The Association Between Different Control Types, ESG Implementation Effectiveness, and Financial Performance

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Abstract

We investigate the relationship among control types, ESG (environmental, social, and governance) performance, and financial performance. Our sample is categorized into family-controlled, jointly-controlled, professionally managed, and government-owned firms. Results show that government-owned and professionally managed firms exhibit superior ESG performance compared to other types. However, the relationship between ESG and financial performance is nuanced. While better ESG performance generally enhances financial outcomes, this effect is nonlinear, suggesting diminishing returns from overinvestment in ESG. Despite this strong ESG performance, government-owned firms do not always translate this into superior financial performance, highlighting the complex relationship between ESG investment and financial outcomes.

Keywords: Control Types, ESG, Financial Performance, Nonlinear, Overinvest

JEL Classifications: G30, H10, M41

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1. Introduction

While a significant body of research on environmental, social, and governance (ESG) and corporate social responsibility (CSR) in Taiwan has predominantly focused on family firms (Lamb, Butler, and Roundy, 2017; Noor, Saeed, Baloch, and Awais, 2020; Sun, Pellegrini, Dabić, Wang, and Wang, 2023), the exploration of ESG practices among firms with diverse ownership structures remains limited. Given that governance mechanisms and strategic priorities can vary significantly across different ownership types (Shleifer and Vishny, 1997; Jensen and Meckling, 2019; Claessens, Djankov, and Lang, 2000), it is imperative to understand how ESG performance is influenced by the control type of firms. Therefore, this study aims to bridge this gap by categorizing Taiwanese firms into four distinct control types: family-controlled, jointly-controlled, professionally managed, and government-controlled, and examining the implications of their ESG performance on financial outcomes.

Previous scholars found that family firms, driven by social emotions, are highly motivated to promote ESG (Dyer and Whetten, 2006; Berrone, Cruz, Gomez-Mejia, and Larraza-Kintana, 2010). Other studies found that family firms are motivated to preserve the family wealth, meaning that there exists a loss aversion that might engage in ESG (Abeysekera and Fernando, 2020). Based on social perceptions and voluntary codes of conduct, jointly-controlled firms mostly pursue corporate sustainability (Arya and Salk, 2006). However, this can create conditions conducive to free riders (Olson, 1971; Ostrom, 1990), which affects ESG; in these cases, the efficiency of ESG promotion often declines, particularly when there are more collaborating partners (Almashayekhi, 2023). With regard to firms controlled by professional managers, Liu and Jiraporn (2010) indicated that most professional managers with high levels of decision-making power are reluctant to disclose internal information, which leads to severe information asymmetry between the firms and their creditors. However, Margolis and Walsh (2003) pointed out that when considering the conflicts between shareholder interests and social problems, professional managers tend to focus on CSR, and when professional managers hold greater influence, the financial performance of the firms in terms of ESG is enhanced (Velte, 2020). Furthermore, government-controlled firms are easily influenced by government policies and demands to engage in ESG (Shleifer and Vishny, 1994). They bear the pressure of relevant policies, releasing CSR reports (Marquis and Qian, 2014), and aiding the government in implementing ESG-related policies (Wang, Liu, and Zhang, 2022). Above these studies, there is a gap in understanding how these different control types interact with ESG performance and its impact on financial outcomes, which this study aims to explore.

On the other hand, the majority of relevant studies found that when firms promote ESG to increase profitability (Eccles, Ioannou, and Serafeim, 2014; Friede, Busch, and Bassen, 2015). Some researchers also argue that corporate engagement in ESG instead affects shareholder equity (Di Giuli and Kostovetsky, 2014), and decrease financial performance (Manchiraju and Rajgopal, 2017). Firms may even only be willing to engage in ESG when they can foresee improved performance (Lys, Naughton, and Wang, 2015). Many studies argued that a threshold exists in ESG engagement,

resulting in a nonlinear correlation between ESG and financial performance (Barnett and Salomon, 2006; Nollet, Filis, and Mitrokostas, 2016; Sun, Yao, and Govind, 2019; Teng, Ge, Wu, Chang, Kuo, and Zhang, 2022). Despite these diverse findings, the interaction between ESG performance and financial outcomes across different firm control types remains underexplored. Therefore, in this study, we explore the impact of difference control types on ESG performance.

Our study broadens the scope by examining a broader range of firm control types, including family-controlled, jointly-controlled, manager-controlled, and government-controlled firms. Utilizing a sample of 1,620 listed firms in Taiwan from 2016 to 2022, we investigate the differences in ESG performance across these diverse control types and assess the subsequent impact on financial performance. This approach allows for a more comprehensive understanding of the relationships among firm control types, ESG performance, and financial outcomes.

The empirical findings found that government-controlled firms exhibit the best performance in terms of overall ESG implementation, followed by manager-controlled firms, which outperform both family-controlled and jointly-controlled firms. Notably, the ESG performance of jointly-controlled firms are found to be the lowest among the different control types. Moreover, our analysis uncovers a nonlinear relationship between ESG performance and financial performance, highlighting that the impact of ESG performance on financial outcomes varies depending on the firm's control type.

This study makes several important contributions. First, it extends the analysis beyond the traditional focus on family vs. non-family firms by examining the ESG performance across four distinct control types, thereby providing a more nuanced understanding of the governance-ESG nexus. Second, our findings challenge the prevailing notion that ESG initiatives uniformly enhance financial performance, highlighting the variability in ESG-financial performance relationships across different firm control types. Third, the identification of a nonlinear relationship between ESG performance and financial outcomes adds complexity to the discourse on the strategic implications of ESG investments. Collectively, these contribution address critical gaps in the literature on corporate governance and ESG.

This study is divided into five sections. Section 1 is the introduction. Section 2 is literature review. Section 3 descript data and methodology. Section 4 presents the empirical result analysis. Section 5 contains the conclusion and suggestions of this study.

2. Literature Review

We explore the impact of different control types of firms and financial performance on ESG. We review the literature on the relationship between different control types of firms and ESG, as well as the literature on the relationship between ESG and financial performance.

2.1. Firm control types and ESG

Previous studies typically classify firms into family and non-family firms or state-owned and private firms, often ignoring other control types. This study expands the categorization to include four control types: family-controlled, jointly-controlled, manager-controlled, and government-controlled firms. Family-controlled firms, defined as those controlled by a group of related individuals with shared interests, are found to have a stronger sense of CSR, valuing their corporate image and reputation, and protecting their family assets (Dyer and Whetten, 2006; Bingham et al., 2011; Lamb et al., 2017). Due to significant differences between family firms and other types of firms in operations and management (Miller, Minichilli, and Corbetta, 2013), they are also inclined to enhance their environmental performance in response to institutional pressures (Berrone et al., 2010). Research in emerging markets has shown that long-term CSR engagement can positively impact firm value, particularly in family firms (Noor et al., 2020). Additionally, family ownership and control are positively correlated with ESG scores (Sun et al., 2023). However, socioemotional wealth can be both a resource and a burden for family firms and their stakeholders (Kellermanns, Eddleston, and Zellweger, 2012). The commitment of family firms to CSR disclosure can be influenced by their shareholding structure, with family shareholding and governance negatively impacting CSR disclosure unless there is foreign investor involvement (Cabeza-García et al., 2017; Sun et al., 2023). Moreover, highly competitive markets may constrain the promotion of ESG by family firms.

Jointly-controlled firms, governed by an alliance of two or more shareholders such as families, groups, or the government, are known for their adaptability to external changes and ability to harness diverse resources for synergy and added value (Pfeffer and Salancik, 2003; Gulati, 1998). Strategic alliances offer an efficient path to resource acquisition (Inkpen and Tsang, 2005). However, the involvement of multiple shareholders presents challenges in internal negotiation and coordination (Ring and Van de Ven, 1994), leading to conflicts arising from divergent objectives and expectations (Das and Teng, 2000). Clashing organizational cultures and values demand additional efforts in persistence, commitment, and integration (Child and Faulkner, 1998). The free rider problem among individual shareholders complicates management and impacts overall firm performance (Olson, 1971; Ostrom, 1990). La Porta et al. (2000) underscore the potential harm to external shareholder equity when multiple shareholders pursue personal interests. Signaling theory indicates a growing trend of firms forming CSR alliances to showcase commitment to stakeholders (Kopka et al., 2014), although Arya and Salk (2006) suggest that voluntary codes of conduct adopted by cross-sector alliances may primarily serve to manage public perceptions. Almashayekhi (2023) stresses the importance of promoting CSR through firm alliances for jointly-controlled entities, noting that efficiency may decrease as the number of partners rises.

Manager-controlled firms, led by professional managers, can face agency problems due to diverging interests between shareholders and managers (Fama, 1980). The visions of these managers significantly influence firms' development and operating strategies (Rotemberg and Saloner, 2000). As they gain recognition, professional managers may demand higher salaries, potentially impacting

financial performance and shareholder equity (Malmendier and Tate, 2009), exacerbating agency issues (Florackis and Ozkan, 2009). Studies show that professional managers with substantial decision-making power may hesitate to disclose internal information, increasing information asymmetry with creditors (Liu and Jiraporn, 2010). Margolis and Walsh (2003) argued that in conflicts between shareholder interests and social issues, professional managers often prioritize promoting CSR. Velte (2020) further demonstrated that the greater influence of professional managers can enhance the translation of firms' ESG performance into financial advantages.

Government-controlled firms are those whose ultimate controllers are local or central governments. As the importance of ESG grows, these firms play a crucial role in supporting government policies related to ESG issues (Shleifer and Vishny, 1994). Moreover, a study on listed firms in China found that government-associated firms, especially those with senior managers involved in politics, are required to disclose detailed CSR reports and explain their CSR activities, highlighting the heightened expectations for government-controlled firms in terms of CSR disclosure and transparency (Marquis and Qian, 2014). Despite their often low operating efficiency, government-controlled firms are mandated to promote relevant policies (Wang et al., 2022). By promoting ESG, these firms can improve production efficiency (Ma, Gao, and Sun, 2022), which suggests that ESG initiatives can serve as a means to enhance the performance of government-controlled firms while fulfilling their policy obligations.

On the whole, the control type of the firm, which determines the different stakeholders and their motivations, exerts varying influences on ESG promotion. As discussed above, government-controlled firms are mandated to support ESG policies, while manager-controlled firms can enhance financial performance through ESG initiatives. In contrast, family-controlled and jointly-controlled firms may face challenges in ESG engagement due to socioemotional wealth concerns and coordination issues among multiple shareholders. Most existing studies have examined the relationship between family firms and ESG; few studies have explored the influence of the type of control over firms on ESG promotion. Therefore, we conducted an in-depth investigation into the relationship between firms of different control types and their ESG performance, specifically quantified by ESG scores. Based on this theoretical foundation and literature review, we propose the following hypothesis:

Hypothesis 1: The ESG performance of a firm is influenced by its control type. Specifically, government-controlled and manager-controlled firms are expected to exhibit higher ESG ratings compared to family-controlled and jointly-controlled firms.

2.2 ESG and financial performance

Whether the ESG increase financial performance of firm. This is long-time debate. Godfrey (2005) argued that firms supporting charity can accumulate moral capital to increase shareholder wealth. Eccles et al. (2014) found that the firms which pay attention to sustainability outperform other firms in long-term stock prices and finances. Khan, Serafeim, and Yoon (2016) found that when firms

tackle important sustainability issues, their financial performance is significantly better than that of other firms. Yoon, Lee, and Byun (2018) argued that when the firm with better CSR performance can increase the market value. Grewal, Riedl, and Serafeim (2019) also found that the firm with worst ESG performance have higher costs, but the firm has better ESG performance to increase the stock return in European Union (EU).

In contrast, Di Giuli and Kostovetsky (2014) found that increases in CSR rating are negatively trade off with stock price return and ROA, implying that CSR may benefit stakeholders, but at the cost of firm profitability. Furthermore, Manchiraju and Rajgopal (2017) also found a significant negative relationship between CSR and market value, meaning that engaging in CSR damages shareholder equity. Surroca, Tribó, and Waddock (2010) argued that a direct relationship between CSR and financial performance does not exist but is achieved through the intangible resources of the firms. Lys et al. (2015) explained that firms only engage in CSR when they can foresee better future performance.

Barnett and Salomon (2006) found a U-shaped nonlinear correlation between CSR engagement and financial performance. This means that when firms engage in CSR have threshold (Han, Kim, and Yu, 2016). Nollet et al. (2016) also found a U-shaped nonlinear correlation between the social and financial performances of firms. Nuber, Velte, and Hörisch (2020) considered that a U-shaped nonlinear correlation exists between firm sustainability and long-term financial performance, which means that as firms engage in ESG, they must bear considerable costs, which will affect their financial performance. However, as their grasp of ESG issues becomes firmer, they can progressively enhance their financial performance. This shows that a certain threshold exists in ESG engagement and financial performance.

Some scholars also found that an inverted U-shaped relationship exists between ESG performance and financial performance. Among these studies, Sun et al. (2019) argued that promoting CSR can help increase shareholder value but that over-investing in CSR can cause shareholder value to become negative. In recent years, an increasing number of studies have presented that an inverted U-shaped relationship exists between ESG performance and market value and between ESG performance and financial performance (Buallay, Al-Ajmi, and Barone, 2022; Ersoy, Swiecka, Grima, Özen, and Romanova, 2022; El Khoury, Nasrallah, and Alareeni, 2023). This implies that engagement in ESG steadily improves the value and financial performance of firms but that over-investment in ESG will drive up operating costs, causing profitability to decline. Similarly, in a study in Taiwan, Teng et al. (2022) also found an inverted U-shaped relationship between ESG and financial performance. With further analysis, they discovered inverted U-shaped relationships between the social and environmental constructs and financial performance as well and no significant relationship between the corporate governance construct and financial performance. Pierce and Aguinis (2013) explained that the too-much-of-a-good-thing (TMGT) effect exists in the operation and management

of firms, meaning that neither too much nor too little engagement in ESG is beneficial. Therefore, firms must find their own optimal ESG engagement model to maximize the benefits.

Previous studies have primarily focused on the relationship between ESG and financial performance, often overlooking the influence of ESG engagement in firms of different control types on financial performance. To address this gap, we investigated the impact of ESG promotion in family-controlled firms, jointly-controlled firms, manager-controlled firms, and government-controlled firms on financial performance. Based on this exploration and the theoretical framework outlined above, we propose the following hypothesis:

Hypothesis 2: The relationship between ESG performance and financial performance may exhibit a non-linear pattern.

3. Data Source and Research Methods

3.1 Data

The sample firms of this study are to explore the relationships among firm control type, ESG performance, and financial performance. Our empirical period is from 2016 to 2022, and we used annual data for empirical analysis. The data are from Taiwan Economic Journal database (TEJ), which have 9,221 observed values from 1,620 listed firms in Taiwan. The detailed definitions and measurement methods of the variables are displayed in Appendix 1.

3.2 Research methods

3.2.1 Relationship between firm control type and ESG performance

The objective of this study was to investigate the relationships between four different firm control types and their ESG performance. Based on this objective, we employee ordinary least squares (OLS) to empirical analysis, as shown in Equation (1).

$$ESG_{i,j,t} = \alpha_0 + \alpha_j + \alpha_t + \Delta_3 \, GCT_{i,j,t} + \lambda \, Control_{i,j,t} + \varepsilon_{i,j,t} \quad (1)$$

In Equation (1), the dependent variable $ESG_{i,j,t}$ represents the ESG performance score of Firm i in Industry j during Year t; α_0 is the intercept term, and α_j and α_t are the control effects of industry and year. We set family-controlled firms as the reference group. The independent variable Δ_3 GCT thus respectively represents jointly-controlled, manager-controlled, and government-controlled firms; Δ denotes the difference between these three control types and the reference group. The control variables, represented by $Control_{i,j,t}$ include firm size, firm age, debt ratio, research and development expenditure (R&D) ratio, independent director ratio, shareholding ratio of institutional investors, and market-to-book ratio. Finally, $\varepsilon_{i,j,t}$ denotes the error term of Firm i in Industry j during Year t.

This research incorporates seven control variables to investigate the potential factors influencing ESG performance. Firm size (ln Assets) is included because larger companies often demonstrate better ESG performance, likely due to their advantages in ESG assessments (Drempetic et al., 2020). Firm age (ln Age) is considered due to its varied effects: it positively influences CSR, environmental,

and social disclosure scores, but negatively impacts corporate governance scores (Fahad & Nidheesh, 2020). The debt ratio is included following the findings of Asimakopoulos, Asimakopoulos, and Li (2023), which suggest that firms with higher ESG ratings tend to shift from public to private debt, such as bank loans. The R&D expenditure ratio is controlled for its association with enhanced ESG performance (Dicuonzo et al., 2022). The independent director ratio is added to reflect the role of independent directors in balancing financial objectives and social responsibilities (Arayssi et al., 2020). The shareholding ratio of institutional investors is considered due to its positive correlation with ESG performance, indicating that superior ESG performance attracts more institutional investors (Velte, 2020). Finally, the market-to-book ratio is included as it may influence investor preferences and is associated with ESG scores, with a negative correlation observed between ESG performance and stock returns (Gavrilakis & Floros, 2023). These control variables are chosen to provide a comprehensive understanding of the factors that may affect corporate ESG performance.

3.2.2 Impact of ESG performance on financial performance

Existing studies have yielded mixed results regarding the relationship between ESG performance and financial performance. To investigate this relationship in the context of listed firms in Taiwan, we employ ordinary least squares (OLS) regression analysis using two distinct equations. Equation (2) examines the linear impact of ESG performance on financial performance, while Equation (3) extends this analysis by incorporating the squared term of ESG (ESG2) as an independent variable. The inclusion of the squared term allows us to capture any potential nonlinear effects of ESG performance on financial performance, providing a more comprehensive understanding of the relationship between these two variables.

$$Perf_{i,j,t+1} = \alpha_0 + \alpha_j + \alpha_t + \beta\, ESG_{i,j,t} + \lambda\, Control_{i,j,t} + \varepsilon_{i,j,t} \quad (2)$$

$$Perf_{i,j,t+1} = \alpha_0 + \alpha_j + \alpha_t + \beta_1\, ESG_{i,j,t} + \beta_2\, ESG^{2}_{i,j,t} + \lambda\, Control_{i,j,t} + \varepsilon_{i,j,t} \quad (3)$$

Dependent variable $Perf_{i,j,t+1}$ in Equation (2) and (3) denote the financial performance of Firm i in Industry j during Year t + 1. We employed return on assets (ROA) as the proxy variable of financial performance in this study. We also included stock return (r_i) to observe the returns that shareholders receive on their investments. α_0 is the intercept term, and α_j and α_t are the control effects of industry and year. The definition of independent variable $ESG_{i,j,t}$ is identical to that in Regression Model (1). To give the empirical results consistency and comparability, the control variables were identical to those in Equation (1).

3.2.3 Impact of firm control type and ESG performance on financial performance

To further understand the influence of different control types and ESG performance on financial performance, we referred to the research method adopted by Yoon et al. (2018) and analyzed the influence of the interaction effects between different control types and ESG performance on financial performance. We employee OLS to analysis, as shown in Equation (4).

$$Perf_{i,j,t+1} = \alpha_0 + \alpha_j + \alpha_t + \beta_1 ESG_{i,j,t} + \Delta_3 GCT_{i,j,t} + \Gamma_3 GCT_{i,j,t} ESG_{i,j,t} + \lambda Control_{i,j,t} + \varepsilon_{i,j,t} \quad (4)$$

In Equation (4), we similarly set family-controlled firms as the reference group. The coefficients Δ_3 denotes the difference between these three control types and the reference group.; Γ_3 denotes the interaction effects between the different control types and ESG on financial performance. The remaining variables are identical to those in Equation (1) and (2). The detailed definitions and measurement methods of the variables are shown in Appendix 1.

To present the empirical results of Equation (4) more clearly, we separately estimate the impact of the interaction terms between the four control types and ESG on financial performance, as shown in Equation (5).

$$Perf_{i,j,t+1} = \alpha_0 + \alpha_j + \alpha_t + \beta_1 ESG_{i,j,t} + \delta_k GCT_{k,i,j,t} + \tau_k GCT_{k,i,j,t} ESG_{i,j,t} + \lambda Control_{i,j,t} + \varepsilon_{i,j,t} \quad (5)$$

In Equation (5), the subscript k in $GCT_{k,i,j,t}$ represents the four different types of firm control, namely family-controlled, jointly-controlled, manager-controlled, and government-controlled firms. The coefficient δ_k captures the differential impact of each control type on financial performance, while τ_k measures the interaction effects between each control type and ESG performance on financial performance. This allows us to examine the nuanced influence of firm control types and their interaction with ESG performance on financial outcomes.

4. Analysis of Empirical Results

4.1 Descriptive statistics of samples

Table 1 presents the descriptive statistics of the main variables and control variables. Panel A shows the control type statistics. The observed values from family-controlled firms accounted for 63.0% of the sample population; those from *jointly-controlled firms and manager-controlled firms* occupied *12.4% and 22.2%, respectively, whereas those from* government-controlled firms only accounted for 2.4%. The mean ESG score of the entire sample population was 164.631, with maximum and minimum ESG scores of 248.710 and 103.070m respectively, and standard deviation of 23.222. These results imply that variances exist among the firms in ESG score. In the financial performance of the following year, the mean and median of ROA were 8.167 and 7.630, respectively, and the mean and median of stock return were 7.824 and 5.668, indicating a certain level of profitability among the sample firms.

Table 2 shows the descriptive statistics of ESG score in each industry, giving us an understanding of the differences among industries. The glass and ceramic industry presented the highest mean score at 178.069, whereas the textile industry had the lowest mean score at 155.492. Observation of variance in the ESG scores of the industries revealed that the differences among the 264 observed values in the iron and steel industry was the greatest; their standard deviation was the highest among the industries.

Table 1. Descriptive Statistics of Research Variables (N=9,221)

	Mean	**Median**	**S.D.**	**Min.**	**Max.**
Panel A: Firm Characteristics					
Family-controlled	0.630	1.000	0.483	0.000	1.000
Jointly-controlled	0.124	0.000	0.330	0.000	1.000
Manager-controlled	0.222	0.000	0.416	0.000	1.000
Government-controlled	0.024	0.000	0.152	0.000	1.000
ESG score	164.631	162.180	23.222	103.070	248.710
ROA year t+1 (%)	8.167	7.630	9.788	-92.800	81.620
Stock return year t+1 (%)	7.824	5.668	34.973	-191.682	222.034
Panel B: Control Variables					
Ending total assets (NTD million)	65,603	4,306	461,113	17	11,594,361
Firm age	32.829	31.000	13.566	1.000	76.000
Debt ratio (%)	42.946	42.720	19.543	0.380	99.760
R&D ratio *(%)*	2.837	1.226	4.720	0.000	70.752
Independent director ratio *(%)*	31.201	30.000	10.877	0.000	80.000
Shareholding ratio of institutional investors (%)	42.011	40.750	22.547	0.000	100.000
market-to-book ratio (%)	2.100	1.500	3.009	0.270	123.500

Note: Table 1 presents the descriptive statistics. Panel A is the descriptive statistics of firm characteristics. Panel B include total assets served as the proxy variable for firm size, and in the subsequent analyses, the natural logarithm (ln Assets) was used for measurement. For firm age, the natural logarithm (ln Age) was also adopted.

Table 2. Descriptive Statistics of ESG Score in Each Industry

Industry no.	Industry category	ESG score				
		Samples	Mean	S.D.	Min.	Max.
01	Cement industry	42	175.435	16.617	137.030	207.700
02	Food industry	160	174.500	24.956	106.380	228.390
03	Plastic industry	132	171.156	20.350	116.480	218.770
04	Textile industry	293	155.492	20.802	113.980	216.090
05	Electric machinery industry	455	162.473	20.912	118.550	232.300
06	Electrical and cable industry	85	156.161	21.887	115.040	208.920
07	Chemical industry	216	178.023	21.834	120.850	229.230
08	Biotechnology and medical care industry	592	166.628	18.645	126.310	247.790
09	Glass and ceramic industry	30	178.069	20.921	143.210	223.190
10	Paper and pulp industry	37	168.211	23.094	125.120	209.100
11	Iron and steel industry	264	164.696	28.497	110.220	229.970
12	Rubber industry	65	161.668	27.010	119.390	218.830
13	Automobile industry	143	173.549	27.713	118.530	231.340
14	Semiconductor industry	828	168.771	21.465	113.420	238.230
15	Computer and peripheral equipment industry	587	168.539	24.859	115.990	241.710
16	Optoelectronic industry	613	159.460	20.670	110.220	233.630
17	Communications and internet industry	496	166.338	24.430	107.750	247.620
18	Electronic parts and components industry	1,124	160.321	22.573	106.140	244.060
19	Electronic products distribution industry	205	158.406	18.709	121.650	207.690
20	Information service industry	191	160.280	18.723	120.510	212.560
21	Other electronic industry	429	164.701	24.494	110.890	228.330
22	Green energy and environmental services industry	95	157.247	23.193	106.580	210.500
23	Digital and cloud services industry	75	166.326	22.669	106.550	225.920
24	Building material and construction industry	480	160.566	20.547	103.400	228.110
25	Shipping and transportation industry	158	169.848	25.621	118.260	230.620
26	Tourism and hospitality industry	209	157.461	23.089	103.070	215.100
27	Financial and insurance industry	247	177.598	24.068	115.430	233.600
28	Trading and consumers' goods industry	73	168.739	23.405	126.670	209.910
29	Cultural and creative industry	138	160.739	20.362	118.130	208.250
30	Agricultural technology industry	19	163.227	27.196	121.460	196.440
31	Sports and leisure industry	110	173.580	21.982	119.890	225.720
32	Household industry	117	165.776	24.156	121.260	223.890
33	Gas and electricity industry	71	156.598	23.571	106.710	212.360
34	General industry and other industry	442	162.396	24.728	109.180	248.710
	Total	9,221	164.631	23.222	103.070	248.710

Note: Table 2 presents the descriptive statistics of ESG score in each industry.

4.2 Correlation coefficient matrix

Table 3 shows the Pearson correlation coefficient matrix of ESG score, ROA, and stock return in the firms of four different control types. The results indicate a positive correlation between ESG score and the ROA of the following year at the 1% level of significance in family-controlled, jointly-controlled, and manager-controlled firms. This correlation was not significant in government-controlled firms. Furthermore, a positive correlation between ESG score and stock return at the 10% level of significance was only found in jointly-controlled firms; this correlation was not significant in the three other control types.

The results of Pearson correlation coefficient analyses merely present the mutual correlations between variables; they do not show whether the relationships are causal in nature and whether the causal relationships are significant. We therefore conducted regression analysis, but first tested for multicollinearity using the approach employed by Cohen, Cohen, West, and Aiken (2013), in which variance inflation factors (VIFs) of less than 10 rule out multicollinearity. We confirmed that the VIFs of all of the variables were less than 10, meaning that no severe multicollinearity existed among the variables.

Table 3. Pearson Correlation Coefficient Matrix

	Family-controlled (N=5,812)			**Jointly-controlled (N=1,143)**		
	1.	2.	3.	1.	2.	3.
1. ESG score	1.000			1.000		
2. ROA (t+1)	0.228*** (17.826)	1.000		0.293*** (10.372)	1.000	
3. Stock return (t+1)	0.011 (0.861)	0.194*** (15.094)	1.000	0.053* (1.784)	0.266*** (9.317)	1.000

	Manager-controlled (N=2,047)			**Government-controlled (N=219)**		
	1.	2.	3.	1.	2.	3.
1. ESG score	1.000			1.000		
2. ROA (t+1)	0.221*** (10.252)	1.000		0.102 (1.521)	1.000	
3. Stock return (t+1)	0.018 (0.819)	0.213*** (9.882)	1.000	0.037 (0.548)	0.152** (2.270)	1.000

Note: Table 3 displays the Pearson correlation coefficient matrix of ESG score and the ROA and stock return in the following year in the firms of four different control types. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, and the figures within the parentheses are the t values.

4.3 Relationships between firm control types and ESG performance

To understand whether the overall ESG performance of firms of different control types varied, we first compared the differences of ESG score means using ANOVA.

The results shown in Table 4 present significant differences. Specifically, the overall ESG performance of family-controlled firms was significantly better than jointly-controlled firms at the 5% level. However, compared to manager-controlled and government-controlled firms, family-

controlled firms were clearly inadequate. The overall ESG performance of jointly-controlled firms were significantly poorer than that of the other three types of firms at the 1% level, and that of manager-controlled firms was superior to that of family-controlled and jointly-controlled firms at the 1% level of significance. It is worth noting that the overall performance of government-controlled firms was significantly better than that of the other three types of firms at the 1% level. This implies that jointly-controlled firms may face challenges in coordination and consistency when implementing ESG policies. Furthermore, the results also suggest that government-controlled firms are subjected to more public scrutiny and are more policy-oriented, which compels them to invest more resources in ESG. To further understand the relationships between different control types and ESG performance, we established Regression Model (1) with firm size, firm age, debt ratio, R&D ratio, independent director ratio, shareholding ratio of institutional investors, and market-to-book ratio as the control variables. We also controlled for the effects of year and industry.

Table 5 presents the results of Model (1). The mean ESG score of family-controlled firms was 38.233 and the difference between the mean of ESG in jointly-controlled firms and family-controlled firms was -0.584, which was not significant. The estimated differences between the mean of ESG in family-controlled firms and manager-controlled firms and between those of family-controlled firms and government-controlled firms were 7.157 and 18.455, respectively, which are significant at the 1% level. This means that the mean ESG scores of manager-controlled firms and government-controlled firms were respectively 18.720% (=7.157 ÷ 38.233) and 48.269% (=18.455 ÷ 38.233) higher than that of the family-controlled firms. In further analysis, we observed the influence of the four control types on ESG score using Models (2) to (5). Model (2) revealed that with the control variables, the ESG of family-controlled firms decreased by 4.914, which is significant at the 1% level. Models (3) and (2) presented similar circumstances; the ESG of jointly-controlled firms dropped by 2.467, which is also significant at the 1% level. In contrast, the ESG of manager-controlled and government-controlled firms increased by 6.718 and 17.109, both significant at the 1% level.

The findings above demonstrate that firms with different control types exhibit significant variations in their ESG implementation. Specifically, jointly-controlled and family-controlled firms tend to neglect engagement in ESG activities, while manager-controlled firms show relatively better ESG performance. In contrast, government-controlled firms are the most proactive in ESG engagement. These results support Hypothesis 1, which posits that a firm's control type influences its ESG performance. Notably, our findings reveal that government-controlled and manager-controlled firms generally achieve higher ESG ratings compared to their family-controlled and jointly-controlled counterparts, which aligns with our initial expectations.

Table 4. ANOVA of Different Firm Control Types in ESG Score

(I) Control type	(J) Control type	Mean difference (I-J)	Standard error	*p* value
Family-controlled	Jointly-controlled	2.232**	0.729	0.025
	Manager-controlled	-8.426***	0.579	0.000
	Government-controlled	-29.376***	1.551	0.000
Jointly-controlled	Family-controlled	-2.232	0.729	0.025
	Manager-controlled	-10.658***	0.832	0.000
	Government-controlled	-31.608***	1.662	0.000
Manager-controlled	Family-controlled	8.426***	0.579	0.000
	Jointly-controlled	10.658***	0.832	0.000
	Government-controlled	-20.950***	1.602	0.000
Government-controlled	Family-controlled	29.376***	1.551	0.000
	Jointly-controlled	31.608***	1.662	0.000
	Manager-controlled	20.950***	1.602	0.000

Note: Table 4 presents the ANOVA results of different firm control types in ESG score. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5. Relationship Between Different Firm Control Types and ESG Score

	ESG score				
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Intercept	38.233*** (12.564)	39.731*** (12.933)	37.767*** (12.230)	35.870*** (11.736)	38.855*** (12.690)
Independent variables					
Family-controlled		-4.914*** (-11.040)			
Jointly-controlled	-0.584 (-0.920)		-2.467*** (-3.894)		
Manager-controlled	7.157*** (13.035)			6.718*** (12.361)	
Government-controlled	18.455*** (12.970)				17.109*** (11.970)
Control variables					
Firm size	7.258*** (42.376)	7.480*** (43.388)	7.578*** (43.771)	7.453*** (43.285)	7.429*** (43.077)
Firm age	2.409*** (4.537)	2.289*** (4.267)	1.662*** (3.093)	2.286*** (4.273)	1.819*** (3.410)
Debt ratio	-0.074*** (-5.889)	-0.074*** (-5.759)	-0.075*** (-5.834)	-0.076*** (-5.945)	-0.073*** (-5.700)
R&D ratio	0.326*** (6.263)	0.365*** (6.971)	0.383*** (7.279)	0.333*** (6.349)	0.390*** (7.468)
Independent director ratio	0.030 (1.408)	0.024 (1.149)	0.017 (0.817)	0.014 (0.643)	0.035* (1.671)
Shareholding ratio of institutional investors	0.049*** (4.549)	0.061*** (5.561)	0.058*** (5.332)	0.059*** (5.454)	0.051*** (4.706)
market-to-book ratio	0.309*** (4.331)	0.321*** (4.453)	0.311*** (4.282)	0.336*** (4.659)	0.285*** (3.948)
Year effect	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.305	0.290	0.282	0.292	0.292
F value	85.376***	82.874***	79.633***	83.813***	83.524***

Note: Table 5 presents the regression analysis results of different firm control types and ESG score. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, and the figures within the parentheses are the t values. Family-controlled firms served as the reference group in Model (1). In the control variables, the natural logarithm of ending total assets (ln Assets) served as the proxy variable for firm size. For firm age, the natural logarithm (ln Age) was also adopted.

4.4 Impact of ESG performance on financial performance

Existing studies have presented varying views on the influence of ESG performance on financial performance. Thus, to verify whether nonlinear correlation exists between the ESG performance and financial performance of listed and OTC firms in Taiwan, we established Equation (2) and (3). The control variables included firm size, firm age, debt ratio, R&D ratio, independent director ratio, shareholding ratio of institutional investors, and market-to-book ratio. We also controlled for the effects of year and industry.

Table 6 presents the regression analysis results of ESG score with regard to financial performance (Year t + 1). The regression coefficients for ESG score with regard to the ROA and stock return in the following year in Models (1) and (3), were significantly positive at the 1% and 5% levels, thereby indicating that firms with better ESG score presented better ROA and stock return in the following year. This means that as firms engage in ESG, financial performance increases. However, the regression coefficient of the ESG score squared with regard to ROA in Model (2) was significantly negative at the 1% level, indicating that an inverted U-shaped nonlinear correlation existed between ESG and ROA. This means that some of the firms overinvested in ESG, producing the TMGT effect and reducing the marginal utility of ESG, which caused financial performance to decline (Pierce and Aguinis, 2013). Furthermore, based on the first order condition, an ESG score of 207.292 is where the ROA reaches its threshold point, which is higher than the mean ESG score of the entire sample population, 164.631, as shown in Fig. 1. This means that when the ESG performance of a firm reaches 207.292, ROA is maximized. However, overinvesting in ESG will increase investment costs and cause profitability to decline.

The above shows that a nonlinear correlation exists between ESG performance and ROA. When the ESG score reaches the threshold value, ROA can be maximized. However, overinvesting in ESG will negatively affect financial performance, greatly increase operating costs, and harm shareholder equity. These results support with Hypothesis 2, which posits that the relationship between ESG performance and financial performance is complex and may exhibit a non-linear pattern. Specifically, our results suggest that effective ESG management can improve a company's financial performance to a certain extent, but excessive or insufficient ESG engagement could negatively impact financial performance.

Table 6. Regression Analysis Results of ESG Score with Regard to Financial Performance (Year t + 1)

	ROA (t+1)		**Stock return (t+1)**	
	Model (1)	Model (2)	Model (3)	Model (4)
Intercept	-11.152 (-1.188)	-8.108*** (-2.853)	-18.812 (-3.758)	-17.743 (-1.211)
Independent variables				
ROA (t)	0.726*** (97.681)	0.725*** (97.132)		
Stock return (t)			-0.092*** (-8.553)	-0.092*** (-8.547)
ESG score	0.019*** (5.761)	0.101*** (3.187)	0.042** (2.475)	0.029 (0.178)
ESG score ^{2}		-0.000*** (-2.603)		0.000 (0.078)
Control variables				
Firm size	0.060 (0.994)	0.070 (1.166)	-0.025 (-0.080)	-0.026 (-0.085)
Firm age	0.024 (0.141)	0.036 (0.217)	2.066** (2.384)	2.064** (2.379)
Debt ratio	-0.002 (-0.517)	-0.002 (-0.500)	0.041** (1.967)	0.041** (1.965)
R&D ratio	0.011 (0.658)	0.009 (0.561)	0.217** (2.549)	0.217** (2.550)
Independent director ratio	-0.010 (-1.547)	-0.010 (-1.479)	-0.032 (-0.931)	-0.032 (-0.933)
Shareholding ratio of institutional investors	0.011*** (3.306)	0.012*** (3.470)	-0.024 (-1.379)	-0.025 (-1.381)
market-to-book ratio	0.102*** (4.464)	0.105*** (4.608)	-0.951*** (-7.972)	-0.951*** (-7.964)
Year effect	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes
Adjusted R^2	0.608	0.608	0.177	0.176
F value	305.157***	299.129***	43.068***	42.167***

Note: Table 6 presents the regression analysis results of ESG score with regard to financial performance (Year t + 1). The dependent variables were the ROA and stock return of the following year. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, and the figures within the parentheses are the t values. In the control variables, the natural logarithm of ending total assets (ln Assets) served as the proxy variable for firm size. For firm age, the natural logarithm (ln Age) was also adopted.

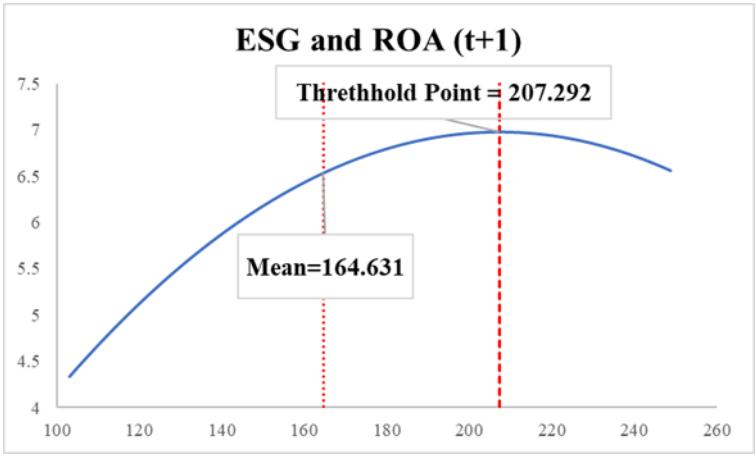

Figure 1. Relationship Between ESG Performance and Financial Performance

Note: Figure 1displays the relationship between ESG score and financial performance. The study period was from 2016 to 2022. The dependent variable was the ROA of the following year. Annual data were adopted. The mean was used for all of the control variables.

4.5 Impact of firm control type and ESG performance on financial performance

To explore the impact of different firm control types and ESG performance on financial performance, this study conducts empirical analysis based on Equations (4) and (5), while controlling for variables such as firm size, firm age, debt ratio, R&D ratio, independent director ratio, institutional investor shareholding ratio, and market-to-book ratio. Additionally, we account for the effects of year and industry. In Section 3.2.3, we specify Equation (4) to analyze the impact of different control types and ESG score on financial performance. Although Equation (4) provides insights into the analysis results, to present these empirical findings more clearly, we further employ Equation (5) to separately estimate the effects of the interaction terms between the four control type categories and ESG on financial performance.

Table 7 shows the regression analysis results for the impact of different control types and ESG score on financial performance in the following year. Specifically, the results of Equation (4) are reflected in Model (1) for ROA and Model (6) for stock return, while the results of Equation (5) are detailed in Models (2) to (5) for ROA and Models (7) to (10) for stock return. Models (1) through (5) present the regression analysis results regarding the four different control types and ESG score with regard to the ROA in the following year. In Model (1), the results with family-controlled firms as the reference group show a significant and positive relationship between increase in ESG score and an increase of 0.069 in ROA in family-controlled firms at the 1% level of significance. In contrast, the difference between family-controlled firms and the interaction term of jointly-controlled firms and ESG was 0.018, which was not significant. Manager-controlled firms and family-controlled firms displayed no significant differences, either. Finally, the difference between government-controlled firms and family-controlled firms was -0.049, which is significantly negative at the 10% level. Thus, Model (1) shows that compared to family-controlled firms, government-controlled firms are more likely to suffer a negative impact on their financial performance when enhancing their ESG score. In

other words, when government-controlled firms actively invest in the environment, society, and governance, it may exert a negative influence on their financial performance.

In Models (2) to (5), we observed whether the interaction effects of the four different firm control types and ESG score influence the ROA in the following year. For instance, the influences of the interaction terms between family-controlled firms and ESG score in Model (2) and between jointly-controlled firms and ESG score in Model (3) on ROA did not reach the level of significance. In Model (4), the regression coefficient of the interaction term between manager-controlled firms and ESG score with regard to ROA indicated a significant and positive correlation at the 1% level, thereby implying that for manager-controlled firms, continuing to improve ESG score could help increase their ROA. Regarding government-controlled firms, the interaction term between government-controlled firms and ESG score with regard to ROA in Model (5) presented a significant and negative correlation at the 1% level, meaning that if government-controlled firms continue to enhance their ESG score, it will instead exert a negative impact on their ROA.

Models (6) through (10) display the regression analysis results regarding the four different control types and ESG score with regard to the stock return in the following year. In Model (1), the results with family-controlled firms as the reference group show no significance in the differences between family-controlled firms and any of the other three types of firms. In Models (7) through (10), the regression coefficients of the interaction effects of the four different firm control types and ESG score with regard to stock return were not significantly different from 0, meaning that the ESG score of the firms did not have a significant impact on stock return.

The analysis results above show that manager-controlled firms could effectively enhance their profitability by improving their ESG performance, which is consistent with the notion that effective ESG management can positively impact financial performance. In contrast, government-controlled firms that continued to increase their engagement in ESG may have faced the problem of overinvestment, leading to a negative impact on their financial performance. This finding supports the hypothesis that excessive ESG engagement could negatively impact financial performance. Moreover, our analysis results revealed that the efforts that firms of different control types devoted to ESG engagement did not have a significant influence on stock return, suggesting that the relationship between ESG performance and financial performance is complex and may exhibit a non-linear pattern. Overall, these findings are in line with Hypothesis 2, which posits that the relationship between ESG performance and financial performance is complex and may be moderated by the control type of the firm.

Table 7. Firm Control Type, ESG Score, and Financial Performance (Year t + 1)

	ROA (t+1)					**Stock return r_i (t+1)**				
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)
Intercept	-10.037*** (-6.721)	-8.923*** (-6.538)	-8.955*** (-6.478)	-8.789*** (-6.370)	-9.811*** (-7.112)	-15.516*** (-2.844)	14.591*** (2.938)	-17.059*** (-3.391)	-17.281*** (-3.439)	-17.758*** (-3.525)
Independent variables										
ESG score	0.069*** (12.139)	0.064*** (13.845)	0.064*** (13.854)	0.061*** (12.930)	0.069*** (14.871)	0.033 (1.594)	0.042** (2.509)	0.043** (2.537)	0.040** (2.322)	0.045*** (2.623)
Family-controlled × ESG		-0.000 (-0.094)					0.002 (0.462)			
Jointly-controlled	-2.939 (-1.436)					-12.316 (-1.647)				
Jointly-controlled × ESG	0.018 (1.423)		-0.000 (-0.088)			0.068 (1.464)		-0.008 (-1.272)		
Manager-controlled	2.845* (1.653)					-0.992 (-0.158)				
Manager-controlled × ESG	-0.013 (--1.240)			0.005*** (3.578)		0.009 (0.242)			0.005 (0.857)	
Government-controlled	4.580 (0.927)					6.003 (0.333)				
Government-controlled × ESG	-0.049* (-1.909)				-0.026*** (-7.888)	-0.039 (-0.421)				-0.010 (-0.832)
Control variables										
Firm size	1.085*** (12.855)	1.071*** (12.650)	1.071*** (12.651)	1.069*** (12.628)	1.087*** (12.879)	-0.297 (-0.962)	-0.293 (-0.951)	-0.297 (-0.965)	-0.297 (-0.964)	-0.288 (-0.936)
Firm age	-1.125*** (-4.690)	-1.145*** (-4.766)	-1.147*** (-4.797)	-1.076*** (-4.487)	-1.191*** (-4.997)	1.926** (2.199)	1.922** (2.199)	1.931** (2.218)	2.023** (2.317)	1.944** (2.234)
Debt ratio	-0.088*** (-15.462)	-0.088*** (-15.453)	-0.088*** (-15.452)	-0.089*** (-15.546)	-0.088*** (-15.499)	0.054** (2.586)	0.055*** (2.645)	0.055*** (2.621)	0.055*** (2.619)	0.055*** (2.641)
R&D ratio	-0.255*** (-10.843)	-0.247*** (-10.510)	-0.247*** (-10.510)	-0.254*** (-10.779)	-0.249*** (-10.632)	0.226*** (2.641)	0.238*** (2.779)	0.232*** (2.713)	0.230*** (2.684)	0.235*** (2.754)
Independent director ratio	-0.024** (-2.514)	-0.020** (-2.065)	-0.020** (-2.069)	-0.021** (-2.170)	-0.024** (-2.572)	-0.030 (-0.852)	-0.028 (-0.809)	-0.029 (-0.840)	-0.028 (-0.824)	-0.029 (-0.851)
Shareholding ratio of institutional investors	0.038*** (7.856)	0.036*** (7.348)	0.036*** (7.338)	0.036*** (7.333)	0.038*** (7.833)	-0.016 (-0.873)	-0.015 (-0.869)	-0.016 (-0.920)	-0.015 (-0.873)	-0.015 (-0.817)
market-to-book ratio	0.341*** (10.571)	0.333*** (10.305)	0.333*** (10.305)	0.337*** (10.420)	0.339*** (10.513)	-1.144*** (-9.713)	-1.144*** (-9.728)	-1.142*** (-9.716)	-1.140*** (-9.690)	-1.141*** (-9.701)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.206	0.200	0.200	0.201	0.205	0.170	0.170	0.170	0.170	0.170
F value	47.078***	50.067***	50.067***	50.409***	51.730***	37.335***	41.189***	41.225***	41.203***	41.201***

Note: Table 7 shows the regression analysis results of firm control type and ESG score on financial performance (Year t + 1). The dependent variables were the ROA and stock return. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, and the figures within the parentheses are the t values. Family-controlled firms were the reference group of Models (1) and (6). In the control variables, the natural logarithm of ending total assets (ln Assets) served as the proxy variable for firm size. For firm age, the natural logarithm (ln Age) was also adopted.

4.6 Robustness analysis

In consideration of the dynamic endogeneity effect that may exist among the different control types, ESG performance, and financial performance, we referred to the GMM proposed by Hansen (1982) to test robustness and rule out the effect of endogeneity on the analysis results.

Table 8 presents the GMM results of firm control type and ESG score. The results indicate that the mean ESG score of family-controlled firms in Model (1) was 38.233 and that the difference between the mean ESG scores of jointly-controlled firms and family-controlled firms was -0.584, which is not significant. In contrast, the estimates of the differences between joint-controlled firms and manager-controlled firms and between joint-controlled firms and government-controlled firms were both significant at the 1% level. Comparison of the analysis results in Models (2) through (5) with the OLS regression analysis results in Table 5 showed that they were consistent. Table 9 displays the GMM results of firm control type and ESG score with regard to financial performance. Comparison of the analysis results with the OLS regression analysis results in Table 6 also showed a high degree of consistency.

The robustness analysis using the GMM method confirms the consistency of our findings with those obtained from the OLS regression analysis. This consistency not only strengthens the credibility of our results but also suggests that the GMM approach adequately addresses the potential dynamic endogeneity among different control types, ESG performance, and financial performance.

Table 8. GMM Results of Firm Control Type and ESG Score

	ESG score				
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Intercept	38.233*** (12.290)	39.731*** (11.270)	37.767*** (12.530)	35.870*** (11.270)	38.855*** (12.340)
Independent variables					
Family-controlled		-4.914*** (-11.090)			
Jointly-controlled	-0.584 (-0.937)		-2.467*** (-4.034)		
Manager-controlled	7.157*** (13.310)			6.718*** (12.670)	
Government-controlled	18.455*** (11.750)				17.109*** (11.010)
Control variables					
Firm size	7.258*** (41.950)	7.480*** (43.370)	7.578*** (43.750)	7.453*** (43.600)	7.429*** (43.660)
Firm age	2.409*** (4.223)	2.289*** (3.993)	1.662*** (2.948)	2.286*** (4.176)	1.819*** (3.260)
Debt ratio	-0.074*** (-5.914)	-0.074*** (-5.763)	-0.075*** (-5.877)	-0.076*** (-5.964)	-0.073*** (-5.724)
R&D ratio	0.326*** (7.135)	0.365*** (7.853)	0.383*** (8.025)	0.333*** (7.262)	0.390*** (8.174)
Independent director ratio	0.030 (1.387)	0.024 (1.133)	0.017 (0.810)	0.014 (0.634)	0.035* (1.652)
Shareholding ratio of institutional investors	0.049*** (4.612)	0.061*** (5.625)	0.058*** (5.377)	0.059*** (5.506)	0.051*** (4.757)
market-to-book ratio	0.309*** (3.428)	0.321*** (3.496)	0.311*** (3.355)	0.336*** (3.607)	0.285*** (3.158)
Year effect	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes
S.D. dependent var	23.221	23.222	23.222	23.222	23.222

Note: Table 8 presents the GMM results of firm control type and ESG score. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, and the figures within the parentheses are the z values. S.D. dependent var denotes the standard deviation of the dependent variables. Family-controlled firms served as the reference group in Model (1). In the control variables, the natural logarithm of ending total assets (ln Assets) served as the proxy variable for firm size. For firm age, the natural logarithm (ln Age) was also adopted.

Table 9. GMM Results of Firm Control Type and ESG Score with Regard to Financial Performance (Year t + 1)

	ROA (t+1)					**Stock return r_i (t+1)**				
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)
Intercept	-9.643*** (-2.188)	-8.959** (-2.413)	-8.954** (-2.444)	-8.789** (-2.499)	-9.811*** (-2.872)	-17.306*** (-3.428)	-17.470*** (-2.938)	-17.059 (-1.436)	-17.281*** (-3.439)	-17.758* (-1.959)
Independent variables										
ESG score	0.067*** (14.340)	0.064*** (15.300)	0.064*** (15.260)	0.061*** (14.090)	0.069*** (16.870)	0.043** (2.510)	0.042** (2.548)	0.043** (2.572)	0.040** (2.447)	0.045*** (2.829)
Family-controlled × ESG		-0.000 (-0.094)					0.002 (0.473)			
Jointly-controlled × ESG	-0.000 (-0.047)		-0.000 (-0.098)			-0.008 (-1.271)		-0.008 (-1.310)		
Manager-controlled × ESG	0.004*** (2.548)			0.005*** (3.462)		0.003 (0.525)			0.005 (0.834)	
Government-controlled × ESG	-0.025*** (-6.942)				-0.026*** (-7.534)	-0.010 (-0.953)				-0.010 (-0.990)
Control variables										
Firm size	1.085*** (5.566)	1.071*** (9.384)	1.071*** (12.651)	1.069*** (8.072)	1.087*** (16.340)	-0.293 (-0.861)	-0.293 (-0.388)	-0.297 (-0.970)	-0.297 (-1.084)	-0.288 (-0.936)
Firm age	-1.135*** (-3.002)	-1.145*** (-4.766)	-1.147*** (-4.797)	-1.076*** (-3.148)	-1.191*** (-4.856)	1.955** (1.974)	1.922 (1.147)	1.931 (1.261)	2.023** (2.317)	1.944** (2.110)
Debt ratio	-0.089*** (-13.040)	-0.088*** (-13.700)	-0.088*** (-15.452)	-0.089*** (-13.190)	-0.088*** (-13.020)	0.054** (2.335)	0.055** (2.328)	0.055** (2.349)	0.055** (2.280)	0.055** (2.323)
R&D ratio	-0.254*** (-4.645)	-0.247*** (-4.925)	-0.247*** (-4.626)	-0.254*** (-4.667)	-0.249*** (-4.623)	0.227** (2.000)	0.238** (1.960)	0.232** (1.965)	0.230** (2.203)	0.235** (2.083)
Independent director ratio	-0.025** (-2.007)	-0.020 (-1.638)	-0.020* (-1.886)	-0.021** (-2.354)	-0.024*** (-3.649)	-0.031 (-0.782)	-0.028 (-0.597)	-0.029 (-0.669)	-0.028 (-0.781)	-0.029 (-0.916)
Shareholding ratio of institutional investors	0.038*** (6.184)	0.036*** (6.134)	0.036*** (6.493)	0.036*** (6.997)	0.038*** (6.489)	-0.015 (-0.713)	-0.015 (-0.713)	-0.016 (-0.754)	-0.015 (-0.743)	-0.015 (-0.679)
market-to-book ratio	0.341** (2.272)	0.333** (2.232)	0.333** (2.234)	0.337** (2.254)	0.339** (2.256)	-1.138*** (-3.613)	-1.144*** (-3.671)	-1.142*** (-3.621)	-1.140*** (-3.606)	-1.141*** (-3.583)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
S.D. dependent var	9.788	9.788	9.788	9.788	9.788	34.973	34.973	34.973	34.973	34.973

Note: Table 9 displays the GMM results of firm control type and ESG score with regard to financial performance (Year t + 1). ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, and the figures within the parentheses are the z values. S.D. dependent var denotes the standard deviation of the dependent variables. Family-controlled firms served as the reference group in Models (1) and (6). In the control variables, the natural logarithm of ending total assets (ln Assets) served as the proxy variable for firm size. For firm age, the natural logarithm (ln Age) was also adopted.

5. Conclusion and Suggestions

This study was to explore the relationships among firm control type, ESG performance, and financial performance of listed firms in Taiwan. The empirical results showed that jointly-controlled and family-controlled firms shown lower ESG performance; manager-controlled firms could enhance their ROA performance via continuous improvements in ESG. Finally, government-controlled firms presented better ESG performance as a whole and performed better than the other three types of firms. However, overinvestment in ESG exerted a negative impact on ROA. Furthermore, we found that even if firms of different control types devoted efforts to ESG, it did not have a significantly positive influence on their stock return. This means that when evaluating stocks, market participants may divert more attention to factors other than ESG performance.

Based on the empirical findings, firms improving ESG performance exerts a positive influence on financial performance in the following year. However, overinvestment in ESG can have a negative impact, meaning that investing more resources in ESG will not result in corresponding returns in financial performance and may even have an adverse influence. Furthermore, regarding the influence of ESG performance on firm performance, we discovered that the relationship between the overall samples and financial performance was nonlinear. Specifically, an inverted U-shaped relationship existed between ESG scores and ROA of the following year. This finding fits the TMGT effect that Pierce and Aguinis (2013) proposed for firm operation and management. Therefore, firms must find their own optimal ESG engagement model to maximize the benefits.

As the global corporate landscape is shifting, the emphasis on ESG management is becoming more pronounced. ESG practices are now recognized not only as a means to bolster a firm's reputation but also as a crucial component of its long-term viability and value, thus making them essential for its survival (Yun and Lee, 2022). Considering the varying impacts of firm control types on ESG, we propose targeted strategies for different types of firms: Family-controlled and jointly-controlled firms should actively enhance their ESG initiatives to improve their return on assets (ROA) performance. In contrast, manager-controlled firms can boost their ROA by consistently advancing their ESG practices. Government-controlled firms, while demonstrating superior ESG performance, should strive for a balanced ESG strategy and prudent resource allocation to mitigate the negative consequences of overinvestment. The inconsistency between the superior ESG performance of government-controlled firms and their financial performance can be attributed to unique challenges such as compliance with governmental policies and bureaucratic inefficiencies, which may hinder the translation of ESG efforts into financial gains. Minutolo, Kristjanpoller, and Stakeley (2019) emphasize that a firm's ESG score is not merely an indicator of its sustainability efforts but also reflects its strategic choices. Consequently, it is imperative that government-controlled firms align their ESG strategies with financial objectives to optimize the benefits of their sustainability initiatives.

Finally, in the section discussing research limitations, firstly, the data used in this study primarily come from listed firm in Taiwan, which may limit the generalizability of the research findings. Future

studies could consider using data from different countries or regions to verify the robustness of the findings of this study. Secondly, this study mainly focuses on the overall ESG performance of companies and has not delved into the specific impacts of different dimensions of ESG (such as environmental, social, and governance) on financial performance. Future research could further dissect the various aspects of ESG to gain a more comprehensive understanding of their relationship with financial performance. Moreover, based on the findings highlighting the complex relationship between ESG performance and financial outcomes in government-controlled companies, future research could explore this issue further. Studies could delve into the motivations and objectives of government-controlled companies to understand the considerations behind their ESG investment decisions. This would help explain why the strong ESG performance of government-controlled companies does not always translate into superior financial performance. Investigating these aspects would enrich the theoretical understanding and provide valuable insights for improving ESG practices and financial outcomes in these firms.

Appendix

Appendix 1. Definitions and Measurement Methods of Variables

Variables	Definitions and measurement methods
Panel A: Firm characteristics	
The control type data originated from the ownership structure and group control type data in the TEJ Corporate Governance database. The ESG score data was retrieved from the TESG Sustainability Index Main Table of the TESG Sustainability Solution database of TEJ. The financial performance data was obtained from the finance and stock price databases of TEJ.	
Family-controlled firms	Family-controlled firms refer to firms ultimately controlled by a group of individuals (natural persons) who share the same interests and goals and are related to each other. The operational definition of family-controlled is as follows: 1. The chairman and CEO are members of a single family. 2. The percentage of directors controlled by this family is greater than 50% (excluding friendly directors), and the percentages of friendly directors and outside directors are both less than 33%. 3. The percentage of directors controlled by this family is greater than 33%, and at least three members of the controlling family serve as directors, supervisors, and managers. 4. The shareholding ratio of this family is greater than the critical control level.
Jointly-controlled firms	Jointly-controlled firms refer to firms that are ultimately controlled by an alliance of two or more controlling shareholders (families, groups, or the government). These individual groups cannot singly direct firm operations or important decisions without cooperating with other groups.
Manager-controlled firms	Manager-controlled firms have no apparent major shareholders or have major shareholders that do not directly participate in firm operations or decisions; any major policies are directed by the professional manager (ultimate controller).
Government-controlled firms	Government-controlled firms whose ultimate controllers are local governments or the central government.
ESG= ESG score	1. The TESG evaluation method is achieved as follows. In accordance with SASB Standards, TEJ divides the listed and OTC firms in Taiwan into 11 industries. Each firm is scored using variables gauging quantitative data and degree of disclosure and then ranked in their respective industries. To maintain evaluation consistency and cover all firms, TEJ simplified the five dimensions used by the SASB into the three constructs, namely, E, S, and G, and 16 major issues. At the same time, GRI disclosure topics are also included in the evaluation. When the scores of the E, S, and G constructs are calculated, quantitative data is weighted to account for 75% of the score, whereas degree of disclosure is weighted to account for 25%. In this way, the scores of the E, S, and G constructs are calculated. 2. The scores of the E, S, and G constructs range from 0 to 100. A higher score indicates better firm performance. The ESG score in this study is the sum of the scores of the individual E, S, and G constructs.
ROA = return on assets	ROA = pre-tax income ÷ ending total assets
r_i = stock return	Stock return = post-tax income ÷ shareholder equity
Panel B: Control variables	
The below data was retrieved from the Company DB database, finance database, and corporate governance database of TEJ.	
Control 1 Firm size	Firm size was measured using the natural logarithm of ending total assets (ln Assets).
Control 2 Firm age	Firm age was measured using the natural logarithm of the number of years since the date of its registration (ln Ages).
Control 3 Debt ratio	Debt ratio = ending total debts ÷ending total assets
Control 4 R&D ratio	R&D ratio = R&D expenses ÷ ending total assets
Control 5 Independent director ratio	Independent director ratio = number of independent directors ÷ number of directors and supervisors
Control 6 Shareholding ratio of institutional investors	Shareholding ratio of institutional investors = 100% - shareholding ratio of domestic retail investors (%) - shareholding ratio of overseas and foreign retail investors (%)
Control 7 Market-to-book ratio	market-to-book ratio = stock price ÷ book value per share

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