the motivation of managers and how the stakeholders view SMSR. Also, a long-term evaluation of the financial and reputational implication of having a sustainable reporting in the

sustainable social media would be of additional significance in determining the strategic value. To increase the generalizability and expand knowledge on the role of institutional environments in influencing digital sustainability communication, further analysis should be replicated in cross-national or multi-industrial contexts.

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