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## Article

# Board diversity effects on environmental performance and the moderating effect of board independence: evidence from the Asia-Pacific region

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## ACCOUNTING, CORPORATE GOVERNANCE & BUSINESS ETHICS | RESEARCH ARTICLE

# Board diversity effects on environmental performance and the moderating effect of board independence: evidence from the Asia-Pacific region

Hamdan Amer Al-Jaifi<sup>1,2\*</sup>, Adel Ali Al-Qadasi<sup>3,4</sup> and Ahmed Hussein Al-Rassas<sup>5</sup>

**Abstract:** This study reckons that although a lot of debate has gained currency of late on whether board diversity is associated with environmental performance, empirical evidence that delved into the effects of age, tenure, and gender board diversity and the moderating effect of board independence are yet to be conducted. This study aims to point out how these board diversity attributes can serve as drivers for environmental performance. Using 14,878 firm-year observations from 11 Asia-Pacific countries, the results indicate that the level of environmental performance is positively associated with age and gender board diversity and negatively associated with tenure board diversity. This striking result can be attributed to the management friendliness hypothesis where long-serving on the board is causing a management-friendly bias, which ultimately reduces environmental activities. The findings of this study also support that board independence moderates the associations between tenure and gender diversity and environmental performance. The findings of this study make valuable implications for understanding how board diversity can serve as a driver for the environmental performance issue.

**Subjects:** Auditing; Corporate Social Responsibility; Corporate Governance

**Keywords:** Environmental performance; board diversity; age; tenure; gender; independence

### 1. Introduction

The need for firms to focus on environmental performance is now broadly acknowledged. Firms have been exposed to pressure from regulators and society for more accountability on environmental issues and climate change (Acar et al., 2021). Though environmental performance is a crucial issue that has increased its importance significantly, in the literature, board diversity has not received much attention and has only been subject to limited studies, particularly in terms of the age, tenure, and gender attributes and the moderating factors that could play significant roles. Furthermore, regulators have reinforced board diversity in developed or emerging countries where firms were required to maintain a diversified board. Firms with high diversity among their board members could bring broad and heterogeneous perspectives, which could help the firms gain good environmental scores and enable the directors to satisfy the interests of different group

stakeholders. Hence, this study examines the impacts of age, tenure, and gender diversity on environmental performance.

In the literature, it is argued that younger and older directors tend to have different views on the importance in involving in environmental activities. Said et al. (2012) found that companies with older directors have greater environmental disclosure as older directors could bring experience and maturity to enhance firms' decision-making. On the contrary, A. H. Ibrahim and Hanefah (2016) supported the positive association between the existence of young board directors and environmental activities. They justified that those young directors are more concerned with environmental issues and less resistant to new ideas. Further, Hafsi and Turgut (2013) examined the US-listed firms and found that firms with higher age diversity experience less socioenvironmental performance. This finding is justified by the age differences that may lead to polarization and generate generational conflict.

In terms of tenure diversity, there are mixed findings where some studies such as Chan et al. (2012); Donoher et al. (2007); Johnson et al. (2012) argued that longer timeserving directors become more familiar with the firm's policies. Hence, they can handle stakeholder relationships. It is aligned with the argument that as directors mature, increased generational behavior leads to better stakeholder management (Hafsi & Turgut, 2013). Other studies reported that due to risk-averseness and limited access to information, directors with a longer tenure tend to be less engaged in innovative activities, and less likely to focus on stakeholders due to their close relationships with the firms' managers (Hafsi & Turgut, 2013).

In the board diversity literature, it has been supported that female directors are more active (Schwartz-Ziv, 2017), leading to higher earnings quality (García Lara et al., 2017; Srinidhi et al., 2011), fewer restatements (Abbott et al., 2012), and less fraud (Cumming et al., 2015). Other studies have supported that young directors are more initiative. Despite these results, findings have been mixed on the impact of gender diversity on firm financial performance (Adams & Ferreira, 2009; Ahern & Dittmar, 2012; Bektur & Arzova, 2020; Carter et al., 2003; Farrell & Hersch, 2005; Matsa & Miller, 2013). García Lara et al. (2017) supported that more representation of women on boards leads to more stringent monitoring of the financial reporting process. However, emerging literature provided mixed results on whether female directors are significantly different from male directors in leadership roles. A plausible path to reconcile the mixed findings is to reexamine the board diversity effect on environmental performance by using recent data for a different region namely Asia-Pacific.

Board independence is one of the mechanisms that has received significant attention for its impact on the firms' outcomes' including environmental performance. It is found empirically that independent directors care more about CSR performance (Beji et al., 2021), more social awareness (Ibrahim & Angelidis, 1994) are more concerned about the compliance of the firm's management with regulations related to the environment (Kassinis & Vafeas, 2002). Although, board independence is considered an internal monitoring mechanism that reduces agency conflict between managers and shareholders. It was recently found by Khan et al. (2021) that the negative effect of CEO tenure on corporate social and environmental disclosures is more pronounced for firms with more independent directors. This can be justified as perhaps independent directors serving for a longer period may ultimately get the confidence of the market participants, hence, uncertainty towards their capabilities goes down.

This study examines the associations between three aspects of diversity among board members (Gender diversity, tenure diversity, and age diversity) and environmental performance. Limited studies have provided evidence for the role of board diversity in managerial decision-making regarding environmental performance. This study is motivated by a recent study done by Feng et al. (2020), who examined board diversity on social responsibility among listed firms in the US. However, due to the different characteristics of the US market, there might be different board roles

and structures across countries. Hence, Feng et al. (2020) recommended that their findings be reexamined in cross-country studies. This study contributes three-fold: Firstly, the findings enrich the corporate governance literature by highlighting the impact of board diversity on corporate environmental performance. Second, the results provide evidence using recent and regional data sets, which could provide implications for regulators in setting requirements for listed firms to enhance their environmental performance. Thirdly, this study focused on three board diversity attributes and the moderating impact of board independence that are yet to be examined jointly for developed or developing countries.

A diversified board could provide different perspectives in board deliberations that would enrich the decision-making processes and lead to more environmental initiatives and disclosure. This study finds that firms with higher average levels of directors' age have better environmental performance. Further, a higher percentage of females on the firm's board positively affects environmental performance. This study also documents that firms with longer tenure boards have incrementally less environmental performance than firms with shorter tenure boards. Given that board diversity on environmental performance is crucial and valuable for firms and industry practitioners. However, prior studies reported mixed findings on the impact of board diversity on the firms' environmental performance, suggesting that the association between board diversity and environmental performance is complex and can be better explained within the context of certain contingency situations. Therefore, this study examines the moderating effect of board independence as a contingency that could alter the magnitude and shape of the association between board diversity and environmental performance. The findings of this study show that board independence is playing a moderating role in the relationships between tenure and gender, however, there is no moderating role for age board diversity.

To alleviate the concern of possible endogeneity, the models are reexamined using the independent variables' one-year lag. Then, the findings show that the results remain similar. An additional robustness test is then employed, where fixed effect regression and random effect regression analysis was used. The findings indicate that all tests are remarkably consistent and support the findings of this study. The study's findings may help policymakers and regulators consider the potential impact of board diversity on environmental performance. This study also provides policy implications for regulators to help design strategies to enhance environmental performance. The findings recommend that policymakers should consider the age, tenure, and gender diversity of the board when developing policies to improve the environmental performance of firms. Moreover, the findings of this study could help traders to formulate their investing decisions. It can enable firms to understand better the factors that influence their environmental performance. In other words, a more diverse board may bring a wider range of perspectives, experiences, and skills, which can positively impact decision-making and enhance the company's performance in various aspects, including environmental performance. This can potentially attract traders who prioritize investing in companies that demonstrate good environmental performance.

This study is organized as follows. The related literature with the hypotheses developed is presented in the following section. In the subsequent section, the methodology and data are presented. Then, the findings and results discussion is included. The last two sections of this study summarize the findings and provide the implications.

## 2. Literature review

Firms no longer aim only to achieve financial performance; they need to satisfy stakeholders, maintain a good reputation, and exist in the market at stake (Dintimala & Amril, 2018). For firms to be sustainable, they must have a good performance on economic, social, and ecological indicators (Nguyen et al., 2021). It is also necessary to increase sensitivity and awareness by providing positive signals to investors. Despite all these benefits, the environmental performance of firms still shows significant variations. In line with the resource-based theory, board diversity enhances the decision-making process due to combining the experience of directors with their different

knowledge, background, opinions, values, and perspectives (Post et al., 2011). This theory argues that for businesses to sustain and thrive, they must adjust to the changes in their surroundings. A diverse board may offer a variety of views and experiences that can be used to find inventive and new solutions to environmental problems. Another argument is that board variety can increase social and environmental responsibility because more varied board members may be more aware of various stakeholder groups' issues, including environmental ones. The stakeholder theory argues that firms need to consider the interests of all their stakeholders. Thus, having a diverse board is beneficial to ensure a variety of shareholder perspectives including those pertaining to environmental concerns.

In this study's context which is the Asia-Pacific region, there is a major concern about environmental performance as this region is home to some of the most populous and economically significant countries in the world. The World Bank Group's Country Climate and Development Report (CCDR) for China (2022) highlights the urgency of action, because of China's large emission of greenhouse gases, the heavy exposure of China's population and economic infrastructure to climate risks, and China's critical role in global efforts to combat climate change. Japan has made significant progress in reducing its carbon emissions and increasing its use of renewable energy sources. The country has also implemented measures to reduce plastic waste and promote recycling. However, Japan is still heavily reliant on fossil fuels and nuclear power, and air pollution remains a problem in some cities. Japan's commitments to cut its greenhouse gas emissions by at least 46% by 2030 and reach net zero by 2050 are among the world's most commendable climate targets, given the unique challenges the country faces (International Energy Agency, 2021). Another country in this region is India which is the world's third-largest emitter of greenhouse gases and faces significant challenges related to air and water pollution. The country has made efforts to transition to renewable energy sources and has set a target of achieving 175 GW of renewable energy by 2022. India also faces challenges related to deforestation and loss of biodiversity. Furthermore, Indonesia is home to one of the world's largest rainforests, but deforestation is a major problem due to agricultural expansion and logging. The country is also a significant emitter of greenhouse gases due to its reliance on coal and other fossil fuels. The government has implemented measures to reduce emissions and promote renewable energy, but progress has been slow.

In the following subsection, three hypotheses are developed to reflect how board diversity captured by age, gender, and tenure affects environmental performance. Board diversity is defined as heterogeneity among board directors based on different aspects (Van Knippenberg et al., 2004). Thus far, there is no one definition for board diversity, but it can be defined as separation, variety, and disparity as three different types of diversity (Harrison & Klein, 2007). It is recommended to increase board diversity as it improves the board's cognitive and behavioral range and information disclosure (Ferrero-Ferrero et al., 2013).

### **3. Hypothesis development**

#### **3.1. Age diversity**

The age of board directors is considered the coexistence of different generations, regarded as an effective attribute of boards. This attribute gains importance as different generations on boards bring other habits, values, experiences, and cultural norms that affect intuitive decision-making approaches (Post et al., 2011). It can be said that older directors have more remarkable experiences, while younger directors bring alertness and energy. Handajani et al. (2014) asserted that older directors had accumulated full-life working skills and experience versus younger directors who are full of energy and are more likely open to technological changes. Hafsi and Turgut (2013) predicted that age diversity is associated with corporate social performance as younger directors are more likely to pay attention to environmental and ethical issues while older directors could pay more concern to social welfare.

It is argued that younger directors are likely more innovative and could bring to the table riskier proposals. The cognitive skills that young directors have, such as learning ability, reasoning, and memory, could enhance the decision-making process (Bantel & Jackson, 1989). Earlier, Vroom and Pahl (1971) justified that younger directors could have superior technical knowledge and be familiar with the changes due to their recent education. Furthermore, younger directors tend to be risk-takers and could engage in more environmental activities to prioritize the stakeholders' needs and concerns. However, empirical evidence showed that age diversity has a negative impact on social performance. Post et al. (2011) supported the positive association between environmental performance and age diversity if the average age of the board is closer to 56 years. Fernandes et al. (2018) found that environmental disclosure increased for firms that have boards with an average age of 60 years. Harrison and Klein (2007) classified the reasons for age diversity into two aspects: age diversity as variety which refers to better information richness and knowledge, whereas age diversity as separation relates to the disagreements and conflicts among members. Ferrero-Ferrero et al. (2013) argued that age diversity on a board favor making efficient decisions, which can raise a company's performance. Hafsi and Turgut (2013) examined US firms and supported that more age diversity among board members leads to lower socioenvironmental performance. This is perhaps due to polarization that comes from the age difference, which generates more generational conflict. For Malaysian firms, Said et al. (2012) supported that the older directors enhance voluntary environmental disclosure due to their experience. This finding was also supported by Sartawi et al. (2014). On the contrary, A. H. Ibrahim and Hanefah (2016) supported the positive association between the existence of young directors in the board members and environmental performance as young directors are more concerned with environmental issues. Recently, Giannarakis et al. (2020) found that the age of the youngest director has a negative effect on the environmental disclosures of US firms.

Empirically, there are mixed findings. Several studies supported the negative relationship between age diversity and CSR performance (Hafsi & Turgut, 2013; Post et al., 2011). In contrast, Ferrero-Ferrero et al., (2013) followed the classification of age diversity as a variety proposed by Harrison and Klein (2007) and found that age diversity positively influences CSR. In the same line, Ferrero-Ferrero et al. (2013) classified age diversity into three generations: veterans, baby boomers, and generation X. Following prior studies, this study formulated the following hypothesis:

**Hypothesis 1:** *There is a significant association between age diversity and environmental performance.*

### **3.2. Tenure diversity**

The tenure of board directors is one of the most widely highlighted attributes in the literature (Feng et al., 2020). It has been argued that longer-tenured board members give the members the ability to be familiar with all the firms' strategies and follow the lead of the management (Hafsi & Turgut, 2013). In line with this argument, it is expected that longer-tenured directors will most likely follow the management practices such as CSR projects to avoid any controversy with managers. Donohue et al. (2007) supported that long-tenure directors better understand the firm's practices, reducing misleading information disclosure. In line with the expertise hypothesis that those long times serving on the board would enhance the firms' competence, knowledge, commitment, and boardroom collegiality. Hence, firms would experience better social and social performance. Those long-time serving on the board are likely better at monitoring the management team. According to Li and Wahid (2017), tenure diversity benefits firms as having senior and junior directors implies more knowledge continuity and independence. It is argued that those long-time serving on the board are likely better at understanding environmental issues. This means that they are better in terms of communicating with the stakeholders.

Nevertheless, according to the management friendliness hypothesis, long-time serving directors could have close relationships with their management teams, leading to what is called

a management-friendly bias (Vafeas, 2003). Due to this close relationship, the board may lose its objectivity and independence and perhaps would be unwilling to perform its monitoring duties that leading to less social performance (Schnake et al., 2011) and less likely to respond to environmental issues (Daboub et al., 1995). Another aspect of the impact of tenure diversity is that due to risk-averseness and limited access to information, directors with a longer tenure tend to be less engaged in innovative activities. In addition, it is argued that long-time serving directors have a lower incidence of adverse social outcomes. Hafsi and Turgut (2013) argued that long-tenure directors are more focused on social welfare, and short-tenure directors are more focused on environmental and ethical issues. Huang and HILARY (2018) supported that shorter-tenured board members might not dare to voice out and become captive without addressing any social responsiveness and responsibility issues. Based on the management friendliness hypothesis and experience hypothesis. The second hypothesis of this study is formulated as follows:

**Hypothesis 2:** *There is a significant association between tenure diversity and environmental performance.*

### **3.3. Gender diversity**

Gender diversity has been examined as a factor that affects CSR. Set'o-Pamies (2015) found that gender diversity is positively affecting CSR scores. Similarly, Bear et al. (2010) supported that the existence of females on boards is positively related to CSR. This positive association is justified as having more women directors would likely develop more proactive and comprehensive CSR strategies (Shaukat et al., 2015). In Australia, Rao and Tilt (2016a, 2016b) found that firms with women on board have higher CSR levels. Post et al. (2014) argued that firms with a more representation of females on their boards are more likely to form sustainability-themed alliances. Kassinis et al. (2016) supported the higher environmental sustainability practices due to more female representation on boards. Furthermore, it is argued that firms that have more proportion of women on their boards are more likely to be generous to communities and tend to focus more on the environment. Braun (2010) examined the association between gender and environmental commitment and supported those female directors are more likely to prefer green entrepreneurship programs. It is also argued that they can satisfy various stakeholders due to the female's distinguished coordinating ability (Wang & Coffey, 1992). On the contrary, Handajani et al. (2014) found that CSR scores are less for Indonesian firms with a higher representation of women on boards. Other studies found no gender difference impacting CSR levels (Giannarakis, 2014; Post et al., 2011). Similarly, Galbreath (2018) supported the insignificant association between gender diversity and environmental performance. In line with the previous literature and based on the above reasoning, this study develops the following hypothesis:

**Hypothesis 3:** *There is a significant association between board gender diversity and environmental performance.*

### **3.4. Moderating effect of board independence**

Board independence is an essential internal corporate governance monitoring mechanism, and it serves as the mechanism that checks the balance of management and protection the interests of shareholders (Agrawal & Knoeber, 1996). In line with the agency theory, independent directors have more control and monitoring over the management team. In addition, the stakeholder theory states that independent directors are more likely required to meet social demands. This causes firms to engage more in environmental activities. It is argued that independent directors have great awareness of social and environmental issues and are likely to present themselves as liable to solve such issues. It is justified that independent directors are more likely to be sensitive to stakeholder pressure concerning environmental issues, as engaging in sustainability projects or activities, including environmental for stakeholder interests, would enhance their reputation and ultimately increase the likelihood of their board nominations (Post et al., 2014). Nadeem (2020)



supported that firms with higher board independence undertake supplemental environmental projects more frequently. Beji et al. (2021) provided evidence that independent directors care more about CSR performance. Furthermore, De Villiers et al. (2011) found that the environmental strengths of firms are positively and significantly related to board independence.

In the literature, prior studies supported the positive association between board independence and environmental practices (Biswas et al., 2018; De Villiers et al., 2011; Rubino & Napoli, 2020). N. A. Ibrahim and Angelidis (1995) indicated that social awareness among boards of directors is higher in firms that include more independent directors. Kassinis and Vafeas (2002) supported that independent directors are more concerned about the firm's management compliance with regulations related to the environment. It is argued that usually independent directors are giving more attention to the interests of firms' stakeholders. As a monitoring mechanism, a firm's board is considered a key device controlling managerial behaviors, including issues related to the environment (Hafsi & Turgut, 2013).

On the other hand, Akbas (2016) found no association between the board's independence and the environmental disclosure of Turkish firms. Furthermore, Khan et al. (2021) found that the negative effect of CEO tenure on corporate social and environmental disclosures is more pronounced for firms having a larger number of independent directors on the board. Following these arguments, the following hypotheses are developed.

**Hypothesis 4a:** *There is a moderating effect of board independence on the association between board age diversity and environmental performance.*

**Hypothesis 4b:** *There is a moderating effect of board independence on the association between board tenure diversity and environmental performance.*

**Hypothesis 4c:** *There is a moderating effect of board independence on the association between board gender diversity and environmental performance.*

## 4. Methodology

### 4.1. Sample and data sources

The study uses a data set consisting of all listed firms in the Asia Pacific region that have environmental performance data available on Bloomberg over the period of 2011 to 2020. The data set was obtained from Bloomberg. This source provides reliable and consistent information and is widely used (Chiaromonte et al., 2021; Giannarakis et al., 2020; Romano et al., 2020; Shrivastava & Addas, 2014). After data processing and missing data were deleted, the final data resulted in 14,878 observations (firm-years) coming from 11 Asia-Pacific countries namely, Australia, China, Hong Kong, India, Indonesia, Japan, Malaysia, Philippines, Singapore, South Korea, and Thailand.

### 4.2. Regression model

In this section, the multivariate regression model is presented to illustrate the links between board diversity variables and environmental performance with other control variables:

$$\begin{aligned} ENV_{it} = & \beta_0 + \beta_1 AGE_{it} + \beta_2 TENURE_{it} + \beta_3 GENDER_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it} + \beta_6 LEV_{it} + \beta_7 TANG_{it} \\ & + \beta_8 BODSIZE_{it} + \beta_9 BODIND_{it} + \sum_{i=3}^n YEAR + \sum_{i=9}^n INDUSTRY + \sum_{i=4}^n COUNTRY + \varepsilon \end{aligned} \quad (1)$$

Where  $ENV_{it}$  is the environmental score for firm  $i$  and year  $t$ ;  $AGE_{it}$  is the age diversity of the board;  $TENURE_{it}$  is the tenure diversity of the board;  $GENDER_{it}$  is the gender diversity of the board;  $SIZE_{it}$  is the size of the firm;  $ROA_{it}$  is the firm's profitability;  $LEV_{it}$  is firm's leverage;  $TANG$ , is the firms' asset tangibility;  $BODSIZE_{it}$  is the  $SIZE_{it}$  of the board;  $BODIND$  is the

independence of the board, and  $\varepsilon$  is the error term. This model controls for the year, country, and industry fixed effects to filter the time-invariant factors and capture unobserved characteristics of the firm. In this study, the statistical program used is STATA and all continuous variables are winsorized at the 1st and 99th percentiles.

To examine the moderating effect, the interaction term of board Independence and the three main variables (age, tenure, and gender diversity) are included in the model. All variables included in Equation 1) are also added in the moderating effect model as shown below.

$$\begin{aligned}
 ENV_{it} = & \beta_0 + \beta_1 AGE_{it} + \beta_2 TENURE_{it} + \beta_3 GENDER_{it} \\
 & + \beta_4 AGE * BODIND_{it} + \beta_5 TENURE * BODIND_{it} + \beta_6 GENDER * BODIND_{it} + \beta_7 SIZE_{it} \\
 & + \beta_8 ROA_{it} + \beta_9 LEV_{it} + \beta_{10} TANG_{it} + \beta_{11} BODSIZE_{it} + \beta_{12} BODIND_{it} + \sum_{i=3}^n YEAR \\
 & + \sum_{i=9}^n INDUSTRY + \sum_{i=4}^n COUNTRY + \varepsilon
 \end{aligned} \tag{2}$$

### 4.3. Variable definitions

Different measurements for disclosures were used either by adopting the CSR indices or ratings. Other researchers adopt counting the words that are related to CSR in the firms' annual reports. In this study, the environmental performance scores of Bloomberg are used. This measure assesses each firm based on 60 items. According to Bloomberg, environmental factors refer to corporate environmental policies on energy efficiency, greenhouse gas (GHG) gas emissions, environmental litigation risk, and renewable energy where applicable. The increasing number of studies that used Bloomberg's scores strengthened the appropriateness of this variable as a proxy for environmental performance (Broadstock et al., 2018; Chiamonte et al., 2021; Giannarakis et al., 2020; Nollet et al., 2016; Romano et al., 2020).

The independent variables used in this study include three board diversity attributes: age, tenure, and gender. In this study, age diversity is measured by the average board directors' age, whereas tenure diversity is measured by the average number of years board members have served in the firm. Furthermore, gender diversity is calculated by the percentage of women's representation on board. Following prior studies such as Ben Fatma and Chouaibi (2021). Feng et al. (2020), Sakunasingha et al. (2018), and Suttipun (2021), this study included firm size (log of total assets), leverage (total debt/total assets), tangibility (property, plant, and equipment cost/assets), profitability (return on assets) as control variables. Furthermore, board size was measured by the number of directors serving on the board, and the percentage of independent directors was included to control the firm's corporate governance strength.

## 5. Results and discussion

### 5.1. Summary statistics

In this section, the descriptive statistics for the study variables are presented in Table 1. For 1959 listed firms in the Asia-Pacific region that has environmental performance data available at Bloomberg, it is found that the firms have an average environmental score of 19.827 with maximum and minimum scores of 1.55 and 63.365, respectively. Further, the average age of board members is 58.728 years, whereas the average number of years directors are serving on a firm's board is 6.447 years. For gender diversity, it is shown that females on board on average represent 7.36 percent. In terms of the control variable, it is shown that, on average, the firms included in this study have a total assets (firm size) value of 7.436 in logs of million USD.

Additionally, firms on average have 31.6% of their assets as fixed assets with a profitability value of 4.101%. Moreover, Table 1 shows that the mean leverage (leverage) value is 21.192 percent. Lastly, the average size of the board is 9.159 members, and on average, 31.905 percent of the

**Table 1. Descriptive Statistics**

Variable	Obs	Mean	Std. Dev.	Min	Max
ENV	14878	19.827	15.455	1.55	63.365
AGE	14878	58.728	5.073	44.5	71.3
TENURE	14878	6.447	3.392	1.454	19.287
GENDER	14878	7.36	10.271	0	50
BODSIZE	14878	9.159	2.677	3	17
BODIND	14878	31.905	18.655	0	100
ROA	14878	4.101	6.686	-93.37	31.219
SIZE	14878	7.436	1.572	2.21	11.288
LEV	14878	21.192	17.034	0	84.938
TENG	14878	.316	.193	.001	.874

directors are independent. Table 2 provides the tabulation for the data set used in this study. It is shown that the firms in the Asia Pacific region are distributed across the nine sectors, and the majority of the forms are from industrial and consumer (cyclical and non-cyclical) sectors. Table 2 also shows the distribution of the study's data set over ten years period. Furthermore, Table 2 shows that 34.06 percent of the observation is from the Asia Pacific emerging economies while the remaining (65.94 percent) is from the Asia Pacific developed economies. In Table 2, the distribution of the data is presented by country name as well.

In Table 3, the correlation matrix of the study variables is illustrated. It is shown that age is positively correlated with environmental performance, while tenure and gender are negatively correlated. For the control variables, it is shown that all variables are significantly associated with environmental performance except firms' profitability. Though the correlation matrix shows that the correlations among the independent variables are significant but not high correlation where the highest correlation is 0.437. Hence, it can be said that multicollinearity is not an issue in this analysis.

### 5.2. Regression results

Table 4 shows the findings of this study. The study finds that age board diversity is significantly related to environmental performance at the 1% level. This means that the first hypothesis H1 is supported. In addition, the findings show a significant negative relationship between the tenure of the board and environmental performance at a 1% level. This means that the second hypothesis is supported. It is also reported in Table 4 that the third hypothesis is supported as there is a significant positive relationship between gender and environmental performance at a 1% level. According to these findings, it can be said that an increase in the age diversity of boards can enhance environmental performance. Further, the significant relationship with tenure implies that the boards that have long-served directors experience less environmental performance. The finding also supported that the presence of women on the board increases the likelihood of environmental performance.

Table 4 also reported the results based on regressing the main study variables (age, tenure, and gender) separately, as these variables might be correlated with each other. The results from panels 1,2,3 illustrate that the coefficient estimates on the three main study variables stay unchanged and consistent with those reported in panel 1.

As shown in Table 4, age diversity is positively affecting environmental performance. This implies that older directors are expected to emphasize and develop the environmental disclosure level because they prioritize stakeholders' concerns regarding environmental issues compared to young directors. Previous studies have supported this finding as Fernandes et al. (2018) supported that

**Table 2. Descriptive of the data set**

<b>Panel 1: Industry</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cum.</b>
Basic Materials	1726	11.60	11.60
Communications	636	4.27	15.88
Consumer, Cyclical	3074	20.66	36.54
Consumer, Non-cyclical	2521	16.94	53.48
Diversified	61	0.41	53.89
Energy	476	3.20	57.09
Industrial	4931	33.14	90.23
Technology	849	5.71	95.94
Utilities	604	4.06	100.00
Total	14878	100.00	
<b>Panel 2: Year</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cum.</b>
2011	942	6.33	6.33
2012	1022	6.87	13.20
2013	1148	7.72	20.92
2014	1205	8.10	29.02
2015	1478	9.93	38.95
2016	1558	10.47	49.42
2017	1749	11.76	61.18
2018	1882	12.65	73.83
2019	1935	13.01	86.83
2020	1959	13.17	100.00
Total	14878	100.00	
<b>Panel 3: Region</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cum.</b>
Asia Pacific Emerging	5068	34.06	34.06
Asia Pacific Developed	9810	65.94	100.00
Total	14878	100.00	
<b>Panel 4: Country</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cum.</b>
Australia	574	3.86	3.86
China	3,671	24.67	28.53
Hong Kong	593	3.99	32.52
India	383	2.57	35.09
Indonesia	160	1.08	36.17
Japan	7,957	53.48	89.65
Malaysia	405	2.72	92.37
Philippines	95	0.64	93.01
Singapore	129	0.87	93.88
South Korea	557	3.74	97.62
Thailand	354	2.38	100
Total	14,878	100	

the age variables showed that environmental disclosure increased on boards with average age up to 60. Said et al. (2012) supported that older directors are enhancing voluntary environmental disclosure in Malaysia. It is also supported by Sartawi et al. (2014) and justified by the older directors' experience and maturity. Recently, Giannarakis et al. (2020) asserted that the age of the youngest director has a negative impact on the environmental disclosures of US firms.

**Table 3. Pairwise Correlations**

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) ENV	1.000									
(2) AGE	0.278*	1.000								
(3) TENURE	-0.101*	0.133*	1.000							
(4) GENDER	-0.010	-0.202*	-0.042*	1.000						
(5) BODSIZE	0.235*	0.155*	0.000	-0.027*	1.000					
(6) BODIND	-0.076*	-0.044*	-0.052*	0.437*	-0.137*	1.000				
(7) ROA	-0.006	-0.077*	0.079*	0.061*	0.090*	-0.001	1.000			
(8) SIZE	0.473*	0.189*	-0.207*	0.099*	0.436*	0.100*	0.067*	1.000		
(9) LEV	0.067*	-0.009	-0.045*	0.046*	0.143*	0.076*	-0.223*	0.283*	1.000	
(10) TENG	0.104*	0.092*	-0.037*	0.029*	0.119*	0.083*	-0.112*	0.205*	0.392*	1.000

\* $p < 0.05$

It is also shown in Table 4 that there is a negative and significant relationship between tenure diversity and environmental performance. This finding implies long-time serving directors are potentially damaging decisions, which are not aligned with the stakeholders. This finding aligns with the management-friendly bias, which is stated by the management-friendliness hypothesis (Vafeas, 2003). Having close relationships with the management team negatively affects the board's independence and objectivity, which results in lowering social and environmental performance (Daboub et al., 1995; Schnake et al., 2011).

Compared with long-serving directors. This finding is contrasting with the arguments that longer tenure board members usually become familiar with their firms' policies (Johnson, Schnatterly, & Hill 2013). It is also conflicting with the argument that short-tenure directors have a less complete understanding of the corporation's business and history, which may diminish the effectiveness of their monitoring and advice. However, this finding is aligned with the argument raised by Hafsi and Turgut (2013) study, that long-tenured directors are too close to the firms' managers, which could lead them to be reluctant to voice out about social responsibility issues and reduce the focus on stakeholders. It is also argued that long-tenure directors are more focused on social welfare, and short-tenure directors are more focused on environmental and ethical issues (Hafsi & Turgut, 2013).

In terms of gender diversity, Table 4 shows that gender diversity has a positive and significant association with environmental disclosure. This finding is in line with the results of Feng et al. (2020), who found that women's representation on the firms' boards is positively associated with CSR justifying those women directors are likely to develop more proactive and comprehensive strategies related to CSR. Francoeur et al. (2017) supported that female directors positively affect various groups of stakeholders. Hence, this finding can be explained by the stakeholder perspective, which implies that female directors enhance stakeholder relations. Female directors are likely to build goodwill and avoid risky proposals to maintain good relations with the stakeholders. In a similar vein, Wang and Sun (2021) supported the positive association between audit committees' female representation and the level of environmental disclosures. However, the finding contrasts with Trireksani and Djajadikerta (2016), and Alazzani et al. (2017), who showed that female directors do not influence environmental performance.

Concerning the control variables, the findings show that firms with large numbers of directors serving on the board and a majority independent are experiencing better environmental performance. In addition, the results show that profitability and leverage are negatively significant. This can be justified as firms are less likely to be concerned about environmental activities than other companies with less profitability due to good profitability. The finding also showed that firms that

**Table 4. Regression analysis**

	(1)	(2)	(3)	(4)
	ENV <sub>i,t</sub>	ENV <sub>i,t</sub>	ENV <sub>i,t</sub>	ENV <sub>i,t</sub>
AGE <sub>i,t</sub>	.159***	.101***		
	(.03)	(.029)		
TENURE <sub>i,t</sub>	-.283***		-.266***	
	(.034)		(.034)	
GENDER <sub>i,t</sub>	.08***			.072***
	(.012)			(.012)
BODSIZE <sub>i,t</sub>	.026	.022	.022	.02
	(.046)	(.046)	(.046)	(.046)
BODIND <sub>i,t</sub>	-.004	.01	.007	.01
	(.01)	(.01)	(.01)	(.01)
ROA <sub>i,t</sub>	-.004	-.012	-.003	-.018
	(.017)	(.017)	(.017)	(.017)
SIZE <sub>i,t</sub>	4.87***	5.016***	4.993***	5.105***
	(.085)	(.084)	(.081)	(.08)
LEV <sub>i,t</sub>	-.04***	-.041***	-.042***	-.043***
	(.008)	(.008)	(.008)	(.008)
TENG <sub>i,t</sub>	4.982***	4.949***	5.055***	4.973***
	(.637)	(.64)	(.639)	(.639)
CONS <sub>i,t</sub>	-22.963***	-21.725***	-13.768***	-17.691***
	(1.919)	(1.872)	(1.183)	(1.146)
Observations	14878	14878	14878	14878
R-squared	.346	.341	.343	.342
Industry Dummies	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES
Country Dummies	YES	YES	YES	YES

Note: ESG is the Environmental, Social, and Governance performance score for company  $i$  at year  $t$ ; AGE is the average age of the directors on the firm's board; TENURE is the average number of years of directors serving on the firm's board. GENDER is the percentage of female directors on the firm's board; SIZE is the log of the book value of the total assets; ROA is the firm's profitability is the net income divided by total assets; LEV is the book value of total liabilities divided by the book value of the total assets; TANG, or asset tangibility, is the net property, plant, and equipment divided by the total assets. BODSIZE is the number of directors on the firm's board; BODIND is the percentage of independent directors on the firm's board. Note: \*, \*\*, \*\*\* are significant at 10%, 5%, and 1% levels, respectively. Standard errors are in parentheses; \*\*\* $p < .01$ , \*\* $p < .05$ , \* $p < .1$

depend highly on debt are less likely to undertake environmental activities to limit the risk. It is also reported in Table 4 that big firms and firms with high tangible assets are more likely to engage in environmental activities.

For the moderation analysis, it is shown in Table 5 that board independence is playing a moderation effect on the relationships between tenure and gender diversity, and environmental performance. It is found that interaction terms are statistically significant at a 1 percent level, which means that hypotheses 4b and 4c are supported. However, the direction of the interaction term of tenure diversity and board independence is negative, while for gender diversity and board independence interaction term is positive. This implies that board independence enhances the impacts found in this study except for age diversity, where board independence is not playing any moderating role. This insignificant interaction term of age diversity and board independence means that the hypothesis is not supported. This implies that regardless of whether old directors are insiders or outsiders, their positive impact on environmental performance is persist.

**Table 5. Interaction analysis**

	(1)	(2)	(3)	(4)
	ENV <sub>i,t</sub>	ENV <sub>i,t</sub>	ENV <sub>i,t</sub>	ENV <sub>i,t</sub>
AGE <sub>i,t</sub>	.077 (.058)	.045 (.058)		
AGE*BODIND <sub>i,t</sub>	.002 (.001)	.002 (.002)		
TENURE <sub>i,t</sub>	-.1 (.066)		-.095 (.066)	
TENURE *BODIND <sub>i,t</sub>	<b>-.006***</b> <b>(.002)</b>		<b>-.006***</b> <b>(.002)</b>	
GENDER <sub>i,t</sub>	<b>-.136***</b> <b>(.029)</b>			<b>-.161***</b> <b>(.029)</b>
GENDER *BODIND <sub>i,t</sub>	<b>.005***</b> <b>(.001)</b>			<b>.006***</b> <b>(.001)</b>
BODSIZE <sub>i,t</sub>	.024 (.046)	.024 (.046)	.015 (.046)	.023 (.046)
BODIND <sub>i,t</sub>	-.141 (.091)	-.09 (.09)	.041*** (.015)	-.021** (.01)
ROA <sub>i,t</sub>	-.004 (.017)	-.013 (.017)	0 (.017)	-.021 (.017)
SIZE <sub>i,t</sub>	4.848*** (.085)	5.018*** (.084)	4.988*** (.081)	5.077*** (.08)
LEV <sub>i,t</sub>	-.038*** (.008)	-.04*** (.008)	-.04*** (.008)	-.043*** (.008)
TENG <sub>i,t</sub>	4.821*** (.638)	4.921*** (.64)	4.92*** (.64)	4.989*** (.637)
CONS <sub>i,t</sub>	-21.651*** (3.556)	-18.411*** (3.513)	-14.773*** (1.229)	-20.265*** (1.179)
Observations	14878	14878	14878	14878
R-squared	.35	.341	.344	.346
Industry Dummies	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES
Country Dummies	YES	YES	YES	YES

Note: ESG is the Environmental, Social, and Governance performance score for company  $i$  at year  $t$ ; AGE is the average age of the directors on the firm's board; TENURE is the average number of years of directors serving on the firm's board. GENDER is the percentage of female directors on the firm's board; SIZE is the log of the book value of the total assets; ROA is the firm's profitability is the net income divided by total assets; LEV is the book value of total liabilities divided by the book value of the total assets; TANG, or asset tangibility, is the net property, plant, and equipment divided by the total assets. BODSIZE is the number of directors on the firm's board; BODIND is the percentage of independent directors on the firm's board. Note: \*, \*\*, \*\*\* are significant at 10%, 5% and 1% levels, respectively. Standard errors are in parentheses; \*\*\* $p < .01$ , \*\* $p < .05$ , \* $p < .1$

### 5.3. Robustness tests

As board diversity usually is unchanged intensity over time, there is a potential serial correlation. Further, to address the issue of eventual reverse causality and because persistent governance levels might occur in firms and some measures would be verified in the next year, a one-year lag for the independent variables is applied in this study. This empirical model with lag for all the right-hand-side variables by one year would mitigate potential endogeneity issues and ensure that all variables are publicly known at the time of prediction. Enormous studies have followed this

**Table 6. Regression analysis using one year lagged independent variables**

	(1)	(2)	(3)	(4)
	ENV <sub>i, t</sub>	ENV <sub>i, t</sub>	ENV <sub>i, t</sub>	ENV <sub>i, t</sub>
AGE <sub>i, t-1</sub>	.125***	.079**		
	(.031)	(.031)		
TENURE <sub>i, t-1</sub>	-.254***		-.245***	
	(.035)		(.035)	
GENDER <sub>i, t-1</sub>	.077***			.072***
	(.013)			(.013)
BODSIZE <sub>i, t-1</sub>	.021	.015	.023	.02
	(.048)	(.048)	(.047)	(.047)
BODIND <sub>i, t-1</sub>	.002	.013	.011	.014
	(.01)	(.01)	(.01)	(.01)
ROA <sub>i, t-1</sub>	-.008	-.017	-.005	-.019
	(.018)	(.018)	(.018)	(.018)
SIZE <sub>i, t-1</sub>	5.067***	5.194***	5.134***	5.242***
	(.09)	(.089)	(.085)	(.084)
LEV <sub>i, t-1</sub>	-.043***	-.045***	-.045***	-.045***
	(.008)	(.008)	(.008)	(.008)
TENG <sub>i, t-1</sub>	4.408***	4.37***	4.495***	4.429***
	(.672)	(.674)	(.669)	(.67)
CONS <sub>i, t-1</sub>	-22.335***	-21.307***	-14.739***	-18.471***
	(2.024)	(1.966)	(1.242)	(1.209)
Observations	13507	13510	13596	13593
R-squared	.35	.346	.348	.347
Industry Dummies	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES
Country Dummies	YES	YES	YES	YES

Note: ESG is the Environmental, Social, and Governance performance score for company  $i$  at year  $t$ ; AGE is the average age of the directors on the firm's board; TENURE is the average number of years of directors serving on the firm's board. GENDER is the percentage of female directors on the firm's board; SIZE is the log of the book value of the total assets; ROA is the firm's profitability is the net income divided by total assets; LEV is the book value of total liabilities divided by the book value of the total assets; TANG, or asset tangibility, is the net property, plant, and equipment divided by the total assets. BODSIZE is the number of directors on the firm's board; BODIND is the percentage of independent directors on the firm's board. Note: \*, \*\*, \*\*\* are significant at 10%, 5%, and 1% levels, respectively. Standard errors are in parentheses; \*\*\* $p < .01$ , \*\* $p < .05$ , \* $p < .1$

approach such as Lu (2021) and Al-Jaifi (2017). The results in Table 6 show that the study variables' associations are persistent, which implies that reverse causality is not an issue.

To corroborate the findings of this study, panel data analysis is applied. The results based on random and fixed effects in Table 7 illustrate no significant difference in the findings, and the associations of the main variables of this study are robust. Though the main models of the study incorporated country dummy variables to account for the heterogeneity among the countries, an additional analysis is employed to capture the level of economic development of the countries where the dummy variable was included in the main models by assigning a value of "1" to developed countries and "0" to others. The results remained robust and consistently significant. Furthermore, the main regression models were re-estimated to assess the sensitivity of the results to the inclusion or exclusion of variables in the regression model. The results remain robust even after the addition or removal of variables, this can provide evidence that the main models do not suffer from omitted variable bias. An additional test is carried out where a regression model is



**Table 7. Regression analysis using fixed and random effects**

	Panel 1: Fixed effects					Panel 2: Random effects				
	ENV <sub>i,t</sub>	ENV <sub>i,t</sub>	ENV <sub>i,t</sub>	ENV <sub>i,t</sub>	ENV <sub>i,t</sub>	ENV <sub>i,t</sub>	ENV <sub>i,t</sub>	ENV <sub>i,t</sub>	ENV <sub>i,t</sub>	ENV <sub>i,t</sub>
AGE <sub>i,t</sub>	.019 (.029)	.011 (.029)				.058** (.027)	.04 (.027)			
TENURE <sub>i,t</sub>	-1.323*** (3.88)	-1.323*** (3.88)				-3.89*** (.072)	-3.84*** (.072)			
GENDER <sub>i,t</sub>	.021** (.01)	.021** (.01)				.03*** (.01)				.028*** (.01)
BODSIZE <sub>i,t</sub>	-.108** (.042)	-.106** (.042)				-.057 (.04)	-.058 (.04)			-.066* (.04)
BODIND <sub>i,t</sub>	-.082*** (.008)	-.082*** (.008)				-.066*** (.007)	-.062*** (.007)			-.062*** (.007)
ROA <sub>i,t</sub>	.017 (.011)	.016 (.011)				.01 (.011)	.008 (.011)			.01 (.011)
SIZE <sub>i,t</sub>	2.448*** (.216)	2.436*** (.215)				4.152*** (.136)	4.258*** (.135)			4.306*** (.133)
LEV <sub>i,t</sub>	.016* (.009)	.017* (.009)				-.009 (.008)	-.01 (.008)			-.011 (.008)
TENG <sub>i,t</sub>	1.889* (1.023)	1.934* (1.023)				3.34*** (.844)	3.365*** (.846)			3.452*** (.845)
CONS <sub>i,t</sub>	7.355** (3.378)	-532 (2.27)				-8.647*** (2.32)	-10.572*** (2.237)			-8.951*** (1.751)
Observations	14878	14878				14878	14878			14878
R-squared	.198	.197				0.3228	0.3179			0.3186
Industry Dummy	NO	NO				YES	YES			YES
Year Dummy	NO	NO				YES	YES			YES
Country Dummy	NO	NO				YES	YES			YES

Note: Standard errors are in parentheses

\*\*\* p<.01, \*\* p<.05, \* p<.1

Panel 1 represents the models used the Fixed Effect Analysis, while Panel 2 represented the models used the Random Effect Analysis

executed for the two nations (China and Japan), which encompass a substantial proportion of the dataset, and it found that the findings remain congruent with those obtained from the main models (the whole dataset). To support the robustness of moderator variable findings, an additional test is carried out by dividing the sample of the study into high and low-board independent firms based on the median value of the percentage of independent directors on the board. The untabulated results show that firms that have a high number of independent directors on their boards exhibit a stronger impact from the direct effects of board diversity on environmental performance.

## 6. Conclusion and implications

Environmental performance is a crucial aspect that has attracted significant attention to how firms can enhance their environmental performance. Although regulators are urging firms to move toward board diversity, societies also demand that companies be more environmentally responsible. However, there are still environmental performance variations among firms. This study aims to enrich the board diversity and environmental performance literature by addressing how age, tenure, and gender board diversity could impact environmental performance across countries. The results from this study indicate that age has a positive influence on environmental performance. This implies that firms with higher-age board members are more likely to engage in environmental activities. These results also show a negative association between tenure boards and environmental performance. This implies that firms with a long-tenured board may have fewer risk-taker to be involved in environmental activities. In terms of gender diversity, it is found that women directors are more likely to engage in environmental activities.

The findings of this study provide implications for investors as they need to refer to the diversity of boards when they make their trading decisions. The findings of this study provide valuable implications to the traders as a more diverse board may signal a company's commitment to social responsibility, diversity, and inclusion, which can appeal to socially responsible investors. These investors may be more likely to invest in companies that prioritize diversity and inclusion and demonstrate good environmental performance, thereby influencing the paradigm of traders in their investing choices. In addition, this finding would help regulators in formulating policy and operational initiatives to enhance corporate environmental performance. The results of this study are robust to alternative estimation methods, and for future research, other board attributes are recommended to be examined. For the moderation analysis, the findings of this study provide valuable theoretical and practical implications. From a theoretical perspective, this study enriches the literature by providing empirical evidence about the moderation effect of board independence on the associations between board diversity and environmental performance in the Asia Pacific region. Notably, the results suggest that the board independence level moderates the effect of gender and tenure board diversity on environmental performance. For firms in the Asia Pacific region, firms should strive to attract female independent board members, which is a board attribute that could be vital to enhancing environmental performance. The findings of this study also provide valuable implications for firms' shareholders as their voting decisions to elect the board of directors need to consider the diversity of the board due to its impact on environmental performance. This study is not circumscribed by any definitive limitations that might impede future research efforts, although the dataset used in this study warrants further consideration. While the current dataset encompasses all publicly listed firms that have an available environmental performance score on Bloomberg, future studies could benefit from exploring alternate sources of data, such as Refinitiv Eikon (formerly Thomson Reuters Eikon). Additionally, while this study has focused on board independence as a moderating variable, other CEO-related characteristics remain ripe for examination.

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