

Determinants of Sustainability Assurance Level: Evidence from Energy Companies in Asia

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Abstract. This research highlights the elements that impact corporate decision-making pertaining to the degree of sustainability assurance among enterprises operating within the Asian energy sector. In light of the escalating demands for the enhancement of transparency and accountability within sustainability disclosures has led to the identification of the assurance level as a crucial instrument for enhancing the veracity of environmental, social, and governance (ESG) disclosures. Utilizing panel data derived from energy firms monitored throughout the duration of the study, this investigation employs panel data regression analysis, specifically estimated via Panel Least Squares methodology. The extent of sustainability assurance—delineated into no assurance, limited assurance, and reasonable assurance—operates as the dependent variable within the analytical framework, the independent variables are constituted by the attributes of the assurance provider, the extent of media pressure, various dimensions of board size, and the independence of the audit committee, with profitability, operationalized through return on assets (ROA), the inclusion of a control variable is warranted. The empirical results suggest that the characteristics of assurance providers, the degree of media pressure, and profitability have a positive and statistically significant effect on the assessment of the level of sustainability assurance. Corporations that engage the services of Big Four assurance firms, experience intensified media scrutiny, and demonstrate superior financial performance are more predisposed to opt for a reasonable assurance level. In contrast, the dimensions of the board and the autonomy of the audit committee do not demonstrate a statistically significant association with the selection of assurance level. These findings indicate that external pressures and financial capacity are more influential drivers of higher sustainability assurance levels than internal governance attributes. Overall, this study offers relevant insights for firms, regulators, and stakeholders seeking to strengthen sustainability assurance practices and enhance the legitimacy and credibility of ESG reporting.

Keywords: Assurance Provider, Legitimacy, Media Pressure, Profitability, Sustainability Assurance

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Introduction

As corporations progressively rely on environmental, social, and governance (ESG) disclosures to articulate their non-financial performance metrics, apprehensions pertaining to the reliability of sustainability information have intensified. Regulatory advancements, intensified scrutiny from investors, and the growing expectations of society have underscored the importance of transparency and the veracity in the methodologies employed for sustainability reporting (Gipper et al., 2025). ESG disclosures are now anticipated to furnish decision-relevant information, rather than serving solely symbolic functions, particularly in scenarios where sustainability performance is intrinsically tied to the creation of long-term value. In spite of the widespread implementation of sustainability reporting, substantial challenges persist concerning the uniformity and comparability of the disclosed ESG information. Unlike financial reporting, which is primarily investor-oriented and governed by well-established standards, sustainability reporting addresses a broader group of stakeholders, including those indirectly affected by corporate activities (Pramono Sari et al., 2023). This broader stakeholder orientation increases reporting complexity and heightens the risk of selective disclosure, thereby strengthening the demand for mechanisms that enhance reporting credibility.

In response to these challenges, sustainability assurance has gained prominence as a tool designed to improve confidence in reported ESG information through independent verification (Gipper et al., 2025). Nevertheless, the practices associated with sustainability assurance exhibit significant disparities across various organizations and legal frameworks. These discrepancies stem not only from the differing assurance standards that have been instituted include ISAE 3000 and AA1000 AS, but also from the diverse professional backgrounds of the assurance providers, which encompass both accounting and non-accounting professionals (Oware & Moulya, 2023). These inconsistencies reflect the absence of internationally harmonized assurance frameworks and indicate that assurance quality cannot be inferred solely from the existence of assurance itself (Maroun, 2022).

A fundamental aspect that differentiates sustainability assurance engagements is the degree of assurance attained, which is typically classified into limited assurance or reasonable assurance. The levels

of assurance exhibit variability concerning the scope of audits, the rigor involved in risk assessment, and the extent of confidence communicated to users of the reports (Maroun, 2022; García-Sánchez et al., 2022). Preliminary investigations suggest that the identification of assurance levels constitutes a strategic choice impacted by reputational factors, financial limitations, and organizational efforts aimed at sustaining legitimacy (Hodge et al., 2009). Consequently, organizations operating within industries that are intensive in Environmental, Social, and Governance (ESG) considerations, or those subjected to intensified external scrutiny, are predisposed to seek elevated assurance levels.

In addition to external influences, internal governance frameworks may significantly influence decisions regarding sustainability assurance. The presence of board oversight, the autonomy of audit committees, along with the efficacy of internal monitoring mechanisms have been correlated with corporate transparency and accountability, which includes the methodologies of sustainability reporting and the criteria for the selection of assurance providers (Emma et al., 2024). Furthermore, concerns regarding legitimacy and media exposure interact with governance structures, thereby affecting outcomes related to assurance (Hammami & Hendijani Zadeh, 2020).

Notwithstanding the widespread dissemination of sustainability reporting on a global scale, the adoption of sustainability assurance demonstrates a notable disparity across various geographical regions. For instance, recent findings from Singapore reveal that a mere 17% of organizations have secured external sustainability assurance, while a considerable proportion of small and medium-sized enterprises persist in relying on manual techniques for data collection methodologies, thereby elevating the risk of inaccuracies in reporting (PwC, 2024). In addition, the International Federation of Accountants underscores that the sustainability assurance market is characterized by fragmentation, marked by a variety of professional backgrounds and the lack of standardized qualification criteria.

These circumstances highlight an enduring disparity between the escalating demand for credible ESG information and the capabilities of firms to produce assured sustainability reports, particularly regarding the identification of suitable sustainability assurance levels. Notwithstanding its critical significance, this matter remains inadequately addressed within the current body of literature.

This study addresses a critical gap in the literature by examining the determinants of sustainability assurance level selection, a topic that remains underexplored, particularly in the context of emerging Asian energy markets. While prior studies have predominantly focused on the adoption of sustainability assurance or ESG disclosure practices, limited attention has been given to the factors influencing firms' choice between different assurance levels, such as limited and reasonable assurance.

Accordingly, this study investigates how assurance provider characteristics, media pressure, corporate governance mechanisms, and firm profitability shape the selection of sustainability assurance levels among energy sector firms in Asia. The novelty of this research lies in its integrated approach, combining external pressures (assurance providers and media influence) with internal governance structures and financial capacity within a single empirical framework. By doing so, the study provides new insights into how firms respond to legitimacy pressures through their assurance decisions, thereby contributing to the development of the sustainability assurance literature.

Literature Review and Hypothesis Development

Legitimacy Theory and Sustainability Assurance

Legitimacy theory asserts that the enduring viability of an organization is contingent upon the degree to which its operations are congruent with the dominant social values, norms, and anticipations (Emma et al., 2024). Organizations are able to maintain their licence to operate as long as their actions are perceived as socially acceptable; nevertheless, divergences from these established standards may instigate challenges to legitimacy that jeopardize the sustainability of organizations (Suchman & Mark C, 1995). In the realm of sustainability, Environmental, Social, and Governance (ESG) issues are acknowledged as prominent sources of legitimacy pressure (Simnett et al., 2009). When organizations face intensified public examination concerning their ESG performance, it is probable that management will react by augmenting the transparency and credibility of corporate disclosures as part of a comprehensive legitimacy-preserving strategy designed to obtain stakeholder endorsement (Hodge et al., 2009). In this context, sustainability reporting serves not only as a disclosure instrument but also as a mechanism through which independently verified non-financial information can

augment the apparent authenticity of organizational discourse (O'Dwyer & Owen, 2005).

Moreover, prior investigations indicate that the level of confidence attributed to sustainability disclosures significantly influences perceptions of reporting quality. Higher levels of assurance, particularly reasonable assurance, are generally regarded as stronger signals of credibility compared to limited assurance. Reasonable assurance has been shown to be more effective in mitigating information asymmetry and reducing concerns related to greenwashing practices associated with ESG disclosures (Maroun, 2022).

Assurance Level in Sustainability Reporting

A relevant and current topic, the matter of sustainability assurance is perceived as an independent verification mechanism, a methodical framework aimed at enhancing the precision and dependability of sustainability disclosures provided by corporate entities (Oware & Moulya, 2023). In contrast to the obligatory nature of financial statement audits, which are conducted in accordance with stringent standards, sustainability assurance is generally elective and exhibits variability concerning the breadth and depth of the assurance rendered (Simnett et al., 2009). At the global dimension, the concept of sustainability assurance is predominantly characterized by the criteria articulated in ISAE 3000 (Revised), promulgated by the International Auditing and Assurance Standards Board (IAASB), and intrinsically includes the principle of two distinct tiers of assurance, specifically limited assurance and reasonable assurance, which diverge considerably with respect to the degree of assurance rendered and the nature of the testing procedures employed and the comprehensiveness of the procedures undertaken by the assurance providers (IAASB, 2013).

Limited assurance confers a moderate level of assurance and encompasses procedures that are generally constrained to inquiries, analytical assessments, and document reviews. The resultant assurance report is typically formulated in the structure of a negative conclusion, which may include a statement such as "nothing has come to the practitioner's attention to cause them to believe that the subject matter is materially misstated." Conversely, reasonable assurance offers a heightened level of confidence through comprehensive testing and additional methodologies, including system evaluations, data validation, and evaluations of internal control frameworks, resulting in the delivery

of a positive assurance conclusion (Simnett et al., 2009; Quick & Inwinkl, 2020). The selection of assurance levels constitutes a strategic decision for corporations, weighing the anticipated advantages against the concomitant costs involved in the process. Reasonable assurance has been proved to be quite effective in overcoming the problem of information asymmetry and the risk of being associated with the phenomenon of greenwashing; in contrast, it calls for higher time and cost, as well as the effort of the assurance giver as compared to limited assurance levels of the process (Perego & Kolk, 2012; García-Sánchez et al., 2022). As a result, firms do not standardize the same assurance level. It is postulated that corporate considerations in making the decision between the use of limited assurance and reasonable assurance are driven by factors such as the drive for legitimacy, corporate governance structures, media coverage, and overall business complexity and sustainability risks (Simnett et al., 2009; Velte, 2025). In this regard, the assurance level not only serves the role of ensuring corporate compliance but is also an indicator of the quality of firm reporting and assurances about taking appropriate measures for transparency and accountability in their respective ESG disclosures.

Assurance Provider and Assurance Level

The identification of a provider for assurance services constitutes a critical decision in the realm of sustainability assurance frameworks, given its inherent association with the autonomy, reliability, and thoroughness of the verification protocols employed in the assessment of sustainability reports. At the international level, sustainability assurance services are delivered by professionals from diverse backgrounds, including public accounting firms, management consulting firms, and specialized sustainability service providers. Nevertheless, prior studies indicate that audit firms—particularly the Big Four—continue to dominate the sustainability assurance market (Ackers, 2015). Differences in assurance provider characteristics are closely associated with variations in assurance level. Sustainability assurance engagements are typically categorized into limited assurance and reasonable assurance, signifying variances in the extent of verification procedures and the level of risk assumed by the assurance provider. Reasonable assurance involves more extensive testing, more extensive verification methodologies, and an elevated degree of professional risk in comparison to restricted

assurance. Consequently, only assurance providers with sufficient methodological expertise and technical capacity are generally able to offer reasonable assurance engagements (Maroun, 2022; Ackers, 2015).

Empirical evidence further suggests that large audit firms face stronger reputation concerns and higher litigation risk, which incentivizes the implementation of more rigorous assurance protocols within sustainability reporting. Ackers (2015) identifies that corporations commonly engage the engagement of a singular audit firm the provision of assurance for both financial statement audits and sustainability evaluations functions to augment both operational efficiency and uniformity in assurance endeavors. This phenomenon indicates that the involvement of the Big Four audit firms is associated not only with the intention to obtain sustainability assurance but also with the propensity for a more advanced level of assurance.

However, the correlation between the attributes of assurance providers and the degree of assurance rendered is not consistently validated across various empirical studies. Maroun (2022) demonstrates that, within particular paradigms of corporate governance, the attributes of assurance providers do not consistently manifest as a primary factor influencing assurance levels. This observation implies that the impact of assurance providers cannot be entirely disentangled from internal governance structures and organizational decision-making processes. However, attributes of assurance providers continue to be a significant contextual element that may influence the rigor of assurance procedures, particularly in differentiating between limited and reasonable assurance engagements.

From the perspective of legitimacy theory, the entity providing assurance functions as a strategic instrument through which firms can bolster the perceived credibility of their sustainability disclosures. Firms that cultivate affiliations with reputable assurance providers, notably Big Four accounting firms, are anticipated to encounter stronger motivations to opt for reasonable assurance rather than limited assurance as a strategy for enhancing organizational legitimacy and stakeholder trust. In light of the aforementioned discussion, the subsequent hypothesis is proposed:

H₁: Assurance provider has a positive effect on the level of sustainability assurance.

Media Pressure and Assurance Level

Media scrutiny constitutes a significant external force that enhances corporate visibility, particularly concerning issues associated with sustainability. Extensive media exposure—especially when characterized by critical or contentious narratives—intensifies stakeholder cognizance of enterprises' environmental, social, and governance (ESG) considerations practices. Within this framework, the media serves as an external evaluative mechanism that influences public perceptions regarding the trustworthiness and caliber of corporate disclosures. Prior scholarly investigations indicate that heightened scrutiny from media entities incentivizes corporations to enhance the quality of data articulated in their sustainability reports (Emma et al., 2024)

From the lens of legitimacy theory, sustained media attention can intensify the risk of legitimacy loss when firms are perceived as failing to meet societal expectations related to ESG performance. To sustain public endorsement and uphold their operational legitimacy, organizations are consequently motivated to augment the veracity of their sustainability disclosures. A strategic approach to address such legitimacy pressures is the implementation of a more advanced level of sustainability assurance, as reasonable assurance imparts greater confidence to stakeholders in comparison to limited assurance (Emma et al., 2024).

Recent empirical findings further suggest that media pressure influences not only corporate disclosure strategies but also assurance practices and auditor behavior. Cai et al. (2024) elucidate that enterprises entangled in controversies pertaining to ESG issues are subjected to heightened audit risk. In response, auditors tend to intensify audit procedures, expand assurance efforts, and apply more rigorous verification processes. This dynamic indicates that media pressure increases firms' demand for more stringent assurance engagements, as higher assurance levels can help mitigate reputational and litigation risks associated with negative media exposure.

Consequently, organizations subjected to intensified media scrutiny are anticipated to seek elevated degrees of sustainability assurance serves to augment the credibility of their ESG disclosures and to respond to increased oversight from stakeholders. In light of this rationale, the subsequent hypothesis is formulated:

H₂: Media pressure has a positive effect on the level of sustainability assurance.

Audit Committee and Assurance Level

The audit committee operates as a fundamental component of corporate governance, assigned with the oversight of the reporting process mechanism and the extent of information transparency. A proficient audit committee augments monitoring capabilities, diminishes information asymmetry, and fosters managerial accountability in the formulation of both monetary and non-monetary disclosures, encompassing sustainability reporting (Cohen et al., 2014).

In the framework of a voluntary sustainability reporting paradigm, the audit committee assumes a critical function in assessing information risk and the dependability of ESG disclosures, as well as in assessing whether external verification mechanisms are necessary. Prior literature suggests that firms with stronger and more influential audit committees tend to exhibit higher reporting credibility, sustainability assurance is frequently illustrated by its implementation (Simnett et al., 2009). Within this context, sustainability assurance functions as a supplementary oversight mechanism aimed at constraining managerial latitude and alleviating the potential for skewed or performative ESG disclosures, including practices related to greenwashing.

Nonetheless, empirical evidence regarding the correlation between the characteristics of audit committees and the level of assurance is not consistent. Maroun (2022) provides evidence that highly effective audit committees may reduce the firm's reliance on high-level external assurance, as robust internal monitoring systems can partially substitute for external verification. This perspective implies that the strength of internal governance mechanisms may lessen the incremental value of reasonable assurance when internal controls are already well established.

Conversely, alternative research suggests that proactive, autonomous, and effectively operating audit committees may still motivate firms to seek elevated levels of sustainability assurance. From this perspective, the adoption of reasonable assurance is construed as a strategic initiative aimed at bolstering organizational legitimacy and augmenting the perceived reliability of sustainability disclosures among external stakeholders (García-Sánchez et al., 2022). The simultaneous existence of these varied findings suggests that the influence of the audit committee on decisions pertaining to assurance levels is contingent upon overarching corporate governance characteristics and contextual organizational factors.

Considering the theoretical frameworks alongside the diverse empirical results, it is expected that the audit committee will assume a crucial role in shaping firms' decisions regarding the extent of sustainability assurance. Therefore, the subsequent hypothesis is proposed:

H₃: Audit committee independence has a positive effect on the level of sustainability assurance.

Board Size and Assurance Level

In sustainability assurance decisions, board size is often associated with an essential component of corporate governance that illustrates the board's ability to supervise managerial operations, encompassing sustainability reporting. Within the domain of voluntary Environmental, Social, and Governance (ESG) disclosures necessitate that effective oversight acquires an augmented significance owing to the credibility of non-financial data cannot be assumed *ex ante* (Carol A & Richard, 2004; Simnett et al., 2009).

Corporate boards influence how firms respond to societal expectations, particularly through decisions related to disclosure and reporting practices. Within this context, legitimacy theory helps explain why boards may shape sustainability-related strategies. Boards of larger dimensions are typically correlated with an increased heterogeneity in terms of expertise, experience, and viewpoints, thereby augmenting the organization's capacity to address legitimacy challenges that may arise due to environmental and social issues (Akhtaruddin et al., 2009; Girella et al., 2022). This diversity enables firms to better articulate sustainability narratives and adopt reporting strategies aimed at maintaining societal approval and stakeholder confidence. Previous research indicates that organizations characterized by larger boards exhibit a heightened propensity to disseminate sustainability-related information with increased thoroughness and quality, predominantly as a reaction to societal anticipations and stakeholder examination (Velte, 2025; García-Sánchez et al., 2022).

From this vantage point, the resolution to implement an elevated degree of sustainability assurance can be interpreted as an element of a more extensive strategy aimed at establishing legitimacy. Compared to limited assurance, reasonable assurance entails more extensive verification procedures and provides a stronger level of confidence to users of sustainability reports, thereby enhancing the perceived legitimacy of the circulated data (IAASB, 2013; Simnett et al., 2009). In accordance with this rationale,

organizations distinguished by more extensive board compositions are anticipated to exhibit an increased propensity to opt for reasonable assurance as a mechanism for bolstering stakeholder trust, safeguarding corporate integrity, and preserving their operational license; hence, the subsequent hypothesis is posited:

H₄: Board size has a positive effect on the level of sustainability assurance.

Profitability as Control Variable

From a resource availability perspective, profitability may influence an important financial characteristic that may influence sustainability reporting and assurance practices. More profitable firms typically possess greater financial resources, enabling them to absorb the additional costs associated with obtaining higher-quality sustainability assurance. Moreover, firms with stronger financial performance are often subject to heightened stakeholder expectations regarding the provision of credible and reliable ESG information.

Empirical investigations illustrate a constructive correlation between profitability and both the magnitude and caliber of sustainability disclosures. Previous scholarly work indicates that financially prosperous enterprises are inclined to augment ESG disclosure as a component of a comprehensive strategy aimed at enhancing corporate legitimacy and reputation (Ali et al., 2017). In alignment with this perspective, Yusrianti et al. (2025) identify that profitability significantly influences the enhancement of sustainability reporting quality. In light of these insights, it is imperative to control for profitability in order to delineate the impacts of other explanatory variables on the degree of sustainability assurance chosen by corporations.

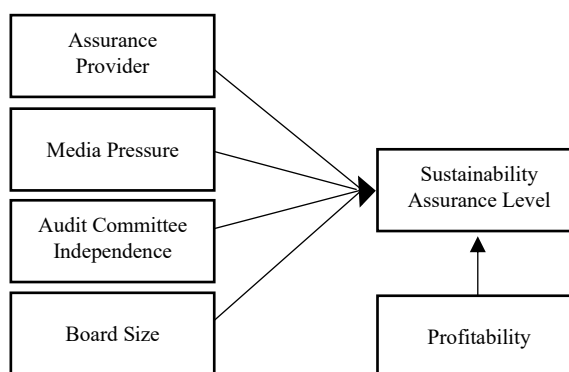


Fig. 1. Research Design Model

Research Method

In this case, this research utilizes a quantitative method that focuses on investigating the link between media pressures and schemes of governance, as well as the sustainability assurance levels adopted by companies. This manuscript shall delineate the demographic and sample characteristics, theoretical constructs, and the analytical model employed in the present investigation.

Population and Sample

The study examines firms operating in the energy sector across Asia, with the research population comprising 554 companies listed in the Refinitiv database during the 2020–2024 period. In accordance with Refinitiv's industry classification, the energy sector includes firms involved in oil and gas, renewable energy, coal, and other related activities. The research sample was determined through purposive sampling, applying specific selection criteria as outlined in Table 1.

Table 1
Sample Selection Criteria

Year	Sample Selection Criteria		Total Sample
	Energy sector companies listed in the Refinitiv database	Companies that do not disclose sustainability assurance data	
2020	554	(508)	46
2021	554	(508)	46
2022	554	(508)	46
2023	554	(508)	46
2024	554	(508)	46
Total	2770	(2540)	230

The analysis utilizes an unbalanced panel dataset spanning the 2020–2024 observation period. Based on the sampling criteria, 46 energy sector firms were included in the final sample. After conducting data screening and excluding observations with incomplete information, the dataset consists of 193 firm-year observations, which are subsequently employed in the regression analysis.

Variables

Table 2
Operational Definition of Variables

Dependent Variable	
Sustainability Assurance Level	
Definition	The sustainability assurance level refers to the degree and rigor of verification procedures applied in the assurance engagement as

reflected in firms' sustainability reports. (Maroun, 2022)

Symbol
Measurement ASSUR_LVL
Assurance Level (ordinal):
0 = no assurance
1 = limited assurance
2 = reasonable assurance

Independent Variables

Assurance Provider

Definition The quality of sustainability assurance providers in consideration of the involvement of the Big Four public accounting firms, which are esteemed for their exemplary reputation, specialized knowledge, and extensive resources (Cai et al., 2024)

Symbol
Measurement PROV_ASSUR
Dummy: 1 = Big Four; 0 = Non-Big Four

Media Pressure

Definition Media pressure is conceptualized as the degree of adverse media coverage associated with environmental, social, and governance (ESG) challenges encountered by organizations, which can influence societal perceptions and impact the legitimacy of the organization (Hammami & Hendijani Zadeh, 2020).

Symbol
Measurement MEDIA_P
ESG Controversy Score (%) from Refinitiv

Audit Committee Independence

Definition The degree of audit committee independence represents the extent to which audit committee members can exercise objective and impartial supervision of corporations' financial and non-financial disclosure mechanisms (García-Sánchez et al., 2022).

Symbol
Measurement AUDIT_C
The ratio of independent audit committee members to the total number of audit committee members.

Board Size

Definition The dimensions of the board are quantified by the aggregate count of directors functioning within the board, which serves as an indicator of the organization's governance framework and its ability to oversee managerial conduct (García-Sánchez et al., 2022)

Symbol
Measurement BOARD_S
The aggregate quantity of members constituting the board of directors.

Control Variables

Profitability (ROA)

Definition Profitability is quantified through a financial performance metric that illustrates an organization's capacity to produce income from its asset portfolio, which may affect sustainability reporting methodologies and the selection of assurance frameworks (García-Sánchez et al., 2022)

Symbol
Measurement ROA
EBIT / Average Total Assets

Research Model

This study utilizes panel data that integrate cross-sectional observations at the firm level with longitudinal datasets encompassing various timeframes. To examine the correlation among attributes of assurance providers, media influence, and corporate governance structures relative to the degree of sustainability assurance, the study applies the panel least squares estimation technique. Data processing, empirical analysis, and model diagnostics were carried out using EViews version 12. The analytical procedure includes panel regression model selection as well as the application of standard classical assumption tests, following established panel data methodology.

$$ASSUR_LVL_{it} = a + \beta_1 PROV_ASSUR_{it} + \beta_2 MEDIA_P_{it} + \beta_3 AUDIT_C_{it} + \beta_4 BOARD_S_{it} + \beta_5 ROA_{it} + \varepsilon_{it}$$

ASSUR_LVL	: Assurance Level
PROV_ASSUR	: Assurance Provider
MEDIA_PRESSURE	: Media Pressure
AUDIT_C	: Audit Committee Independence
BOARD_S	: Board Size
ROA	: Profitability

The Chow test was administered to differentiate in distinguishing between the Common Effect Model and the Fixed Effect Model, the Hausman test was utilized to differentiate between the Fixed Effect Model and the Random Effect Model. Given that the results of these assessments suggested a proclivity for the Fixed Effect Model, the present study employs the Fixed Effect Model due to its perceived superiority the most appropriate way in which firm-specific characteristics that are time-invariant but not observable can be controlled for (Hsiao, 2003). The evaluation of multicollinearity and heteroskedasticity was conducted to ascertain the validity and robustness of the estimated model. Such model selection and diagnostic processes are common and recommended in panel data analysis studies (Gujarati & Porter, 2009).

Results And Discussion

Descriptive Statistics

Table 3
Descriptive Statistics

ASSUR_LVL			
Mean	0.69	Max	2
Median	1	Std. Dev	0.55
Min.	0		
PROV_ASSURANCE			
Mean	0.36	Max	1
Median	0	Std. Dev	0.48
Min.	0		
MEDIA_PRESSURE			
Mean	92.4	Max	100
Median	100	Std. Dev	17
Min.	21.5		
AUDIT_C			
Mean	77.9	Max	100
Median	80	Std. Dev	21.2
Min.	33.3		
BOARD_S			
Mean	9.6	Max	20
Median	10	Std. Dev	4.3
Min.	0		
ROA			
Mean	0.05	Max	0.45
Median	0.05	Std. Dev	0.06
Min.	-0.16		

As reported in Table 3, the sustainability assurance level (ASSUR_LVL) has a mean value of 0.69, with a median of 1 and values ranging from 0 to 2. The median value of 1 indicates that the typical firm in the sample adopts limited assurance. However, the mean value below 1 suggests that a considerable proportion of firms either do not obtain sustainability assurance or remain at lower assurance levels. The distribution across assurance categories is more clearly reflected in Table 7, which shows that limited assurance is the most commonly adopted level among firms. The standard deviation of 0.55 indicates a moderate degree of variation in assurance levels across the sample.

Concerning the assurance provider variable (PROV_ASSURANCE), the mean value of 0.36 signifies that a mere minority of enterprises procure the services of the predominant assurance providers, often referred to as the Big Four, are utilized by a significantly lesser number of enterprises compared to those that engage non-Big Four organizations. This observation is further corroborated by the median value of zero and the maximum value of one. The standard deviation of 0.48 indicates a notable variability in the selection of assurance providers across diverse enterprises.

Media pressure (MEDIA_PRESSURE) demonstrates a notably elevated mean of 92.4, alongside a median value of 100, with recorded values spanning from 21.5 to 100. These statistics suggest that firms within the energy sector under consideration frequently encounter ESG-related media scrutiny. Nonetheless, the standard deviation of 17 highlights the discrepancies in the magnitude of media pressure encountered by various firms. It is important to note that this variable encompasses fewer observations relative to other variables, as controversy score data are not uniformly accessible for all firms throughout the observation period.

In terms of corporate governance attributes, board size (BOARD_S) has an average of 9.6 members, a median of 10, and a range that extends from 0 to 20 members. The standard deviation of 4.3 indicates substantial variation in board composition across energy sector firms. Meanwhile, audit committee independence (AUDIT_C) reveals a mean value of 77.9% and a median of 80%, suggesting that most firms demonstrate relatively high levels of audit committee independence, consistent with established corporate governance best practices. However, the number of observations for this variable is somewhat diminished due to inconsistencies in audit committee disclosures among firms.

Profitability, as gauged by return on assets (ROA), demonstrates a mean of 0.05 and a median of 0.05, with values extending from -0.16 to 0.45. This distribution reflects disparities in firms' financial performance, encompassing both loss-generating firms and those exhibiting relatively high profitability. The standard deviation of 0.06 indicates significant dispersion in profitability levels throughout the sample.

In summary, these descriptive statistics furnish an initial overview of the characteristics delineating energy sector firms within the Asian market, illustrating that a sufficient degree of variability exists across all variables utilized in the study to substantiate subsequent regression analyses.

Estimation Model Selection

Table 4
Chow and Hausman Test

Variable	CEM	FEM	REM
C	0.0007	0.3968	0.0097
PROV_ASSUR	0.0039	0.0093	0.0021
MEDIA_PRESSURE	0.0084	0.0015	0.0037
AUDIT_C	0.2789	0.8846	0.3236
BOARD_S	0.7782	0.9291	0.9532

Variable	CEM	FEM	REM
ROA	0.0752	0.0001	0.0077
Test	Statistic	d.f	Prob.
Chow Test (Cross-section F)	2.072523	(42,145)	0.0008
Chow Test (Cross-section Chi-square)	90.748936	42	0.0000
Hausman Test (Cross-section random)	13.882895	5	0.0164

Based on the findings delineated in Table 4, the process of selecting the most suitable panel data regression model was executed through a comparative analysis of the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The preliminary comparison between CEM and FEM was conducted utilizing the Chow test. The Chow test produces a probability value that falls beneath the 5% significance threshold, signifying that the Fixed Effect Model exhibits a superior fit in comparison to the Common Effect Model.

Subsequently, the Hausman test was employed to determine the optimal specification between the Fixed Effect Model and the Random Effect Model. The results of the Hausman test also indicate a probability value that is below 5%, implying that the Fixed Effect Model is more favorable compared to the Random Effect Model. As a result, the Fixed Effect Model is identified as the most appropriate estimation methodology for this research.

Heteroskedasticity Test

Table 5
Heteroskedasticity Test

Dependent Variable: ABS(RESID)			
C			
Coefficient	0.44	t-Stat.	1.60
Std. Error	0.27	Probability	0.109
PROV_ASSUR			
Coefficient	0.34	t-Stat.	1.22
Std. Error	0.28	Probability	0.22
MEDIA_PRESSURE			
Coefficient	0.00	t-Stat.	0.39
Std. Error	0.001	Probability	0.69
AUDIT_C			
Coefficient	-0.00	t-Stat.	-0.06
Std. Error	0.002	Probability	0.94
BOARD_S			
Coefficient	-0.007	t-Stat.	-0.48
Std. Error	0.01	Probability	0.62
ROA			
Coefficient	0.83	t-Stat.	2.37
Std. Error	0.35	Probability	0.189

As delineated in Table 5, the examination of heteroskedasticity within the regression model is

conducted utilizing the Absolute Residual (ABSRES) methodology, in which the absolute values of the regression residuals are regressed against all independent variables. The outcomes of the test reveal that the probability values corresponding to each independent variable surpass the 5% significance threshold ($p > 0.05$). This observation suggests the absence of a statistically significant relationship between the absolute residuals and the independent variables.

Consequently, the regression model does not demonstrate heteroskedasticity, signifying that the error variance remains constant across observations (homoskedastic). In light of these conditions, the estimated regression coefficients fulfill the criteria of the Best Linear Unbiased Estimator (BLUE). As a consequence, the forthcoming hypothesis testing can be construed as both valid and reliable.

Multicollinearity Test

Table 6
Multicollinearity Test

C	
Coefficient Variance	0.090946
Uncentered VIF	63.56607
Centered VIF	NA
PROV_ASSUR	
Coefficient Variance	0.006901
Uncentered VIF	1.499536
Centered VIF	1.03335
MEDIA_PRESSURE	
Coefficient Variance	5.28E-06
Uncentered VIF	32.40359
Centered VIF	1.11708
AUDIT_C	
Coefficient Variance	3.38E-06
Uncentered VIF	15.46373
Centered VIF	1.06085
BOARD_S	
Coefficient Variance	0.000116
Uncentered VIF	9.403674
Centered VIF	1.15837
ROA	
Coefficient Variance	0.324642
Uncentered VIF	1.867724
Centered VIF	1.07284

Based on the findings delineated in Table 6, the evaluation of multicollinearity is conducted through the application of the Variance Inflation Factor (VIF). The centered VIF metrics for all independent variables remain beneath the widely acknowledged benchmark of 10, with the majority of values approximating 1. These findings suggest that the independent variables exhibit minimal correlation with one another.

Consequently, the regression model does not experience complications associated with multicollinearity. This signifies that each explanatory variable imparts unique information pertinent to elucidating the dependent variable, thereby enabling the estimated regression coefficients to be interpreted with a high degree of confidence.

Results

Table 7
Frequency Distribution

PROVIDER_ASSUR			
Assurance Level	Category		
	Big 4	Non-Big 4	
No assurance	-	-	
Limited Assurance	94.5%	91.5%	
Reasonable Assurance	5.5%	8.5%	
Total	100%	100%	
MEDIA_PRESSURE			
Assurance Level	Category		
	Low	Medium	High
No assurance	20.69%	18.75%	32.93%
Limited Assurance	72.41%	50%	64.63%
Reasonable Assurance	6.90%	31.25%	2.44%
Total	100%	100%	100%
AUDIT_C			
Assurance Level	Category		
	Low	Medium	High
No assurance	36.17%	23.21%	35.16%
Limited Assurance	57.45%	73.21%	59.34%
Reasonable Assurance	6.38%	3.57%	5.49%
Total	100%	100%	100%
BOARD_S			
Assurance Level	Category		
	Small	Medium	Large
No assurance	53.03%	29.27%	26.83%
Limited Assurance	42.42%	68.29%	65.85%
Reasonable Assurance	4.55%	2.44%	7.32%
Total	100%	100%	100%
ROA			
Assurance Level	Category		
	Low	Medium	High
No assurance	54.55%	33.35%	25.58%
Limited Assurance	42.42%	60.65%	69.77%
Reasonable Assurance	3.03%	5.81%	4.65%
Total	100%	100%	100%

Based on Table 7, the distribution of sustainability assurance levels indicates that limited assurance predominates across nearly all variable categories. Among firms engaging Big Four assurance providers, limited assurance accounts for the largest share (94.55%), followed closely by firms using non-Big Four providers (91.49%). In contrast, the proportion of firms adopting reasonable assurance remains relatively small in both groups.

With respect to media pressure, firms classified under low and high media pressure categories

predominantly adopt limited assurance. However, firms exposed to a moderate level of media pressure exhibit a comparatively higher incidence of reasonable assurance, amounting to 31.25%. This pattern suggests that moderate media scrutiny may be associated with a greater inclination toward more rigorous assurance practices.

The distribution of governance-related variables, namely audit committee independence and board size, similarly demonstrates the dominance of limited assurance across categories. Nevertheless, firms with smaller boards display a slightly higher proportion of sustainability reports without external assurance. In terms of financial performance, firms with lower profitability (ROA) show a higher incidence of non-assured sustainability reports (54.55%). Conversely, firms with stronger financial performance tend to favor limited assurance, as reflected by a higher proportion of limited assurance adoption among firms with high ROA values (69.77%).

Overall, the patterns observed in Table 7 provide preliminary insights into how firm characteristics are associated with the selection of sustainability assurance levels. As such, this table serves as an initial descriptive analysis of firms' assurance level decisions prior to formal multivariate testing.

Table 8
Results

C			
Panel Least Squares			
Coefficient	Std. Error	t-Statistic	Prob.
0.53278	0.6268	0.8499	0.3968
PROVIDER_ASSUR			
Panel Least Squares			
Coefficient	Std. Error	t-Statistic	Prob.
0.34223	0.1298	2.6357	0.0093
MEDIA_PRESSURE			
Panel Least Squares			
Coefficient	Std. Error	t-Statistic	Prob.
0.05121	0.0158	3.2336	0.0015
AUDIT_C			
Panel Least Squares			
Coefficient	Std. Error	t-Statistic	Prob.
0.00074	0.0051	0.1454	0.8846
BOARD_S			
Panel Least Squares			
Coefficient	Std. Error	t-Statistic	Prob.
0.00293	0.0328	0.0890	0.9291
ROA			
Panel Least Squares			
Coefficient	Std. Error	t-Statistic	Prob.
3.23984	0.7757	4.1766	0.0001
R-squared	0.439307	F-statistic	2.417201
Adjusted R-squared	0.257565	Prob(F-statistic)	0.000033

Notes: significant at 5%

Discussion

Assurance Provider dan Assurance Level

As elucidated in Table 8, the variable `PROVIDER_ASSUR` demonstrates a positive and statistically significant association with the degree of sustainability assurance ($\beta = 0.342$; $p = 0.0093$; $p < 0.05$). This finding indicates that entities which procure services from Big Four assurance providers manifest a greater propensity to implement elevated levels of sustainability assurance, particularly reasonable assurance, in contrast to limited assurance. Consequently, Hypothesis H1 is substantiated, indicating that the selection of assurance provider exerts a favorable influence on the sustainability assurance level.

This observation aligns with existing empirical literature. Rajgopal et al. (2020) contend that auditors with esteemed reputations serve as effective external monitoring mechanisms, thereby alleviating the disparities in information access between management and stakeholders. In a comparable context, Cai et al. (2024) the involvement of Big Four auditing firms markedly elevates the caliber of sustainability assurance.

From the standpoint of legitimacy theory, the inclusion of Big Four assurance organizations may be interpreted as a strategic methodology employed by organizations aimed at bolstering legitimacy in the perception of investors, the public, and other stakeholders concerning ESG disclosures. Big Four auditors incentivize firms to opt for more stringent assurance levels as a manifestation of their commitment to the credibility and quality of reporting. The descriptive evidence articulated in Table 7 further corroborates this interpretation, revealing that firms utilizing Big Four providers are inclined to adopt higher assurance levels compared to those that depend on non-Big Four providers. In summary, these findings underscore the role of reputable assurance providers as integral components of firms' legitimacy-building strategies designed to fortify the credibility of sustainability reporting.

Media Pressure and Assurance Level

Based on the findings delineated in Table 8, the `MEDIA_PRESSURE` variable exhibits a positive and statistically significant correlation with the degree of sustainability assurance ($\beta = 0.051$; $p = 0.0015$; $p < 0.05$). This finding suggests that entities exposed to elevated levels of media pressure are more inclined to

opt for reasonable assurance as opposed to limited assurance. Consequently, Hypothesis H2 is corroborated, validating that media pressure exerts a positive influence on the sustainability assurance level.

This outcome aligns with previous research that underscores the significance of media exposure in influencing corporate sustainability practices. Velte (2025) posits that media scrutiny acts as a pivotal external mechanism that motivates organizations to augment transparency in sustainability reporting, including the integration of assurance frameworks. In this context, the current findings substantiate the assertion that media pressure serves as a critical determinant in organizational choices regarding sustainability assurance.

From the vantage point of legitimacy theory, media pressure operates as an external impetus this compels organizations to either sustain or enhance the credibility of their Environmental, Social, and Governance (ESG) disclosures (Emma et al., 2024). Elevated media scrutiny, particularly when characterized by negative or contentious coverage, heightens public examination of corporate sustainability performance. In reaction to such scrutiny, organizations generally endeavor to augment the veracity of their Environmental, Social, and Governance (ESG) disclosures can be enhanced by selecting higher standards of assurance, consequently protecting institutional integrity and preserving legitimacy (Emma et al., 2024; Cai et al., 2024). The empirical data presented in Table 7 supports the outcomes of the regression analysis, suggesting that organizations subjected to moderate or substantial media pressure demonstrate a greater inclination to implement heightened assurance levels in contrast to those facing comparatively minimal media pressure.

Audit Committee Independence dan Assurance Level

Based on the regression analysis presented in Table 8, the independence of the audit committee (AUDIT_C) exhibits a positive, albeit statistically insignificant, association with the degree of sustainability assurance. This assertion is corroborated with a p-value of 0.8846, which surpasses the 5% threshold for statistical significance. The results imply that the extent of audit committee independence does not serve as a pivotal determinant in the decision-making processes of firms concerning the level of sustainability assurance implemented. Consequently, Hypothesis H3 is not corroborated, as audit committee

independence does not seem to exert a significant effect on the tiers of sustainability assurance.

This observation aligns with earlier studies indicating the role of autonomous audit committees within the framework of sustainability assurance often manifests as indirect and contingent upon various contextual variables. Maroun (2022) it is asserted that the existence of proficient audit committees does not necessarily result in an augmented reliance on external verification, as robust internal governance frameworks may act as partial substitutes for external validation. Similarly, García-Sánchez et al. (2022) it can be deduced that the attributes of audit committees do not consistently demonstrate a substantial influence on sustainability assurance practices across varied institutional and regulatory contexts.

From the viewpoint of legitimacy theory, the absence of statistical significance may be elucidated by the symbolic essence of audit committee independence. While independence is typically correlated with adherence to governance standards, it does not necessarily translate into meaningful actions, such as the implementation of elevated levels of sustainability assurance. Emma et al., (2024) underscore that strategic reactions to ESG-related pressures assume a more significant role in augmenting corporate legitimacy within the sustainability framework than formal governance characteristics alone. The descriptive evidence showcased in Table 7 further reinforces this interpretation, as fluctuations in audit committee independence do not reveal a definitive trend in relation to the selection of sustainability assurance levels.

Board Size and Assurance Level

Referring to the regression analysis outcomes delineated in Table 8, the BOARD_S variable presents a coefficient that is positive yet statistically insignificant ($\beta = 0.0029$; $p = 0.9291$; $p > 0.05$). This discovery indicates that the number of directors comprising the board does not significantly influence firms' determinations to embrace elevated levels of sustainability assurance. As a result, Hypothesis H4 lacks empirical support, given that board size fails to demonstrate a substantial relationship with the level of sustainability assurance.

Empirically, this observation is consistent with the insights delineated by Tjahjadi et al. (2021), who contend that the dimensions of the board do not have a substantial influence on the performance pertaining to environmental sustainability. Nonetheless, it stands

in contrast to the evidence provided by Maroun (2022) and Emma et al., (2024), which posits that larger boards may favorably affect the execution of sustainability practices and the adoption of sustainability assurance. These divergent findings suggest that the impact of board composition on sustainability-oriented matters outcomes is dependent on the efficacy and involvement of boards in promoting organizational sustainability initiatives, as opposed to board size in isolation.

From a legitimacy theory perspective, board size may signal formal compliance with good governance principles but does not necessarily translate into substantive actions aimed at enhancing the quality of sustainability reporting. Emma et al. (2024), argue that corporate legitimacy is more strongly shaped by firms' strategic responses in comparison to external influences, structural governance characteristics, including the dimensions of the board, exert a lesser degree of impact. In this context, the size of the board may predominantly serve as a mechanism of symbolic legitimacy, without directly influencing the choice of sustainability assurance level. The descriptive evidence reported in Table 7 supports this interpretation, as variations in board size do not reveal a clear pattern in assurance level selection. Firms with small, medium, or large boards remain predominantly associated with limited assurance, indicating that larger board size alone does not prompt the adoption of reasonable assurance.

Profitability as Control Variable

Referring to the regression results reported in Table 8, profitability, measured by return on assets (ROA), shows a positive and statistically significant relationship with the level of sustainability assurance ($\beta = 3.23984$; $p = 0.0000$; $p < 0.05$). This observation suggests that corporations exhibiting elevated levels of profitability are predisposed to prefer reasonable assurance over limited assurance. This conclusion aligns with previous research conducted by Ali et al. (2017) (Emma et al., 2024) and García-Sánchez et al. (2022) (Emma et al., 2024), which underscore the critical significance of financial performance in facilitating the disclosure of Environmental, Social, and Governance (ESG) information, as well as the endeavors related to sustainability assurance, is of paramount importance. The integration of Return on Assets (ROA) as a control variable within this analytical framework significantly bolsters the empirical robustness, suggesting that the financial capacity of firms is intricately linked to their

determinations concerning the level of sustainability assurance.

From the perspective of legitimacy theory, higher profitability is also associated with greater public and stakeholder expectations for credible and reliable sustainability information (Velte, 2025). Strong financial performance signals the availability of sufficient resources to absorb the additional costs associated with more rigorous assurance engagements. As a result, financially stronger firms are better positioned to pursue higher-quality sustainability assurance as part of their broader strategy to maintain legitimacy and stakeholder confidence.

Conclusion

This study investigates the determinants that affect the choice of sustainability assurance levels among organizations within the energy sector functioning in the Asian context. The empirical results demonstrate that external assurance-related factors and firm-specific financial capacity play a central role in shaping firms' assurance decisions. Specifically, the choice of assurance provider, media pressure, and profitability are found to significantly affect the propensity to embrace elevated standards of sustainability assurance can be significantly affected. Entities that engage the offerings of the Big Four assurance firms, encounter increased scrutiny from the media, and demonstrate enhanced financial outcomes are inclined to prefer reasonable assurance, which provides an elevated level of credibility to stakeholders.

These findings highlight the predominance of external pressures and resource availability over internal governance structures in determining sustainability assurance strategies. In comparison, the features of the governing body and the judgment of the audit committee do not indicate a statistically significant connection with the magnitude of sustainability assurance executed by corporations. This suggests that formal governance attributes alone are insufficient to explain assurance level choices when compared to the influence of reputational concerns, public scrutiny, and financial capability. Interpreted through the framework of legitimacy theory, the findings suggest that organizations exhibit a more pronounced reaction to external legitimacy pressures in comparison to internal governance attributes when formulating strategic decisions pertaining to sustainability assurance. The credibility of assurance entities, the degree of media visibility, and the strength of financial resources appear to

operate as critical mechanisms through which organizations endeavor to augment the veracity of their Environmental, Social, and Governance (ESG) disclosures while simultaneously preserving societal endorsement.

Notwithstanding its contributions, this study is subject to several limitations that provide directions for future research. First, the sample is limited to 46 energy sector companies in Asia, which may constrain the generalizability of the findings to the broader population of energy firms across the region. Accordingly, the results should be interpreted with caution, as they may not fully represent the diversity of sustainability assurance practices among all energy sector companies in Asia. Future studies are encouraged to employ larger and more representative samples to enhance the generalizability of the findings. Second, the analysis is restricted to a selected set of explanatory variables, namely assurance provider characteristics, media pressure, corporate governance mechanisms, and profitability. Future research may incorporate additional variables, such as regulatory stringency, ownership structure, or stakeholder engagement, to provide a more comprehensive understanding of sustainability assurance decisions. Finally, this study relies on a panel least squares approach, which may not fully capture the ordinal nature of the dependent variable. Future research could consider alternative methodological approaches, such as ordered logit or probit models, to further validate and extend the findings.

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