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Article

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Unveiling the link between board gender diversity and energy firm's performance in South Asia: the mediating role of earnings management

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ABSTRACT

This paper attempts to shed light on an analytical model that examines both direct relationship between board gender diversity and energy firms' performance and an indirect connection in which earnings management is a mediating variable that is affected by the board gender diversity, which in turn affects the performance of energy firms. This study employs a dynamic panel model with the two-step system generalized methods of moments (system GMM) technique using 77 listed energy firms of South Asian emerging economies (i.e. Bangladesh, India, & Pakistan) covering from 2015 to 2019. The findings show that gender diversity significantly and positively impacts energy firms' performance in South Asia. The study results also find that earnings management plays a complementary mediating role (i.e. partial mediation) in the association between gender diversity and energy firms' performance. This research demonstrates the economic value of having female directors on corporate boards by strengthening companies' governance structure and decreasing earnings management. On the issue of board gender diversity policy, this research offers vital practical information for South Asian regulators, particularly in the energy sector. The present study is a novel study on the emerging South Asian energy sector that contributes to the literature for the first time by exploring the nexus between board gender diversity and firm performance with the mediating role of earnings management, which the previous literature has overlooked.

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1. Introduction

One of the 17 Sustainable Development Goals the United Nations (UN) has set to accomplish by 2030 is SDG-5, i.e. gender equality and empowerment of women (Ding et al., 2022). UN SDG target 5.5¹ focuses on women's equal opportunity and effective participation in leadership and decision-making at all economic, political, and public levels. Also, SDG 5.5.2 focuses on increasing the percentage of women in managerial positions. However, in a report by ILO in 2023,² the gender gap has hardly improved during the past 20 years. The employment gap is particularly acute in developing nations, where 24.9% of women are unemployed, and this gap for men is 16.6%, which is alarmingly high but much lower than the rate for women. A 2023 update by Global Gender Report³ shows gender gap for economic participation and opportunity increases by 0.2% from 2022 to 2023. The statistics mentioned above raise the motivation to study gender diversity. Increasing the gender diversity of corporate boards is one strategy for engaging corporations in adopting sustainable practices (Naciti, 2019). However, the need for more diversity in corporate boardrooms has grown significantly over the last two decades (Lu et al., 2022; Oldford et al., 2021). Gender is a significant global concern that has garnered attention from national and international institutions such as Australia, Canada, Malaysia, Norway, South Africa, and the US. These institutions, including the World Bank, EU, and OECD, have issued recommendations on how to

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enhance the representation of gender minorities on corporate boards (Ntim & Soobaroyen, 2013). Numerous reforms have been implemented that provide a specific gender quota requirement (e.g. 40% in Norway, 50% in Quebec, Canada, 30% in Austria, 40% in France, at least 30% in Germany, 25% in Greece, at least 30% in Spain, 33% in Portugal, at least 1/3rd in Belgium, Italy, and Taiwan, at least one woman in India and South Korea).⁴ However, Asian countries lagged in this regard. For example, according to the report of Deloitte (2022),⁵ the global average of women directors on corporate boards is 19.7%, a slight increase of 2.8% from the last report published in 2019. The report also shows that the percentage of women directors on corporate boards in Asia (11.7%) is increasing but smaller than the world average (19.7%) and other parts of the world (for example, 24.3% in North America, 18% in the Caribbean, 30.7% in Europe, 29.9% in Australasia). Thus, there is a growing interest in researching gender diversity and how it impacts corporate outcomes in Asian countries.

In the recent literature, numerous scholars emphasize the association between board gender diversity (BGD) and firm performance. Most studies between board gender diversity and firm performance are based on the developed economy. A recent systematic review by Laique et al. (2023) using 89 studies from 1996 to 2022 indicates that 66% of the studies were on the developed market perspectives, 29% on emerging economies, and the remaining 5% on global perspectives. The study also finds that the recent studies after 2015 indicate 44% of the studies regarding the BGD-performance relationship in emerging economies. Thus, the information suggests a growing interest in researching the association between BGD and performance in emerging economies in recent years. However, academics have not yet reached a unanimous conclusion regarding the connection between BGD and firm performance. Using a systematic review study, Laique et al. (2023) find that 57% of studies indicate positive, 24% show negative, 13% get evidence of no relation, and the remaining indicates the non-linear relationship between BGD and performance. For example, academicians find a positive association (Alodat et al., 2023; Amin et al., 2022; Boukattaya et al., 2022; Brahma et al., 2021; Chen et al., 2023), while other scholars find negative nexus (Ahmad et al., 2020; Ghafoor et al., 2022). Other studies find no association between board gender diversity and firm performance (Almarayeh, 2023; Marquez-Cardenas et al., 2022; Yarram & Adapa, 2024). The mixed and inconclusive findings of the previous research give the impetus to investigate this relationship further.

Earlier studies advocated that the reasons behind the mixed and inconclusive findings between board gender diversity and firm performance are the effect of other factors, i.e. moderating or mediating factors (Hazaea et al., 2023). For example, researchers have looked at moderating factors, including corporate social responsibility (Jiang et al., 2021), institutional context (Post & Byron, 2015), ownership (Abdullah et al., 2016), intellectual capital (Farooq & Ahmad, 2023), corporate social responsibility (Ben Fatma & Chouaibi, 2023; Ghafoor et al., 2022; Jiang et al., 2021; Saleh et al., 2021), internationalization (Song et al., 2020), innovation (Cabeza-García et al., 2021), national governance quality (Nguyen et al., 2021), family firms (Amin, Ali, Rehman, et al., 2022; D'Amato, 2017), firm size (Li & Chen, 2018), and culture (Mohsni et al., 2021). Other scholars have looked at the mediating factor, such as sustainability disclosure (Alodat et al., 2023), green innovation (Mahsina & Agustia, 2023), board attendance (Joecks et al., 2023), intellectual capital (Ouni et al., 2022; Shahzad et al., 2020), agency cost (Khuong et al., 2022), corporate social responsibility (Boukattaya et al., 2022; Sial et al., 2018), political embeddedness (Teng et al., 2022), employment downsizing (Chen & Kao, 2022), working capital efficiency (Khan et al., 2020), innovation (Manita et al., 2020), managerial ability (Fernando et al., 2020), and board effectiveness (Martinez-Jimenez et al., 2020).

In line with the earlier investigation and following the extant literature, this study claims earnings management can be a possible mediator in the relationship between board gender diversity and firm performance. The recent decades of growing literature in the field of accounting argued that earnings management has emerged as a central issue, notably after the bankruptcy of large corporations (e.g. Enron, WorldCom, and Xerox), which have been blamed for causing substantial damage to the global economy (Elzahaby, 2021). Many reasons exist for companies' motivations to control earnings, including maximizing executive remuneration, boosting the price of seasoned offerings and initial public offerings, averting debt covenant breaches, preserving earnings stability, and minimizing tax burden (Yoon & Miller, 2002). As noted by Pham et al. (2019), managers have incentives to misrepresent accounting data (for example, earnings) to mislead accounting users about a firm's financial performance or to generate personal benefits at the expense of shareholders. Prior studies have suggested that an effective corporate

governance mechanism can decrease managerial incentives toward manipulating earnings, regulate the opportunism of insiders, and lessen information asymmetry (Chen et al., 2015; Pham et al., 2019). According to the agency theory, a more diverse board is better for shareholders because it strengthens oversight of management and better lines up the interests of shareholders with those of management (Orazalin, 2020). Along the same lines, Zalata et al. (2018) claim that the inclusion of female members on the board enhances board independence and monitoring capability, increasing the financial reporting quality by lessening earnings manipulation. Supporting the resource dependence view, Ntim (2015) argues that female board member's skills, expertise, and experiences are vital resources and help to reduce earnings manipulation of the organisation. Several studies find a negative association between BGD and earnings management (Borralho et al., 2020; Orazalin, 2020; Saona et al., 2020). Hence, on the one hand, board gender diversity may reduce earnings management; on the other hand, many scholars find that the quality of earnings may positively affect firm performance (Bouaziz et al., 2020; Dakhilallh et al., 2020; Kumar et al., 2020). It is worth mentioning that the existing literature on board gender diversity, earnings management, and firm performance has focused on (i) the direct effect of board gender diversity on firm performance, (ii) the direct effect of board gender diversity on earnings management; (iii) the direct effect of earnings management on firm performance, separately. Existing research, however, has not examined the potential indirect association between board gender diversity and firm performance through earnings management.

Against this backdrop, this research attempts to fill the knowledge gap in the existing corporate governance literature by investigating the following specific research questions:

RQ1. Does gender diversity matter for energy firms' performance in the South Asian emerging economies?

RQ2. To what extent does earnings management mediate the effects of gender diversity on the energy firm's performance?

By answering the above research questions and building on both the agency theory and the resource dependence theory, this study seeks to add to the existing literature on the energy sector in South Asian emerging economies by investigating whether board gender diversity (BGD) directly affects firm performance and indirectly affect through earnings management. Using 77 listed energy firms from South Asian emerging economies (Bangladesh, India, and Pakistan), this study uses a dynamic panel model using the two-step system generalised methods of moments (system GMM) technique covering the period from 2015 to 2019. The results demonstrate that gender diversity has a significant and positive effect on the performance of energy firms in South Asia. The study's findings also indicate that the relationship between gender diversity and the performance of energy firms is partially mediated through earnings management.

The present study contributes to the existing literature in several ways. First, we extend the boundaries of the existing literature on the association between board gender diversity and firm performance by including the mediation effects of earnings management on the relationship. More precisely, our study extends the works of Saleh et al. (2020), Feviana & Supatmi (2021), Istianingsih (2021), Kang & Kim (2011), Latif (2018), Latif et al. (2017), Mahrani & Soewarno (2018), Nuryantini (2022), Quddoos, Akhtar, et al. (2020), Quddoos, Ullah, et al. (2020), Savitri et al. (2020), and Asghar et al. (2020), who have examined the mediating role of earnings management in the association between corporate governance and firm performance but not considered board gender diversity as a mechanism of corporate governance. Second, we investigate the energy sector, where earlier studies paid less attention to the board gender diversity research to attain the objectives of SDG-5. Laique et al. (2023) argue that the effect of BGD on a company's financial performance varies by industry, taking gender-specific talents into account. For instance, Frink et al. (2003) find that gender-diverse boards work better in the service sector than in the small-scale and large-scale manufacturing sectors. Third, although previous research mainly focuses on single-country perspectives (Zhang, 2020), we consider a sample of multiple countries collectively from South Asian emerging economies, where firms are mainly dominated by concentrated ownership, i.e. the existence of more family firms. Laique et al. (2023) suggest that future investigations use various samples from multiple aspects to fully understand the BGD-performance relationship. Also, the study of Amadi et al. (2023) suggest that the future study on the relationship between BGD-performance should focus

on emerging and developing nations. Fourth, we present strong findings by using both the Blau index and the Shannon index to assess the influence of gender diversity on company performance, unlike previous research that is largely focused on the presence/absence or number or the percentage of one gender category in the group. We are motivated to use the Blau and Shannon index from the study of Simionescu et al. (2021), which suggests using these two diversity measures in future research. Fifth, the study considers the endogeneity issues between board gender diversity and firm performance, ignoring it gives biased results (Maji & Saha, 2021), which were not addressed by the many earlier studies (Amin et al., 2022; Jyothi & Mangalagiri, 2019; Kumar et al., 2020; Sanan, 2016). Laique et al. (2023) opine that there is a complex and non-linear relationship between BGD and the company's performance. Consequently, it is essential to address endogeneity and reverse causality when investigating the relationship between BGD and firm performance. We have used a two-step system generalized method of moments (GMM) technique to control for endogeneity. Sixth, this study uses Zhao et al. (2010) techniques for the mediation analysis, which is rarely used in the panel data analysis. In contrast, the recent studies (Alodat et al., 2023; Boukattaya et al., 2022) published in scholarly journals use Baron & Kenny (1986) and Sobel (1982) models for the mediation analysis, those are obsolete and face much criticism from renowned scholars.⁶ Our study uses the med sem command in Stata, which uses Zhao et al. (2010) strategy. Thus, adopting this mediation technique extends the existing literature and contributes to future research. Finally, the study shows robust evidence by employing an alternative regression technique (fixed-effect model) and both the accounting and market-based measures of firm performance. Laique et al. (2023) opine that the heterogeneity in the inferences of the earlier studies is due to the different measures of firm performance and methodologies used.

The organization of this article is as follows. The next section presents a review of the literature, theoretical underpinnings, and formulation of research hypotheses, followed by a research methodology. The regression models and their associated findings are then presented, followed by concluding remarks indicating a summary of the results, implications, limitations, and future research avenues.

2. Background

The institutional setting of previous studies is a crucial reason that may have contributed to ambiguous findings (Ramadan & Hassan, 2022). The institutional environment in emerging economies is different from that in developed countries because it is weaker (declining market efficiency), more dynamic (rapid-growth countries), and diverse (a wide range of cultural, philosophical, and religious traditions) (Oehmichen, 2018), research on this context may provide innovative insights. Among the emerging economies, the South Asian emerging economies are the key laboratory as the majority shareholders or family ownership mainly controls most of the companies in this region, and there is a weaker presence of the corporate governance elements compared to the other areas (Farooque et al., 2007; Majeed et al., 2015; Malik & Kanwal, 2018; Masud et al., 2018). However, our study mainly focuses on the three countries (Bangladesh, India, & Pakistan) of the South Asian economies. According to the World Bank Database, these three countries contribute 95.95% to the GDP and hold 85.19% of the population in the SA region.⁷ In the present study, we focus on the energy sector of South Asian economies. A report prepared by the International Finance Corporation (IFC) and the International Energy Agency (IEA) (2023)⁸ noted that to fulfil rising energy demands and achieve the climate targets outlined in the Paris Agreement, annual renewable energy investments in emerging and developing nations will need to more than quadruple from \$770 billion in 2022 to as much as \$2.8 trillion per year by the early 2030s. The report also indicates that emerging and developing Asian countries need to invest approximately 500 billion USD in annual clean energy investment to meet SDGs and climate goals. These statistics show the importance of investigating the energy sector from the perspectives of the South Asian (SA) emerging economies.

South Asian economies include eight countries: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. Afghanistan, Bhutan, and Nepal have not adopted corporate governance codes. Maldives and Bhutan have few listed firms, and there are very few energy firms. No firms are listed yet on the Afghanistan Stock Exchange. Given the above facts, this study mainly focuses on Bangladesh, India, and Pakistan. The initial implementation of the CG code in Bangladesh's capital market occurred in 2006, adopting a 'comply or explain' strategy (Islam et al., 2022). In light of companies' apparent reluctance to adhere to the lax regulations and the reported lack of compliance with certain

overstatements (Islam et al., 2020), the regulatory body overseeing the capital market in Bangladesh, the Bangladesh Securities and Exchange Commission (BSEC), revised the guidelines in 2012 to enforce the stipulations. In 2018, the third edition of the code was examined and amended by BSEC after a period of six years (Islam et al., 2022). However, there is no mandatory or legal requirements for appointing female board member in the new corporate governance code of Bangladesh.⁹ In India, the formation of the Securities and Exchange Board of India (SEBI) in 1992 was a direct response to the economic instability that India witnessed in 1991. At first, SEBI's main goal was to oversee and control the securities industry. Nevertheless, the organization promptly acknowledged the significance of implementing Corporate Governance (CG) changes and commenced actively pursuing them as an integral component of its regulatory mandate (Wasdani et al., 2021). The inception of Corporate Governance (CG) in India can be traced back to 1999, when the Confederation of Indian Industry (CII) assumed a prominent role in its implementation. This code established explicit criteria for organisations, with a specific emphasis on areas such as accounting transparency and disclosure methods, in accordance with international norms (Wasdani et al., 2021). Currently, the supervision of Corporate Governance (CG) in India is effectively administered by the Securities and Exchange Board of India (SEBI) and the Ministry of Corporate Affairs (MCA). The modified Companies Act of 2013 is a significant legislative measure that establishes more stringent corporate governance rules, namely in relation to the areas of disclosures, transparency, and norms (Arora & Bodhanwala, 2018). The implementation of the Companies Act of 2013 brought forward regulations mandating the presence of women and independent directors on the boards of Indian firms. The requirements in question are outlined in Section 149 of the Act, in conjunction with the Companies Rules (Appointment and Qualification of Directors) 2014. Furthermore, the Securities and Exchange Board of India (SEBI), the regulatory body overseeing the Indian market, has taken action by imposing a need for the inclusion of at least one female director who is independent in the top 500 listed businesses (Nigam et al., 2022). This requirement will be enforced from April 2019 onwards, and will be extended to the top 1,000 companies by March 2020. The implementation of these legislative measures has significantly influenced the operational dynamics of Indian firms. These circumstances have effectively compelled a transformation in corporate governance methodologies. Currently, there is an increasing inclination towards undertaking research to evaluate the impact of gender diversity in boardrooms on the success of companies operating within the Indian corporate environment (Nigam et al., 2022). In Pakistan, the Securities Exchange Commission of Pakistan (SECP) adopted the first Corporate Governance (CG) code in 2002, which became obligatory for all Pakistani listed companies (Tariq & Abbas, 2013). The 2002 CG code underwent revision in 2012, following a decade of implementation. This revision involved the incorporation of more stringent provisions pertaining to the board committees, board of directors, and compliance clauses (Khan et al., 2022). However, there are no regulatory requirements regarding the appointment of female directors to the board in the CG codes of 2002 and 2012. The SECP implemented a compulsory gender quota through the Pakistani Companies Act 2017, which mandates that corporations must designate a minimum of one female member to their board.¹⁰ Thus, there is a growing interest how this gender quota impacts on Pakistani firms.

3. Theoretical literature review

The board of directors' main responsibilities are to (a) oversee and control management, (b) advise management, (c) ensure legal and regulatory compliance, and (d) link the firm to the external environment (Abdullah, 2014). Due to the inherent complexity of the interplay between gender diversity on boards and corporate performance, it is impossible to investigate this nexus using a single theory (Laique et al., 2023). Most of the standalone theories have serious flaws, including a failure to account for important contextual factors, an overemphasis on the interests of financial stakeholders, a tendency toward managerial mistrust and power abuse, and so on (Sarhan et al., 2019). However, when more than one theory is combined, their ability to explain phenomena is greatly increased (Ntim et al., 2015). A recent systematic review of Hazaea et al. (2023) examine the association between board gender diversity (BGD) and firm performance using 152 studies from the Web of science and Scopus database. The study finds that agency theory is the dominant theory (53% of studies used this theory) to represent the BGD-performance relationship, followed by the resource dependence theory (39%) and other theories used by only 8% of studies. Using a systematic review study of 634 studies, Nguyen et al.

(2020) also find that agency theory is the dominant theory to examine the impact of women on corporate boards on financial and non-financial performance. Another systematic review by Laique et al. (2023) also finds that agency and resource dependence theories are dominance theories to explain the BGD-performance relationship, and the study results show that 53% of the studies used these two theories. Thus, this study explains the BGD-performance nexus from the perspectives of agency and resource dependence theories in line with other studies (Arora, 2021; Marquez-Cardenas et al., 2022; Ramadan & Hassan, 2022).

3.1. Agency theory

The agency theory examines the inherent conflicts of interest between principals, such as shareholders, and agents, such as managers. In this context, the board of directors plays a crucial role in mitigating and resolving these conflicts (Fama & Jensen, 1983; Jensen & Meckling, 1976). As per the abovementioned theory posited by Brahma et al. (2021), including women on a board with diverse composition enhances monitoring capabilities and mitigates agency costs. Supporting the agency view, Arora (2021) contends that the presence of a higher number of women on a company's board of directors leads to a reduction in agency costs. Female directors are more inclined to enhance board independence by incorporating diverse perspectives and ideas. In the same vein, Liao et al. (2015) argue that there are notable cultural, societal, and individual differences between men and women. In light of this, it is crucial to emphasise the importance of gender diversity among board members. Furthermore, the inclusion of individuals from various backgrounds, both male and female, on the boards contributes to a wide range of ideas, information, perspectives, and experiences during the decision-making process. This diversity aids in the execution of strategic functions such as advising and monitoring, ultimately leading to an improvement in business performance (Khosa, 2017; Ntim, 2015). Moreover, women are often regarded as being more progressive, displaying a greater willingness to collaborate with others, and exhibiting less self-centeredness compared to men (Pucheta-Martínez & Gallego-Álvarez, 2019). Consequently, the incorporation of women into boards of directors contributes to a more balanced allocation of skills and characteristics among board members, enhancing the autonomy of the board and the quality of managerial supervision (Jizi, 2017), which, in turn, fosters heightened levels of transparency and accountability concerning both financial and non-financial affairs (Shamil et al., 2014). Because the agency problem could affect the company's performance and valuation, it is vital to investigate whether gender diversity reduces agency costs (Chen & Hassan, 2022). In summary, the agency theory supports the notion that women's presence on corporate boards is associated with enhanced decision-making capabilities and heightened profitability.

3.2. Resource dependence theory

According to resource dependence theory, a firm can be sustainable when it links with the external environment (Pfeffer & Salancik, 2003). The theory further emphasises that the board of directors is the cornerstone for the firm to access external resources such as human and financial capital, quality information, technology, etc. (Kiel & Nicholson, 2003). According to this line of thinking, boards with a high degree of diversity are superior to boards with a low degree when offering and obtaining access to essential external resources for running businesses. A board of directors of both sexes can benefit from access to various information, viewpoints, knowledge, and abilities (Arvanitis et al., 2022). Supporting the resource dependence theory, Ntim (2015) also argues that the board's diversity can impact the firm by providing valuable resources (such as experiences, legitimacy, prestige, and skills) from the external environment, which is also mentioned in the study of Arora (2021). Furthermore, several existing studies argue that the existence of women on board enhances a firm financial position, mainly because of their quality decision-making power (Bart & McQueen, 2013), their better records of attendance in the board meetings compared to males (Huse & Solberg, 2005), their public image, creativity, and better knowledge regarding the market conditions (Smith et al., 2006), and their quality of listening and communication skills (Julizaerma & Sori, 2012). To summarise, the resource dependence theory suggests that increasing the percentage of female directors on corporate boards is essential to improving corporate performance since doing so can improve an organisation's access to critical external resources.

4. Empirical literature review and hypotheses development

4.1. *The effects of board gender diversity on firm performance*

The prior empirical studies provide mixed and inconclusive findings. Numerous scholars find a positive impact of the presence of women directors on firm performance (Ahmadi et al., 2018; Alodat et al., 2023; Amin et al., 2022; Arora, 2021; Assenga et al., 2018; Boukattaya et al., 2022; Brahma et al., 2021; Chen et al., 2023; Green & Homroy, 2018; Ramadan & Hassan, 2022; Tahir et al., 2021). In contrast, some scholars find a negative association (Ahmad et al., 2020; Ghafoor et al., 2022). Some scholars conclude no association (Almarayeh, 2023; Marquez-Cardenas et al., 2022; Yarram & Adapa, 2024). The recent study of Chen et al. (2023) find the positive impact of BGD on Taiwan's firm performance. The study argues that female directors work as effective monitors in a weak corporate governance environment, and the study encourages the inclusion of more females on the board. In another recent study of the Indian environment, Chatterjee & Nag (2023) note that only when sufficient female participation on corporate boards can it significantly impact a firm's financial success. A study by Alodat et al. (2023) in the Jordanian context finds a positive impact of women directors on firm performance. The study opines that women's participation on boards of directors can improve a company's bottom line by sparking new approaches to problems and helping the board maintain a competitive edge. Using the sample of 369 (comprising 3332 firm-year observations) listed on the Standard and Poor's 500 in the US from 2004 to 2015, Đặng et al. (2020) examine the influence of board gender diversity on firm performance. The study concludes that the female members on board significantly and positively influence the firm performance. Another recent study by Song et al. (2020) investigates the impact of board diversity on firm performance with the moderating effects of internationalisation using publicly traded lodging companies in the US from 1993-2018. The study finds significant positive impacts of gender diversity on firm performance. Using 73 listed firms in the context of Saudi Arabia Shukeri & D Alfordy (2022) find that the female presence in the corporate board does not affect firm performance. The study also argues that the reason behind the no impact on firm performance is the lower number of females on corporate boards, which is only 8.1% of firms, and most of the firms are controlled by family firms.

Overall, taking into account the fact that the fundamental qualities of women that are supported by the two theories (agency and resource dependence theories) can be maintained in any given institutional environment and the presence of women on the board as a whole can be taken as a sign of better governance. Considering this, the following is the hypothesis for this investigation:

H1: Board gender diversity has a positive impact on energy firm's performance in South Asia.

4.2. *Gender diversity, earnings management, and firm performance*

The effectiveness of corporate governance depends on the board of directors, who approves and evaluates the firm's investment and financing activities (Detthamrong et al., 2017). Strong or weak corporate governance in a firm may increase or decrease the manager's opportunistic behaviour, including earnings management. According to the agency view, managers work for their self-interest rather than the owner's interest to get incentives from the firms, which creates agency conflict (Jensen & Meckling, 1976). Good board governance can minimise the agency conflict that leads to firm performance (Puni & Anlesinya, 2020). In this point of view, the diversity of gender, i.e. the female members' existence on the board, prevents unethical activities as they are considered more ethical and socially responsible (Wahid, 2019). The inclusion of female members on the board also increases the board's independence and monitoring capability, which ultimately reduces EM and improves the firm financial reporting quality (Zalata et al., 2018). Using discretionary accruals as a proxy for management opportunism, (Zalata et al. (2019) find evidence that female directors in monitoring roles reduce such behavior. Supporting the resource dependence view, Ntim (2015) argues that female board member's skills, expertise, and experiences are vital resources and help to reduce earnings manipulation of the organisation.

Thus, from the above discussion, it is apparent that board gender diversity can reduce the managers' opportunistic behaviour, including earning manipulation, by providing valuable resources and establishing an effective monitoring system for the firms. Moreover, because of the decline, the earnings manipulation by the managers induces them to increase the firm's profit by expanding its operational activities

(Mahrani & Soewarno, 2018). Thus, the increased operational activities enhance the firm financial position, and the managers can get incentives from the generated profit of doing more operational activities rather than manipulating earnings (Mahrani & Soewarno, 2018).

It's worth mentioning that the existing literature shows mixed and inclusive findings on the BGD-performance relationship (see section 4.1); it indicates that other factors may indirectly affect this relationship (Laique et al., 2023). On the one hand, the empirical studies find that BGD impacts earnings management (Alves, 2023; Aryani et al., 2024; Borralho et al., 2020; Orazalin, 2020; Saona et al., 2020), and, on the other hand, earnings management impacts firm performance (Bouaziz et al., 2020; Dakhlallh et al., 2020; Kumar et al., 2020). Hence, this study expects earnings management to be a possible mediator in the association between board gender diversity and firm financial performance. Consistent with the above arguments, the present study proposes the following testable hypothesis:

H2: Earnings management mediates the effects of board gender diversity on firm performance.

5. Research design

5.1. Data and sample

This study sample covers all the listed energy firms of the South Asian (SA) emerging economies (i.e. Bangladesh, India, and Pakistan) from 2015 to 2019. Furthermore, the study considers collecting little data from 2014 to estimate the lag variables. This study limits the selection of three emerging SA countries because these countries have a significant economic impact on the SA region. For example, according to the World Bank Database, these three countries contribute 95.95% to the GDP and hold 85.19% of the population in the SA region.¹¹ The study excludes five SA countries (i.e. Afghanistan, Bhutan, Maldives, Nepal, and Sri Lanka) from this investigation because of the following significant reasons. Firstly, no corporate governance codes have been adopted by Afghanistan, Bhutan, and Nepal. Secondly, Maldives and Bhutan have few listed firms with very few energy firms (1 listed energy firm in Maldives,¹² Sri Lanka¹³ has only 2 listed energy firms and 1 listed energy firm in Bhutan.¹⁴) Thirdly, there are no firms listed yet on the Afghanistan stock exchange. By following the previous studies (Jamil et al., 2020; Muttakin et al., 2015), the study excluded the financial firms which have different regulations, accounting systems, capital structure, disclosure requirements, and governance structures compared to non-financial firms. From the listed non-financial firms, we select the energy sector purposively to show evidence of how board gender diversity works to deter earnings management and enhance firm performance in a specific sector to contribute to this sector in emerging South Asia. The investigation periods are limited to the years from 2015 to 2019 for two reasons: firstly, the years 2015–2019 are the most recent years at the time of research, and secondly, the data period from 2020 onwards is affected by the COVID-19 pandemic. The study data has been hand-collected manually from the audited annual reports of the listed energy firms of the three SA emerging countries, namely, Bangladesh (listed on Dhaka Stock Exchange, i.e. DSE), India (Nifty 500 index companies¹⁵ listed on the National Stock Exchange, i.e. NSE), and Pakistan (listed on Pakistan Stock Exchange). All the audited annual reports have been collected from the mentioned stock exchanges' and sample firms' websites, which are publicly available (For Bangladesh: https://www.dsebd.org/by_industrylisting.php, For India: <https://www.nseindia.com/companies-listing/corporate-filings-directory>, For Pakistan: <https://dps.psx.com.pk/financial-reports> and <https://opendoors.pk/annual-reports-list/>).

Furthermore, ethical approval was obtained from Putra Business School, Malaysia, to collect data for this study as a part of doctoral research. To be included in the final sample, firms must fulfil the following criteria:

- all the sample firms must be listed on the mentioned stock exchanges;
- a firm included in the sample with at least three years of annual reports available as a listed firm from 2015 to 2019 (Ashraf, 2017);
- data relating to all study variables, including lag variables, must be available for the sample firms in the required ranges of years.

Based on the above selection criteria, a total of 77 energy firms adopted from the three countries 84 energy firms, which represents an unbalanced panel data of 351 firm-year observations as shown in Table 1.

5.2. Measurement of variables

5.2.1. Measurement of firm performance

Core et al. (2006) claim that accounting-return-based measures, i.e. ROA, are not affected by discretionary items, leverage, and extraordinary items; thus, it's a better proxy of firm performance. Song et al. (2020) argue that the market-return-based measures, i.e. Tobin's Q, reflect the firm performance better than the traditional accounting-return-based measures. The most crucial thing for using Tobin's Q, it's a forward-looking measure of performance that reflects a firm's future growth potential (Al-Okaily & Naueihed, 2020). Thus, in line with the prior studies (Coleman & Wu, 2020; Wang et al., 2020), this study measured firm performance by using both the accounting and market-based measures as given below:

- i Return on assets (ROA): It is the percentage of net income to total assets (Ciftci et al., 2019; Coleman & Wu, 2020; Majumder et al., 2017; Shahbaz et al., 2020).
- ii Tobin's Q: It is the ratio of the sum of the market value of equity and the book value of total debt divided by total assets (Chijoke-Mgbame et al., 2020; Khidmat et al., 2020; Shahbaz et al., 2020).

5.2.2. Measurement of earnings management

This study used accrual earnings management (AEM) as a measurement of earnings management. Real Earnings management (REM) results in reduced expenses in comparison to accrual-based management as it is subject to less scrutiny from regulators and auditors (Francis, 2011). The practice of earnings management is influenced by various elements, including individual manager and firm-specific factors and institutional factors such as legal frameworks, market mechanisms, and regulatory measures (Wysocki, 2004). Managers in countries with weaker investor protection tend to favour accrual-based earnings management over real earnings management, as indicated by (Enomoto et al., 2015). Since, the majority shareholders or family ownership mainly controls the South Asian emerging economies, and there is a weaker presence of the corporate governance elements compared to the other areas (Farooque et al., 2007; Majeed et al., 2015), there is a tendency to AEM by managers in this region. Hence, this study adopted AEM rather than REM as a proxy of earnings management.

We use the cross-sectional version of the modified-Jones model (Dechow et al., 1995) to calculate the AEM. In the modified-Jones model, AEM is the firm's discretionary accrual, which is calculated by subtracting non-discretionary accruals from total accruals as follows:

Step-1: Measurement of total accruals:

$$\frac{TACC_{it}}{TASSETS_{it-1}} = \alpha_1 \left(\frac{1}{TASSETS_{it-1}} \right) + \alpha_2 \left(\frac{\Delta REV_{it} - \Delta AR_{it}}{TASSETS_{it-1}} \right) + \alpha_3 \left(\frac{PPE_{it}}{TASSETS_{it-1}} \right) + \varepsilon_{it} \quad [1]$$

Where,

$TACC_{it}$ = the total accruals, which is estimated as earnings before extra-ordinary items and discontinued operations minus cash flows from operations of firm i in year t (Li et al., 2020).

$TASSETS_{it-1}$ = total assets of firm i in year t-1;

Table 1. Summary of study samples.

Sample selection process	Sample size			
	Bangladesh	India	Pakistan	Total
Total energy firms	23	28	33	84
Less: Firms have not fulfilled the inclusion criteria	04	00	03	07
Eligible sample firms	19	28	30	77
Total firm-year observations from 2015-2019	95	140	150	385
Less: Data missing in firm-year observations	10	11	13	34
Final sample firm-year observations	85	129	137	351

ΔREV_{it} = changes in sales revenue of firm i in year t ;
 ΔAR_{it} = change of accounts receivable of firm i in year t ;
 PPE_{it} = property plant and equipment of firm i in year t ;
 α_1, α_2 , and α_3 are the beta coefficients; and ε_{it} is the error term.

Step-2: Measurement of non-discretionary accruals:

$$NDACC_{it} = \alpha_1 \left(\frac{1}{TASSETS_{it-1}} \right) + \alpha_2 \left(\frac{\Delta REV_{it} - \Delta AR_{it}}{TASSETS_{it-1}} \right) + \alpha_3 \left(\frac{PPE_{it}}{TASSETS_{it-1}} \right) \quad [2]$$

Where,

$NDACC_{it}$ = non-discretionary accruals of firm i in year t ; and other components have the same meaning as mentioned in Equation (1).

Step-3: Measurement of discretionary accruals:

$$DACC_{it} = \frac{TACC_{it}}{TASSETS_{it-1}} - NDACC_{it} \quad [3]$$

Where,

$DACC_{it}$ = discretionary accruals of firm i in year t .

5.2.3. Measurement of board gender diversity

This study uses five proxies of board gender diversity, such as:

- (i) The first proxy of board gender diversity is the total number of women directors on the board (NWD) (Gull et al., 2018; Orazalin, 2020);
- (ii) The second proxy of board gender diversity is the percentage of the total number of women directors to the total board of directors (Gull et al., 2018; Jiang et al., 2021; Nadeem et al., 2017);
- (iii) The third proxy of board gender diversity is a dummy variable that is equal to '1' if at least one women director is on the board and '0' otherwise (Gull et al., 2018; Nadeem et al., 2017; Orazalin, 2020);
- (iv) The fourth proxy of board gender diversity is the Blau index of gender diversity (Blau, 1977). By following the previous studies (Jiang et al., 2021; Maji & Saha, 2021; Nadeem et al., 2017), we measure it as follows:

$$\text{Blau index} = 1 - \sum_{i=1}^n P_i^2 \quad [4]$$

Where P_i is the % of male and female composition in the board and $n=2$, which represents two categories, i.e. male and female. The values range between 0 and 0.5, which is the point at which there is an equal number of male and female board members, and therefore the maximum amount of diversity is achieved (Blau, 1977).

- (v) The fifth proxy of board gender diversity is the Shannon index of gender diversity (Shannon, 1948). By following the previous studies (Jiang et al., 2021; Maji & Saha, 2021), we measure it as follows:

$$\text{Shannon index} = - \sum_{i=1}^n (P_i \times \ln P_i) \quad [5]$$

Where P_i indicates the same meaning as the Blau index, the values range between 0 and 0.69, which is the point at which there is an equal number of male and female board members. Therefore, the maximum amount of diversity is achieved over the Blau index.

5.2.4. Measurement of control variables

In line with the prior studies (Maji & Saha, 2021; Nadeem et al., 2017; Nguyen et al., 2015), this study uses two categories of control variables, i.e. corporate governance mechanisms and firm-specific

characteristics. We incorporated nine control variables in this study: board size, board independence, board meetings, ownership concentration, leverage, firm size, firm age, year dummies, and country dummies. Board size is measured by the total number of directors on the board (Al-Okaily & Naueihed, 2020; Song et al., 2020), while board independence is measured by the percentage of independent directors to total the number of the director's on the board (Orazalin, 2020); board meetings is measured by the total number of board meetings held in a year (Queiri et al., 2021); ownership concentration is measured by the sum of the percentage of shareholdings held by the investors who each hold 5% or more ordinary shares of the firm (Ciftci et al., 2019); leverage is calculated by the ratio of total debt to total assets by following the previous studies (Akter et al., 2018; Majumder & Li, 2018); firm size is measured by taking the natural logarithm of total assets (Al-Okaily & Naueihed, 2020); firm age is measured by taking the natural logarithm of the number of years since the establishment year of the firm (Al-Okaily & Naueihed, 2020). In line with the prior studies, this study also controls for the year effects (A. AlHares, 2020; AlHares, 2017; Detthamrong et al., 2017) and country effects (AlHares, 2020; AlHares, 2017) by taking year and country dummies. Table 2 summarizes all the variables used in this study.

5.3. Empirical model specifications

5.3.1. Models specifications for direct effects

The previous studies argue that the current practices of corporate governance and firm performance are affected by the past performance of the firms (Đặng et al., 2020; Wintoki et al., 2012). Thus, to examine the effect of board gender diversity on firm performance, this study employs the dynamic panel model using one-lag of the dependent variable in the right-hand side of the regression equation as follows:

$$FPM_{ijt} = \beta_0 + \beta_1 FPM_{ijt-1} + \beta_2 \text{Board Gender Diversity}_{ijt} + \sum_{i=3}^n \beta_i \text{Controls}_{ijt} + \text{Country Dummies}_j + \text{Year Dummies}_t + \varepsilon_{ijt} \quad [6]$$

Table 2. Summary of study variables.

Variables	Acronyms	Operationalization
Main variables		
Firm performance		
Return on assets	ROA	It is the percentage of net income to total assets.
Tobin's Q	TQ	It is the ratio of the sum of market value of equity and book value of total debt divided by total assets.
Earnings management		
Accrual earnings management	AEM	Modified-Jones model of (Dechow et al., 1995)
Board Gender diversity		
Number of women directors on board	NWD	The total number of women directors on the board.
Percentage of women directors on board	PWD	The percentage of total number of women directors to total board of directors.
Presence of women directors on board	DWD	A dummy variable is equal to '1' if at least one women director on the board and '0' otherwise.
Blau index of gender diversity	BLGD	$1 - \sum_{i=1}^n p_i^2$
Shannon index of gender diversity	SGD	$-\sum_{i=1}^n (p_i \times \ln p_i)$
Control variables		
Board size	BSZ	The total number of directors on the board.
Board independence	BIND	The percentage of independent directors to total the number of the directors on the board.
Board meetings	BMT	The total number of board meetings held in a year.
Ownership concentration	OWNC	The sum of the percentage of shareholdings held by the investors who each hold 5% or more ordinary shares of the firm.
Leverage	LEV	The ratio of total debt to total assets.
Firm size	FSIZE	The natural logarithm of total assets.
Firm age	FAGE	The natural logarithm of the number of years since the establishment year of the firm.
Year dummies	YDM	Dummy variables for the years 2015, 2016, 2017, 2018, & 2019.
Country dummies	CDM	Dummy variables for the countries Bangladesh, India, and Pakistan.

In the above equations, i , j , and t subscripts stand for firm, country, and year respectively. In the above equation, FPM indicates firm performance is measured by using two proxies, i.e. Return on assets (ROA) and Tobin's Q (TQ). Board gender diversity is measured using five proxies, i.e. Number of women directors on board (NWD), Percentage of women directors on board (PWD), Presence of women directors on board (DWD), Blau index of gender diversity (BLGD), and Shannon index of gender diversity (SGD). Controls indicate control variables such as board size (BSZ), board independence (BIND), board meetings (BMT), ownership concentration (OWNC), leverage (LEV), firm size (FSIZE), and firm age (FAGE). Also, year dummies (YDM), i.e. dummies for the study periods 2015, 2016, 2017, 2018 & 2019, and country dummies (CDM), i.e. dummies for Bangladesh, India, and Pakistan, are taken as additional control variables.

5.3.2. Models specifications for mediation effects

The basic approach for testing the mediation effect was given by (Baron & Kenny, 1986) based on the original guidelines mentioned by (Judd & Kenny, 1981). However, due to the several criticisms of Baron & Kenny's (BK) approach (Hair et al., 2021; Preacher & Hayes, 2008; Zhao et al., 2010), researchers later used the Sobel (1982) test to quantify the indirect effects and significance of indirect effects. The Sobel (1982) test used as a supplement to the BK approach was also criticized by many researchers (Hair et al., 2019; Ramayah et al., 2018). Thus, in line with the recent studies (Betti et al., 2020; Demircioglu, 2021), this study conducts the mediation analysis using the post-estimation 'medsem' command in Stata version-16 software using structural equation modelling (Mehmetoglu, 2018), which uses the output strategies articulated by Zhao et al. (2010) with Monte Carlo Simulations. Basically, Zhao et al. (2010) approach is the modified version of the BK approach. Zhao et al. (2010) suggest one should use two regression equations of the BK approach, i.e. Equation (1) and (3) and run simultaneously using SEM or run the two equations using regression technique to estimate the three parameters a , b , c' and then test the significance of the direct and indirect effect. The output strategies of Zhao et al. (2010) are presented in Figure 1. Hence, by following the techniques of Zhao et al. (2010), we specified the following two equations and run simultaneously using SEM:

$$\begin{aligned} EMGT_{ijt} = & \beta_0 + \beta_1 EMGT_{ijt-1} + a(\text{Board Gender Diversity}_{ijt}) \\ & + \sum_{i=3}^n \beta_i \text{Controls}_{ijt} + \text{Country Dummies}_j + \text{Year Dummies}_t + \varepsilon_{ijt} \end{aligned} \quad [7]$$

$$\begin{aligned} FPM_{ijt} = & \beta_0 + \beta_1 FPM_{ijt-1} + b(\text{Earnings Management}_{ijt}) + c'(\text{Board Gender Diversity}_{ijt}) + \\ & \sum_{i=4}^n \beta_i \text{Controls}_{ijt} + \text{Country Dummies}_j + \text{Year Dummies}_t + \varepsilon_{ijt} \end{aligned} \quad [8]$$

In the above Equation (7) and (8), all the components have the same meaning, which is described in section 3.3.1.

5.4. Estimation techniques

In the field of corporate governance research Wintoki et al. (2012), as well as the research on the linkage between gender diversity and firm performance Brahma et al. (2021), has recognized the issue of endogeneity bias. Wintoki et al. (2012) argue that endogeneity may occur because of three essential reasons: (i) the dynamic nature of the data, (ii) reverse causality, and (iii) omitted variable bias or unobserved heterogeneity. As mentioned earlier (see section 3.3.1), firm performance and earnings management are dynamic; thus, endogeneity is a great concern for this study. Another cause of endogeneity is the existence of reverse causality between corporate governance and firm performance. For example, while good or poor corporate governance affects the firm financial performance, poor performance also induces the firm to change the corporate governance structures (for example, changes the board members, audit committee members, etc.) (Đặng et al., 2020; Wintoki et al., 2012). Due to endogeneity problems, ordinary least squares (OLS) and fixed-effect regression cannot produce consistent and unbiased results (Nguyen et al., 2014).

Đặng et al. (2020) claim that fixed-effect regression can handle the omitted variables bias or unobserved heterogeneity but cannot handle the issue of reverse causality and dynamic endogeneity. Therefore, to address the endogeneity issue, this study uses GMM by following the prior studies (Đặng et al., 2020; El Diri et al., 2020; Wintoki et al., 2012). GMM has two features; one is Difference GMM as developed by Arellano & Bond (1991), and another one is System GMM (Arellano & Bover, 1995; Blundell & Bond, 1998). However, the Difference GMM provides inconsistent results if the lagged level of the regressors for the first-differenced variables are serially correlated, which may provide weak instruments (Arellano & Bover, 1995; Blundell & Bond, 1998). Hence, to overcome the weaknesses of the Difference GMM, this study employs System GMM. Besides the first differencing, System GMM exploits the lagged levels of the variables as instruments for the equation in first differences, and variables in differences are instrumented with their own lags. (Blundell & Bond, 1998) find that the System GMM estimator provides better results than Difference-GMM. The study also employs the best panel regression technique (i.e. fixed effect regression) among the Pooled OLS, fixed effect, and random effect regression for the robust findings. (Brahma et al., 2021) claim that the fixed effect regression is a good complement to the GMM for robust findings.

6. Empirical results and discussion

6.1. Descriptive statistics

Table 3 reports the descriptive statistics of all the study variables. The Return on assets (ROA) of the three countries ranges from -15.12% to 88%. The average ROA of the three countries' energy sectors is 8.99%, indicating the highest ROA is 10.70% in Pakistan, which is followed by 9.70 in India, and the lowest is 5.17 in Bangladesh. Tobin's Q (TQ) ratio also indicates the highest position in Pakistan, followed by India and Bangladesh, respectively. The average accrual earnings management (AEM) is 0.04 for the full sample. The study reports that the AEM value is more than the average value in Pakistan, which indicates the highest position and is followed by India and Bangladesh, respectively. The descriptive statistics of gender diversity report that the maximum number of women present on the board is 4, whereas the minimum is 0. The mean number of highest women directors present is 0.98 in the case of Bangladesh, followed by Pakistan and India, respectively. The average highest percentage of women directors is 11.03 in Bangladesh, followed by India and Pakistan. When considering the two categories (male and female) of gender diversity, the Blau and Shannon index shows the highest mean value in the case of India, followed by Pakistan and Bangladesh, respectively. The descriptive statistics of the control variables are also shown in Table 3.

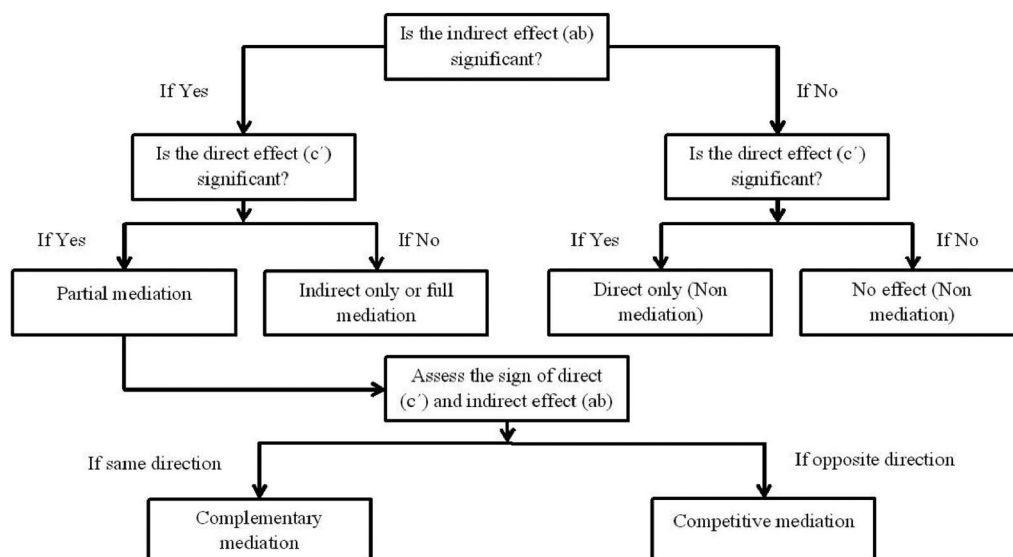


Figure 1. Output strategies of mediation analysis adapted from Zhao et al. (2010).

Table 3. Descriptive statistics.

Variables	Full Sample				Bangladesh				India				Pakistan			
	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
Main Variables																
Firm performance																
ROA (%)	8.99	11.44	-15.12	88.00	5.17	6.59	-15.12	26.41	9.70	12.60	-0.32	74.00	10.70	12.10	-0.19	88.00
TQ	2.30	1.67	0.12	16.78	1.89	1.15	0.12	9.74	2.27	1.62	0.17	13.68	2.58	1.92	0.67	16.78
Earnings Management																
AEM	0.04	0.62	-1.05	5.04	0.001	0.09	-0.79	0.31	0.004	1.01	-1.05	5.04	0.09	0.11	0.002	0.83
Gender Diversity																
NWD	0.63	0.89	0.00	4.00	0.98	1.23	0.00	4.00	0.44	0.68	0.00	4.00	0.59	0.73	0.00	3.00
PWD (%)	5.97	11.52	0.00	66.69	11.03	18.05	0.00	66.67	4.73	7.48	0.00	55.69	4.00	8.00	0.00	43.00
DWD	0.36	0.46	0.00	1.00	0.49	0.51	0.00	1.00	0.36	0.49	0.00	1.00	0.28	0.36	0.00	1.00
BLGD	0.16	0.20	0.00	0.49	0.13	0.16	0.00	0.44	0.18	0.23	0.00	0.49	0.17	0.19	0.00	0.49
SGD	0.23	0.17	0.00	0.69	0.21	0.24	0.00	0.63	0.25	0.11	0.00	0.69	0.22	0.17	0.00	0.68
Control Variables																
BSZ	9.05	2.70	3.00	22.00	9.87	3.67	5.00	19.00	9.63	2.68	3.00	22.00	8.00	1.31	6.00	15.00
BIND (%)	31.47	18.58	0.00	93.00	18.62	7.86	0.00	33.33	48.70	11.75	0.00	86.00	23.22	16.30	0.00	93.00
BMT	7.95	4.16	2.00	27.00	11.43	6.07	4.00	26.00	8.46	2.27	2.00	27.00	5.32	1.38	3.00	14.00
OWNC (%)	42.22	19.77	14.50	78.29	27.45	9.67	14.50	66.75	65.63	5.29	32.00	78.29	29.33	9.99	16.76	77.93
LEV	0.39	0.24	0.01	0.93	0.49	0.25	0.03	0.93	0.24	0.17	0.01	0.88	0.48	0.22	0.01	0.89
FSIZE	12.72	3.81	5.75	26.06	9.83	1.85	5.75	12.15	10.12	1.35	6.44	15.34	16.97	1.93	13.90	26.06
FAGE	3.29	0.87	0.71	5.03	2.43	0.67	1.09	3.76	3.67	0.63	1.08	5.03	3.46	0.82	0.71	4.69
Obs.	351				85				129				137			

Note: SD=Standard deviation; Min=Minimum value; Max=Maximum value; Obs. = total firm-year observations. The elaboration and definitions of all the variables are presented in Table 2.

6.2. Correlations

Table 4 presents the Pearson's correlations among the study variables. As a rule of thumb, multicollinearity is an issue when the absolute value of correlation between two independent or control variables is 0.70 or higher (Liu et al., 2014). Table 4 indicates the highest value of correlation in this study lies between leverage (LEV) and return on assets (ROA) is -0.44, which is below the cut-off score of 0.70. Thus, the problem of multicollinearity is not a serious issue for this investigation.

6.3. The effects of gender diversity on firm performance

Table 5 shows the empirical results from Equation (6) with the two proxies of firm performance, i.e. both the accounting (ROA) and market (Tobin's Q) measures and five proxies of gender diversity, namely, number of women directors on board (NWD), percentage of women directors on board (PWD), presence of women directors on board (DWD), Blau index of gender diversity (BLGD), and Shannon index of gender diversity (SGD). As shown in Table 5, the system GMM is our baseline model in this study. The results of Hansen J-statistic (reported in Table 5) confirm the validity of the over-identifying restrictions and the justifications for choosing the system GMM. The F-statistic value is significant for all models in Table 5, indicating that the model has predictive power. Consequently, all the requirements of GMM are met, and the findings are credible. In addition, the test results (reported in Table 5) of AR(1) and AR(2) indicate that autocorrelation exists in the first order but not in the second order. According to the findings shown in Table 5, the coefficient of one-year lagged performance (FPM_{ijt-1}) demonstrates statistical significance and a positive relationship across all models. This suggests that for the firms included in the sample, there is a considerable impact of the previous year's financial performance on the current year's performance. This finding aligns with recent research (See, e.g. Đặng et al., 2020; Wintoki et al., 2012) and other studies, which indicate that it is crucial to incorporate past financial performance as a significant factor to account for the dynamic nature of the relationship between board gender diversity and firm performance. The results displayed in Table 5 demonstrate a statistically significant and positive correlation between various measures of board gender diversity (NWD, PWD, BLGD, SGD) and return on assets (ROA). Furthermore, a noteworthy and statistically significant positive correlation has been seen between proxies for board gender diversity, namely PWD, BLGD, SGD, and Tobin's Q. The impact of DWD on both ROA and Tobin's Q is statistically insignificant. Therefore, the null hypothesis (H1) is accepted. This finding suggests that having more women

Table 4. Pearson correlation matrix.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ROA	1														
TQ	0.328***	1													
AEM	-0.08***	-0.021**	1												
NWD	0.125*	0.116*	-0.121*	1											
PWD	0.217***	0.197***	-0.112**	0.013**	1										
DWD	0.015	0.001*	-0.121	0.001	0.002*	1									
BLGD	0.256***	0.315***	-0.132**	0.121**	0.118*	0.005	1								
SGD	0.242**	0.276***	-0.085*	0.115**	0.082**	0.003*	0.062***	1							
BSZ	0.091***	0.076**	-0.082***	0.248**	0.189**	0.011***	0.146**	0.132***	1						
BIND	0.116***	0.142***	-0.012***	0.321***	0.215**	0.015**	0.183***	0.161**	0.251***	1					
BMT	0.224***	0.184**	-0.081**	0.176***	0.139***	0.112**	0.092***	0.084*	0.194***	0.163**	1				
OWNC	0.184*	0.163	-0.116**	0.112**	0.083*	0.063*	0.072**	0.057*	0.182**	0.178*	0.222**	1			
LEV	-0.44***	-0.333**	0.052	0.08**	0.061**	0.058	0.053*	0.041***	0.031*	0.004*	0.001**	0.051*	1		
FSIZE	0.198*	0.205**	-0.116	0.012*	0.011*	0.012	0.011*	0.019	0.042**	0.031**	0.139*	0.182**	0.217*	1	
FAGE	-0.052	-0.069	-0.181***	0.021*	0.025*	0.036*	0.029	0.031*	0.085	0.162*	0.127	0.136*	-0.07	0.118**	1

Note: *** There is significant correlation at the 1% level (2-tailed); **There is significant correlation at the 5% level (2-tailed); *There is significant correlation at the 10% level (2-tailed).

Table 5. The effects of gender diversity on firm performance (Using System GMM).

Variables	ROA					Tobin's Q				
	M1	M2	M3	M4	M5	M1	M2	M3	M4	M5
FPM _{ijt-1}	0.283* (1.78)	0.436*** (4.95)	0.108* (1.76)	0.521** (2.36)	0.643*** (8.88)	0.231** (2.58)	0.334*** (4.56)	0.112* (1.81)	0.554*** (8.36)	0.663*** (9.98)
NWD	0.023* (1.71)	–	–	–	–	0.012 (1.11)	–	–	–	–
PWD	–	0.098*** (4.69)	–	–	–	–	0.093*** (4.11)	–	–	–
DWD	–	–	0.031 (1.23)	–	–	–	–	0.043 (1.07)	–	–
BLGD	–	–	–	0.086** (2.57)	–	–	–	–	0.078*** (3.35)	–
SGD	–	–	–	–	0.095** (2.42)	–	–	–	–	0.087** (2.58)
BSZ	0.081** (2.32)	0.088*** (4.13)	0.067** (2.24)	0.089*** (3.38)	0.091** (2.22)	0.066* (1.84)	0.092*** (4.67)	0.043* (1.78)	0.095*** (3.05)	0.086** (2.37)
BIND	0.012* (1.72)	0.045*** (4.13)	0.006* (1.76)	0.076*** (3.82)	0.034** (2.42)	0.001* (1.89)	0.054** (2.33)	0.003* (1.91)	0.087** (1.98)	0.074*** (4.04)
BMT	0.002 (0.98)	0.021** (2.36)	0.011* (1.77)	0.034** (2.12)	0.032* (1.94)	0.001 (0.87)	0.014*** (4.74)	0.001* (1.67)	0.056*** (6.78)	0.043* (1.93)
OWNC	0.001 (1.09)	0.002 (0.99)	0.003 (0.76)	0.011 (1.11)	0.008 (0.97)	0.004 (1.08)	0.007 (1.09)	0.012 (0.56)	0.009 (0.99)	0.007 (1.12)
LEV	–0.051* (–1.88)	–0.099** (–2.14)	–0.043* (–1.92)	–0.093** (–2.43)	–0.076** (–1.99)	–0.043* (–1.75)	–0.097* (–1.74)	–0.021* (–1.81)	–0.084** (–2.55)	–0.091** (–2.12)
FSIZE	0.021 (1.21)	0.032** (2.17)	0.015 (1.09)	0.034*** (2.76)	0.042** (2.43)	0.013 (0.86)	0.047** (2.36)	0.009 (0.54)	0.044** (2.32)	0.037* (1.88)
FAGE	0.003 (1.15)	0.032* (1.71)	0.003 (1.13)	0.045** (2.26)	0.031* (1.78)	0.003 (0.32)	0.002 (0.21)	0.014 (0.86)	0.023 (1.14)	0.009 (0.75)
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	6.09* (1.69)	9.06** (2.58)	7.88 (1.08)	10.23** (2.31)	8.99*** (3.81)	5.76* (1.88)	9.20*** (6.89)	3.65* (1.75)	8.85*** (3.56)	7.87* (1.69)
F Statistic	158.23*	243.76***	166.61*	278.59***	345.32**	150.04*	256.54**	147.89*	302.64***	423.76***
Hansen J-statistic (p value)	0.391	0.367	0.289	0.442	0.423	0.442	0.406	0.325	0.548	0.469
AR(1) p value	0.030	0.026	0.032	0.013	0.039	0.031	0.028	0.036	0.011	0.041
AR(2) p value	0.298	0.412	0.364	0.445	0.189	0.317	0.434	0.371	0.478	0.222
No. of observations	351	351	351	351	351	351	351	351	351	351

Note: The values in parentheses indicate heteroscedasticity-robust t-statistics. *, **, *** denote significance at 10%, 5%, and 1% levels respectively.

on the board can boost a company's success, consistent with other studies (Alodat et al., 2023; Amin et al., 2022; Boukattaya et al., 2022; Brahma et al., 2021; Chen et al., 2023). Our findings align with the agency theory, which suggests that the conflict of interests between managers and owners can be solved through the proper monitoring skills by employing more women on corporate boards (Amin et al., 2022). The study's findings also align with the resource dependency theory, which states that female board members are valued for the knowledge, experience, and perspective they bring to the boardroom table (Siciliano, 1996). The findings of our study also align with the perspective put forth by Boukattaya et al. (2022), which posits that augmenting the representation of women on corporate boards enhances the board's resource base. This is attributed to the unique experiences and skills that women directors bring, distinct from their male counterparts. Consequently, such diversity fosters the cultivation of broader perspectives and encourages multi-faceted thinking that is expected to optimise the board's functioning and subsequently enhance the company's performance. Other researchers (e.g. Arora, 2021; Ramadan & Hassan, 2022) also find similar results using resource dependency theory. In conclusion, women directors have the ability to improve a company's performance by participating in board meetings and bringing a range of strategies for maintaining a competitive advantage.

Regarding control variables, our results show that board size (BSZ), board independence (BIND), board meetings (BMT), and firm size (FSIZE) significantly and positively impact both measures of firm performance (ROA, Tobin's Q). In contrast, leverage (LEV) has found significant negative impacts on ROA and Tobin's Q. However, firm age (FAGE) has found significant positive impacts only on ROA but not on Tobin's Q. In addition, Ownership concentration (OWNC) has no significant effect found on both ROA and Tobin's Q.

6.4. The mediating effect of earnings management

Table 6 represents the mediation effect in line with the Zhao et al. (2010) mediation strategies, as Figure 1 explain. The findings indicate that among the five proxies of gender diversity, only the percentage of women directors on the board has a significant direct and indirect effect on firm performance (ROA and Tobin's Q), indicating that partial mediation exists here. We further see that the direction of direct effects ($c' = 0.098$ for ROA and 0.093 for Tobin's Q) and indirect effects ($ab = 0.0057$ for ROA and $ab = 0.0055$ for Tobin's Q) show the same direction which indicates that there are complementary mediation effects of earnings management in the association between gender diversity and firm performance. This study further calculated the size of the direct and indirect effects of gender diversity on firm performance by following the previous study of Zhao et al. (2010). We find that the impact of gender diversity on firm performance mediated through earnings management is 5% and 7% of the total effects, respectively, for both ROA and Tobin's Q proxies. We further find that the mediation effect through earnings management is 0.06 times larger than the direct effect of gender diversity on firm performance measured by ROA and Tobin's Q.

6.5. Robustness analysis

This study ensures the robustness of the findings by including both accounting and market measures of firm performance. Also, the study applies an alternative regression technique (fixed effect regression) using a static panel model. The p-values (not reported) of both the Chow test and Breusch-Pagan LM tests reject the null hypothesis, indicating using either fixed effect or random effect regression techniques. To choose between fixed or random effect regression, the Hausman fixed or random (F/R) test (not reported) results confirm that fixed effect is the appropriate technique among the Pooled OLS, fixed effect, and random effect regression. The findings are similar to GMM results (not presented here to save space, but available from authors).

7. Summary and conclusion

7.1. Summary

In this paper, paying attention to SDG-5 and drawing on agency and resource dependence theories, we have examined whether earnings management mediates the association between board gender diversity and energy firms' performance in South Asian emerging economies. The study uses five proxies of gender diversity (Number of women directors on board, percentage of women directors on board, presence of women directors on board, Blau index of gender diversity, and Shannon index of gender diversity) and two proxies of firm performance, i.e. both the accounting (ROA) and market (Tobin's Q) measures. This paper measures earnings management by using the proxy of accrual earnings management. Using a total of 77 energy firms from three countries of SA emerging economies (Bangladesh, India, and Pakistan), the study finds that gender diversity on energy firms' boards directly and positively impacts firm performance. We also find that earnings management mediates (complementary mediation) in the BGD-performance relationship. The complementary mediation indicates the same direction of direct effects and indirect effects. In our case, like the positive direct effects of the BGD-performance relationship, we also find the positive indirect effects because BGD reduces earnings management and, in turn, lower earnings management increases firm performance. Therefore, this study can conclude that through the reduction of earnings management, women on boards positively impact South Asian energy firms' performance. Our evidence supports agency theory and resource dependence theories, which argue that more women on boards can boost legitimacy, monitoring, decision-making, and access to scarce external resources, all beneficial to a company's financial performance.

7.2. Implications

The results of this investigation offer valuable theoretical and policy implications. While several studies have investigated the relationship between board gender diversity and firm performance (Ahmadi et al., 2018; Alodat et al., 2023; Amin et al., 2022; Arora, 2021; Assenga et al., 2018; Boukattaya et al., 2022;

Table 6. The mediation effects of earnings management.

Estimates	Monte Carlo (Dependent variable: ROA)					Monte Carlo (Dependent variable: Tobin's Q)				
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
Indirect effect	0.0007	0.0057**	0.0016	0.0002	0.0011	0.0003	0.0055**	0.0004	0.0015	0.0011
Standard error	0.0005	0.0022	0.0013	0.0002	0.0009	0.0003	0.0024	0.0003	0.0011	0.0011
Z-value	1.38	2.58	1.25	1.09	1.19	1.05	2.32	1.11	1.34	1.02
Indirect effect/ Total effect	0.03	0.05	0.05	0.002	0.01	0.03	0.07	0.008	0.02	0.01
Indirect effect/ Direct effect (Zhao et al., 2010) output approach	0.03	0.06	0.05	0.002	0.01	0.03	0.06	0.008	0.02	0.01
	Direct only (Non mediation)	Complementary mediation (partial mediation)	No effect (Non mediation)	Direct only (Non mediation)	Direct only (Non mediation)	No effect (Non mediation)	Complementary mediation (partial mediation)	No effect (Non mediation)	Direct only (Non mediation)	Direct only (Non mediation)

Note: M1 to M5 indicates result for the effect of different proxies of gender diversity i.e. NWD, PWD, DWD, BGD, and SGD respectively on firm performance (ROA) by considering EM as mediator in the relationship, whereas M6 to M10 also indicates the same meaning like M1 to M5 except Tobin's Q is the proxy of firm performance instead of ROA. *, **, *** denote significance at 10%, 5%, and 1% levels respectively.

Brahma et al., 2021; Chen et al., 2023; Green & Homroy, 2018; Ramadan & Hassan, 2022; Tahir et al., 2021), as well as earnings management (Borralho et al., 2020; Orazalin, 2020; Saona et al., 2020), there is a dearth of research focusing on the mediating effect of earnings management on the BGD-performance relationship. By providing empirical evidence, this study addresses a theoretical gap in existing literature. It suggests that having more female directors in the boardroom broadens the perspective and that different skill sets, morals, ideologies, and problem-solving techniques might help handle the opportunistic behaviour (e.g. earnings management) of managers. This could be linked to increased board productivity and problem-solving abilities, improving firm performance. This study provides practical ramifications in addition to its theoretical contributions. Policymakers should improve the governance system by including more women on the board of directors so that good governance reduces earnings manipulations, improving firm performance. It is observed that energy corporations in India and Pakistan adhere to regulatory requirements by appointing at least one female member to their corporate boards. However, it is noteworthy that a significant majority of these firms appoint only one female member, suggesting the presence of tokenism in their compliance efforts. Also, in Bangladesh, there is no regulation to increase women directors in corporate boards. Supporting the critical mass theory, some studies proposed to include 3 or more women on corporate boards. A critical mass of three or more female directors has a positive impact on financial performance, according to (Brahma et al. (2021). Similarly, it is suggested that governments and market regulators consider the implementation of gender quotas for women on corporate boards, as has been observed in other European countries.

7.3. Limitations and avenues for future research

Our research has several limitations. Further investigation is required to address this one's caveats. Firstly, this study analysed data from the years 2015 to 2019. Following 2019, the COVID-19 pandemic substantially impacted the global economy, affecting both earnings management and corporate performance. Subsequent investigations might employ the same research model used in the study to compare the results before, during, and after the epidemic. Secondly, the current body of research emphasises the significance of additional gender characteristics, such as political affiliations, diversity within audit committees, professional experience, educational background, social connections, age, and specialised knowledge, in elucidating the influence of gender on corporate board positions. Excluding these aspects, this study suggests that future research should investigate these attributes to comprehensively understand the correlation between gender diversity, earnings management, and firm performance. Thirdly, the sample size for this study was restricted exclusively to energy firms in the South Asian region. Subsequent research endeavours could perform comparative analyses by examining energy companies from diverse places that possess distinct institutional frameworks. Fourthly, this study examined how earnings management mediates the connection between gender diversity and firm performance. Additional investigation is required to examine additional elements (such as moderators and mediators) that may impact this association, according to the inconsistent findings in existing studies. Fifthly, future research endeavours could incorporate alternative performance measures, such as Return on Equity (ROE), Return on Sales (ROS), Earnings Per Share (EPS), and Z-score, in addition to the utilisation of ROA and Tobin's Q in this study. In addition, this study employed the modified Jones model to assess accrual earnings management. Subsequent research could explore alternative models for measuring both accrual earnings management and real earnings management. Finally, it is crucial to acknowledge that this study relies on secondary data and is empirical in its approach. Future researchers can do analysis using primary data, mixed study, or a systematic review (see, for example, (Jebarajakirthy et al., 2021)); meta-analysis (see, for instance, (Majumder et al., 2019) and (Majumder et al., 2017)); bibliometric analysis (see, for example, (Kent Baker et al., 2020)); and other review analysis to identify other dominating factors influencing on BGD-firm performance relationship.

Notes

1. <https://sdgs.un.org/goals/goal5>
2. https://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_869930/lang-en/index.htm

3. https://www.weforum.org/reports/global-gender-gap-report-2023/?gclid=CjwKCAjw-7OIBhB8EiwAnoOEK3QvbKChZBJTFjHuJ-fbkYyAPmhQQcj6qGJ5R3GcdNyxeBUGL32RgRoCvs4QAvD_BwE
4. <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/gx-women-in-the-boardroom-seventh-edition.pdf>
5. <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/gx-women-in-the-boardroom-seventh-edition.pdf>
6. For more details, we encourage readers to read the Zhao et al. (2010) paper to avoid using the Baron & Kenny (1986) and Sobel (1982) model for the mediation analysis.
7. World Bank Data, 2019 (available at <https://data.worldbank.org/country>)
8. <https://www.iea.org/reports/scaling-up-private-finance-for-clean-energy-in-emerging-and-developing-economies/executive-summary>
9. <https://thefinancialexpress.com.bd/views/analysis/taking-women-on-board-1617387504>
10. <https://www.secp.gov.pk/laws/regulations/>
11. World Bank Data, 2019 (available at <https://data.worldbank.org/country>)
12. <https://stockexchange.mv> (accessed on 05 October, 2021)
13. <https://www.cse.lk/pages/gics-classification/gics-classification.component.html>
14. <https://rsebl.org.bt> (accessed on 05 October, 2021)
15. Nifty 500 index companies are the top 500 companies in India based on full market capitalization.

Authors' contributions

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Data availability statement

The data collected for this research are from the annual reports of each sample firm, which are available on the firms' websites. The data presented in this study are available on request from the corresponding author.

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