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The Role of Chief Sustainability Officer on Sustainability Performance: Case Study on Automotive Companies in Asia

Juniarti[1*], Evelyn Shalomita Sugiarto[2], Celsya Caeciliana[3], Alan Darmasaputra[4], Joel Tan[5]
[1,2,3,4] Accounting Department, Petra Christian University
Jalan Siwalankerto 121-131, Surabaya 60236, Indonesia
[5] College of Accounting Education, University of Mindanao
Bolton St, Poblacion District, Davao City, 8000 Davao del Sur, Philippines
*Corresponding author; Email: jak-acc@petra.ac.id

ABSTRACT

Sustainability is increasingly viewed as a competitive advantage, not just a compliance requirement. However, there is still limited research on Chief Sustainability Officers (CSOs) in Asia, especially in the automotive sector, which plays a major role in emissions and sustainability issues. This research examines how having a CSO and the presence of CEO duality affect sustainability performance in Asian automotive companies. The research uses 570 observations from 2017 to 2024. The findings show that the presence of CSOs has a positive and significant effect on sustainability performance, while CEO duality has a significant positive effect. Research demonstrates that CEO duality moderates the partial positive effect of CSOs on sustainability performance. This implies that the presence of CEO duality influences CSO performance. The results of this research have several important implications for companies, particularly those in the automotive sector, that are considering the integration of CSOs into their organizational structures. This conclusion is because CSOs have been demonstrated to significantly enhance sustainability performance.

Keywords: Chief sustainability officer; sustainability performance; CEO duality; automotive industry.

INTRODUCTION

Companies must view sustainability not as an obligation but as a source of competitive advantage. Stakeholders evaluate a company's success based on its social and environmental impact, in addition to its financial performance [7, 26, 47, 60]. This is because companies that only focus on financial performance tend to ignore the negative effects of their operations on the environment and society [5]. Therefore, it is necessary to strike a balance between the company's non-financial and financial goals while keeping the public interest in mind [64]. As a result, there has been an increase in demand for Sustainability Performance (SP) disclosure, which refers to the balance between economic, social, and environmental performance to optimally meet stakeholder expectations [5, 27, 56]. To meet these demands, companies need leaders who focus on sustainability, namely Chief Sustainability Officers (CSOs).

Sustainability strengthens a company's competitiveness. Companies that do not embrace it may fall behind in the market [56]. CSO incorporates sustainability into the company's culture and systems. They ensure that the company's values align with stakeholder expectations [17]. One reason to hire a CSO is when competitors increase their Corporate Social Responsibility (CSR) efforts [59]. This study indicates that there is a growing awareness of sustainability as an important aspect of business governance and operations. Several studies have found that having a CSO can improve sustainability practices [27, 17, 52, 56, 28, 60].

However, the effectiveness of CSOs' role is still open to debate. Peters et al. (2019) state that having CSOs does not necessarily impact corporate sustainability strategies in a meaningful way [41]. Toukabri (2025) also found that in developed countries, CSOs are usually more active in improving SP [54]. In contrast, in developing countries, their involvement remains limited and often ineffective. This aligns with Good Corporate Governance (GCG) practices in developed nations, which are generally stronger than those in developing countries [50]. GCG makes CSOs more open and responsible [8, 53]. Additionally, Kouaib et al. (2022) discovered that GCG can strengthen the link between internal factors and SP [33].

One important aspect of GCG is the organization of leadership, particularly regarding CEO duality. This structure can weaken oversight and accountability functions, reducing independence in strategic decision-making, including the sustainability agenda [65, 16, 45, 43]. As a result, the legitimacy of the CSO may be at risk. Research by Romano et

al. (2020) found that CEO duality can weaken the positive relationship between gender diversity and SP [48].

This research focuses on the automotive industry in Asia, which is important to the economy but also produces high levels of carbon emissions, uses a lot of energy, and causes pollution [57, 34]. The push for net zero emissions is leading companies to reduce their carbon output [54]. Many automotive companies are now developing global sustainability strategies to adapt [36]. The industry must improve its manufacturing processes and lower product emissions while dealing with economic, environmental, market, and policy challenges [36]. Companies that do not adapt risk facing stricter regulations, losing their competitive edge, and losing market trust. In this context, CSOs play a key role in promoting corporate social responsibility and leading environmentally friendly changes [1, 32, 56].

Most earlier studies have looked at multiple sectors at once [27, 52, 56, 37]. This can lead to bias because each sector has its own structure and views on sustainability [23, 32]. For this reason, sector-specific research is important. Furthermore, there is little research on the link between CSOs and sustainability performance in Asia, as most studies are from Europe [27, 52, 55, 33, 37] . This research focuses on the automotive sector in Asia to avoid bias and address gaps in the literature.

This paper provides two primary contributions. First, it contributes to the literature on sustainability governance, specifically by examining the moderating influence of CEO duality on the interplay between the presence of CSOs and SPs. Prior research conducted by Romano et al. (2020) found that CEO duality can weaken the positive relationship between gender diversity and SP, but Zhu et al. (2022) did not indicate a significant role [48, 65]. In this context, this paper seeks to clarify the role of CEO duality as a moderating factor in the relationship between CSO and SP. Second, this research focuses on the automotive sector in Asia, which is still rarely researched. This industry faces challenges such as the lack of standardized sustainability metrics, regional inconsistencies in reporting practices, and adverse perceptions of sustainability as a financial liability [36, 56]. The appointment of a CSO can strengthen a company's sustainability strategy and commitment [17]. CSOs are becoming increasingly crucial due to the high emissions generated by this industry. They need to ensure that their sustainability plans also address what stakeholders expect.

The structure of this research is as follows. Section 2 defines the theoretical framework, research hypotheses, and variables. Section 3 presents the sample, methods, and statistical techniques used. Section 4 presents the main empirical results. Section 5 presents the conclusions, implications, and limitations.

Literature Review

Stakeholder Theory

Freeman & Parmar (2010) say that companies owe duties to stakeholders, or those affected by their activities, as well as shareholders [18]. Stakeholders include various groups, such as investors, creditors, customers, employees, the government, and the community. Therefore, it is important to have leaders who can play a stakeholder-oriented role and manage stakeholders. Rehan et al. (2025) emphasize the need for organizations to meet the social, environmental, and ethical expectations of different interest groups [47]. Companies that recognize and respond to stakeholder needs will build a positive reputation, gain social legitimacy, and create long-term value [24].

Stakeholder theory appears in several studies. For example, Kouaib et al. (2022) use it to show that when companies engage in sustainability practices, they are acting in accordance with social accountability [33]. Appiagyei et al. (2023) also use this theory to show how integrated reporting and sustainability help businesses stay legitimate, keep their good name, and stay alive in the public eye [7]. Within this framework, CSOs represent a clear response to stakeholder pressure by including social and environmental interests in the company's structure [24] CSOs can address the interests of all parties and help ensure that the company's sustainability practices meet stakeholder expectations [11].

Upper-echelon Theory

Hambrick & Mason (1984) argue that the qualities of top executives, like their competence, shape a company's strategic decisions and affect its overall performance [21]. Top managers also bring their personal values into decisions, so their choices are not completely objective. This idea suggests that companies reflect their leaders, and differences in management skills can lead to different company policies and results. For this reason, the makeup of the top management team matters. In particular, the CSO represents the company's sustainability approach [17]. The CSO's competence affects how the company understands, prioritizes, and puts sustainability into practice. This role cannot be filled by someone else, such as the CFO, because it requires a leader who understands sustainability [41]. Kouaib et al. (2022) found that having CSOs in top management improves corporate SP because of their expertise and

commitment to sustainability [33]. CEOs with education and experience in environmental issues encourage companies to be more active in sustainability. Overall, these studies show that top management's skills, especially those of CSOs, have a real impact on how well a company carries out its sustainability efforts.

Agency Theory

Agency theory examines the relationship between principals, such as shareholders, and agents, such as managers. The theory posits that conflicts of interest may emerge when two groups possess divergent objectives and unequal access to information [25]. For example, a CEO acting as an agent might make decisions that do not align with shareholders' preferences, leading to agency problems. To address this, GCG acts as an internal tool to solve agency issues. GCG establishes a framework to ensure CSOs and management are accountable and transparent [8, 53].

Agency theory suggests that it is necessary to keep the roles of CEO and chairman separate to reduce conflicts of interest and improve accountability [25]. When one person holds both roles, oversight can weaken, and managers may act in their interests, leading to agency problems. Because of this, good governance recommends separating the CEO and board of commissioners roles to maintain accountability and reduce the risk of conflicts [16, 44].

Tjahjadi et al. (2021) found that board and management structures can help reduce agency conflicts and support sustainable performance [53]. Rashid & Kabir (2025) explain, using agency theory, that strong GCG mechanisms can limit managers' tendency to act in their interests [46]. This theory helps explain the moderating effect of CEO duality in this research. When one person holds both roles, oversight of sustainability efforts led by the CSO may not work well. A dominant CEO might not fully support CSO initiatives or could make the CSO's role just a formality. As a result, poor leadership structure can weaken the CSO's positive impact on the company's SP.

Chief Sustainability Officer

The Chief Sustainability Officer (CSO) is an executive who develops, oversees, and leads a company's sustainability policies [39]. According to stakeholder theory, CSO shows how a company responds to growing expectations for social and environmental responsibility. The CSO connects internal and external interests and makes sure the company's strategy supports its sustainability goals [39]. This role also helps the company balance financial goals with the social and environmental values that stakeholders expect [24, 60]. Whether a company has a CSO is measured using a dummy variable: 1 if it does, and 0 if it does not.

CEO Duality

CEO duality occurs when one person serves as both the Chief Executive Officer (CEO) and the chairman [63]. This setup can weaken oversight and make decision-making less objective [16, 65]. Research shows that CEO duality negatively affects board performance [4]. According to agency theory, CEO duality can lead to more conflicts of interest between managers and company owners [16]. This is because the same person acts as both the decision maker and the supervisor, which can encourage the CEO to act in their own interest [65]. CEO duality can also make information less transparent and create information gaps [6]. Often, CEO duality is used for personal benefit rather than for the company as a whole [40]. Studies have found that CEO duality can hurt company performance [6, 40].

Good corporate governance (GCG) highlights the need to separate the roles of CEO and the board of commissioners to support independence [40]. Keeping these roles separate can strengthen the board's oversight, improve accountability, and prevent one person from having too much power. Companies without CEO duality often perform better because their decisions reflect the interests of more stakeholders [65]. CEO duality is measured using a dummy variable: 1 if the company has CEO duality, and 0 if it does not.

Sustainability Performance

In this research, Sustainability Performance (SP) is the dependent variable, affected by the presence of CSOs and a strong GCG system. It reflects how well companies handle the social, environmental, and economic effects of their business activities in a sustainable way. Measuring SP helps make sure companies act responsibly in financial matters and toward the environment and local communities [7, 60]. Stakeholder theory says that SP shows how well a company meets the needs of different stakeholder groups. A high SP indicates that a company balances profit-making with social responsibility. Upper Echelon Theory holds that SP depends on how company leaders, especially CSOs, understand and address sustainability issues in their policies and operations. SP is measured by the company's ESG score. Companies are rated on their economic, environmental, and social performance and receive an overall ESG score from 0 to 100. A higher score means better SP [27, 30].

Chief Sustainability Officer and Sustainability Performance

Appointing a CSO is a practical way for companies to meet growing stakeholder expectations and comply with stricter global sustainability rules. According to stakeholder theory, companies are responsible not just to shareholders but also to governments, consumers, local communities, and the environment [18]. CSO brings these interests together by leading social, environmental, and governance efforts that show the company's commitment to meeting stakeholder needs and maintaining legitimacy [17]. Studies show that having a CSO improves SP [27, 56]. Thun and Zülch (2023) found that a CSO improves the quality of sustainability reporting, which is a key measure of SP [52]. Kanashiro and Rivera (2019) also noted that companies with CSOs perform better environmentally, especially when regulations are strict [28].

CSOs are especially important in the automotive industry, which produces substantial carbon emissions, consumes significant energy, and faces strict sustainability rules [34]. Here, the need for strong CSO leadership is greater than in many other fields. CSOs help companies comply with environmental laws and uncover ways to innovate and grow sustainably. Appointing a CSO demonstrates a company's commitment to sustainability and underscores the importance of this role in the industry [17].

Upper echelons theory (Hambrick & Mason, 1984) says that the backgrounds and values of top executives influence a company's strategies and results [21]. Having the CSO on the top management team helps companies make and carry out sustainability plans in a more organized and measurable way. This approach makes sustainability a key part of the company's overall strategy. Therefore, we expect the inclusion of a CSO in top management to directly enhance corporate sustainability. In summary, the CSO is central to successful sustainability efforts through planning, reporting, and decision-making, which improves the company's sustainability performance. Therefore, the first hypothesis of this research is:

H_1: Firms with a Chief Sustainability Officer exhibit higher Sustainability Performance than firms without a Chief Sustainability Officer.

CEO Duality and Sustainability Performance

Corporate Governance (CG) is the system and rules that guide how a company is run, aiming for transparency, accountability, and long-term value for everyone involved [29]. A key issue in this system is CEO duality, in which one person serves as both the CEO and chairman. Agency theory suggests this setup is not ideal because it can increase conflicts between managers and shareholders [16]. When one person holds both roles, the CEO has greater control over decisions, making it harder for the board to provide independent oversight. This mix can reduce transparency, weaken accountability, and increase the risk of decisions that do not support the company's long-term goals, including sustainability [38, 12].

Research shows that CEO duality negatively impacts SP. Zhu et al. (2022) found a strong negative link between CEO duality and corporate SP [65]. Akhtar and Abdullah (2025) also observed that companies where the CEO is also the board chair tend to have higher carbon emissions, indicating worse sustainability outcomes [2]. Álvarez and Martínez (2022) observed that CEO duality elevates corporate risk by exacerbating information asymmetries and diminishing accountability, resulting in less effective sustainability strategies [6]. These results are similar to those of Ali et al. (2022) and Mubeen et al. (2021), who found that CEO duality also harms overall firm performance [4, 40].

A dual leadership structure can diminish accountability, hinder inclusive decision-making, and reduce a company's commitment to sustainability values. It also restricts the involvement of other officials, like CSOs, which makes it harder to support sustainability efforts and lowers SP. Based on agency theory and prior research, this research expects that CEO duality will negatively affect SP. This research formulates its second hypothesis as follows:

H_2: Firms with CEO Duality have a lower Sustainability Performance than firms without CEO Duality.

Chief Sustainability Officer and Sustainability Performance: The Moderation Role of CEO Duality

CSOs develop and carry out sustainability strategies to improve a company's economic, social, and environmental results [39]. They ensure that business goals match what outside stakeholders expect. Strong GCG helps organizations accept sustainability efforts, supports the CSO's work, and ensures the implementation of sustainable policies, as noted by Bansal and Kaicker (2024) [9]. Leadership structure is an important part of GCG, especially CEO duality, which is often criticized for weakening oversight and raising the risk of conflicts of interest [4, 6, 16].

Agency theory says that CEO duality puts too much power in one person's hands, which weakens the board's independence and ability to supervise [16, 25]. Ali et al. (2022) found that CEO duality

makes boards less effective and increases the chance that managers act in their interests [4]. Such an arrangement often limits the CSO's influence because the role may not have enough authority in the company's governance structure [53]. When the CEO has most of the power, decisions are centralized, making it harder for the CSO to guide the company's sustainability plans [53]. CEO duality can also make information less transparent in the organization [6].

Stakeholder theory says companies are responsible not just to shareholders but to many groups [18]. However, CEO duality often leads leaders to focus on short-term or personal goals, which can ignore the broader, long-term interests of stakeholders [56]. Álvarez and Martínez (2022) contend that concentrating excessive power in a single individual diminishes transparency and elevates risk, thereby undermining sustainability initiatives [6]. When one person makes most decisions, stakeholders have less influence, and the CSO has less ability to balance their interests.

Upper echelons theory says that the traits and values of top leaders shape a company's strategy and results [21]. In this case, CEO duality shows a dominant leadership style that can limit different viewpoints when making sustainability plans. If the CSO works under strict leadership, they have less influence over the company's direction [53]. As a result, CEO duality can reduce the CSO's impact on sustainability performance.

Therefore, CEO duality is likely to weaken the link between having a CSO and the company's sustainability performance. In other words, the more power the CEO has, the less the CSO can help improve sustainability. Based on this, the following hypothesis is proposed:

H3. The positive relationship between the presence of a Chief Sustainability Officer and Sustainability Performance is weaker in firms with CEO duality than in firms without CEO duality.

Control Variable

Company Size

Previous studies discussing SP generally include company size as a control variable [41, 53, 60]. Company size is considered to influence a company's ability to manage sustainability strategies. Peters et al. (2019) explain that larger companies tend to have more adequate free funds and resources, enabling them to invest in specialized managerial strategies or executive positions and implement various sustainability initiatives that ultimately have the potential to improve SP [41]. Thus, the larger the company size, the higher the SP level. In this research, company size is measured using the natural logarithm of total assets [41].

$$SIZE = Ln\ (Total\ Assets)$$

Return on Assets (ROA)

This research measures profitability using Return on Assets (ROA), calculated as total profit divided by total assets, following previous research [27, 52, 64]. Companies with strong financial performance often make greater contributions by participating in social and environmental activities [64]. A high ROA can show a company's ability to support sustainability efforts, which may increase SP [22]. In summary, higher ROA is associated with higher SP.

$$ROA = Net\ Income/Total\ Assets$$

Leverage (LEV)

Leverage shows how financially stable a company is, especially when managing changes in external funding needs [27]. Previous studies measure leverage by dividing total debt by total assets [41]. Companies with high leverage often feel pressure from creditors and institutional investors to protect their reputation and long-term stability. Because of this, managers tend to make more careful decisions and pay attention to sustainable practices.

$$Lev = Total\ debt/Total\ asset$$

ESSI (Environmental and Social Sensitive Industry)

ESSI is a control variable that shows corporate activity in industries sensitive to environmental and social issues [41]. It helps identify if companies in these industries gain extra benefits from sustainability practices [62]. The automotive industry is sensitive to sustainability, allowing for higher SP compared to other industries [36]. ESSI is generally measured using a dummy variable, which has a value of 1 if the company is in an industry classified as sensitive to environmental issues (energy, manufacturing, automotive, etc.), and 0 if not [62].

Company Age

Previous studies have used company age as a control variable because it is considered to influence a company's tendency to engage in sustainability activities [41, 64, 53]. Older companies are assumed to be more concerned with reputation, social legitimacy, and long-term sustainability [1, 64]. Thus, the longer a company has been established, the higher its SP level. Company age is measured as the natural logarithm of the number of years since the company was established [64].

AGE = Ln(Year of research - Year the company was founded)

RESEARCH METHOD

Sample

This research uses a sample of automotive companies listed in Asia that meet the following criteria: (1) are in the automotive sector in Asia, (2) have ESG data, and (3) have research variable data for the research period (2017–2024). Data was obtained from Thomson Reuters Refinitiv, sustainability reports, and company annual reports accessed through the official websites of each entity. Companies that meet the above criteria will be selected as research samples.

The observation period used is 5 years (2017–2024), except for 2019–2021, because this period was the COVID-19 pandemic, which could potentially cause bias in the research results due to abnormal external conditions. The final sample size used in this research is 570 observations from 148 companies that meet the criteria. The sample selection process according to the above criteria is presented in Table 1.

Table 1. Sample Selection

Research Criteria	Number of observations
Companies listed in the automotive sector in Asia	1,009
Companies without an ESG score / ESG score less than 3 years	(861)
Total Company Sample	148
Total Observations	740
Samples with incomplete variables	(170)

Analysis Model

The following is the analysis model used in this research to test the hypothesis. The analysis model is illustrated in Figure 1.

Based on the analysis model described above, the hypothesis will be tested using multiple linear regression with the following equation:

$$SP_{i,t} = + \beta CSO_{i,t-1} + \beta CEODuality_{i,t-1} + \beta(CSO_{i,t-1} * CEODuality_{i,t-1}) + \beta SIZE_{i,t-1} + \beta ROA_{i,t-1} + \beta LEV_{i,t-1} + \beta ESSI_{i,t-1} + \beta AGE_{i,t-1} + \varepsilon_{i,t-1}$$

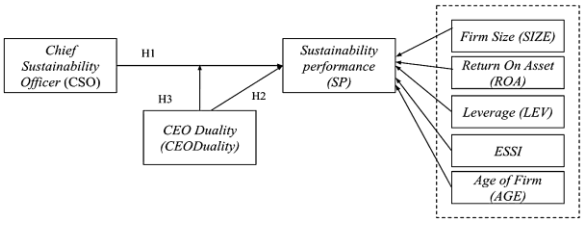

Figure 1. Analysis Model

Table 2. Variable Description

Variable	Description
SPi,t	SP of company i in year t
α	Constant
β	Regression Coefficient
CSOi,t-1	Chief Sustainability Officer of company i in year t-1
CEODuality i,t-1	CEO Duality of company i in year t-1
SIZE i,t-1	Company Size (Ln total assets) of company i in year t-1
ROA i,t-1	Return On Asset (net income/total assets) of company i in year t-1
LEV i,t-1	Leverage (total debt / total assets) of company i in year t-1
ESSI i,t-1	Environmental and Social Sensitive Industry of company i in year t-1
AGE i,t-1	Age (Ln(Year of research - Year the company was founded) of company i in year t-1
ε	Standard Error

Data Analysis Techniques

This research uses a quantitative, panel-data regression approach to examine the effect of CSOs on SP [17]. The first step is to use descriptive statistics to show the characteristics of each variable. These statistics include the minimum, maximum, mean, and standard deviation values. They also identify the type of each variable (dummy, interval, or ratio) and provide an overview of the data distribution. Next, the process of selecting the best model is carried out. The initial stage is to estimate the Common Effect as the base model. Model selection begins with the Chow Test to compare the Common Effect with the Fixed Effect Model (FEM). If the p-value is less than 0.05, FEM is more suitable. When FEM is selected, the next step is to use the Hausman Test to compare FEM and the Random Effect Model (REM). Choose FEM if the p-value is below 0.05; otherwise, use REM. If the Chow Test indicates a Common Effect model, use the Lagrange Multiplier (LM) Test to compare it with REM. If the p-value is less than 0.05, REM is used.

The next step is to verify the classical assumptions. If the Common Effect model is chosen, normality testing is done first. Data is considered normally distributed if the p-value exceeds 0.05; otherwise, it is not normally distributed. Thereafter, a heteroscedasticity test is conducted to see if the residual variances differ, which can affect estimation efficiency. If the p-value is above 0.05, the model does not have heteroscedasticity. Then, test for autocorrelation. If the p-value is above 0.05, there is no autocorrelation. Finally, examine for multicollinearity using the Variance Inflation Factor (VIF). The model is free of multicollinearity if all VIF values are below 10.

If FEM is chosen, a heteroscedasticity test is performed. The model is free of heteroscedasticity if the p-value is above 0.05. If it is less than 0.05, there

is heteroscedasticity; use a Weighted Least Squares (WLS) correction to get accurate, unbiased estimates when the error variance is not constant. If REM is chosen, a multicollinearity test is performed by examining the VIF to confirm the absence of significant correlation among independent variables. If the VIF is below 10, the model does not have multicollinearity.

The last step in data analysis is hypothesis testing to see how each independent variable affects SP. Use a partial t-test in a panel regression model to determine the individual effects of CSO and CEO duality on SP [55]. To test for moderation, add an interaction term between CSO and CEO Duality (CSO × CEO Duality) to the panel regression model [15]. The hypothesis is proven if the coefficient is in line with the hypothesis and the p-value is ≤0.1 [28]. To test the consistency of the results, a robustness test was conducted by giving a two-year lag to the independent variables, considering that the influence of the existence of CSO on the ESG Score is not direct.

RESULTS AND DISCUSSION

This research represents a sample of automotive companies in Asia with a total of 570 observations. Table 3 shows the sample composition by country. Developing countries, particularly China (25.79%) and India (22.46%), dominate the sample (60.35%). Developed countries make up 39.65% of the total sample, with Japan having the largest share at 23.86%. The total shows that the research includes not only emerging markets but also developed countries recognized for their automotive innovation and technology.

Table 3. Sample by Country

Country	Sample	Percentage
Developing Country		
China	147	25.79%
Malaysia	27	4.74%
India	128	22.46%
Indonesia	3	0.53%
Turkey	16	2.81%
Thailand	18	3.16%
Philippines	5	0.88%
TOTAL	344	60.35%
Developed Country		
South Korea	43	7.54%
Singapore	3	0.53%
Japan	136	23.86%
Taiwan	28	4.91%
Hong Kong	16	2.81%
TOTAL	226	39.65%

Table 4 shows how the sample is divided among automotive industry subsectors. Nearly half of the sample (48.42%) comes from auto, truck, and motorcycle parts companies. This means the research includes not only major vehicle manufacturers but also supporting sectors such as automotive components, which are important to the Asian automotive value chain. This sample distribution provides a balanced picture between developed and developing countries as well as between major manufacturers and supporting industries, so that the results of the research are expected to comprehensively reflect the real conditions of the Asian automotive industry.

Table 4. Sample by Industrial sub-sector

Sub-sector	Sample	Percentage
Auto, Truck & Motorcycle Parts	276	48.42%
Auto & Truck Manufacturers	209	36.67%
Tires & Rubber Products	85	14.91%
TOTAL	570	100%

Descriptive Statistics

Table 5 describes the general characteristics of the entire sample through descriptive statistics. The average SP of companies is 46.8, which shows that, in general, companies in the sample have a medium level of commitment to sustainability. Company size shows that the sample is dominated by medium- to large-scale companies. Furthermore, the average firm age has a mean log value of 3.75, suggesting that most companies in the sample are mature companies with a long operational history and established sustainability practices. However, when looked at in terms of ROA, which is around 5.95%, the efficiency of profit generation is comparatively moderate. Conversely, the leverage ratio of 0.467 suggests that debt accounts for nearly half of the company's funding structure. This combination of characteristics illustrates that the companies in the sample are not only large and established but also have complex strategies involving compliance, reputation, and financial pressure.

Table 5. Descriptive Statistics

Variable	Mean	Median	S.D.	Min	Max
SP	46.8	47.4	19.9	4.32	89.5
SIZE	31.7	31.9	1.85	27.0	36.8
ROA	0.0595	0.0479	0.0447	1.72e-005	0.323
LEV	0.467	0.478	0.162	0.0565	0.846
AGE	3.75	3.71	0.606	2.08	4.69

Meanwhile, the results of the SP difference test for companies with a CSO and those without one are presented in Table 6. According to the t-test results, there is a t-value of -6.910 and a significance level of

<0.001, indicating a statistically significant difference in the average SP score for the two groups.

Table 6. Test of differences between companies with CSOs and without CSOs

	SP
F	0.302
Sig	0.583
T	6.786
Df	527
Sig (2-tailed)	<0.001
Mean Difference	12.483
Standard Error Difference	1.839

Table 7. Descriptive statistics for companies with CSOs (Group A) and without CSOs (Group B)

Variable	Mean	Median	S.D.	Min	Max
Group A					
SP	55.7	57.1	18.8	14.4	89.5
SIZE	32	32.3	1.85	28.3	36.8
ROA	0.073	0.061	0.049	0.002	0.24
LEV	0.477	0.486	0.183	0.056	0.835
AGE	3.94	4.04	0.509	2.89	4.69
Group B					
SP	43.2	43.4	19.3	4.32	84.4
SIZE	31.6	31.8	1.84	27	36.4
ROA	0.054	0.0443	0.041	0.0017	0.323
LEV	0.463	0.470	0.153	0.0673	0.846
AGE	3.68	3.66	0.626	2.08	4.69

Companies with a CSO have an SP score higher than companies without a CSO by an average of 12.175. These results underline that appointing a CSO is connected to increased SP. The difference between companies with and without CSOs is shown in Table 7. Companies with CSOs have higher average SPs, suggesting that this role helps focus on environmental, social, and governance (ESG) issues. Interestingly, companies with a CSO also have a higher average ROA. This suggests that focusing on sustainability can support, rather than hurt, financial performance by improving efficiency, reputation, and investor trust.

On the other hand, the distribution of leverage is relatively similar between the two groups, so it can be concluded that the decision to appoint a CSO is not driven by capital structure, but rather by corporate strategy. The age of the company also shows a tendency for more mature companies to be more likely to have a CSO, as older companies have greater capacity and awareness to integrate sustainability practices to maintain their reputation.

Selection of the Best Model

Table 8 displays the results of the optimal model selection test. The Chow test results indicate that the p-value is >0.05, so the data can be treated consistently throughout the period. Furthermore, the Breusch-Pagan test was significant, indicating the existence of individual effects on cross-section units, so that the pooled least squares model is not appropriate and a panel model needs to be used. The Hausman test was also significant, indicating that the fixed effect model is more appropriate than the random effect model due to the correlation between the independent variables and individual effects. Therefore, the best model selected is the fixed effect model.

Table 8. Best Model Test Results

	Coefficient	P-value
Chow test	1.419	0.185
Breusch-Pagan test	286.562	0.000
Hausman test	103.519	0.000

Table 9, 10, 11 present a comparison of the results from Common Effect, FEM, and REM. All three models consistently show that the existence of CSOs has a positive and significant effect on SP, indicating that the function of CSOs is correlated with improvements in corporate SP. Although the patterns are generally consistent, the FEM model can be considered the most reliable because it is able to control the fixed characteristics of each company. Only in the FEM model do the CEO and CSO*D coefficient values reach statistical significance. The negative coefficient on CSO*D in FEM signals that when CSO and CEO duality are present simultaneously, the increase in SP becomes weaker than when CSO stands alone.

Table 9. Common Effect Results

Common Effect		
	Coefficient	P-value
Const	-152.436	<0.0001***
CSO	8.460	<0.0001***
CEODuality	2.076	0.2777
CSO*D	-2.790	0.4682
SIZE	5.273	<0.0001***
ROA	55.694	0.0013***
LEV	12.260	0.0114**
AGE	5.327	<0.0001***

Table 10. Fixed Effect Results

Fixed Effect		
	Coefficient	P-value
Const	-720.904	<0.0001***
CSO	4.980	0.0047***
CEODuality	4.018	0.0463**
CSO*D	-6.021	0.0823*
SIZE	24.232	<0.0001***
ROA	-18.509	0.2680
LEV	-5.449	0.5451
AGE		

Furthermore, since the best model selected was FEM, a heteroscedasticity test was conducted to see if there were any heteroscedasticity issues. The heteroscedasticity test statistic was 81.184, with a p-value of 0.000001, indicating that the null hypothesis of homoscedasticity was rejected at a significance level of 1%. This means that there is a strong indication of heteroscedasticity in the model. This situation suggests that differences in company characteristics may influence the error variance, which is not uniform. Failure to address heteroscedasticity will bias the standard error, rendering any significance tests of the coefficient meaningless. To correct this, this research undertakes a WLS method, as the WLS method can provide suitable weights that generate more efficient, consistent, and reliable parameter estimates.

Table 11. Random Effect Results

Random Effect		
	Coefficient	**P-value**
Const	-183.964	<0.0001***
CSO	10.218	<0.0001***
CEODuality	1.718	0.3598
CSO*D	-4.946	0.1483
SIZE	6.893	<0.0001***
ROA	-14.347	0.3709
LEV	-3.204	0.6200
AGE	3.060	0.1483

Hypothesis Testing

Table 12. Hypothesis Testing Results

	Coeff.	**S.E.**	**t-ratio**	**P-value**
Const	-157.479	4.282	-36.78	<0.0001***
CSO	8.399	0.786	10.69	<0.0001***
CEODual	2.382	0.734	3.243	0.0013***
CSO*D	-3.455	1.414	-2.443	0.0149**
SIZE	5.331	0.170	31.25	<0.0001***
ROA	72.931	7.526	9.690	<0.0001***
LEV	16.561	2.231	7.4230	<0.0001***
AGE	5.483	0.559	9.800	<0.0001***
R-squared	0.882726			
Adjusted R-squared	0.881151			
F(7,561)	560.2293			
P-value(F)	8.3e-238			

The results of testing the research hypotheses are shown in Table 12. The CSO variable has a positive coefficient of 8.399 and a p-value of less than 0.0001, which means it is significant at the 1% level. This means that the first hypothesis, which says that CSO has a positive effect on SP, can be accepted. The CEO Duality variable shows a positive coefficient of 2.382 and a p-value of 0.0013, indicating significance at the 1% level; this finding contradicts the second hypothesis, which predicted a negative relationship, leading to the rejection of that hypothesis. Meanwhile, the CSO*D interaction variable, which represents the moderating effect of CEO duality on the relationship between CSO and SP, has a negative coefficient of –3.455 with a p-value of 0.0149, which is significant at the 5% level, thus supporting the third hypothesis that CEO duality weakens the influence of CSO on SP. All control variables, including company size (SIZE), profitability (ROA), leverage (LEV), and company age (AGE), show positive and significant coefficients (p-value < 0.0001). This finding supports the idea that internal company characteristics also influence SP.

Discussion

This research finds that having CSOs leads to significant improvements in corporate SP. Evidence from the automotive industry shows that CSOs are key in promoting sustainability. Their role goes beyond adding sustainability to company culture and systems. CSOs also help connect a company's internal values with stakeholders' expectations, as Ebele et al. (2023) highlight [17]. This role is especially important in the automotive sector, which faces strong global pressure to quickly adapt and develop sustainability strategies [36].

These findings match earlier studies showing that CSOs have a positive impact on SP [17, 27, 28, 35, 52, 55, 60] . In the automotive industry, which faces many pressures, having CSOs in top management helps companies design and implement more organized and measurable sustainability strategies, as upper-echelon theory suggests [21, 36]. This leadership can guide policy and may also improve ROA. From the stakeholder theory view, CSOs help address the interests of all groups involved in sustainability [17, 60]. When companies face issues such as unclear sustainability standards or the perception that sustainability is just a cost, CSOs help them comply with regulations and encourage innovation for sustainable growth [36, 42, 56].

This research found that CEO duality in the automotive industry yields different outcomes than earlier theories suggested. The findings reveal that CEO duality affects SP in a way that may be unique to this sector. In the automotive industry, CEO duality can actually improve a company's SP. This aspect may be because, under strong pressures to decarbonize and advance sustainability, having one leader in both roles helps companies make decisions faster and strengthen their sustainability policies [38, 42]. When CEOs hold both positions, they have greater authority to shape the company's sustainability agenda (Wu et al., 2024) and greater control while maintaining the organization's legitimacy [38, 61]. A CEO with this power can use SP to benefit

themselves, build better relationships with stakeholders, and even increase their compensation if it is tied to shareholder returns [38]. This supports Mubeen et al. (2021), who found that CEO duality does not always negatively affect sustainability disclosure. In some cases, it can have a positive impact, depending on the company's culture and the broader institutional context [40].

When CEO duality is present, it weakens the link between having a CSO and SP. This means that when the CEO has too much control over sustainability issues, it can lead to biased decisions and lower SP [4, 40]. CEO duality can also limit the CSO's independence, making it harder for them to promote sustainability and provide oversight [65, 10, 63]. This issue is especially important in the automotive industry, which faces global pressure to move toward low-emission vehicles and greener supply chains [36]. Without strong oversight, a dominant CEO may focus on short-term goals, such as cutting costs or increasing output, rather than investing in green innovation and long-term sustainability [40]. CEO duality can also make companies less transparent and accountable, thereby reducing stakeholder trust in their sustainability efforts [58]. This aspect supports agency theory, which says that conflicts of interest and weak oversight are major risks [6, 53]. Company size and ROA both positively affect SP, as larger and more profitable companies have greater resources for sustainability [13, 22]. Leverage also helps, since pressure from creditors encourages better management of sustainability risks [51]. Furthermore, older companies often perform better in sustainability because of their experience and stability [1, 64].

Additional Test

To ensure consistency of the results, a robustness test was done by applying a two-year lag to the independent variables, as shown in Table 13. This lag helped determine whether sustainability activities from the previous period affect future SP or whether the effect is limited to the current year. The results were consistent, as the robustness test produced results similar to the main model.

The results show that the CSO variable continues to have a significant positive effect on SP. This means that CSOs consistently help promote the sustainability agenda over the long term. These findings support the main conclusion that CSOs make a real difference in improving corporate SP. In addition, the robustness test results also show that most control variables remain significant and positively directed, confirming that company characteristics and financial performance also influence sustainability achievement [31].

This research also adds separate tests for each ESG dimension, namely environmental, social, and governance. This was done to examine in greater depth the influence of CSO and CEO duality on each aspect of corporate sustainability. The selection of the best model is shown in Table 14, and the test results can be seen in Table 15, 16, 17.

Table 13. Robustness test

	Coeff.	S.E.	t-ratio	P-value
Const	-145.322	5.582	-26.03	<0.0001***
CSO_1	5.02997	0.975	5.157	<0.0001***
CEODua_1	4.23544	0.947	4.473	<0.0001***
CSO*D_1	-4.68132	1.773	-2.64	0.0086***
SIZE_1	5.19754	0.210	24.76	<0.0001***
ROA_1	36.0909	5.570	6.479	<0.0001***
LEV_1	14.8320	2.369	6.261	<0.0001***

The results of testing each sustainability pillar vary significantly. In the Environmental Score (Model 1a), the CSO variable was found to have a significant positive effect. This data confirms that the existence of CSOs has the authority to encourage corporate environmental policies, such as energy efficiency, waste management, and emission reduction [17]. Company size, leverage, and age also have a significant positive effect, indicating that large, mature companies with high leverage tend to be better prepared to implement environmental agendas [3, 19]. Conversely, the insignificant ROA shows that short-term profitability is not a major driver of environmental agendas [3]. The negative impact of CEO duality supports agency theory, suggesting that concentrated power weakens oversight and hinders environmental sustainability efforts [40].

In the Social Score (Model 1b), CSOs help improve social performance, particularly in areas such as employee welfare, corporate social responsibility, and community relations. Company size, age, leverage, and profitability also have a positive effect, meaning larger and more profitable companies can better support social goals. Previous research found that bigger companies are more likely to recognize and formally implement CSR than smaller ones [20]. However, if CEOs have too much power, it can limit CSOs' ability to improve the company's social performance.

The Governance Score (Model 1c) displays more intricate patterns compared to previous models. CSOs have little impact here, so governance performance depends more on the organization's structure, internal controls, and power-sharing [49]. CEO duality has a negative effect, supporting the idea that excessive power in one person can cause agency problems [63]. But when CEO duality is viewed as a moderating factor, it can have a positive

effect, suggesting that strong internal governance can make concentrated leadership more effective. Larger and more profitable companies also tend to have better governance [49]. On the other hand, older companies are more likely to face governance challenges [14].

Table 14. Comparison of ESG Scores

	p-value		
	Env_score	**Soc_score**	**Gov_score**
Chow test	0.2236	0.0819	0.0140
LM test	1.347e-079	3.013e-072	4.666e-066
Hausman test	1.545e-014	1.447e-021	0.0011512
White test	0.000807	0.000000	0.004023

Table 15. Environmental Score

	Model 1a. Env Score	
	Coefficient	**P-value**
Const	-266.604	<0.0001***
CSO	9.225	<0.0001***
CEODuality	2.888	0.0414**
CSO*D	-12.829	<0.0001***
SIZE	8.359	<0.0001***
ROA	43.396	<0.0001***
LEV	15.449	<0.0001***
AGE	9.637	<0.0001***

Table 16. Social Score

	Model 1b. Soc Score	
	Coefficient	**P-value**
Const	-130.412	<0.0001***
CSO	11.623	<0.0001***
CEODuality	1.323	0.3653
CSO*D	-2.840	0.2228
SIZE	4.275	<0.0001***
ROA	48.387	<0.0001***
LEV	6.380	0.0069***
AGE	7.492	<0.0001***

Table 17. Governance Score

	Model 1c. Gov Score	
	Coefficient	**P-value**
Const	-39.389	<0.0001***
CSO	1.263	0.4372
CEODuality	-5.312	<0.0008***
CSO*D	9.849	<0.00010***
SIZE	3.062	<0.0001***
ROA	137.331	<0.0001***
LEV	19.693	<0.0001***
AGE	-6.153	<0.0001***

CONCLUSION

The findings provide a new understanding of how CEO duality affects the link between CSOs and SP. The findings suggest that CSOs contribute to increased SP, particularly as their role becomes more prominent in the automotive industry. CEO duality alone can contribute to increased SP, but this effect is reversed when a CSO is also present. Concentrating leadership speeds up decision-making, but power imbalances and potential conflicts of interest limit the influence of CSOs. This implies that the success of sustainability roles hinges not only on the presence of CSOs but also on the distribution of power among top leaders.

This study adds to existing research by providing data from the often-overlooked automotive industry. Even though this industry is complex and faces high environmental risks, the findings show that sustainability efforts need to be fully carried out. For companies to put sustainability strategies into practice, they need strong leadership and effective teamwork. In summary, top management structure, including the balance of power and the role of CSOs, has a strong impact on corporate sustainability outcomes.

Implication

To achieve long-term sustainability, companies should create a CSO position as clear proof of their commitment to sustainable business practices. But simply appointing a CSO is not enough. The CSO must have real strategic authority, and the company needs a strong governance structure to support sustainability efforts. Avoiding CEO duality is also important, since it helps keep the CSO's role independent and effective in decision-making. Companies can better balance the needs of management, the board, and stakeholders as they work toward sustainability goals if they clearly separate leadership from oversight.

Regulators should require companies to have a CSO, rather than leaving it voluntary. Making this role mandatory ensures that every company has someone directly responsible for planning, carrying out, and reporting on sustainability strategies. Such regulations would help apply ESG principles more consistently, improve management accountability, and strengthen companies' commitment to meeting sustainability goals at both national and regional levels.

For investors, having a CSO shows that a company is serious about sustainability. It means the company has a structure in place to address environmental, social, and governance (ESG) issues. Investors should consider how much authority the CSO has to make strategic decisions. They should also review the company's actual sustainability performance to see if its actions match its promises.

Limitations

This research could also be applied to other sectors with similar characteristics, like energy, mining,

or manufacturing, which are high-profile and have significant sustainability impacts. This approach would help reveal if the roles of CSOs and the effects of CEO duality are similar in these industries. This research did not separate substantive from symbolic CSO, a key limitation because not every CSO appointment reflects a real commitment to sustainability.

Future research should examine this difference to determine how much CSO effectiveness and credibility contribute to improved sustainability performance. It would also help to consider other factors, such as sustainability regulations or board diversity, as these may influence how effectively CSOs can improve sustainability outcomes.

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