



Carbon Emissions and Employee Turnover on Firm Value: The Moderating Role of Corporate Governance

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Abstract: *The rapid growth of the global video game industry has been accompanied by increasing environmental and social challenges. As a sector that relies heavily on data centers, online distribution, and skilled human capital, the video game industry faces sustainability pressures that may influence investor perceptions and firm valuations. This study aimed to analyze the effects of carbon emissions intensity and employee turnover rate on firm value, with Good Corporate Governance (GCG) as a moderating variable. The sample comprises 30 publicly listed international video game companies over the 2022–2024 period. This study employs Moderated Regression Analysis (MRA). The results reveal that carbon emission intensity has a significant negative effect on firm value. Meanwhile, independent boards can moderate the impact of carbon emissions intensity on firm value. Furthermore, employee turnover rates show no significant effect on firm value.*

Keywords: *Carbon emission; Employee turnover rate; Firm value; Governance.*

1. Introduction

The video game industry is one of the largest industries in the entertainment and creative industries (Rykała, 2020). However, this growth also has significant environmental and social consequences. Researchers found that video game companies worldwide accounted for at least 14 million tons of CO₂ emissions by 2023. This could even reach 24 million tons of carbon emissions per year (Mills et al., 2019). Greenhouse gas emissions are a major driver of climate change, characterized by rising global temperatures due to the accumulation of atmospheric carbon (Abbass et al., 2022). In addition to environmental aspects, this industry also faces employment issues such as crunch culture, high work pressure, and job instability (Cote & Harris, 2023). These pressures can negatively affect employee well-being, including stress, which significantly contributes to employee turnover (Salama et al., 2022). Therefore, sustainability issues, including environmental and social aspects, are crucial in the video game industry because they can affect a company's reputation. So stakeholders will see it as a risk and be reluctant to invest in the shares, which in the end can increase or decrease the firm's value (Le & Nguyen-Phung, 2024; Li et al., 2022).

Companies with high emissions can potentially experience reputational damage and increased operational costs (Trinks et al., 2020). Some research has found that carbon emissions negatively impact company performance (Le & Nguyen-Phung, 2024). However, several studies showed inconsistent results (Alzura, 2025; Feng & Wareewanich, 2024; Y. Han et al., 2023; Kurnia et al., 2021; Lee & Cho, 2021). On the other hand, high employee

Turnover can reduce productivity, increase recruitment and training costs, and reduce a company's intellectual capital (Al-Suraihi et al., 2021). Previous research shows that low employee turnover and high firm value are generally rooted in high employee satisfaction (Singh & Loncar, 2010; Wen et al., 2022). Firm value itself reflects market perceptions of a company's prospects and efficiency in managing resources (Samhadi & Saiful, 2024).

The inconsistent findings may be partly due to differences in the effectiveness of GCG implementation across firms, which can affect firm value (Kurnia & Listyaningsih, 2025). GCG encourages greater transparency in performance and the disclosure of greenhouse gas (GHG) emissions. Researchers found that companies with high governance quality are viewed by investors as more capable of investing effectively in carbon-reduction technologies than companies with inadequate governance (Perdichizzi et al., 2024). The independence of boards of directors is associated with lower GHG emissions and helps balance financial performance and environmental responsibility (Kim et al., 2023). Regarding employee turnover, the implementation of GCG through ethical leadership, responsible management, and governance mechanisms promotes job satisfaction, reduces employee turnover intentions, increases organizational commitment, and improves decisions regarding termination of employment (Islam et al., 2023; Malikov et al., 2021; Yasin, 2021), thereby minimizing turnover and clarifying its impact on firm value. However, previous research linking GCG's role to reducing carbon emissions and employee turnover, which in turn affect firm value, remains very limited. Therefore, this study aims to examine the role of GCG in the relationship between carbon emissions and employee turnover, and firm value.

2. Literature Review & Hypotheses development

2.1. Stakeholder Theory

Stakeholder theory is a fundamental concept in business ethics and organizational management that views companies as entities that create value for various parties, not just shareholders (Kivits & Sawang, 2021). This approach emphasizes the importance of managing relationships with all stakeholders to create shared value and ensure sustainable organizational success (Jones et al., 2018). In the context of the video game industry, companies need to control carbon emissions as an environmental responsibility and maintain employee well-being to reduce workforce turnover. This is because high carbon emissions can harm a company's reputation and increase operational costs (Trinks et al., 2020). High employee turnover at that video game company can disrupt productivity and increase company costs (Al-Suraihi et al., 2021). By balancing these interests, companies can maintain productivity and increase corporate value sustainably.

2.2. Firm Value

Firm value reflects a company's success in increasing its share price and improving shareholder welfare (Muliani et al., 2023). Firm value is also reflected in its debt structure and equity market value, as investment decisions and new share issuances can increase firm value (Sudarmanto et al., 2021; Diantara & Budiarto, 2025). According to Jensen and Meckling (1976), maximizing firm value is crucial for increasing shareholder wealth and

attracting investor interest in the theory of the firm (Indrarini, 2019; Trinks et al., 2020). Sustainability issues, including environmental and social aspects, in the video game industry are crucial because they can affect a company's reputation, which in turn can increase or decrease firm value (Le & Nguyen-Phung, 2024; Li et al., 2022). Firm value is the result of capital market activities and is often associated with stock prices. For investors, firm value indicates the extent to which a company optimizes the use of its resources, as reflected in price movements; hence, an increase in the stock price may suggest a rise in firm value (Samhadi & Saiful, 2024). Based on the issues in the video game industry discussed earlier, high carbon emissions can harm a company's reputation and increase operational costs (Trinks et al., 2020). while high employee turnover can disrupt productivity and increase company costs (Al-Suraihi et al., 2021). Therefore, these two factors, which are carbon emissions and employee turnover, can influence firm value.

2.3. Carbon Emission

Carbon emissions are naturally occurring, but the primary cause is human activity. In companies, they generally originate from the combustion of fossil fuels and various energy-based operational activities (Abbass et al., 2022). Many business activities have the potential to generate emissions. Even in the video game industry, emissions can arise from energy consumption across video game development, distribution, server operations, and even gameplay (Mayers et al., 2015). Carbon emissions are important because companies with high emissions may face reputational damage and higher operational costs (Trinks et al., 2020). According to the United Nations Framework Convention on Climate Change (UNFCCC), there are six types of gases classified as greenhouse gases (GHGs). Although Carbon Dioxide (CO₂) has the lowest warming potential among GHGs, it is the most abundant gas in the atmosphere. Therefore, CO₂ has become the primary driver of global warming and has attracted greater attention from companies and governments, prompting various efforts to reduce emissions (IPCC, 2022, 2023; Lightfoot & Ratzer, 2024).

2.4. Turnover Employee

Employee turnover is the movement of employees out of an organization and their replacement by new employees, encompassing both voluntary and involuntary separations, and it impacts productivity, morale, and operational stability (Abbasi & Hollman, 2000). Turnover can be categorized as voluntary vs. involuntary, functional vs. dysfunctional, and controllable vs. uncontrollable turnover (Hom et al., 2020). Causal factors include job aspects, such as stress, dissatisfaction, and low commitment, as well as organizational factors such as poor leadership, an unhealthy work environment, and inadequate rewards (Songara, 2025). The consequences of employee turnover are both positive and negative. Positive impacts include opportunities for reorganization, recruitment of better-performing employees, and new perspectives. However, negative impacts are more pronounced, including decreased productivity, workflow disruption, and damage to service quality and customer satisfaction, as well as damage to the company's reputation, which can hinder organizational sustainability (Al-Suraihi et al., 2021; Hom et al., 2017).

2.5. Good Corporate Governance

Corporate governance (GCG) is a system that directs and controls a company by distributing rights and responsibilities among the board of directors, management, shareholders, and other stakeholders, guided by the principles of independence, transparency, accountability, fairness, and responsibility (Hamdani, 2016; Sudarmanto et al., 2021). GCG implementation enables businesses to define goals, assess performance, and maximize the creation of economic and social value. In the environmental context, independent boards have been linked to lower greenhouse gas emissions and increased transparency (Kim et al., 2023). In terms of human resources, GCG can improve job satisfaction, minimize turnover intentions, and strengthen organizational commitment (Islam et al., 2023; Malikov et al., 2021; Yasin, 2021). In general, GCG practices boost corporate value by increasing supervisory roles, although their effectiveness varies with firm characteristics (Mayzona & Rusmanto, 2025). GCG measurement encompasses various mechanisms, including an independent board of directors, institutional ownership, board gender diversity, board size, audit committee size, and managerial ownership (Aryani & Andesto, 2025; Eugster et al., 2024). This study uses three mechanisms, namely an independent board of directors, audit committee size, and managerial ownership.

2.6. Hypotheses

Several studies have shown that carbon emissions impact firm value. A European study found that carbon emissions negatively affect market value by increasing cash flow uncertainty and the cost of capital due to regulatory risk and future environmental liabilities (Perdichizzi et al., 2024). Similar findings in Australia and Korea indicate that increasing carbon emissions lowers firm value, as investors perceive high emissions as risks associated with carbon taxes, compliance costs, and regulatory pressure (Choi et al., 2021; Kim et al., 2023). Cross-country research also shows that markets tend to discount companies with high emissions, particularly those with low carbon disclosure (Choi & Luo, 2021). However, conflicting findings indicate a positive relationship between carbon emissions and firm value, attributed to investor perceptions and a relatively relaxed regulatory context (H. Han et al., 2023). Nevertheless, the majority of the literature supports a negative relationship between carbon emissions and firm value. Based on these arguments, the following hypotheses are proposed:

H₁: Carbon emissions intensity has a significant negative effect on firm value.

Employee turnover can reduce productivity due to the loss of experience, workflow disruption, and recruitment and training costs, ultimately impacting firm value (Al-Suraihi et al., 2021). Research shows that employee turnover tends to negatively impact firm value or performance, although the magnitude of the effect depends on company characteristics (Li et al., 2022). The negative impact is stronger in small, young, or immature companies. A study of publicly traded companies in Europe also found that turnover is negatively correlated with firm value, particularly in low-performing companies (Garsa, 2024). Furthermore, the departure of high-performing employees has a greater negative impact than that of average employees (Kwon et al., 2023). While there are indications of an optimal

turnover rate, most of the literature suggests that higher employee turnover tends to decrease firm value. Based on these arguments, the following hypotheses are proposed:

H₂: Employee turnover rate has a significant negative effect on firm value.

The inconsistent findings may be partly due to differences in GCG implementation across firms. GCG encourages greater transparency in performance and the disclosure of greenhouse gas (GHG) emissions. Researchers found that companies with high governance quality are viewed by investors as more capable of investing effectively in carbon-reduction technologies than companies with inadequate governance (Perdichizzi et al., 2024). Furthermore, board independence is associated with lower GHG emissions and helps balance financial performance and environmental responsibility (Kim et al., 2023). Regarding employee turnover, the implementation of GCG through ethical leadership, responsible management, and governance mechanisms promotes job satisfaction, reduces employee turnover intentions, increases organizational commitment, and improves decisions regarding termination of employment (Islam et al., 2023; Malikov et al., 2021; Yasin, 2021), thereby minimizing turnover and clarifying its impact on firm value. However, previous research linking GCG's role to reducing carbon emissions and employee turnover, which in turn affect firm value, remains very limited. Therefore, this study aims to examine the role of GCG in the relationship between carbon emissions and employee turnover, and firm value.

Strong corporate governance helps improve carbon emissions control and investor confidence. Companies with strong GCG practices are considered better able to invest in low-carbon technologies and to manage environmental risks effectively (Perdichizzi et al., 2024). GCG practices, particularly board independence, also contribute to increasing firm value through oversight and transparency, although their effectiveness is influenced by company and industry characteristics (Halimah et al., 2025; Mayzona & Rusmanto, 2025). Various studies have shown that governance mechanisms such as independent boards, sustainability committees, and active oversight structures are associated with better emissions management (Elsayih, 2021; Oyewo, 2023). In addition, the market tends to penalize companies with high emissions and weak governance, whereas strong governance can mitigate risk perceptions through better carbon disclosure and management (Choi & Luo, 2021). Nevertheless, the effectiveness of certain mechanisms, such as ESG-based compensation, remains mixed (Cezanne et al., 2025). Based on these arguments, the following hypothesis is proposed:

H_{3a}: Independent board moderates the effect of carbon emissions on firm value.

H_{3b}: Managerial ownership moderates the effect of carbon emissions on firm value.

H_{3c}: Audit committee size moderates the effect of carbon emissions on firm value.

Implementing Good Corporate Governance (GCG) in a company can minimize employee turnover. GCG fosters ethical leadership and responsible management, thus encouraging job satisfaction and reducing employees' intention to leave the organization. Furthermore, GCG can increase organizational commitment and improve managerial decisions regarding workforce management, including recruitment, retention, and termination policies. These

conditions can increase company productivity and ultimately contribute to higher firm value (Islam et al., 2023; Malikov et al., 2021; Yasin, 2021). This is supported by previous research, which found that GCG has a significant positive effect on employee job satisfaction (Karyatun et al., 2023). This implies that the better the implementation of GCG in a company, the higher the job satisfaction, which in turn affects employee motivation, productivity, and the desire to remain in the organization, thereby reducing employee turnover.

Beyond its direct influence, GCG mechanisms may also play an important role as a moderating factor in the relationship between employee turnover and firm value. Effective governance mechanisms strengthen monitoring functions, improve accountability, and ethical conduct (Khatri et al., 2025). Companies with stronger governance structures are better able to manage human resource risks, maintain operational stability, and mitigate risks to organizational performance and long-term value (Manginte, 2024). Therefore, the presence of governance mechanisms such as an independent board, managerial ownership, and an audit committee may moderate the effect of employee turnover on firm value. Based on these arguments, the following hypotheses are proposed:

H_{4a}: Independent board moderates the effect of employee turnover on firm value.

H_{4b}: Managerial ownership moderates the effect of employee turnover on firm value.

H_{4c}: Audit committee size moderates the effect of employee turnover on firm value.

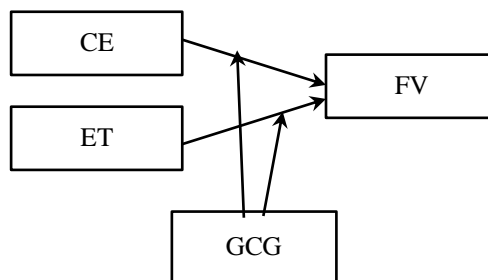


Figure 1. Research Model

Carbon Emission (CE) and Employee Turnover (ET) are proposed to directly influence Firm Value (FV), as they represent environmental and human capital risks that may affect investor perceptions and future cash flow expectations. Higher emissions and turnover can increase regulatory, reputational, and operational risks, thereby reducing firm value. Good Corporate Governance (GCG) moderates these relationships by strengthening monitoring, transparency, and strategic oversight.

3. Method

The population in this study was international video game companies that went public between 2022 and 2024. The sample was determined using a purposive sampling method, selecting samples based on the following criteria:

- a. This study only examined international video game companies that had gone public and whose primary business was video games, not parent companies whose primary business lines were outside the video game sector.
- b. This study only examined companies that had carbon emission reports.
- c. This study was conducted only during the period 2022 and 2024.

Based on these criteria, 30 companies were selected for the three periods 2022 and 2024, resulting in a total of 90 observations. The data used were secondary, drawn from reports disclosed by each company.

Firm value was measured using the Tobin's Q ratio, which represents the market value of a company's assets at replacement cost (H. Han et al., 2023). If Tobin's Q is 1, the stock is considered average, indicating that its asset management and investment growth potential are not developing. Meanwhile, if Tobin's Q is >1, the stock is overvalued, indicating successful management of the company's assets and thus offering high investment growth potential. Carbon emissions (CE) were measured using data readily available in companies' sustainability reports on greenhouse gas (GHG) emissions. To measure carbon emissions, this study employed the method used in previous research, namely, carbon emission intensity (Perdichizzi et al., 2024). An independent board is measured by comparing the number of independent board directors to the company's total number of board members (Kim et al., 2023). Managerial ownership is measured using a ratio scale that compares the number of shares owned by management to the company's total outstanding shares (Himawan, 2022).

Table 1. Variable Measurement

Variable	Measurement
Firm Value (H. Han et al., 2023)	Tobin's Q = $\frac{(\text{Equity Market Value} + \text{Debt})}{(\text{Equity Book Value} + \text{Debt})}$
Carbon Emission (Perdichizzi et al., 2024)	$E = \frac{\Sigma \text{Carbon Emission}}{\text{Revenue}}$
Employee Turnover (Hasibuan, 2017)	$ET = \frac{\text{Number of Employees accepted} - \text{Number of employees left}}{(\text{Initial number of employees} + \text{final number of employees}):2} \times 100\%$
Independent Board Proportion (Kim et al., 2023)	$IB = \frac{\Sigma \text{Independent Board}}{\Sigma \text{Board Director}} \times 100\%$
Managerial Ownership (Himawan, 2022)	$MO = \frac{\Sigma \text{Shares owned by management}}{\Sigma \text{Outstanding shares}} \times 100\%$
Audit Committee (Himawan, 2022)	$AC = \Sigma \text{ Audit committee}$

4. Result

4.1. Descriptive Statistics

In this study, descriptive statistics are used to characterize the data gathered without drawing additional statistical conclusions or generalizations. This analysis determines the mean, standard deviation, maximum, and minimum for each variable (Table 2). Based on descriptive statistics, the average level of carbon emissions at public video game companies is 8 kg of CO₂ per \$1,000 in revenue. The maximum carbon emissions recorded are 35 kg of CO₂ per thousand US dollars of revenue, observed at one company in the research sample

during the observation period. Meanwhile, the lowest value indicates that a company emits 0.5 kg of CO₂ per US\$1,000 in revenue. The average standard deviation indicates that carbon emissions among companies in the research sample vary relatively little. The descriptive statistics show that the average employee turnover rate in public video game companies is 16%, with a maximum of 78%, indicating that some companies experience very high turnover. Meanwhile, the minimum employee turnover rate is 0.2%, indicating a relatively high level of workforce stability. The average standard deviation indicates that employee turnover across companies varies widely.

Table 2. Descriptive Statistics

Description	Mean	Median	Maximum	Minimum	Std. Dev.
FV	2.996	2.703	7.636	0.820	1.725
CE	0.008	0.004	0.035	0.005	0.008
ET	16.166	11.800	78.000	0.248	13.566
IB	53.053	50.000	87.500	16.666	16.703
MO	21.224	14.964	91.706	0.000	21.750
AC	2.927	3.000	6.000	0.000	1.315

The descriptive statistics show that the average firm value for video game companies is 2.996, indicating strong firm value growth. The minimum value of 0.820 was observed for one company in the research sample, indicating that the company is undervalued. The standard deviation value of 1.725 indicates variation in firm value among companies within the research sample. The descriptive statistics show that the average proportion of independent board members is 53.053, indicating that video game companies have, on average, 53% independent directors on their boards, reflecting good governance. The minimum value of the independent board variable was observed in a European company, while the maximum was observed in a company in the United States. The average standard deviation, which represents the dispersion of the independent board variable, is 16.703. The descriptive statistics show an average managerial ownership of 21.224%, indicating that managerial members in Video Game companies own approximately 21.224% of company shares. The minimum managerial ownership was observed in one Asian company, while the maximum was observed in another. The average standard deviation of the managerial ownership variable is 21.750. The descriptive statistical results also show that the average audit committee size is 2.970, meaning that public video game companies have approximately 2–3 audit committee members, indicating a fairly good proportion. The minimum value of the audit committee variable is 0, observed in several Asian companies, while the maximum value is observed in several European and Asian companies. The average standard deviation, which represents the dispersion of the audit committee variable, is 1.315.

4.2. Hypothesis Result & Discussion

Hypothesis testing is a statistical method used to assess whether there is sufficient evidence to reject or fail to reject the null hypothesis for a given sample. Several steps are performed before running the hypothesis test. A preliminary determination test is conducted, and the

selected model is the FEM model. Table 3 shows that the carbon emissions intensity has a negative and significant effect on firm value. Therefore, carbon emissions negatively affect firm value, supporting Hypothesis 1. It shows that employee turnover rate has no significant effect on firm value, with a P-value of $0.7050 > 0.05$.

Table 3. Carbon Emission, Employee Turnover, Firm Value

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Results
C	-1.389	0.977	-1.421	0.163	
CE	-0.453	0.180	-2.510	0.016**	H ₁ : Accepted
ET	-0.052	0.138	-0.381	0.705	H ₂ : Rejected
R-squared	0.898	Mean dependent var		0.851	
Adjusted R-squared	0.837	S.D. dependent var		0.590	
S.E. of regression	0.237	Akaike info criterion		0.248	
Sum squared resid	2.145	Schwarz criterion		1.071	
Log likelihood	16.306	Hannan-Quinn.		0.571	
F-statistic	14.702	Durbin-Watson stat		3.373	
Prob(F-statistic)	0.000**				

**Sig < 5%

The results of the study indicate that hypothesis 1 is accepted: carbon emissions have a significant negative effect on firm value. This means that the higher the carbon emissions, the lower the firm value. In the video game industry, which relies on energy-intensive data centers and high-powered computing devices, carbon emissions reflect operational efficiency and environmental management (Mayers et al., 2015). High emissions increase exposure to regulatory, operational, and reputational risks. This impact could cause losses for stakeholders and reduce firm value. Furthermore, high carbon emissions influence investors' perceptions of corporate risk (Choi & Luo, 2021). Investors tend to view high carbon emissions as an indicator of operational inefficiency and sustainability issues. As a result, investor confidence declines, which can reduce firm value (Choi & Luo, 2021). The results of the study indicate that employee turnover does not have a significant effect on firm value (Hypothesis 2 Rejected). This suggests that employee turnover does not have a meaningful impact on firm value. This condition may be because most companies in the sample are large firms with more than 250 employees (Wu, 2020). Large companies generally have stronger financial resources, allowing them greater flexibility in recruiting new employees and managing the loss of human capital. As a result, workforce vacancies can be filled more easily. The negative effect of employee turnover on firm value is also weaker in large companies because they have greater experience handling employee separation and recruitment processes and are better known in the labor market (Li et al., 2022). Therefore, although turnover may incur additional costs for recruitment and training, its impact on firm value can be minimized when managed effectively. In addition, because not all companies disclose employee turnover rates in their corporate reports, these results may also be limited by data availability (Dhika & Dewi, 2024).

Based on the research results, independent directors can moderate the impact of carbon emissions on firm value (Table 4). This means that the number of independent directors on the board will strengthen the influence of carbon emission levels on firm value. It may imply

that when there are a large number of independent directors, their monitoring power is stronger, which effectively encourages managers to actively address carbon-emission-related decisions, thereby increasing firm value (Choi & Luo, 2021). Therefore, hypothesis 3a is accepted. This finding may result from the role of independent boards of directors in improving the quality of reporting, transparency, accountability, and oversight of the company (Halimah et al., 2025), thus making the company more compliant and upholding environmental responsibility. Furthermore, independent boards of directors tend to encourage companies to improve carbon emissions performance, which can indirectly strengthen firm value by increasing environmental sustainability and stakeholder trust. However, in the short term, the cost impact remains dominant or does not provide immediate financial benefit (Kim et al., 2023).

Table 4. Carbon Emission, GCG, Firm Value

Variable	Model (1)		Model (2)		Model (3)		Results
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	
C	4.170	0.017	2.396	0.198	1.500	0.386	
CE	-0.021	0.925	-0.421	0.133	-0.408	0.021	
ET	-0.125	0.308	-0.060	0.642	0.005	0.971	
IB	-0.796	0.020	-0.994	0.008	-0.968	0.007	
MO	0.127	0.199	0.118	0.299	0.122	0.245	
AC	-0.005	0.703	-0.003	0.836	0.134	0.201	
CE*IB	-0.803	0.014**					H _{3a} : Accepted
CE*MO			-0.109	0.880			H _{3b} : Rejected
CE*AC					-0.048	0.211	H _{3c} : Rejected

**Sig < 5%

According to the research findings, managerial ownership does not influence the relationship between carbon emissions and firm value. Therefore, hypothesis 3b is rejected. The extent of managerial ownership does not amplify the effect of carbon emissions on firm value. These results suggest that managers' shareholding does not enhance or diminish the influence of carbon emissions on firm value. This situation may arise because managerial ownership's ability to influence this connection depends on managers' approaches and proactive involvement in the decision-making process. More specifically, it hinges on how effectively managers implement long-term environmental sustainability initiatives, rather than merely prioritizing financial gains. Overall, even when managers possess considerable ownership stakes, their power may be constrained if sustainability efforts are not completely integrated with the company's priorities or if short-term financial concerns overshadow decision-making and may put preserving their position and authority ahead of exploring innovation and possibly disruptive new business prospects (Ongsakul et al., 2025).

Based on the study's results, the audit committee cannot moderate the effect of carbon emissions on firm value; therefore, hypothesis 3c is rejected. The size of the audit committee does not strengthen the influence of carbon emission levels on firm value. These findings imply that the size of the audit committee does not affect the relationship between carbon emissions and firm value. It may suggest that the effectiveness of the audit committee's role

is not always supported by adequate capacity, but also by knowledge and skills, especially in understanding and reviewing sustainability reports. Without strong competencies, efforts to improve the quality and performance of carbon emissions management are limited, and the audit committee's contribution to the relationship between carbon emissions levels and firm value remains minimal. Overall, the lack of effectiveness in this role suggests that the presence of the audit committee does not necessarily guarantee a significant increase in value; competence also plays a crucial role (Razali et al., 2025).

Table 5. Employee Turnover, GCG, Firm Value

Variable	Model (4)		Model (5)		Model (6)		Results
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	
C	2.194	0.188	0.266	0.914	3.790	0.000	
CE	-0.470	0.008	-0.470	0.007	0.304	0.000	
ET	3.800	0.531	-0.106	0.508	0.000	0.998	
IB	2.814	0.639	-0.683	0.142	-0.237	0.358	
MO	0.115	0.280	0.028	0.289	-0.087	0.043	
AC	-0.002	0.863	-0.002	0.888	-0.085	0.441	
ET*IB	-3.827	0.524					H4a: Rejected
ET*MO			0.064	0.572			H4b: Rejected
ET*AC					0.026	0.412	H4c: Rejected

**Sig < 5%

Hypothesis 4a examines whether independent directors moderate the effect of employee turnover on firm value. Based on the study's results, independent directors do not significantly moderate the effect of employee turnover on firm value. In other words, the presence of independent directors neither strengthens nor weakens the influence of employee turnover on firm value. High turnover may disrupt organizational continuity and reduce operational efficiency if not properly managed. Meanwhile, independent directors tend to focus primarily on corporate governance, compliance, risk oversight, and transparency in decision-making processes. Consequently, although independent directors play an important role in strengthening governance quality, their ability to influence the relationship between employee turnover and firm value remains relatively limited. Overall, employee turnover may affect companies by causing the loss of knowledge, skills, and experience accumulated during employees' tenure, which is generally related to human resource strategies, career development systematization, and the work environment (Chen, 2025).

Hypothesis 4b examines whether managerial ownership moderates the effect of employee turnover on firm value. Based on the study's results, managerial ownership does not significantly moderate the effect of employee turnover on firm value. In other words, the level of managerial ownership neither strengthens nor weakens the influence of employee turnover on firm value. Therefore, hypothesis 4b is rejected. This finding suggests that managerial ownership does not fully reflect the comprehensive implementation of stakeholder theory. This may imply that, even with managerial equity, decisions on workforce management and employee retention are still influenced more by short-term financial goals than by long-term human capital development, limiting the moderating role

of ownership in this context. Overall, although managers may hold shares or have a financial interest in the company, their orientation may focus more on financial aspects than on employees' interests in efforts to enhance firm value (Foss & Klein, 2018).

The audit committee is unable to moderate the effect of employee turnover on firm value. The size of the audit committee does not strengthen the effect of carbon emissions on firm value. These findings imply that the size of the audit committee does not affect the relationship between carbon emissions and firm value. Therefore, hypothesis 4c is rejected. This may occur because although the audit committee plays an important role in corporate governance quality and internal control systems, its influence on the relationship between employee turnover and firm value remains limited. Therefore, its role is not significant in moderating the effect of employee turnover on firm value. This is mainly because audit committees' primary focus is financial oversight and reporting compliance, and cybersecurity has also become a top priority for them (Thapa et al., 2025).

Stakeholder theory states that a company is responsible not only to its shareholders but also to stakeholders (Kivits & Sawang, 2021). The study's findings support stakeholder theory by showing that stakeholders, such as investors, influence firm value through their perceptions of environmental performance. Independent boards were able to moderate the effect of carbon emissions on firm value, highlighting the role of governance in addressing stakeholder concerns related to sustainability. Although employee turnover had no significant effect, some governance mechanisms, including audit committees and managerial ownership, were unable to moderate these relationships, suggesting that their impact depends on active engagement and strategic alignment. Overall, the findings emphasize that balancing stakeholder expectations with effective governance is crucial for sustaining firm value (Amis et al., 2020).

5. Conclusion & Limitation

In this study, two hypotheses were accepted. The conclusions drawn from this research are that carbon emissions have a significant negative effect on firm value among international publicly listed video game companies during the 2022–2024 period. This means that if carbon emissions decrease, firm value will increase, and vice versa. Carbon emissions can serve as a signal of a company's operational efficiency and carbon footprint management. In addition, an increase in carbon emissions can reduce the value of international publicly listed video game companies due to investor risk perceptions, who may doubt the company's ability to manage operations efficiently and sustainably. Investors tend to view high carbon emissions as an indicator of additional risk.

Independent boards of directors can moderate the effect of carbon emissions on firm value among international publicly listed video game companies during the 2022–2024 period. Through the role of independent boards of directors in improving reporting quality, transparency, accountability, and corporate oversight, companies are encouraged to be more compliant and responsible toward the environment. Furthermore, independent boards of directors tend to encourage companies to improve their carbon emissions performance,

which can indirectly strengthen firm value through enhanced environmental sustainability and increased stakeholder trust.

It is important to note that this study has several limitations that should be addressed in future research. The first limitation concerns potential sample bias, which may affect the generalizability of the findings. In addition, access to primary data on employee turnover was limited. The second limitation concerns differences in organizational structures among the sampled companies. Variations in organizational structure and operational models may influence analysis results, thereby limiting comparability, as these factors can affect firm outcomes (Zhihuang & Yuchen, 2025). Future studies are encouraged to focus on more homogeneous organizational settings to ensure greater consistency of analysis.

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