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Abstract: Recent technological advancements have evolved corporate disclosure practices towards social media platforms, as they cater to the weaknesses of traditional disclosures. This study empirically examines the determinants of social media disclosure by testing the impacts of firm characteristics, board characteristics, and ownership structure. This study also examines whether social media disclosures help reduce or increase information asymmetry in the market. Using a sample of 106 unique firms over 6 years from 2017 to 2022, this research finds that firm size, profitability, board meeting frequency, and managerial ownership promote information disclosure through Facebook, while board family members have a negative impact on it. In contrast, profitability, board size, board gender diversity, managerial ownership, and board family members positively impact the disclosure of information through X. These results suggest that some factors have a heterogeneous impact on the usage of different social media platforms. In addition, we also find that information disclosure through Facebook helps reduce information asymmetry. This research contributes to the literature in several ways. First, we contribute to the growing literature that has utilized data science techniques to explore corporate disclosures. Second, we explore the determinants of social media disclosures, a gap not comprehensively addressed in the literature. Third, this study considers multiple social media platforms and is not restricted to a specific type of disclosure, which helps us provide valuable information lacking in the literature. Fourth, we provide evidence that social media platforms help reduce information asymmetry. Finally, we contribute to the literature by providing valuable evidence from a developing country.

Keywords: Corporate governance, Social media disclosure, Facebook, X, Firm characteristics, Board characteristics, Ownership structure.

JEL Classification: .

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1. Introduction

In the past few decades, corporate disclosures have emerged as one of the most important areas in accounting research (Nuseir & Qasim, 2021). Traditionally, the disclosure of information was primarily conducted through print media such as annual and sustainability reports. However, technological advancements in the internet (Lodhia et al., 2004) and the advent of social media have evolved corporate disclosure practices toward digital platforms (Zhou et al., 2015). Disclosure through digital platforms, such as social media, caters to the weaknesses of traditional disclosures by providing comprehensive, timely, and easily accessible information (Cormier et al., 2010). The importance of social media disclosures is consistently increasing, while some have even contended that these advancements will render traditional print media disclosures obsolete (Miller & Skinner, 2015). Although firms are increasingly adopting social media platforms to disclose information, the literature that has focused on analysing this disclosure is still very limited (Basuony et al., 2020; Jung et al., 2018).

In the past few years, researchers have focused on disclosures through digital platforms such as websites and social media. However, most existing studies have relied on manual processes to analyse the content of such digital disclosures (e.g., Basuony et al., 2018; Rozario et al., 2022; Zhou et al., 2015). Only a few studies have utilized machine learning or data science to analyse and categorize such disclosures. For instance, Amin et al. (2020, 2021) focused on analysing financial and CSR disclosures through X (formerly Twitter) using a data science approach. Basuony et al. (2020) used big data analytics to understand the impact of corporate internet disclosure practices in the USA, the UK, Australia, and Canada.

Although valuable, these studies have several limitations. For instance, Amin et al. (2020, 2021) focused primarily on X (formerly Twitter) and did not consider disclosures on other social media platforms, such as Facebook. Basuony et al. (2020) consider several social media platforms; however, they rely on manual coding and use big data only for clustering

the data. In addition, Basuony et al. (2018) combined multiple platforms to collectively assess firms' social media disclosure practices while relying on manual coding processes. Moreover, in testing the determinants of social media disclosure, previous studies have considered only the impact of limited board and firm characteristics. These studies do not consider other corporate governance factors, such as ownership structures. The literature has argued that ownership structure is a crucial factor because it impacts the level of monitoring and disclosure by corporations (Haniffa & Cooke, 2002).

To address these weaknesses, this study first assesses the impact of firm characteristics, board characteristics, and ownership structure on the extent of social media usage by Pakistani firms by focusing on two social media platforms: X (formerly Twitter) and Facebook. Second, this study examines whether these social media disclosures help reduce or promote information asymmetry in the market. Third, this study explores the type of information disclosed on these platforms using a data science technique, i.e., latent Dirichlet allocation (LDA) topic modelling. In our additional analysis, we test the determinants of these disclosure topics by not restricting ourselves to a specific type of disclosure, i.e., financial or CSR. However, we consider the different types of information that Pakistani companies disclose on social media platforms.

To test the determinants, we focus on the extent of social media usage, i.e., which firms provide greater disclosures through X and Facebook. By utilizing the theoretical perspectives of agency and signalling theory, we find that larger firms tend to prefer Facebook as a disclosure platform compared to X, while more profitable firms tend to use both X and Facebook. Furthermore, we find that firms with larger boards and greater gender diversity tend to use X more, while firms with higher board meeting frequency prefer Facebook as a disclosure channel.

Interestingly, board family members have a negative impact on the usage of Facebook while having a positive impact on the usage of X. Such a preference suggests that firms with more board family members view X as a platform that can help them enhance their reputation and maintain a positive image for future generational succession. This preference may also be based on the type of audience on each platform. For example, X attracts more corporate and political attention (Lodhia et al., 2020), which suggests that firms with more family members on the board incline their disclosures toward more corporate and political audiences. Overall, this

finding exemplifies the heterogeneous impact of firm and governance characteristics on the usage of different social media platforms.

Regarding ownership structure, firms with greater managerial ownership tend to use both Facebook and X for information disclosure. This finding is consistent with the perspective that managerial ownership can help align managerial interests (Singh & Davidson III, 2003) and promote information disclosure. Finally, we also find that information disclosure through Facebook can help reduce information asymmetry in the market, while X has an insignificant impact. This finding may be due to the greater use of Facebook by Pakistani firms. This result suggests that social media platforms (such as Facebook) facilitate broader and timelier information dissemination than traditional channels and can help reduce information asymmetry in the market (Blankespoor et al., 2014; Jung et al., 2018).

Furthermore, through LDA topic modelling, we find that Pakistani firms disclose about ten topics on X and seven on Facebook. Subsequently, we conduct an additional analysis by considering a sample of the discovered topics (5 for each platform) as dependent variables and explore the impact of firm characteristics and corporate governance mechanisms. This additional analysis reveals some interesting insights. For instance, in terms of Facebook, while manager-owned firms are more likely to talk about political and economic conditions, foreign-owned firms tend to avoid talking about the political and economic landscape of the country, which may be to avoid any controversial discussion. In contrast, while larger firms use X to disclose about their management and overall social responsibility, they do not use X as a platform for marketing purposes. Furthermore, while firms with more family board members prefer X as a disclosure platform, they provide lower sustainability and social responsibility disclosures. This is interesting because while family ownership positively impacts sustainability disclosures on X, entrenchment through board family members negatively impacts sustainability disclosures.

Furthermore, we conduct an additional analysis to test the moderating impact of family firms on the relationship between firm characteristics and corporate governance and the extent of social media usage. While our primary results indicate a negative impact of board family members on disclosures through Facebook, the moderation analysis reveals that more profitable family firms and family firms with larger boards tend to use

Facebook as a disclosure platform. Regarding X, family firms with foreign ownership prefer not to use X as a disclosure platform.

This study contributes to the growing literature on social media disclosures in several ways. First, we contribute to the nascent literature that has utilized the latest data science techniques instead of the manual coding processes widely used in accounting and disclosure research (e.g., Amin et al., 2020; 2021). Using data science techniques, such as LDA, helps us to categorize each post/tweet into distinct disclosure topics and aids in the generation of specific keywords related to each topic that future studies can use. Furthermore, these techniques are more reliable and less subjective than manual coding processes. Therefore, the resulting topics are relatively more accurate.

Second, this research also contributes by exploring the determinants of social media disclosures, a gap that has not been comprehensively addressed in the literature (Ayman et al., 2019). In addition to firm and board characteristics, we consider the impact of family variables (family board members and family ownership) and ownership structures (such as managerial ownership), which have not been explored regarding the extent of social media usage and disclosure topics. Therefore, we provide new evidence about the factors that impact firms' social media usage and disclosure practices.

Third, by considering the disclosures on multiple platforms and not restricting ourselves to a specific type of disclosure, we provide valuable information lacking in the literature. For instance, previous studies such as Basuony et al. (2018) have considered social media disclosures by considering different platforms together. Our results suggest that a more nuanced approach should be taken because different factors have different impacts on the adoption of different platforms. That is, different types of firm characteristics and governance mechanisms have varying impacts on the adoption of different social media platforms as disclosure channels. Therefore, our results help us understand whether firms prefer specific platforms for disclosing certain information and how different firm characteristics and governance mechanisms are associated with disclosure on different platforms.

Fourth, we contribute to the literature by providing evidence that using social media platforms such as Facebook helps reduce information asymmetry in the market. This is valuable because social media platforms

act as a channel for providing comprehensive, timely, and easily accessible information (Cormier et al., 2010). This finding provides legitimacy to social media platforms and suggests that in a developing country such as Pakistan, such platforms can be used to convey information to the masses effectively.

Finally, most existing social media disclosure research has primarily been conducted in developed countries. Therefore, this study provides valuable evidence from a developing country perspective and fills an important gap in the literature by examining whether firms use social media disclosure practices extensively and whether engagement in such disclosures is effective for firms in disseminating information to the general public.

The rest of the paper is structured as follows. Section 2 provides the literature review and hypothesis development, while section 3 discusses the methodology. Section 4 provides the results and discussion, while section 5 provides the conclusion, implications, and limitations.

2. Literature Review

2.1. Theoretical Framework

The literature has utilized several theoretical frameworks to characterize corporate disclosures. Agency theory is one of the most popular of these theoretical frameworks (Healy & Palepu, 2001). According to the underpinnings of agency theory, firms engage in disclosures to reduce information asymmetry and agency costs and fulfil the requirements of investors and analysts. Managers have incentives to engage in corporate disclosures to assure shareholders that they are acting in their best interests (Watson et al., 2002).

These incentives are also directly linked with corporate governance practices to control and monitor the activities of managers. In this sense, governance mechanisms effectively mitigate agency problems by improving transparency and eliciting better financial reporting (Kent et al., 2010). Second, signalling theory (Spence, 1974) suggests that information asymmetry in the market can be reduced when a party with greater information provides signals to others. Therefore, high-quality firms tend to provide more voluntary disclosures to differentiate themselves from others. However, these signals must be credible (Watson et al., 2002).

Agency and signalling theories collectively characterize different incentives that firms have to provide higher disclosures. Social media has become a new avenue for corporate disclosures, mainly because it allows the dissemination of financial and nonfinancial information to key stakeholders (Akmese et al., 2016). Social media has a key benefit in that it allows information dissemination that is quicker and more widely distributed; thus, it may help reduce information asymmetry (Jung et al., 2018).

2.2. Empirical Literature Review and Hypotheses

2.2.1. Firm Characteristics

Previous literature has linked firm size with the extent of corporate disclosures. For instance, authors have argued that firm size is a relevant factor that depicts the information environment of an organization (Brockman & Cicon, 2013). According to agency theory, large firms usually have higher agency costs due to increased information asymmetry with market participants (Jensen & Meckling, 1976). Therefore, larger firms tend to provide greater disclosures to reduce agency costs. In addition, disclosures through social media and the internet provide an avenue to disseminate information at lower costs (Basuony et al., 2020). According to signalling theory, larger firms face greater stakeholder pressure and attention; therefore, to respond positively to these pressures, these firms engage in greater corporate disclosures (Cormier et al., 2010).

Empirically, the literature has found that larger firms are more likely to provide greater disclosures because of higher information demand from stakeholders (Hutton, 2005). Moreover, the empirical results also suggest that large companies disclose more information than smaller firms because doing so helps them save costs (Kasznik & Lev, 1995). A strand of literature has also argued that managers in larger firms tend to be more sophisticated and consequently provide greater disclosures to reduce agency costs and provide signals to the market (King, 1996). Previous literature has also linked larger firms with more disclosures on the internet (Rozario et al., 2022); therefore, we hypothesize the following:

H1a: Larger firms provide more disclosures on social media platforms.

Research has also linked the disclosure practices of a firm with its financial performance for numerous reasons. According to agency theory, managers in more profitable firms tend to provide more disclosures on the internet to

enhance their reputation and achieve benefits such as solidifying their positions and encouraging greater compensation (Haniffa & Cooke, 2002). Similarly, according to signalling theory, more profitable firms provide more disclosures to signal to investors about the company's financial performance to raise capital at a lower price (Marston & Polei, 2004).

Empirically, authors have found higher profitability to be positively linked with a greater level of information disclosure (Desoky, 2009). In contrast, some studies have found profitability to be negatively associated with financial reporting on the internet (Marston & Polei, 2004; Al-Shammari, 2007). This is because reporting on the internet may provide useful information to competitors, which may attract more firms to enter the market and result in a loss of competitive advantage. Furthermore, some recent explorations have found a lack of a significant link between financial performance and corporate financial disclosures on the internet (Rozario et al., 2022). However, taking into account the theoretical impact of financial performance on corporate disclosures, it is likely that more profitable firms tend to provide more disclosures on social media platforms; therefore, it is hypothesized that:

H1b: Firms with higher financial performance provide more disclosures on social media platforms.

In addition to factors such as financial performance and firm size, firm age has also been argued to impact the disclosure practices of corporations. For instance, previous literature has argued that older firms are more inclined toward providing more voluntary financial disclosures on the internet (Al-Shammari, 2007). Therefore, established, older companies are more likely to provide more information than newer companies. The literature has also argued that older firms have more developed and extensive stakeholder networks that can help them set a tone and pace for corporate disclosures (Alsaeed, 2006). However, research has also argued that disclosures related to research and development, new products, and other capital expenditures may negatively impact a firm's competitive advantage; therefore, they may be less inclined to engage in such disclosures (Al-Shammari, 2007).

In contrast, Haniffa and Cooke (2002) argue that newer companies are incentivized to disclose more information to satisfy and reassure investors. Empirically, Rozario et al. (2020) found that a firm's age does not significantly impact the extent of financial disclosures on the internet. In

light of the diverging theoretical and empirical evidence, a nondirectional hypothesis is formulated:

H1c: Firm age significantly impacts the extent of disclosures made on social media platforms.

2.2.2. Board Characteristics

According to agency theory, the board's composition has a key impact on the disclosure strategies of firms (Jensen, 1993). Specifically, board size has been argued to be a vital factor that determines the performance and effectiveness of the board (Amin et al., 2020). On the one hand, large boards can result in reduced cohesiveness, greater conflict, and reduced communication effectiveness, resulting in ineffective decision-making (Kathy Rao et al., 2012). On the other hand, larger boards are also linked to higher performance and more effective governance due to greater experience and expertise (Dalton et al., 1999). Research has shown that a larger board size is linked with more effective control and monitoring (Sandhu & Singh, 2019). Similarly, larger boards can reduce managers' opportunism by ensuring that information is not withheld (Samaha & Dahawy, 2010).

Empirically, research has shown that board size is associated with greater voluntary disclosure (Laksmana, 2008). Similarly, Kathy Rao et al. (2012) found that board size is associated with greater environmental disclosure. Consistent with this, research has also found that larger boards are associated with more corporate internet disclosures (Samaha et al., 2012). Specifically, regarding social media disclosures, research has found that board size has an insignificant impact on financial and nonfinancial disclosures on social media platforms (Amin et al., 2020; 2021; Basuony et al., 2018). Nevertheless, based on the positive empirical and theoretical impact of board size, the following is hypothesized:

H2a: Board size positively impacts the extent of social media disclosures.

Agency theory suggests that gender diversity results in a better balance on the board of directors and mitigates the risk of decision-making domination by a single member (Basuony et al., 2018). Female board members are crucial for improving board performance because they tend to be more diligent in monitoring and encouraging transparency in corporate reporting (Adams & Ferreira, 2009). In some instances, it has

been suggested that the positive impact of female members on the board's performance is similar to the benefits that are accrued from having higher board independence (Adams & Ferreira, 2009; Basuony et al., 2018).

Empirically, research has shown that board gender diversity positively impacts the volume and frequency of corporate disclosures (Ahmed et al., 2017). Basuony et al. (2018) found that firms with more female board members tend to provide more disclosures on social media platforms. Similarly, Amin et al. (2020) found that female members positively influence the extent of financial disclosures on Twitter. Therefore, consistent with the positive theoretical and empirical impact of board gender diversity, the following is hypothesized:

H2b: Higher board gender diversity positively impacts the extent of social media disclosures.

Furthermore, the number of board meetings is an important aspect of the board's commitment to the firm and directly impacts corporate performance (Basuony et al., 2018). Agency theory suggests that higher board meeting frequency enhances the capacity to monitor and provide effective advice to management and thus can result in greater transparency and greater disclosures. Board meetings are crucial because they impact the quality of governance, conformance with regulations, and firm performance (Jensen, 1993). A higher meeting frequency allows the board to evaluate important issues in detail and on time, which enhances efficiency (Lin et al., 2009).

Empirically, previous literature has shown that board meeting frequency is positively associated with a firm's financial performance (Ntim & Osei, 2011). Furthermore, this positive association has also been observed with the quality of financial reporting (Kent et al., 2010). However, Basuony et al. (2018) found the impact of board meeting frequency on social media disclosures to be insignificant. Based on the positive theoretical impact, the following is hypothesized:

H2c: Higher board meeting frequency positively impacts the extent of social media disclosures.

Family members on the board of directors are one of the key distinguishing factors of Pakistani firms and represent a crucial characteristic of family firms (Anwar et al., 2024). According to agency

theory, board family members can aid in mitigating the agency problem (principal-agent) by enhancing the monitoring function and ensuring low separation between ownership and control (Ali et al., 2007). However, family members on the board can also enhance agency problems between majority and minority shareholders (principal-principal).

Through higher family board membership, families can obtain more control over management through entrenchment (Anderson & Reeb, 2003). In such a situation, the information asymmetry between the management and majority shareholders would be low. In addition, because of greater principal-principal conflict, family board members may reduce transparency and lower the level of disclosure (Ali et al., 2007). Moreover, the literature suggests that family members can have conflicts of interest and disagreements, which can negatively impact the level of disclosure (Le Breton-Miller & Miller, 2016). Empirically, Ho and Wong (2001) find that family members negatively impact voluntary disclosure by firms. Similarly, Haniffa and Cooke (2002) also find that boards with more family members tend to provide fewer voluntary disclosures. Specifically, in the context of digital disclosures, Sandhu and Singh (2019) find that firms with more family board members tend to provide fewer disclosures on the internet.

In contrast, the literature has noted that family firms are concerned with reputational costs and litigation risks (Chen et al., 2008). This is because boards with more family members are concerned about preserving their family image and ensuring smooth succession. In this context, such firms tend to disclose more information (Biswas et al., 2019). Similarly, because such firms are concerned about maintaining their reputation, they tend to maintain strong communication with external stakeholders to enhance their legitimacy. Therefore, from the signalling perspective, firms with more family board members will provide more disclosures to signal to the public that their objectives are aligned with overall societal values. Based on the diverging empirical and theoretical evidence, the following hypothesis is proposed:

H2d: Higher family board members significantly impact the extent of social media disclosures.

2.2.3. Ownership Structure

Apart from board composition, the literature has argued that ownership structure is a crucial factor because it impacts the level of monitoring and

disclosure by corporations (Haniffa & Cooke, 2002). For instance, if a firm has high family ownership, the concerns related to accountability to the general public might be low, resulting in lower voluntary disclosures (Chau & Gray, 2002). When family ownership is high, it can lead to a convergence of interests between minority and majority shareholders because controlling shareholders (family members) may be less likely to engage in opportunistic behavior because they will have to bear the consequences (Jensen & Meckling, 1976). In such a case, the principal-principal conflict is reduced, resulting in a lower need for voluntary disclosures (Chau & Gray, 2010). Empirically, previous literature has shown that family-owned firms tend to provide overall lower disclosures (Ho & Wong, 2001). Similarly, Ali et al. (2007) found that family firms in the US are less likely to provide governance disclosures. In addition, family-owned firms are less likely to engage in conference calls and provide fewer earnings forecasts (Chen et al., 2008).

In contrast, if family owners have significant shareholding, it could also lead to a problem of entrenchment, i.e., they may start pursuing activities that are in their self-interests. Such a situation can result in greater information asymmetry between minority and majority shareholders and potentially in the expropriation of minority shareholders (Fan & Wong, 2002). Such an entrenchment problem can increase demand for information and monitoring by outside investors, which can be mitigated through greater voluntary information disclosure (Chau & Gray, 2010). Another perspective suggests that family-owned firms may be more concerned about enhancing their social value (Van Gils et al., 2014) because they want to hand over the firm to the next generation of family members (Anderson & Reeb, 2003). In such a case, family-owned firms may provide greater disclosures to avoid scrutiny from the public. For instance, Chen et al. (2008) highlight that family firms are more likely to provide earnings warnings. Based on the conflicting empirical and theoretical evidence, a nondirectional hypothesis is formulated:

H3a: Family ownership significantly impacts the extent of social media disclosures.

According to agency theory, managerial ownership is one of the key tools used to align the interests of shareholders and managers (Singh & Davidson III, 2003). A low level of managerial ownership can lead to more severe agency problems (LaFond & Roychowdhury, 2008). Therefore, increasing managerial ownership can reduce agency problems

and motivate managers to make decisions that enhance firm value (Denis et al., 1997). Managers may provide more voluntary disclosures if they are perceived to increase firm value. Empirically, this is consistent with Chau and Gray (2002), who found that managerial ownership positively impacts voluntary disclosure. Similarly, Alotaibi and Hussainey (2016) revealed that managerial ownership is linked to higher-quality CSR disclosure. In the case of Pakistan, Anwar et al. (2024) found that managerial ownership is linked to greater tax responsibility disclosure.

In contrast, if managerial ownership is too high, it can lead to entrenchment and result in higher opportunistic behavior (Fan & Wong, 2002). In such a situation, managers may not provide more voluntary disclosures, so they do not reveal much about their self-serving behavior. Consistent with this, Ghazali (2007) found that managerial ownership negatively affects information disclosure. Similarly, in the case of Pakistan, research has shown that managerial ownership negatively impacts sustainability reporting decisions (Hasan et al., 2022). Mohamed et al. (2017) found that managerial ownership has a negative impact on online corporate disclosures. Based on the diverging theoretical and empirical literature, we postulate a nondirectional hypothesis:

H3b: Managerial ownership significantly impacts the extent of social media disclosures.

Research has shown that foreign ownership positively impacts the quality of decision-making within a firm (Hasan et al., 2024). Foreign owners have been shown to improve the information environment, enhance shareholder value, promote good governance, and decrease earnings management behavior (Shan, 2019). The literature has argued that foreign owners generally incur more agency and information costs. This is because foreign owners face a high level of information asymmetry due to the geographical distance between ownership and management, as well as differences in accounting standards, language barriers, and lack of local knowledge (Huafang & Jianguo, 2007).

As a result, foreign owners from countries with greater disclosure requirements tend to demand greater disclosures from the firms they invest in to reduce information asymmetry (Haniffa & Cooke, 2005). Empirically, this is consistent with Tsang et al. (2019), who found that foreign ownership is linked to greater voluntary disclosures. However, similar to institutional investors, foreign owners may also obtain such

information from management privately; thus, it may reduce the amount of public information that is disclosed by the firm (Laidroo, 2009). Nevertheless, Haniffa and Cooke (2002) argue that management may utilize greater disclosures to encourage foreign capital flows and satisfy the greater information needs of foreign investors. Consistent with this, Jiang and Kim (2004) show that foreign ownership is associated with lower information asymmetry between management and owners due to more voluntary disclosures. Therefore, based on the positive theoretical and empirical impact, it is hypothesized that foreign-owned firms provide greater disclosure through social media platforms.

H3c: Foreign ownership positively impacts the extent of social media disclosures.

2.2.4. Social Media Disclosures and Information Asymmetry

Previous literature has argued that social media disclosures differ from traditional disclosures, such as those made through press releases and company websites (Cade, 2018). Social media platforms allow two-way interactions, whereby managerial control over what is said is lower (Miller & Skinner, 2015). Therefore, the traditional assumptions about investor reactions to corporate disclosures may not be fully generalizable to the reactions of investors in the ever-evolving information environment.

Empirical research has shown that being active on social media platforms impacts stock prices and returns and reduces information asymmetry in the market (Blankespoor et al., 2014). Social media platforms allow both financial and nonfinancial information to be disclosed (Akmese et al., 2016). Moreover, since the reliance on social media platforms for firm-specific news is increasing, firms that do not participate in social media disclosures may be noticed for their absence (Cade, 2018). Compared to other traditional media, social media allows information to be disclosed quicker and enables dissemination to a broader audience, thus having a direct impact on information asymmetry (Blankespoor et al., 2014; Jung et al., 2018). Therefore, the following is hypothesized:

H4: Disclosures through social media platforms decrease information asymmetry in the market.

3. Methodology

3.1. Sampling and Data Collection

For this study, the sample is drawn from listed companies on the Pakistan Stock Exchange (PSX). First, we selected a sample from the total PSX population to collect data on corporate governance and firm characteristics. Of the 544 listed companies, 121 were financial, banking and investment companies. These were removed from the analysis due to different regulatory requirements. Furthermore, 273 companies were eliminated due to missing data and annual reports. This resulted in 150 companies for which firm characteristics and governance data were available.

The next step was identifying the listed companies' X (formerly Twitter) and Facebook accounts. First, the company websites were searched for X and Facebook links. If these links were unavailable, the site map was reviewed to identify direct or indirect links that may redirect to these social media platforms. Subsequently, the website was searched for these links using the search bar. If a search on the company websites did not identify the X and Facebook accounts, then these platforms themselves were searched for by using the company name. Once an account on these platforms was found, it was verified by looking for blue tick verification provided by X and Facebook. Due to recent changes to the blue tick mechanism on X (formerly Twitter), additional checks such as analysis of post history, engagement, and tagging were utilized to ensure that the identified accounts were official company accounts.

Furthermore, we removed the X and Facebook accounts that have been inactive since 2016. Resultantly, we arrived at 96 active Facebook accounts and 68 X accounts. Out of the initial sample of 150 companies, 106 unique firms were discovered that had either a Facebook or an X account. Once these official company accounts were identified on X and Facebook, the posts and tweets made through these accounts were extracted. For the extraction of tweets, a specific code was written for this study that helped us to collect only the required data. A total of 47,964 Facebook posts and 23,877 X tweets were collected (71,841 total tweets and posts). We limited our analysis from 2016 to 2022, mainly because prior to 2016, the extent of social media usage by Pakistani companies was minimal. This resulted in a total of 636 firm-year observations (576 for Facebook and 408 for X). Table I provides details of the sampling process.

Table I: Sampling Process

Particulars	Number of Companies
Panel A: Governance	
Total PSX population	544
Less: Financial, investment and banking companies	(121)
Less: Missing annual reports	(273)
Total Available Sample	150
Panel B: Facebook	
Total Available Sample	150
Less: No Account	(42)
Less: Inactive since 2016	(12)
Final Facebook Sample	96
Firm Year Observations (96*6)	576
Panel C: X (Formerly Twitter)	
Total Available Sample	150
Less: No Account	(72)
Less: Inactive since 2016	(10)
Final Twitter Sample	68
Firm Year Observations (68*6)	408
Total Unique Firms	106
Total Firm Year Observations (106*6)	636

3.2. Topic Modelling Technique

To analyse and categorize the content of social media disclosures, this research utilized topic modelling. Topic models are statistical methods for discovering topics in a collection of documents. Specifically, LDA was used to categorize the data through minemytext. LDA is a popular machine learning-based technique used to build topic models. LDA applies a Dirichlet prior distribution to the text for categorization (Blei et al., 2003). Before running the techniques, preprocessing steps were conducted to clean tweets and posts, such as stop word filtering, stemming and lemmatization, removal of HTML tags, and generation of n-gram tokens (Feldman & Sanger, 2007). The number of topics had to be prespecified to apply the LDA topic model to the raw posts and tweets. To determine the most appropriate number of topics for both Facebook and X, several iterations were run with different numbers of topics. The most appropriate models were achieved by specifying seven topics for Facebook and ten topics for X. A lower number of topics for each resulted in overlap between topics, while a greater number of topics led to the discovery of duplicate topics. Once the topics were identified, several experts, including researchers and chartered accountants, were consulted

to identify the most appropriate title for each topic. These titles were determined based on the most likely words in each category and the sample posts/tweets in each topic.

3.3. Dependent Variables

In terms of the dependent variables, first, this study tests the impact of firm and corporate governance characteristics on the extent of corporate disclosures on social media. To measure the extent of social media usage, we calculate the ratio of Facebook posts made by the company to the total number of posts in the sample in each year (FUSE). Similarly, for X, we calculate the ratio of X tweets made by the company to the total number of tweets in the sample in each year (XUSE). Information asymmetry is another dependent variable in this study. Previous studies have used average stock return volatility to reflect information asymmetry (Frino et al., 2023; Elbadry et al., 2015). Wang (1993) highlights that information asymmetry can increase stock return volatility, which signifies that they have a positive association. Therefore, based on previous literature (e.g., Elbadry et al., 2015), it is assumed that the higher the average stock return volatility is, the greater the information asymmetry in the market will be.

3.4. Independent and Control Variables

For this study, the independent variables are characterized into three categories. In terms of firm characteristics, firm size, firm performance, and firm age are considered. In terms of board characteristics, this study examines the impact of board size, gender diversity, board meetings, and family board members. Regarding ownership structure, the impacts of family, managerial, and foreign ownership are examined. Furthermore, we also utilize several financial and nonfinancial control variables. These include liquidity, leverage, growth opportunities, board independence, and audit committee independence. Leverage reflects the amount of debt a firm has undertaken, while liquidity highlights whether the firm's financial policies are sound. Moreover, growth opportunities reflect how well the market responds to the firm and whether the company's stock price is likely to increase. In addition, board and audit committee independence is the ratio of independent members on the board and the ratio of independent members on the audit committee, respectively. The definitions and measures for all the variables are provided in Table II.

Table II: Measurement of Variables

Variable	Definition	Measure
Dependent Variables		
FUSE	Facebook Usage	Ratio of Facebook posts made by the company to total number of posts in the sample.
XUSE	X (Twitter) Usage	Ratio of tweets made by the company to total number of tweets in the sample.
VOL	Stock Return Volatility	Average volatility of daily stock returns.
Independent Variables		
SIZE	Firm Size	Natural logarithm of the total assets of a firm.
AGE	Firm Age	Number of years elapsed since the incorporation of a firm.
PROF	Firm Profitability	Ratio of income before tax to total assets.
BSIZE	Board Size	Total number of members on the board of directors.
BGD	Board Gender Diversity	Ratio of female board members to the total number of directors.
BM	Board Meetings	Total number of board meetings held in a year.
BFAM	Board family members	Ratio of family members to total number of directors.
FMOWN	Family Ownership	Percentage of shares owned by family members.
MOWN	Managerial Ownership	Percentage of shares owned by directors and key executives.
FOWN	Foreign Ownership	Percentage of shares owned by foreign investors.
Control Variables		
LIQ	Asset Liquidity	Ratio of current assets (less inventory) to current liabilities.
LEV	Financial Leverage	Ratio of total debt to total assets.
MTB	Growth Opportunities	Ratio of market value to book value of equities.
BI	Board Independence	Ratio of independent directors to total members.
ACI	Audit Committee Independence	Ratio of independent audit committee members to total members

3.5. Empirical Model

The following regression models are used for hypothesis testing:

$$Disclosure\ Ratio_{it} = \beta_0 + \beta_1 SIZE_{it} + \beta_2 \mathrm{PROF}_{it} + \beta_3 \mathrm{AGE}_{it} + \beta_4 \mathrm{BSIZE}_{it} + \beta_5 \mathrm{BGD}_{it} +$$

$$\beta_6 \text{BFAM}_{it} + \beta_7 BM_{it} + \beta_8 \text{FMOWN}_{it} + \beta_9 MOWN_{it} + \beta_{10} \text{FOWN}_{it} + \beta_{11} \text{LIQ}_{it} + \beta_{12} LEV_{it} + \beta_{13} \text{MTB}_{it} + \beta_{14} \text{BI}_{it} + \beta_{15} \text{ACI}_{it} + \varepsilon_{it} \quad (1)$$

where *i* represents the observed firm, *t* represents the year, β_0 represents the constant, ε represents the error term, *Disclosure Ratio* represents the extent of Facebook and X usage, *SIZE* represents the firm size, PROF represents firm profitability, *AGE* represents firm age, *BSIZE* represents board size, *BGD* refers to board gender diversity, *BFAM* refers to board family members, *BM* refers to board meetings, *FMOWN* represents family ownership, *MOWN* represents managerial ownership, *FOWN* refers to foreign ownership, *LIQ* represents asset liquidity, *LEV* represents financial leverage, *MTB* refers to growth opportunities, *BI* represents board independence and *ACI* refers to audit committee independence.

$$VOL_{it} = \beta_0 + \beta_1 \text{Disclosure Ratio}_{it} + \beta_2 \text{LIQ}_{it} + \beta_3 \text{LEV}_{it} + \beta_4 MTB_{it} + \beta_5 \text{BI}_{it} + \beta_6 \text{ACI}_{it} + \varepsilon_{it} \quad (2)$$

where *i* represents the observed firm, *t* represents the year, β_0 represents the constant, ε represents the error term, *VOL* refers to stock return volatility, *Disclosure Ratio* represents the extent of Facebook and X usage, *LIQ* represents asset liquidity, *LEV* represents financial leverage, *MTB* refers to growth opportunities, *BI* represents board independence, and *ACI* refers to audit committee independence.

3.6. Preliminary Analyses

To determine the most appropriate statistical test for our data, we performed several preliminary analyses. The Breusch and Pagan Lagrange multiplier (LM) test is used to determine whether the data should be tested through pooled or panel techniques (Hasan et al., 2024). The LM test was significant ($p < 0.05$), thus suggesting that the panel data estimation methods are appropriate. Second, the Hausman test is used to test whether a random or fixed effects model is more appropriate for the dataset. The Hausman test was significant ($p < 0.05$), suggesting that the fixed-effects model is more appropriate. Therefore, we assess our models using the fixed-effects model (within-groups estimator). The fixed effects model helps control time-invariant unobserved firm-level heterogeneity (Black et al., 2006). Therefore, the fixed-effects model can effectively mitigate endogeneity issues arising from time-invariant omitted variables (Klock et al., 2005). Furthermore, before running the regression analysis

for H4, the Hausman test was conducted to determine the most appropriate method. The results of the Hausman test were not significant ($p > 0.05$); therefore, the random effects model is used to test H4.

4. Results and Discussion

4.1. Descriptive Statistics

Table III provides descriptive statistics for the variables used in the study. In terms of the dependent variables, the average extent of Facebook usage (FUSE) is 1%, while the average extent of X usage is 1.4%. These figures suggest that, on average, the usage of Facebook by each firm accounts for 1% of the total Facebook usage in each year, while the usage of X by each firm accounts for 1.4% of the total X usage in each year. Furthermore, the average stock return volatility is 0.025. In terms of the independent variables, the average size of the firm after logarithmic transformation is 9.189, while the average firm age is almost 48 years. Furthermore, the average firm profitability is 6.9%. The average board size is almost eight members, the average gender diversity is 12.4%, and the average board family members are 27.4%. Moreover, the average number of board meetings is 5.6 in a financial year. In addition, the average family ownership is 13%, while the average managerial ownership is 15.1%. Finally, the average foreign ownership is 18.7%.

Table III: Descriptive Statistics

	Obs.	Mean	P25	Median	P75	Std. Dev.
Dependent Variables						
FUSE	576	0.010	0.000	0.005	0.015	0.014
XUSE	408	0.014	0.000	0.002	0.023	0.015
VOL	636	0.025	0.020	0.024	0.029	0.007
Independent Variables						
SIZE	636	9.189	8.054	9.871	11.025	2.804
AGE	636	47.921	29.500	49.500	63.000	21.878
PROF	636	0.069	0.010	0.056	0.107	0.116
BSIZE	636	8.456	7.000	8.000	9.000	1.776
BGD	636	0.124	0.077	0.125	0.143	0.104
BM	636	5.670	4.000	5.000	6.000	2.400
BFAM	636	0.274	0.000	0.285	0.428	0.239
FMOWN	636	0.130	0.000	0.002	0.216	0.210
MOWN	636	0.151	0.000	0.031	0.258	0.220
FOWN	636	0.187	0.000	0.010	0.260	0.297

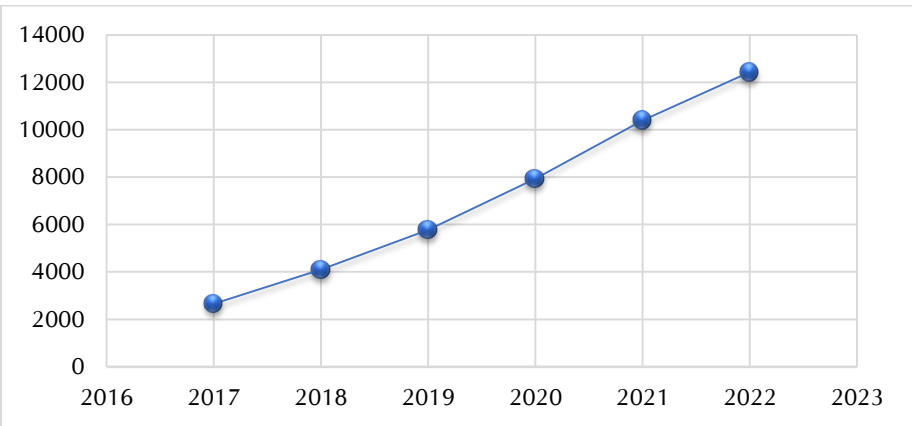
	Obs.	Mean	P25	Median	P75	Std. Dev.
Control Variables						
LIQ	636	0.954	0.445	0.740	1.090	0.858
LEV	636	0.270	0.104	0.257	0.378	0.222
MTB	636	2.628	0.633	1.267	2.543	4.255
BI	636	0.255	0.142	0.285	0.300	0.127
ACI	636	0.399	0.333	0.333	0.500	0.195

FUSE: Facebook usage, XUSE: X usage, VOL: stock return volatility, SIZE: firm size, AGE: firm age, PROF: firm profitability, BSIZE: board size, BGD: board gender diversity, BM: board meetings, BFAM: board family members, FMOWN: family ownership, MOWN: managerial ownership, FOWN: foreign ownership, LIQ: asset liquidity, LEV: financial leverage, MTB: growth opportunities, BI: board independence, ACI: audit committee independence.

For the control variables, the average liquidity is 0.95 times, the mean leverage is 27%, and the average market-to-book value is 2.62 times. Finally, the average board independence is 25.5%, and the average audit committee independence is almost 40%.

Furthermore, in terms of Facebook usage, Figure 1 highlights that the use of the platform has consistently increased from 2017 to 2022. For instance, in 2017, the observed sample had only posted 2658 times, compared to 12,421 posts in 2022.

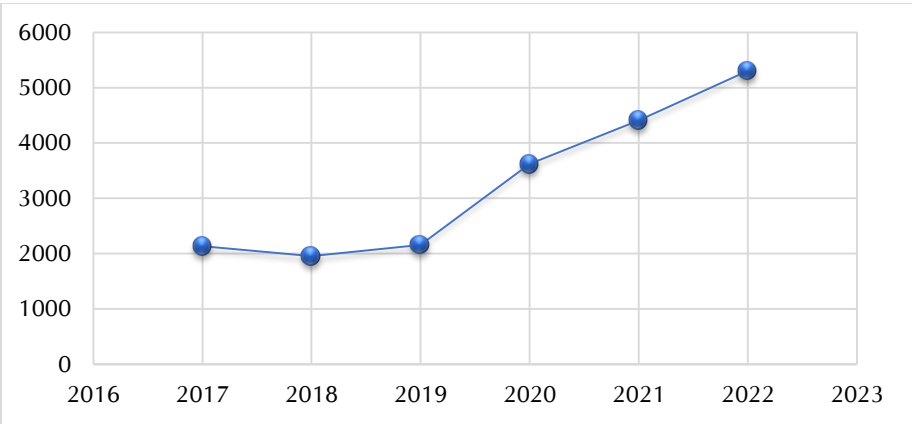
Figure 1: Facebook Yearly Usage



Comparatively, as shown in Figure 2, the growth in the usage of X decreased from 2017 to 2019. However, subsequently, the usage of the platform has grown consistently. For instance, in 2017, the observed sample had tweeted 2132, followed by 1956 in 2018 and 2160 in 2019.

Since then, usage has consistently increased, with a maximum of 5303 tweets in 2022.

Figure 2: X Yearly Usage



4.2. Topic Modelling Results

Table IV provides the Facebook topic model results and depicts the most probable words and labels for the seven discovered topics. As suggested by the results, Pakistani companies disclose about automotive awareness, sustainability, disease awareness, festivities and celebrations, sports and engagement, political and economic conditions, and corporate management.

Table IV: Facebook Topic Model

Topic	Most Probable Words	Label
T1	Free batteri offer road power onlin dealership avail drive tyre design visit book experi make call car	Automotive Awareness
T2	Busi employe nation commit world future team woman celebr year make sustain work day	Sustainability
T3	People life diabet diseas care healthi stay medic consult child breast prevent cancer hospit covid19 heart	Disease Awareness
T4	Bless happi refresh winter celebr smile season food Ramadan eid day collect love nation time good	Festivities and Celebrations
T5	Cricket chanc competit today match team watch congratul contest winner partcip live excit final comment	Sports and Engagement

Topic	Most Probable Words	Label
T6	Price prime psx ministri govern pkr equity pm price energype divis present minist everi	Political and Economic
T7	Manag company package appli group corpor intern award office hotel limit posit hold	Corporate Management

Table V provides the X topic model results and the most probable words and labels for each of the ten discovered topics. As highlighted by the results on X, Pakistani companies disclose about sustainability, social responsibility, branding and marketing, festivities and celebrations, disease awareness, automotive awareness, corporate management, economic and financial performance, sports and engagement, and automotive initiatives.

Table V: X (Twitter) Topic Model

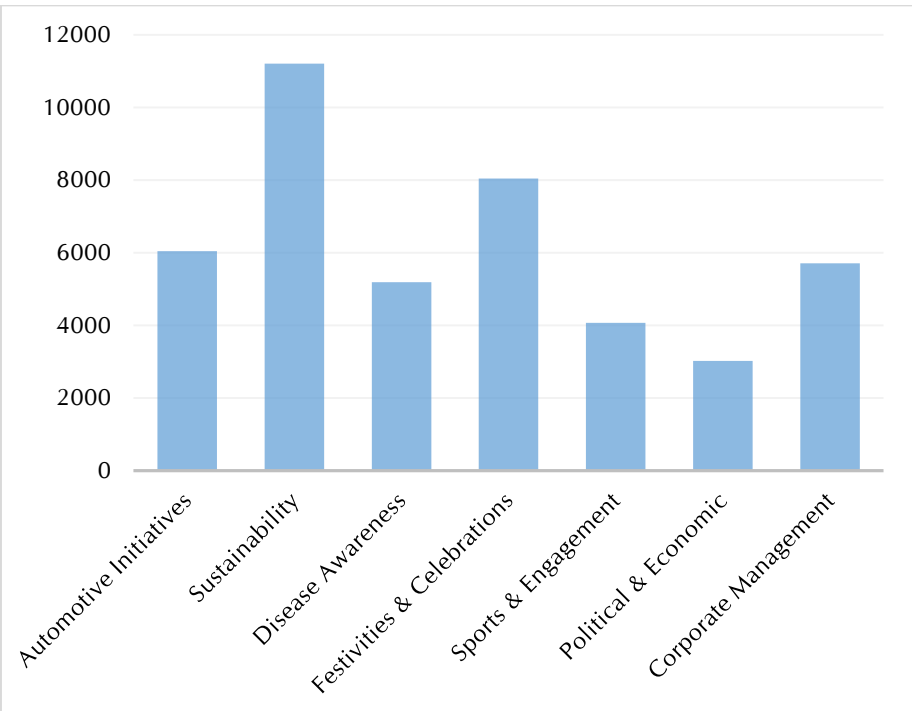
Topic	Most Probable Words	Label
T1	Sustain busi chang future join build climat global innov energi world make technolog work learn	Sustainability
T2	Environ world initi healthi woman commit sustain plant educ provid support life community work life program part	Social Responsibility
T3	Shop onlin discount enjoy post collect photo decor color design great winter style product check avail	Branding and Marketing
T4	Happi eid bless life celebr Ramadan world today Mubarak prosper peopl tribut love famili day nation year	Festivities and Celebrations
T5	Health cancer diseas vaccin learn people diabet blood patient covid19 awar world care live risk hospit prevent consult	Disease Awareness
T6	Visit tyre car make drive experi power speed perform road vehicl adventur safety comfort	Automotive Awareness
T7	Corpor group program hold company intern posit career appli visit offic team organ ceo manag hire packag	Corporate Management
T8	Economi psx pkr compani result buy market trade equiti billion announc profit price news investor sell	Economic & Financial Performance
T9	Win team excit congratul chanc cricket watch contest tune game lucki prize make share	Sports and Engagement
T10	Experi alert servic car visit free live stall road gas author detail shut certifi call avail offer	Automotive Initiatives

Collectively, the results of both topic models suggest that while the frequency of usage of Facebook is much higher, X is used as a platform

for the disclosure of a greater number of topics. Furthermore, there is also an overlap of several topics between the two platforms. In contrast, some topics, such as social responsibility and branding and marketing, are specific to X. In addition, companies tend to disclose more about their financial performance on X than on Facebook, where discussion is mostly related to the country's overall political and economic conditions.

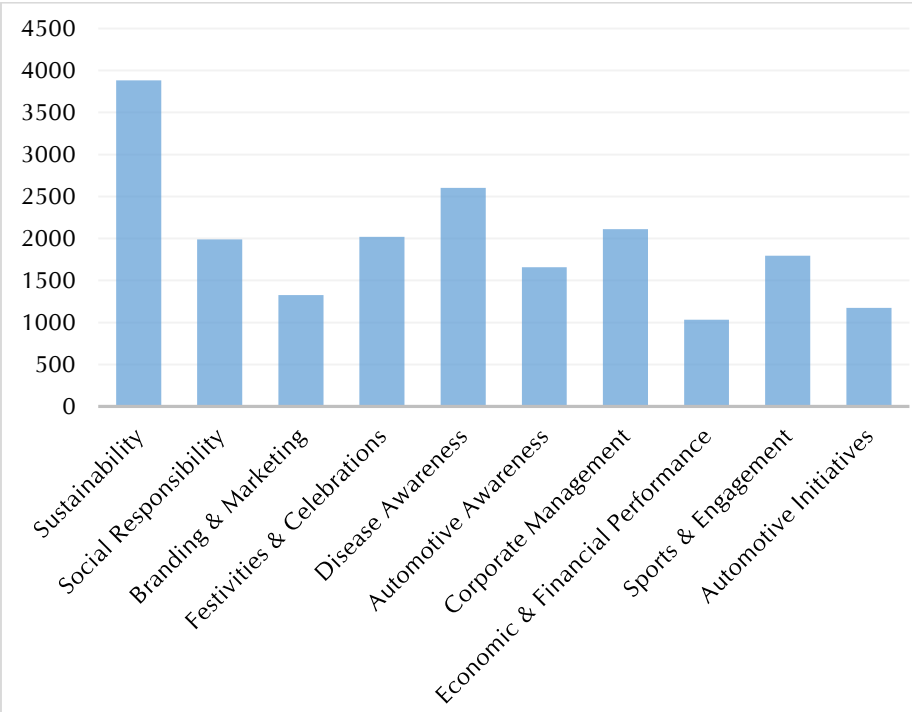
Figures 3 and 4 show the frequency of Facebook and X topics. Sustainability is the most common topic on Facebook, while political and economic is the least common.

Figure 3: Facebook Topic Frequency



On X, Pakistani companies also disclose sustainability information the most, while economic and financial performance is the least common. Therefore, the most and least disclosed topics on both Facebook and Twitter are quite similar.

Figure 4: X Topic Frequency



4.3. Correlation Analyses

Prior to running the regression analysis, this study utilized Pearson/Spearman's correlation matrix to assess the correlations between the independent and dependent variables. As shown in Table VI, there are significant correlations between Facebook/X usage and the independent and control variables. These results support testing the association between these variables using regression analysis. Furthermore, the correlation matrix also shows that the correlation coefficients among the independent and control variables are not too high, suggesting that collinearity may not be a cause for concern. Moreover, the variance inflation factor (VIF) is used to test for multicollinearity. The results of the tests reveal that the VIF for all the individual variables is less than 10, indicating a low multicollinearity level in the model.

Table VI: Correlation Analyses

	FUSE	XUSE	VOL	SIZE	AGE	PROF	BSIZE	BGD	BM	BFAM	FMOWN	MOWN	FOWN	LIQ	LEV	MTB	BI	ACI
FUSE	1	0.319***	0.071	0.122**	0.005	-0.033	0.034	0.031	0.055	-0.002	-0.054	-0.070	0.097*	-0.132**	0.031	-0.042	0.121**	0.003
XUSE	0.263***	1	-0.060	-0.018	0.082	-0.021	0.027	0.019	-0.009	-0.043	-0.098*	-0.108**	0.140***	-0.036	0.110**	0.082	0.161***	0.065
VOL	-0.013	-0.068	1	-0.428***	-0.041	-0.468***	-0.201***	0.076	-0.161***	0.046	0.006	-0.057	-0.168***	-0.259***	0.068	-0.078	0.050	-0.022
SIZE	0.102*	-0.075	-0.363***	1	-0.170***	0.259***	0.248***	-0.125**	0.251***	-0.001	-0.024	-0.042	-0.003	0.097*	0.078	-0.237***	0.112**	0.070
AGE	0.077	0.058	-0.091*	-0.160***	1	-0.043	0.106**	-0.017	0.033	-0.190***	-0.141***	-0.114**	0.241***	-0.028	0.083	0.052	0.200***	0.134**
PROF	0.045	0.051	-0.389***	0.229***	0.048	1	0.132**	0.027	0.034	0.063	0.079	0.080	0.156***	0.310***	-0.169***	0.362***	-0.087	-0.058
BSIZE	0.015	0.002	-0.144***	0.205***	0.030	0.103*	1	-0.268***	0.251***	-0.113**	-0.079	-0.089*	-0.040	0.087	-0.009	0.183***	0.217***	0.178***
BGD	-0.067	0.018	0.027	-0.036	0.017	0.044	0.000	1	-0.216***	0.151***	0.084	0.066	-0.051	0.070	-0.159***	0.098*	0.069	0.005
BM	0.062	0.014	-0.106**	0.287***	0.087	-0.088	0.338***	-0.170***	1	-0.158***	-0.190***	-0.185***	-0.026	0.145***	0.036	-0.143***	0.251***	0.189***
BFAM	-0.061	-0.057	0.065	0.024	-0.192***	0.019	-0.124**	0.125**	-0.244***	1	0.695***	0.644***	-0.332***	-0.123**	0.296***	0.086	-0.149***	-0.048
FMOWN	-0.018	-0.108**	0.064	-0.014	-0.158***	-0.029	-0.104*	-0.005	-0.191***	0.483***	1	0.814***	-0.352***	-0.081	0.213***	-0.021	-0.189***	-0.050
MOWN	-0.059	-0.102*	0.002	-0.007	-0.135**	-0.029	-0.126**	0.052	-0.192***	0.462***	0.850***	1	-0.343***	-0.115**	0.278***	-0.068	-0.213***	-0.023
FOWN	0.127**	0.184***	-0.128**	-0.162***	0.228***	0.236***	-0.056	-0.087	-0.149***	-0.329***	-0.315***	-0.345***	1	0.047	-0.314***	0.347***	-0.097*	-0.187***
LIQ	-0.097*	-0.078	-0.197***	0.152***	-0.091*	0.181***	0.112**	0.011	0.266***	-0.176***	-0.110**	-0.150***	0.014	1	-0.272***	-0.008	0.054	0.056
LEV	-0.018	0.048	0.137**	-0.048	0.117**	-0.268***	-0.003	-0.192***	0.066	0.180***	0.122**	0.138**	-0.263***	-0.307***	1	-0.246***	0.164***	0.019
MTB	0.052	0.116**	-0.097*	-0.047	0.096*	0.535***	0.255***	0.147***	-0.149***	0.048	-0.127**	-0.150***	0.308***	-0.115**	-0.140***	1	-0.172***	-0.145***
BI	-0.042	0.046	0.072	0.017	0.175***	-0.162***	0.186***	0.034	0.336***	-0.186***	-0.106**	-0.111**	-0.098*	0.152***	0.268***	-0.133**	1	0.618***
ACI	-0.072	0.098*	-0.047	0.066	0.148***	-0.106**	0.210***	-0.002	0.256***	-0.075	-0.036	-0.012	-0.099*	0.109**	0.208***	-0.035	0.692***	1

FUSE: Facebook usage, XUSE: X usage, VOL: stock return volatility, SIZE: firm size, AGE: firm age, PROF: firm profitability, BSIZE: board size, BGD: board gender diversity, BM: board meetings, BFAM: board family members, FMOWN: family ownership, MOWN: managerial ownership, FOWN: foreign ownership, LIQ: asset liquidity, LEV: financial leverage, MTB: growth opportunities, BI: board independence, ACI: audit committee independence.

Lower-triangular cells report Pearson's correlation coefficients, and upper-triangular cells are Spearman's rank correlation.

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

4.4. Regression Analysis

The results of the fixed-effects method are provided in Table VII, where the extent of Facebook usage (FUSE) and the extent of X usage (XUSE) are the dependent variables. In terms of firm characteristics, the results highlight that firm size has a statistically significant positive impact on FUSE ($p < 0.05$), which is consistent with H1a. These results align with the agency theory perspective that larger firms provide greater disclosures to reduce agency costs and information asymmetry (Jensen & Meckling, 1976). In doing so, social media platforms, specifically Facebook, provide a cost-effective information dissemination method (Basuony et al., 2020). In contrast, the insignificant impact on XUSE suggests that the increasing costs associated with X (subscription) may be viewed as a hindrance to the adoption of the platform by larger firms. Furthermore, these results also align with the signalling perspective and suggest that larger firms use Facebook as a disclosure mechanism to respond to greater stakeholder pressure (Cormier et al., 2010). These results are also consistent with the findings of Basuony et al. (2018).

Furthermore, firm profitability has a significant positive impact on both FUSE ($p < 0.10$) and XUSE ($p < 0.10$), which is consistent with H1b. These results align with agency theory, which suggests that managers in more profitable firms tend to provide greater disclosures to improve their reputation and obtain higher compensation, among other benefits (Haniffa & Cooke, 2002). These results also align with the signalling perspective, whereby more profitable firms provide greater disclosures to signal to investors and raise capital at lower prices (Marston & Polei, 2004). These results are consistent with previous empirical findings (e.g., Desoky, 2009; Al-Shammari, 2007). However, our results contradict the findings of Basuony et al. (2018), who found an insignificant impact of firm profitability on social media disclosures, and Amin et al. (2020, 2021), who found an insignificant impact on financial and CSR disclosures on X.

Firm age has a negative impact on both FUSE and XUSE; however, this impact is not statistically significant. These results are inconsistent with H1c. This suggests that firm age does not impact the adoption of social media platforms as a disclosure mechanism. This insignificant impact is consistent with the findings of Rozario et al. (2020), who found that firm age does not significantly impact the extent of financial disclosures on the internet.

Table VII: Extent of Social Media Usage

D.V. =	FUSE	XUSE
Independent Variables		
SIZE	0.00548**	0.00386
	(0.00279)	(0.00545)
AGE	-0.000135	-0.000612
	(0.000281)	(0.000506)
PROF	0.0173*	0.0366*
	(0.00960)	(0.0208)
BSIZE	0.000437	0.00343**
	(0.000847)	(0.00164)
BGD	-0.00620	0.0375*
	(0.0104)	(0.0213)
BM	0.00136***	0.000347
	(0.000470)	(0.000884)
BFAM	-0.0161**	0.0221*
	(0.00629)	(0.0133)
FMOWN	0.0139	0.00606
	(0.0107)	(0.0214)
MOWN	0.0231*	0.0655**
	(0.0122)	(0.0276)
FOWN	-0.00925	-0.00380
	(0.00567)	(0.00961)
Control Variables		
LIQ	0.00221	0.000511
	(0.00179)	(0.00361)
LEV	0.00795	-0.00116
	(0.00569)	(0.00971)
MTB	0.000260	-4.04e-05
	(0.000370)	(0.000582)
BI	-0.00940	-0.0189
	(0.00836)	(0.0158)
ACI	0.000952	0.0306***
	(0.00526)	(0.00969)
Constant	-0.0474*	-0.0529
	(0.0246)	(0.0486)
Observations	576	408
Unique Firms	96	68
Years	6	6
R^2	0.072	0.089
F	2.39	2.12

FUSE: Facebook usage, XUSE: X usage, SIZE: firm size, AGE: firm age, PROF: firm profitability, BSIZE: board size, BGD: board gender diversity, BM: board meetings, BFAM: board family members, FMOWN: family ownership, MOWN: managerial ownership, FOWN: foreign ownership, LIQ: asset liquidity, LEV: financial leverage, MTB: growth opportunities, BI: board independence, ACI: audit committee independence.
Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

In terms of board characteristics, consistent with H2a, board size has a significant positive impact on XUSE ($p < 0.05$), while the impact on FUSE is insignificant. These results suggest that firms with larger boards tend to use X as a disclosure mechanism compared to Facebook. These results align with the agency theory perspective that larger boards provide better monitoring and reduce opportunistic behavior by ensuring that information is not withheld (Samaha & Dahawy, 2010). Empirically, these results are consistent with previous studies that have shown that board size is linked to greater voluntary disclosures (Laksmana, 2008), environmental disclosures (Kathy Rao et al., 2012), and corporate internet disclosures (Samaha et al., 2012). However, our results contradict the findings of previous studies that have investigated this impact in the context of social media platforms (e.g., Amin et al., 2020,2021; Basuony et al., 2018).

Moreover, consistent with H2b, board gender diversity has a significant positive impact on XUSE ($p < 0.10$), while it has an insignificant negative impact on FUSE. Similar to board size, these results suggest that firms with greater gender diversity prefer X as a disclosure platform. These results are consistent with previous empirical research showing that gender diversity positively impacts the volume and frequency of corporate disclosures (Ahmed et al., 2017), social media disclosures (Basuony et al., 2018), and financial and CSR disclosures on X (Amin et al., 2020, 2021). These findings indicate that female members are more likely to adopt social media platforms for information disclosure and interact with stakeholders to strengthen relationships (Amin et al., 2021).

In addition, consistent with H2c, board meetings have a significant positive impact on FUSE ($p < 0.01$), while the impact on XUSE is statistically insignificant. These results suggest that firms with higher board meeting frequency tend to prefer Facebook as a disclosure platform. These findings align with agency theory, which states that higher board meeting frequency improves monitoring and efficiency and results in greater transparency and disclosure (Jensen, 1993; Lin et al., 2009). Empirically, these results are consistent with previous studies that have found that board meeting frequency is associated with higher financial reporting quality (Kent et al., 2010). However, specifically regarding social media disclosures, our results contrast with the findings of Basuony et al. (2018), who found it to have an insignificant impact.

Consistent with H2d, board family members have a negative impact on FUSE ($p < 0.05$) and a positive impact on XUSE ($p < 0.10$). These results are quite interesting because they indicate that family members on the board prefer X

as a disclosure platform while actively discouraging the use of Facebook. The negative impact on Facebook usage is coherent with the perspective that more family members on the board may be able to entrench themselves into management and may reduce the level of disclosures they provide (Ali et al., 2007). These results are consistent with empirical studies that have shown that family members negatively impact voluntary disclosures (Ho & Wong, 2001; Haniffa & Cooke, 2002), including online disclosures (Sandhu & Singh, 2019; Thangatorai et al., 2013). In contrast, the positive impact on X usage is consistent with the notion that firms with more family members on the board are concerned about maintaining their reputation and preserving their family image to ensure smooth succession for future generations (Chen et al., 2008; Biswas et al., 2019). In this sense, by providing greater disclosures through X, they can also signal to the public that their objectives align with overall societal values. The preference for X over Facebook suggests that firms with more family members view X as a relevant platform to help them maintain a better image and preserve their reputation.

Regarding ownership structure, family ownership has a statistically insignificant positive impact on both X and Facebook usage, which is inconsistent with H3a. These results suggest that while board family members significantly impact social media disclosures, family ownership alone does not influence firms' social media disclosure strategies.

Consistent with H3b, managerial ownership has a statistically significant impact on both FUSE ($p < 0.10$) and XUSE ($p < 0.05$). These results are consistent with the agency theory perspective that managerial ownership can effectively align managers' interests with those of shareholders (Singh & Davidson III, 2003). These results also suggest that managers in Pakistani firms view disclosures through social media platforms such as X and Facebook as potential tools to enhance firm value; thus, they provide greater disclosures through these platforms. These results are consistent with the empirical results of studies that have found managerial ownership to be positively linked with higher voluntary (Chau & Gray, 2002), CSR (Alotaibi & Hussainey, 2016), and tax responsibility disclosures (Anwar et al., 2024).

Finally, foreign ownership has a statistically insignificant negative impact on both FUSE and XUSE, which is inconsistent with H3c. These results suggest that while foreign ownership is a tool for transferring good governance strategies and enhancing information disclosure (Shan, 2019; Haniffa & Cooke, 2005), this effect does not translate to disclosures on social media platforms. In terms of control variables, only audit committee

independence has a positive impact on XUSE ($p < 0.01$), while all other variables have an insignificant impact on both FUSE and XUSE.

To test H4, we use FUSE and XUSE as independent variables and stock return volatility as a proxy for information asymmetry. As shown in Table VIII, consistent with H4, FUSE has a significantly negative impact on stock return volatility ($p < 0.05$), while the impact of XUSE is insignificant. These results suggest that while social media platforms can be effective tools for reducing information asymmetry in the Pakistani market, this impact is limited to the usage of Facebook. This may be due to the significantly greater volume of usage of Facebook compared to X. Overall, these results are consistent with the notion that social media platforms help to reduce information asymmetry because of the more timely and broader dissemination of information compared to traditional disclosure tools (Blankespoor et al., 2014; Jung et al., 2018).

Table VIII: Social Media Usage and Information Asymmetry

Social Media Platform	**Facebook**	**X**
D.V. =	VOL	VOL
Independent Variable		
FUSE/XUSE	-0.0372**	-0.0178
	(0.0178)	(0.0127)
Control Variables		
LIQ	-0.000942*	-0.000531
	(0.000518)	(0.000621)
LEV	0.00343*	0.00470**
	(0.00189)	(0.00193)
MTB	-8.57e-05	9.74e-05
	(0.000104)	(0.000104)
BI	0.00575*	0.00649*
	(0.00303)	(0.00334)
ACI	-0.00341*	-0.00350
	(0.00199)	(0.00217)
Constant	0.0257***	0.0243***
	(0.00121)	(0.00142)
Observations	576	408
Unique Firms	96	68
Years	6	6
R^2	0.058	0.082
Wald Chi^2	19.99	16.04

FUSE: Facebook usage, XUSE: X usage, VOL: stock return volatility, LIQ: asset liquidity, LEV: financial leverage, MTB: growth opportunities, BI: board independence, ACI: audit committee independence. Standard errors in parentheses

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

4.5. Additional Analyses

To delve deeper into our results, we conduct an additional analysis by analysing the impact of corporate governance on a sample of topics discovered through the topic model for both Facebook and X. We conduct this additional analysis on five topics for both platforms. These topics are selected based on their frequency and relevance. The dependent variable is calculated following Amin et al. (2020, 2021), whereby the total number of posts/tweets for each topic is divided by the total number of tweets by the company in each year. The results of the additional analysis for Facebook topics are presented in Table IX.

Table IX: Facebook Topics

D.V. =	Automotive Awareness	Sustainability	Festivities and Celebrations	Political and Economic	Corporate Management
Independent Variables					
SIZE	-0.00453	0.118***	0.147***	0.0220	-0.00172
	(0.0245)	(0.0395)	(0.0341)	(0.0175)	(0.0404)
AGE	0.00956***	0.00851**	0.00562	0.00127	0.00837**
	(0.00248)	(0.00398)	(0.00344)	(0.00177)	(0.00407)
PROF	0.0440	0.0609	-0.137	0.0842	0.108
	(0.0845)	(0.136)	(0.117)	(0.0603)	(0.139)
BSIZE	0.00696	-0.000335	0.00322	0.00386	-0.00691
	(0.00746)	(0.0120)	(0.0104)	(0.00532)	(0.0123)
BGD	0.251***	-0.0464	-0.140	-0.0103	-0.0558
	(0.0918)	(0.148)	(0.128)	(0.0655)	(0.151)
BM	0.00378	0.00352	0.0104*	0.00783***	0.00391
	(0.00414)	(0.00666)	(0.00575)	(0.00295)	(0.00681)
BFAM	-0.00561	-0.173*	0.0738	-0.0938**	-0.0951
	(0.0554)	(0.0891)	(0.0770)	(0.0395)	(0.0911)
FMOWN	-0.0631	-0.0234	-0.104	0.0776	-0.0474
	(0.0946)	(0.152)	(0.131)	(0.0674)	(0.156)
MOWN	-0.0356	-0.211	-0.153	0.220***	-0.0983
	(0.107)	(0.173)	(0.149)	(0.0765)	(0.177)
FOWN	-0.0269	-0.115	0.00282	-0.0876**	-0.0178
	(0.0499)	(0.0803)	(0.0694)	(0.0356)	(0.0821)
Control Variables					
LIQ	-0.00715	-0.00781	-0.00288	-0.00132	0.0233
	(0.0157)	(0.0253)	(0.0219)	(0.0112)	(0.0259)
LEV	0.217***	0.0187	-0.0508	-0.0531	0.0120
	(0.0501)	(0.0806)	(0.0696)	(0.0357)	(0.0824)
MTB	0.00228	8.13e-05	0.0134***	-0.00299	0.00234
	(0.00326)	(0.00524)	(0.00453)	(0.00232)	(0.00536)
BI	-0.129*	0.0486	0.0414	0.0625	-0.0699
	(0.0736)	(0.118)	(0.102)	(0.0525)	(0.121)

D.V. =	Automotive Awareness	Sustainability	Festivities and Celebrations	Political and Economic	Corporate Management
ACI	0.0406	0.0823	-0.0316	-0.0399	-0.00264
	(0.0463)	(0.0746)	(0.0644)	(0.0331)	(0.0763)
Constant	-0.476**	-1.265***	-1.564***	-0.297*	-0.164
	(0.217)	(0.349)	(0.301)	(0.154)	(0.356)
Observations	576	576	576	576	576
Unique Firms	96	96	96	96	96
Years	6	6	6	6	6
R^2	0.134	0.121	0.092	0.105	0.021
F	4.82	4.28	3.13	3.64	0.68

SIZE: firm size, AGE: firm age, PROF: firm profitability, BSIZE: board size, BGD: board gender diversity, BM: board meetings, BFAM: board family members, FMOWN: family ownership, MOWN: managerial ownership, FOWN: foreign ownership, LIQ: asset liquidity, LEV: financial leverage, MTB: growth opportunities, BI: board independence, ACI: audit committee independence.
Standard errors in parentheses
***p<0.01, ** p<0.05, * p<0.10

The results indicate that board size positively impacts sustainability disclosure and information about festivities and celebrations. Firm age positively impacts sustainability, corporate management, and automotive awareness disclosure. In terms of board characteristics, although board gender diversity has an insignificant impact on FUSE, it positively impacts automotive awareness disclosure. Board meeting frequency positively impacts political and economic disclosure and the disclosure of festivities and celebrations. Furthermore, board family members have a negative impact on sustainability and political and economic disclosures, which is consistent with our primary analysis. In terms of ownership structure, managerial ownership has a positive impact on political and economic disclosures. Finally, foreign ownership negatively impacts political and economic disclosure.

The additional analysis results for X topics are presented in Table X. The results highlight that firm size positively impacts social responsibility and corporate management disclosure while negatively impacting branding and marketing disclosure. Furthermore, firm age has a negative impact on social responsibility disclosure. However, more profitable firms tend to provide greater sustainability disclosures on X. In terms of board characteristics, firms with larger boards also provide greater sustainability disclosures on X. Interestingly, while family board members generally prefer X as a disclosure platform, they tend to provide less sustainability

and social responsibility disclosures while using it as a branding and marketing platform. In terms of ownership structure, while insignificant in the overall analysis, family ownership positively impacts sustainability and corporate management disclosures. Furthermore, while the impact of managerial ownership is positive in the primary analysis, it has a negative impact on corporate management disclosure on X. This suggests that manager-owned firms tend to reveal less about their overall management practices. Finally, similar to Facebook, foreign-owned firms tend to provide fewer economic and financial disclosures on X.

Table X: X (Twitter) Topics

D.V. =	Sustain-ability	Social Responsibility	Branding and Marketing	Corporate Management	Economic and Financial
Independent Variables					
SIZE	0.0671	0.132***	-0.0706**	0.0823*	0.0108
	(0.0424)	(0.0279)	(0.0342)	(0.0428)	(0.0172)
AGE	-0.00398	-0.00788***	-0.00469	0.00274	0.000944
	(0.00394)	(0.00259)	(0.00317)	(0.00397)	(0.00160)
PROF	0.331**	0.0641	0.00615	-0.0877	0.0243
	(0.162)	(0.107)	(0.131)	(0.163)	(0.0659)
BSIZE	0.0347***	0.0127	0.00422	0.00184	0.00122
	(0.0128)	(0.00839)	(0.0103)	(0.0129)	(0.00518)
BGD	-0.0204	0.0362	0.0255	0.0317	0.0583
	(0.165)	(0.109)	(0.133)	(0.167)	(0.0672)
BM	0.00498	0.000880	0.00388	0.00163	0.000640
	(0.00688)	(0.00452)	(0.00554)	(0.00694)	(0.00279)
BFAM	-0.194*	-0.190***	0.214**	-0.0949	0.0141
	(0.103)	(0.0678)	(0.0831)	(0.104)	(0.0419)
FMOWN	0.326*	0.0574	-0.00725	0.664***	0.0352
	(0.167)	(0.110)	(0.134)	(0.168)	(0.0678)
MOWN	-0.168	0.0971	0.130	-0.385*	0.134
	(0.215)	(0.141)	(0.173)	(0.217)	(0.0872)
FOWN	-0.0976	-0.0801	0.0212	0.00791	-0.0510*
	(0.0748)	(0.0492)	(0.0603)	(0.0754)	(0.0304)
Control Variables					
LIQ	0.00680	-0.00455	-0.0262	0.00970	0.00743
	(0.0281)	(0.0185)	(0.0226)	(0.0283)	(0.0114)
LEV	-0.000121	-0.00328	-0.0217	-0.0261	0.0153
	(0.0755)	(0.0497)	(0.0609)	(0.0762)	(0.0307)
MTB	-0.00505	0.000890	-0.00125	-0.00503	-0.00100
	(0.00453)	(0.00298)	(0.00365)	(0.00457)	(0.00184)
BI	0.114	-0.0179	0.137	-0.0361	-0.0414
	(0.123)	(0.0808)	(0.0989)	(0.124)	(0.0499)
ACI	0.0528	0.0412	-0.0331	0.00718	-0.0110
	(0.0754)	(0.0496)	(0.0607)	(0.0760)	(0.0306)
Constant	-0.680*	-0.876***	0.797***	-0.798**	-0.149

D.V. =	Sustain-ability	Social Responsibility	Branding and Marketing	Corporate Management	Economic and Financial
	(0.378)	(0.249)	(0.305)	(0.381)	(0.154)
Observations	408	408	408	408	408
Unique Firms	68	68	68	68	68
Years	6	6	6	6	6
R^2	0.090	0.119	0.072	0.094	0.041
F	2.14	2.92	1.69	2.26	0.92

SIZE: firm size, AGE: firm age, PROF: firm profitability, BSIZE: board size, BGD: board gender diversity, BM: board meetings, BFAM: board family members, FMOWN: family ownership, MOWN: managerial ownership, FOWN: foreign ownership, LIQ: asset liquidity, LEV: financial leverage, MTB: growth opportunities, BI: board independence, ACI: audit committee independence.
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

Family ownership and family board membership are vital characteristics of Pakistani firms. Therefore, we conduct an additional analysis to assess the impact of family firms on FUSE and XUSE and examine the moderating impact of family firms on the relationship between firm characteristics and corporate governance and the extent of social media usage. To do so, we utilize a dummy variable (1 if family firm, 0 otherwise), which is based on a compositive measure to delineate family firms, i.e., if family ownership is greater than equal to 20% and there are at least two family members on the board (Anwar et al., 2024). To conduct the analysis, we reran the regression analysis by removing the family ownership and family board members variables and including the dummy variable. As shown in Table XI, family firms have a positive impact on XUSE, which is consistent with our main analysis, while the impact on FUSE is insignificant.

Table XI: Family Firms and Social Media Disclosure

	(1) FUSE	(2) FUSE	(3) XUSE	(4) XUSE
SIZE	0.00449	0.00474*	0.00333	0.00384
	(0.00279)	(0.00277)	(0.00539)	(0.00578)
AGE	3.83e-05	0.000105	-0.000571	-0.000578
	(0.000274)	(0.000269)	(0.000483)	(0.000485)
PROF	0.0168*	0.00429	0.0339	0.0430*
	(0.00965)	(0.0103)	(0.0206)	(0.0225)
BSIZE	0.000556	-0.000273	0.00324**	0.00429**
	(0.000850)	(0.000922)	(0.00162)	(0.00172)
BGD	-0.00879	-0.000670	0.0287	0.0379*
	(0.0106)	(0.0118)	(0.0213)	(0.0226)

	(1) FUSE	(2) FUSE	(3) XUSE	(4) XUSE
BM	0.00147***	0.00140***	0.000332	0.000379
	(0.000471)	(0.000504)	(0.000876)	(0.000902)
MOWN	0.0231**	0.00606	0.0581**	-0.0263
	(0.0116)	(0.0145)	(0.0265)	(0.0497)
FOWN	-0.00822	-0.00448	-0.00578	-0.00374
	(0.00569)	(0.00579)	(0.00951)	(0.00953)
FAMILY	0.00325	-0.0132	0.0183***	0.107**
	(0.00371)	(0.0216)	(0.00667)	(0.0474)
SIZEXFAMILY	-	-0.000143	-	-0.00430
		(0.00164)		(0.00390)
AGEXFAMILY	-	-0.000574***	-	-0.000614
		(0.000209)		(0.000457)
PROFXFAMILY	-	0.0706***	-	-0.0530
		(0.0217)		(0.0545)
BSIZEXFAMILY	-	0.00446**	-	-0.00510
		(0.00201)		(0.00477)
BGDXFAMILY	-	-0.0561***	-	-0.00123
		(0.0213)		(0.0570)
BMXFAMILY	-	0.00118	-	0.000445
		(0.00125)		(0.00365)
MOWNXFAMILY	-	0.0279	-	0.0795
		(0.0191)		(0.0609)
FOWNXFAMILY	-	-0.0215	-	-0.126*
		(0.0181)		(0.0758)
LIQ	0.00147	-0.000370	0.000172	0.00128
	(0.00177)	(0.00182)	(0.00357)	(0.00361)
LEV	0.00723	0.00752	0.00110	0.00280
	(0.00571)	(0.00559)	(0.00963)	(0.00969)
MTB	0.000242	0.000298	-9.85e-05	-0.000167
	(0.000372)	(0.000366)	(0.000578)	(0.000588)
BI	-0.00740	-0.00814	-0.0236	-0.0284*
	(0.00837)	(0.00823)	(0.0157)	(0.0162)
ACI	0.00201	0.00259	0.0330***	0.0310***
	(0.00529)	(0.00521)	(0.00958)	(0.00974)
Constant	-0.0516**	-0.0475*	-0.0424	-0.0488
	(0.0247)	(0.0250)	(0.0478)	(0.0513)
Observations	576	576	408	408
Unique Firms	96	96	68	68
R^2	0.059	0.121	0.102	0.129
F	2.07	2.85	2.63	2.14

FUSE: Facebook usage, XUSE: X usage, SIZE: firm size, AGE: firm age, PROF: firm profitability, BSIZE: board size, BGD: board gender diversity, BM: board meetings, MOWN: managerial ownership, FOWN: foreign ownership, FAMILY: family firm, LIQ: asset liquidity, LEV: financial leverage, MTB: growth opportunities, BI: board independence, ACI: audit committee independence.
Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.10$

To test the moderating impact of family firms on the nexus between firm characteristics, corporate governance and social media disclosure, we reran the regression after including the interaction terms, as shown in columns 2 and 4. The results show that older family firms tend to use Facebook less, while more profitable family firms tend to use Facebook more as a disclosure platform. Similarly, family firms with larger boards also tend to use Facebook more. However, in family firms, gender diversity has a negative impact on Facebook usage. In terms of X, only the interaction between foreign ownership and family firms is significant. This suggests that family firms with higher foreign ownership do not prefer X as a disclosure platform.

4.6. Robustness Test

To ensure that our results are robust and free from endogeneity issues, we use the generalized method of moments (GMM). The GMM technique is commonly used to assess the reliability of study results. Therefore, consistent with the previous literature (Wintoki et al., 2012), we utilize the two-step GMM technique to address endogeneity issues. The GMM estimator enables us to address endogeneity related to dynamic, simultaneous, and omitted variables (Abdallah et al., 2015). Table XII provides the results of the GMM analysis. The results show that most of the results of the GMM model are consistent with those of the fixed-effects model, with slight variations in statistical significance. However, the impact of firm profitability and managerial ownership, which were significant at the 10% level in the main analysis, became insignificant in the Facebook model. Similarly, in terms of the X model, the impact of board family members (which was significant at the 10% level in our main analysis) and managerial ownership become insignificant. Overall, most of these results are consistent with those of the fixed-effects method.

Table XII: Robustness Test (GMM)

D.V. =	FUSE	XUSE
Independent Variables		
L.DV	0.631***	0.771***
	(0.0453)	(0.187)
SIZE	0.00417**	-0.00517
	(0.00191)	(0.00426)
AGE	-0.000203	-0.00423***
	(0.000204)	(0.000938)
PROF	0.00113	0.104*

D.V. =	FUSE	XUSE
	(0.0104)	(0.0558)
BSIZE	-0.00118*	0.00378*
	(0.000650)	(0.00212)
BGD	0.00294	0.127*
	(0.00824)	(0.0710)
BM	0.00172***	0.00715**
	(0.000520)	(0.00300)
BFAM	-0.0245***	0.00507
	(0.00802)	(0.0765)
FMOWN	0.00786	0.163
	(0.0106)	(0.102)
MOWN	0.00267	-0.137
	(0.0151)	(0.0943)
FOWN	-0.00303	0.0848***
	(0.00579)	(0.0258)
Control Variables		
LIQ	0.00339**	-0.0197
	(0.00150)	(0.0147)
LEV	-0.000193	0.175***
	(0.00583)	(0.0639)
MTB	8.92e-05	-9.78e-05
	(0.000202)	(0.00130)
BI	-0.00597	0.151*
	(0.00710)	(0.0901)
ACI	-0.00229	-0.00473
	(0.00453)	(0.0471)
Constant	-0.0197	0.0613
	(0.0193)	(0.0524)
Observations	480	340
Unique Firms	96	68
Years	6	6
AR (1)	-3.26***	-1.66*
AR (2)	-1.47	-1.51
Wald Chi^2	401.82	122.04

FUSE: Facebook usage, XUSE: X usage, SIZE: firm size, AGE: firm age, PROF: firm profitability, BSIZE: board size, BGD: board gender diversity, BM: board meetings, BFAM: board family members, FMOWN: family ownership, MOWN: managerial ownership, FOWN: foreign ownership, LIQ: asset liquidity, LEV: financial leverage, MTB: growth opportunities, BI: board independence, ACI: audit committee independence.
Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.10$

5. Conclusion

This study explores the impact of firm characteristics and corporate governance on the extent of social media usage by Pakistani firms and assesses whether this usage helps reduce information asymmetry in the

market. In addition, we also examine the type of disclosures these firms provide on social media platforms, namely, X and Facebook. To do so, we utilize the LDA topic model, which helped us find ten topics on X and seven on Facebook. Utilizing the theoretical perspectives of agency theory and signalling theory, we find that firm characteristics and corporate governance mechanisms have heterogeneous impacts on the extent of Facebook and X usage. For instance, while larger firms tend to prefer only Facebook for their corporate disclosures, more profitable firms use both X and Facebook.

In terms of board characteristics, we find that firms with larger boards and greater gender diversity prefer X as a disclosure platform, while firms with higher board meeting frequency tend to prefer Facebook. The impact of board family members exemplifies the heterogeneous impact of corporate governance on the usage of social media platforms. This is because firms with more family board members tend to prefer X as a disclosure platform while discouraging the use of Facebook. This preference might be based on the audience that they are trying to reach. Furthermore, it also suggests that family firms view X as a relevant platform that can help them maintain a positive image and preserve their reputation.

In terms of ownership structure, firms with higher managerial ownership tend to prefer both Facebook and X for corporate disclosures, thus supporting the positive role of managerial ownership in aligning the interests of managers with those of shareholders (Singh & Davidson III, 2003). Furthermore, our results reveal that disclosure through social media platforms, namely, Facebook, can help to reduce information asymmetry in the market. These findings suggest that social media platforms facilitate timely and wider information dissemination and help reduce information asymmetry (Blankespoor et al., 2014; Jung et al., 2018).

The results of this research have important implications for both theory and practice. For instance, our results provide information to guide policymakers, regulators, and shareholders regarding good governance practices and how they encourage disclosures on different social media platforms. Investors can use this information to understand which firm characteristics and governance structures are more likely to promote disclosures on social media platforms. Furthermore, our results also provide valuable information to help firms understand how different disclosure channels can be utilized to facilitate greater access of information to stakeholders. Since social media platforms provide quick

and less expensive ways to provide information to stakeholders and reduce information asymmetry, regulators can encourage organizations to adopt social media platforms to provide quicker access to information.

In terms of theory, these results provide valuable evidence from a developing country where corporate social media adoption is still nascent. Our results provide evidence that contrasts with the findings of studies conducted in developed countries. We demonstrate that the characteristics of firms that tend to provide greater disclosures on Facebook differ from those of firms that tend to provide greater disclosures on X. The results also help demonstrate how different data science techniques can be used to categorize the content of disclosures on different social media platforms. Overall, the results of this study allow us to understand whether firms prefer specific platforms for disclosing certain information and how different firm characteristics and governance mechanisms are associated with disclosure on different platforms.

Even though this study provides valuable contributions, there are some limitations. For instance, this study only utilizes two social media platforms, i.e., Facebook and X. Future research can explore other social media platforms, such as Instagram and LinkedIn. Furthermore, future studies can explore the impact of other ownership structures, such as institutional and concentrated ownership, on social media disclosures. In addition, since board meeting frequency has a significant impact, it would be valuable to explore the impact of meeting attendance as well. Apart from that, this study only focuses on Pakistani firms. Future studies can conduct multicountry analyses, providing comparative information on how firms use social media platforms. Last, this study uses the LDA topic modelling technique. Future studies can apply other machine learning-based techniques, such as the Pachinko Allocation Method (PAM), to explore the different topics disclosed on social media platforms.

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