ประเภทอุตสาหกรรมมีบทบาทในการปรับผลกระทบของ ESG ต่อผลการดำเนินงานทางการเงินของบริษัทจดทะเบียนในประเทศไทยที่อยู่ในดัชนีความยั่งยืนดาวโจนส์ (DJSI) หรือไม่

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บทคัดย่อ

งานวิจัยนี้ศึกษาผลกระทบของ ESG และองค์ประกอบแต่ละด้านของ ESG ซึ่งประกอบไปด้วย ด้านสิ่งแวดล้อม (E) ด้านสังคม (S) และด้านธรรมาภิบาล (G) ที่มีต่อผลการดำเนินงานทางการเงินของบริษัทจดทะเบียนไทยที่อยู่ในดัชนีความยั่งยืนดาวโจนส์ นอกจากนี้ ยังทดสอบว่าประเภทของอุตสาหกรรมเป็นตัวแปรที่มีอิทธิพลต่อผลกระทบของ ESG ที่มีต่อผลการดำเนินงานทางการเงินหรือไม่ โดยงานวิจัยนี้ใช้การประมาณค่าพารามิเตอร์ด้วยวิธีกำลังสองน้อยที่สุดที่มีการทดสอบแบบจำลองแบบสุ่มและแบบคงที่บนข้อมูลทุติยภูมิของบริษัทจดทะเบียนไทย 25 บริษัทที่อยู่ในดัชนีความยั่งยืนดาวโจนส์ ช่วง ปี ค.ศ. 2012 ถึง ปี ค.ศ. 2022 จากการศึกษาพบว่า ESG ไม่มีผลต่อผลการดำเนินงานทางการเงินของบริษัท อย่างไรก็ตาม องค์ประกอบของ ESG ด้านธรรมาภิบาล (G) มีผลต่อผลการดำเนินงานทางการเงินในทางบวกอย่างมีนัยสำคัญทางสถิติ อีกทั้งยังพบว่า อิทธิพลร่วมระหว่างองค์ประกอบของ ESG ด้านธรรมาภิบาล (G) กับประเภทของอุตสาหกรรมมีผลต่อผลการดำเนินงานทางการเงินในทางลบอย่างมีนัยสำคัญทางสถิติ แสดงให้เห็นว่าประเภทของอุตสาหกรรมเป็นตัวแปรมีอิทธิพลต่อความสัมพันธ์ระหว่าง ESG ด้านธรรมาภิบาล (G) กับผลการดำเนินงานทางการเงิน

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Does Industry Type Moderate the Impact of ESG on Financial Performance of Thai Listed Firms in Dow Jones Sustainability Indices (DJSI)?

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Abstract

This research studies the impact of ESG and its three pillars, comprising of environmental (E), social (S), and governance (G), on financial performance of Thai listed firms in Dow Jones Sustainability Indices (DJSI), and tests whether industry type acts as a moderator on the impact of ESG performance on firm financial performance. In addition, this research uses OLS with the tests for random and fixed effects on the secondary data of 25 Thai listed firms in Dow Jones Sustainability Indices (DJSI) during 2012–2022. The results show an insignificant effect of ESG on financial performance. However, the governance pillar of ESG exhibits a positive and significant impact on financial performance. Furthermore, the interaction term between the governance pillar of ESG and industry type is negatively significant, indicating that industry type is a moderator on the relationship between the governance pillar of ESG and financial performance.

Keywords: Dow Jones Sustainability Indices, Environmental, Financial performance, Governance, Social

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Introduction

Thailand has been vigorously involving in encouraging sustainable practices and ESG principles through global cooperations. The development of ESG in Thailand is growing continuously as the increasing number of companies in Thailand realizes the significance of ESG; especially, on firm financial performance. According to the National Economic and Social Development Board (NESDB, 2017), Thai government provides regulations and incentives to promote ESG initiatives. One of the sample policies is the Sustainable Development Goals (SDGs) Thailand 4.0, which is consistent with the United Nations' SDGs. Moreover, Thai government created the Thailand Greenhouse Gas Management Organization (TGO) to measure and decrease carbon footprint in businesses (Thailand Greenhouse Gas Management Organization [TGO], 2019). Furthermore, the Stock Exchange of Thailand (SET) helps listed firms prepare an ESG disclosure in line with the Form 56-1 One Report of the Securities and Exchange Commission (SEC) as well as other ESG reporting frameworks (Stock Exchange of Thailand [SET], 2022). Consequently, risk management and responsibility to stakeholders, society, and environment are ensured to put in place in accordance with the United Nations' SDGs.

By implementing ESG practices in businesses, Thai firms can enhance their financial performance because of the increasing in the reputation, trust, and loyalty among all stakeholders, the usage of proactive risk management approach, the reduction in energy consumption and operational costs, the better access to capital by attracting socially responsible investors, and the more competitive advantage from the development of new products, services, and business models.

There are some global indices comprising of ESG stocks such as the Dow Jones Sustainability Indices (DJSI), the FTSE4Good Index Series, and the MSCI Global ESG Indices. The Stock Exchange of Thailand (SET) also provides SETESG Index. Referring to the SET (2018), stocks in the latest SET ESG Ratings with the minimum average daily market capitalization at 5,000 million Baht for the past 3 months, free-float of no less than 20% of the listed company's paid-up capital, and a monthly turnover ratio of at least 0.5% of company's total listed shares for at least 9 out of the 12 months are qualified to be in the SETESG Index constituents. However, this study focuses on Thai listed firms in the Dow Jones Sustainability Indices (DJSI).

Besides fulfilling the ESG literature in developing countries in Southeast Asia, the findings of this study are expected to benefit investors, companies as well as government in Thailand. Firstly, investors can apply a suitable strategy to trade ESG stocks. Next, companies can enhance their financial performance by participating in ESG practices. Lastly, relevant government organizations can initiate and promote more ESG policies to increase a sustainable and responsible business environment.

This paper is organized as follows. First, the research objectives are presented. Next, literature review, hypotheses, and a conceptual framework are provided. Then, the methodology used in this paper and findings are reported. After that, the results are concluded and discussed. The last section is recommendations from the results of this paper as well as recommendations for future research.

Research objectives

1) To examine the impact of ESG and each of its pillars, namely Environmental (E), Social (S), and Governance (G), on financial performance of Thai listed firms in Dow Jones Sustainability Indices (DJSI).

2) To investigate whether industry type (service vs non-service) moderates the effect of ESG performance on firm financial performance.

Literature Review

Globally, as exhibited in Amel-Zadeh and Serafeim (2018), ESG data reporting has been increasing from fewer than 20 companies in the early 1990s to more than 9,000 companies in 2016. The number of investors who are interested in ESG issues rises as well. From the survey data, Amel-Zadeh and Serafeim (2018) also show that relevance to investment performance, client demand, product strategy, and ethical considerations are main motivation for investors to use reported ESG information. However, the major obstacle to ESG information usage is the lack of reporting standards. Moreover, Schumacher et al. (2020) investigate practices in sustainable finance in Japan, including the implementation of ESG in financial decision-making, more strict reporting and disclosure standards, and the evolution of green bond and sustainable investment markets. They suggest Japan to establish a framework of a set of ESG and sustainable finance policy targets for all sectors.

In addition, there are many papers reviewing previous studies that examined the impact of ESG on firm financial performance. For example, Friede et al. (2015) examine approximately 2,200 individual studies of a relation between ESG and corporate financial performance by using vote-count studies as well as meta-analyses. Most studies show positive results. Additionally, ESG outperformance opportunities can be found in North America, Emerging Markets, and nonequity asset classes. They also suggest the study of ESG determinants for long-term positive performance impacts as future research. Moreover, Starks (2021) reviews papers published in the Financial Analysts Journal within the past 60 years. The author finds that the focus on ESG issues by investors and corporations has increased, and the debate on the performance effects of applying ESG to investment decisions has continued to exist. Furthermore, Halid et al. (2023) review previous papers examining the relationship between ESG score and firm performance. They find inconclusive results. Some papers reveal a positive relationship, but other papers show a negative or no relationship. They also suggest that the reasons may come from the differences in firm performance measurements and years of data. Recently, Bai and Kim (2024) investigate whether ESG practices enhance financial performance by comparing English, Chinese, and Korean papers. The findings from a bibliometric analysis on 2,659 ESG-related papers show a significant turning point in ESG studies in 2019 as indicated by a huge increase in publications in all three languages. According to the meta-analysis, Chinese and Korean papers display a positive correlation between ESG and financial performance. However, English papers exhibit no significant correlation.

Furthermore, there are a lot of studies investigating the impact of ESG performance on firm financial performance. For instance, Khan (2019) collects company data from the MSCI All Country World Investable Market Index (ACWI IMI). The sample includes 338,626 monthly observations from 42 countries during 2009–

2017. This study presents ESG measures as guidance to companies' financial performance and proposes possible investment value in ESG indicators. Next, Ahmad et al. (2021) study 351 firms from FTSE350 during 2002–2018 by employing static and dynamic panel data techniques. They find that total ESG has a positive and significant impact on firm financial performance, and firm size is a moderator in the relationship between ESG and firm financial performance. In addition, Díaz-Peña et al. (2022) compare financial performance of the most outstanding companies in six green countries, including Sweden, the United Kingdom, France, Denmark, Hungary, and New Zealand, with the worldclass companies for ten industries, comprising of Energy, Industrials, Basic Materials, Real Estate, Healthcare, Utilities, Consumer Cyclicals, Consumer Non-Cyclicals, Financials, and Technology. They find that firms from the net zero legislation approval countries such as Sweden, Denmark, and the United Kingdom have a better financial performance than other comparable firms in the same industry. They also find that the social factor, not the environmental factor, has the highest correlation to the ESG combined score. Moreover, Chen et al. (2023) examine how ESG affects corporate financial performance by using a sample of 3,332 listed companies globally during 2011–2020. The results from regression analysis show a positive and significant association between ESG performance and financial performance for large-scale companies.

Nonetheless, some papers show mixed results. For example, Atz et al. (2022) employ meta-analyses with a basic Bayesian random effects model on the universe of 1,141 studies during 2015–2020. They find a positive relation between sustainability and financial performance on the firm level. However, they find indifference in financial performance between ESG investments and conventional investments. In addition, Weston and Nnadi (2021) examine the impact of corporate social responsibility and ESG on corporate financial performance. The sample consists of iShares MSCI KLD 400 Social exchange traded fund (ETF), iShares Core S&P 500ETF, and firms that follow the Principles for Responsible Investing (PRI). This study shows no support that ethical ETFs outperform conventional ETFs, but it finds that firms that follow PRI have better performance than those do not follow. Al-Tarawneh et al. (2024) study the relationship between Environmental, Social, and Governance (ESG) scores and financial performance of 188 non-financial firms listed in the UK from 2015 to 2023. Panel regression and the Generalized Method of Moments (GMM) estimation are employed to analyze the data. A significant negative relationship between ESG combined score and Tobin's Q as well as a significant negative relationship between governance score and Tobin's Q are found. On the other hand, there is no significant relationship between ESG scores and return on total assets, (ROA).

Recently, in Thailand, the topics of the effect of sustainability disclosures and ESG performance on corporate financial performance are also of interest to both investors and companies. For instance, Sirikanerat (2022) investigates 67 agro and food industry firms listed on the Stock Exchange of Thailand in 2022. Sustainability management disclosures have positive impacts on return on total assets (ROA), return on equity (ROE) as well as net profit margin at 0.05 level of statistical significance. Next, Pumiviset and Duangtong (2024) study a cross-sectional data of 615 Thai listed firms that had undertaken the assessment of the Thailand Sustainability Investment (THSI) in 2023 by using multiple regression analysis. They find the impact of ESG rating on financial performance as measured by return on equity (ROE), but no impact of ESG

rating on financial performance as measured by return on total assets (ROA). Moreover, Sirathavornvong et al. (2024) investigate the relationship between ESG and financial performance of 50 firms listed in the Stock Exchange of Thailand (SET50) during the period from 2020 to 2023. By employing regression analysis with panel data, they find that ESG combined score, environmental score, and social score have a positive and significant relationship with return on total assets (ROA). However, only social score has a positive and significant relationship with return on equity (ROE).

However, in Thailand, more studies on the impact of ESG and each of its three pillars (including environmental pillar, social pillar and governance pillar) on firm financial performance need to be executed to prove whether ESG and each of its three pillars have a positive impact on firm performance, and whether industry type acts as a moderator on the relationship between ESG performance and firm financial performance. In addition to the existing literature, the findings can fulfill the lack of studies on ESG and firm performance in the developing countries in Southeast Asia. Therefore, the hypotheses and the conceptual framework in Figure 1 are as follows.

H_1: ESG score has a positive impact on firm financial performance.

H_2: Environmental pillar score has a positive impact on firm financial performance.

H_3: Social pillar score has a positive impact on firm financial performance.

H_4: Governance pillar score has a positive impact on firm financial performance.

H_5: Industry type moderates the relationship between ESG performance and firm financial performance.

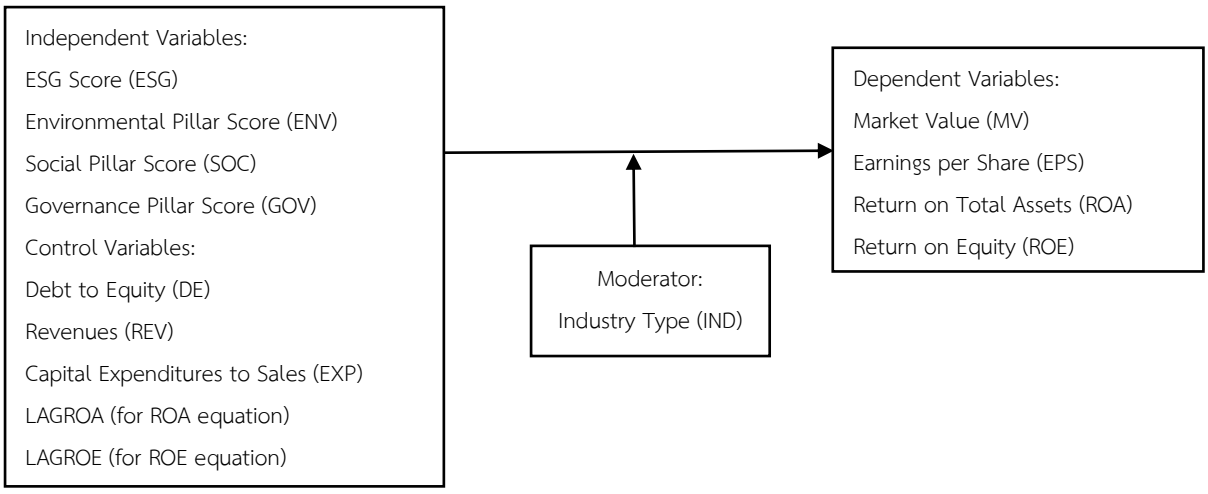

Figure 1 Conceptual framework

Source: Author

Methodology

This paper collects the secondary data of 25 Thai listed companies in the Dow Jones Sustainability Indices (DJSI) during 2012–2022 from LSEG database. Dependent variables are market value (MV), earnings per share (EPS), return on total assets (ROA), and return on equity (ROE). Independent variables are ESG score (ESG), environmental pillar score (ENV), social pillar score (SOC), and governance pillar score (GOV). In addition, control variables include debt to equity (DE), revenues (REV), and capital expenditures to sales (EXP). This study also uses industry type (IND) as a moderator to examine whether the industry type (service (IND = 1) versus non-service (IND = 0)) diminishes or rises the impact of ESG on financial performance of Thai listed firms in Dow Jones Sustainability Indices (DJSI). Descriptive statistics as well as OLS with the tests for random and fixed effects are used. Furthermore, models employed are as follows.

Model 1: The impact of ESG score on financial performance of Thai listed firms in Dow Jones Sustainability Indices

$$MV_{it} = b_0 + b_1ESG_{it} + b_2DE_{it} + b_3REV_{it} + b_4EXP_{it} + b_5IND_{it} + e_{it} \quad (1)$$

$$EPS_{it} = b_0 + b_1ESG_{it} + b_2DE_{it} + b_3REV_{it} + b_4EXP_{it} + b_5IND_{it} + e_{it} \quad (2)$$

$$ROA_{it} = b_0 + b_1ESG_{it} + b_2DE_{it} + b_3REV_{it} + b_4EXP_{it} + b_5IND_{it} + b_6LAGROA_{it} + e_{it} \quad (3)$$

$$ROE_{it} = b_0 + b_1ESG_{it} + b_2DE_{it} + b_3REV_{it} + b_4EXP_{it} + b_5IND_{it} + b_6LAGROE_{it} + e_{it} \quad (4)$$

Model 2: The impact of each pillar of ESG score on financial performance of Thai listed firms in Dow Jones Sustainability Indices

$$MV_{it} = b_0 + b_1ENV_{it} + b_2SOC_{it} + b_3GOV_{it} + b_4DE_{it} + b_5REV_{it} + b_6EXP_{it} + b_7IND_{it} + e_{it} \quad (1)$$

$$EPS_{it} = b_0 + b_1ENV_{it} + b_2SOC_{it} + b_3GOV_{it} + b_4DE_{it} + b_5REV_{it} + b_6EXP_{it} + b_7IND_{it} + e_{it} \quad (2)$$

$$ROA_{it} = b_0 + b_1ENV_{it} + b_2SOC_{it} + b_3GOV_{it} + b_4DE_{it} + b_5REV_{it} + b_6EXP_{it} + b_7IND_{it} + b_8LAGROA_{it} + e_{it} \quad (3)$$

$$ROE_{it} = b_0 + b_1ENV_{it} + b_2SOC_{it} + b_3GOV_{it} + b_4DE_{it} + b_5REV_{it} + b_6EXP_{it} + b_7IND_{it} + b_8LAGROE_{it} + e_{it} \quad (4)$$

Model 3: Industry type as a moderator on the impact of ESG score on financial performance of Thai listed firms in Dow Jones Sustainability Indices

$$MV_{it} = b_0 + b_1ESG_{it} + b_2ESG_{it}*IND_{it} + b_3DE_{it} + b_4REV_{it} + b_5EXP_{it} + b_6IND_{it} + e_{it} \quad (1)$$

$$EPS_{it} = b_0 + b_1ESG_{it} + b_2ESG_{it}*IND_{it} + b_3DE_{it} + b_4REV_{it} + b_5EXP_{it} + b_6IND_{it} + e_{it} \quad (2)$$

$$ROA_{it} = b_0 + b_1ESG_{it} + b_2ESG_{it}*IND_{it} + b_3DE_{it} + b_4REV_{it} + b_5EXP_{it} + b_6IND_{it} + b_7LAGROA_{it} + e_{it} \quad (3)$$

$$ROE_{it} = b_0 + b_1ESG_{it} + b_2ESG_{it}*IND_{it} + b_3DE_{it} + b_4REV_{it} + b_5EXP_{it} + b_6IND_{it} + b_8LAGROE_{it} + e_{it} \quad (4)$$

Model 4: Industry type as a moderator on the impact of each pillar of ESG score on financial performance of Thai listed firms in Dow Jones Sustainability Indices

$$MV_{it} = b_0 + b_1ENV_{it} + b_2SOC_{it} + b_3GOV_{it} + b_4ENV_{it}*IND_{it} + b_5SOC_{it}*IND_{it} + b_6GOV_{it}*IND_{it} + b_7DE_{it} + b_8REV_{it} + b_9EXP_{it} + b_{10}IND_{it} + e_{it} \quad (1)$$

$$EPS_{it} = b_0 + b_1ENV_{it} + b_2SOC_{it} + b_3GOV_{it} + b_4ENV_{it}*IND_{it} + b_5SOC_{it}*IND_{it} + b_6GOV_{it}*IND_{it} + b_7DE_{it} + b_8REV_{it} + b_9EXP_{it} + b_{10}IND_{it} + e_{it} \quad (2)$$

$$ROA_{it} = b_0 + b_1ENV_{it} + b_2SOC_{it} + b_3GOV_{it} + b_4ENV_{it}*IND_{it} + b_5SOC_{it}*IND_{it} + b_6GOV_{it}*IND_{it} + b_7DE_{it} + b_8REV_{it} + b_9EXP_{it} + b_{10}IND_{it} + b_{11}LAGROA_{it} + e_{it} \quad (3)$$

$$ROE_{it} = b_0 + b_1ENV_{it} + b_2SOC_{it} + b_3GOV_{it} + b_4ENV_{it}*IND_{it} + b_5SOC_{it}*IND_{it} + b_6GOV_{it}*IND_{it} + b_7DE_{it} + b_8REV_{it} + b_9EXP_{it} + b_{10}IND_{it} + b_{11}LAGROE_{it} + e_{it} \quad (4)$$

Research results

Table 1 shows descriptive statistics of all firms. Natural logarithm of market value (MV) has the maximum value of 27.90, the minimum value of 24.79, and the mean value of 26.29. There is also a wide range of earnings per share (EPS) from -4.71 baht to 46.74 baht with the mean of 5.73 baht. Moreover, return on total assets (ROA) and return on equity (ROE) have average values of 5.07% and 13.38%, respectively. By concentrating on ESG performance, ESG score (ESG) exhibits the maximum value of 91.06, the minimum value of 39.53, and the mean value of 69.55. Among the three pillars of ESG, environmental pillar score (ENV) has the highest maximum value of 96.99. Social pillar score (SOC) has the highest mean value of 78.57. Governance pillar score (GOV) has the lowest minimum value of 19.86. Furthermore, on average, sample firms have debt to equity (DE) of 117.49%, natural logarithm of revenues (REV) of 25.73, and capital expenditures to sales (EXP) of 23.13%. In addition, 58% of the sample firms are in the non-service industry (IND = 0), including resources, agrobusiness & food industry, property & construction, and industrials. The rest 42% of the sample firms are in the service industry (IND = 1), comprising of technology, services, and financials.

Table 1 Descriptive statistics (All firms)

	MV	EPS	ROA	ROE	ENV	SOC	GOV	ESG	DE	REV	EXP
Mean	26.29	5.73	5.07	13.38	69.64	78.57	58.16	69.55	117.49	25.73	23.13
Median	26.16	1.76	4.91	12.49	69.02	80.48	61.18	69.68	97.33	25.92	23.08
Maximum	27.90	46.74	25.42	82.32	96.99	96.59	93.08	91.06	443.92	28.85	25.78
Minimum	24.79	-4.71	-9.78	-40.52	22.33	43.18	19.86	39.53	5.27	21.54	19.33
SD	0.81	9.19	4.58	14.32	15.67	10.10	19.17	9.27	81.70	1.54	1.37
Observations	143	143	143	143	143	143	143	143	143	143	143

Table 2 Descriptive statistics (Service firms)

	MV	EPS	ROA	ROE	ENV	SOC	GOV	ESG	DE	REV	EXP
Mean	26.50	3.91	5.96	18.11	62.79	81.95	55.50	67.97	127.36	25.17	22.50
Median	26.54	1.66	6.24	16.69	62.38	84.84	52.35	66.73	118.82	24.89	22.56
Maximum	27.69	16.79	25.42	82.32	96.98	96.59	93.08	91.06	443.92	27.44	24.76
Minimum	25.43	-4.71	-9.78	-40.52	22.33	51.10	19.86	51.09	7.82	22.68	19.70
SD	0.63	5.45	5.68	19.38	16.17	10.33	22.85	9.43	106.82	1.04	1.20
Observations	60	60	60	60	60	60	60	60	60	60	60

Table 3 Descriptive statistics (Non-Service firms)

	MV	EPS	ROA	ROE	ENV	SOC	GOV	ESG	DE	REV	EXP
Mean	26.13	7.05	4.41	9.96	74.60	76.13	60.08	70.69	110.36	26.13	23.59
Median	26.06	2.13	4.52	10.38	73.94	78.17	62.34	70.18	96.05	26.41	23.70
Maximum	27.90	46.74	13.47	25.14	96.99	90.83	88.28	91.00	261.82	28.85	25.78
Minimum	24.79	-3.07	-4.13	-7.75	40.31	43.18	24.67	39.53	5.27	21.54	19.33
SD	0.89	10.99	3.48	7.53	13.34	9.25	15.88	9.04	56.80	1.71	1.30
Observations	83	83	83	83	83	83	83	83	83	83	83

Table 2 and table 3 exhibit descriptive statistics of service firms and non-service firms, respectively. The means of MV, ROA and ROE of non-service firms are lower than those of service firms. However, the mean of EPS of non-service firms is higher. On average, the ESG score as well as the pillar scores of ENV and GOV of non-service firms are higher than service firms, except for the average pillar score of SOC. Moreover, on average, non-service firms have higher REV and EXP, but less DE.

Table 4 displays the unit root test results. By employing Levin, Lin & Chu test, all the variables (excluding environmental pillar score, governance pillar score, and industry type) are stationary at level. However, governance pillar score and industry type are stationary at the first difference, and environmental pillar score is stationary at the second difference.

Table 4 Unit root test[1]

Levin, Lin & Chu	Statistic	Prob.
MV	4.43312	0.0000
EPS	7.11390	0.0000
ROA	5.17407	0.0000
ROE	3.90661	0.0000
D(ENV,2)	1.43811	0.0452
SOC	4.79629	0.0000
D(GOV)	5.01612	0.0000
ESG	1.47849	0.0496
DE	3.35940	0.0004
REV	13.9713	0.0000
EXP	6.03709	0.0000
D(IND)	4.86609	0.0000
LAGROA	6.99502	0.0000
LAGROE	7.86523	0.0000

Table 5 shows the correlation matrix among all variables. No pair of independent variables has correlation above 0.80 or below -0.80. In addition, table 6 presents VIFs of all variables. Since none of the VIFs is greater than 5, there is no multicollinearity problem.

[1] Since the positive t-statistics with small p-values are practically uncommon in the Levin, Lin, & Chu (LLC) panel unit root test, both the test specifications and the underlying data were re-evaluated. However, the results are still the same. Thus, there is the possibility of small sample bias.

Table 5 Correlation matrix

	MV	EPS	ROA	ROE	ENV	SOC	GOV	ESG	DE	REV	EXP	IND	LAGROA	LAGROE
MV	1.00													
EPS	0.31	1.00												
ROA	0.33	0.22	1.00											
ROE	0.32	0.21	0.64	1.00										
ENV	-0.04	-0.07	-0.21	-0.34	1.00									
SOC	0.09	0.12	-0.07	-0.11	0.33	1.00								
GOV	-0.38	0.15	0.03	0.02	-0.07	-0.06	1.00							
ESG	-0.14	0.14	-0.12	-0.20	0.60	0.55	0.54	1.00						
DE	-0.22	-0.23	-0.29	-0.06	0.07	0.03	0.14	0.14	1.00					
REV	0.47	0.26	0.08	0.12	0.24	-0.11	-0.26	-0.05	-0.06	1.00				
EXP	0.52	0.19	0.10	0.14	0.19	-0.28	-0.07	0.02	-0.02	0.58	1.00			
IND	0.22	-0.17	0.17	0.28	-0.37	0.29	-0.12	-0.15	0.13	0.31	-0.15	1.00		
LAGROA	0.21	0.12	0.43	0.42	-0.28	-0.18	-0.02	-0.18	-0.18	-0.05	0.08	0.10	1.00	
LAGROE	0.24	0.11	0.42	0.63	-0.37	-0.19	-0.01	-0.20	-0.01	0.00	0.11	0.23	0.42	1.00

Table 6 Variance inflation factor (VIF)

Variable	VIF
ENV	3.907933
SOC	3.355431
GOV	4.300255
ESG	1.086486
DE	1.180844
REV	1.724968
EXP	1.863805
IND	1.804058
LAGROA	1.186623
LAGROE	1.311875

Table 7 shows the results of model 1 and model 2. In model 1, ESG is statistically insignificant in every measurement of financial performance. Nonetheless, in model 2, only GOV has a positive impact on ROA and ROE at the statistical significance level of 0.01 and 0.05, respectively. According to both models, DE negatively affects MV and ROA at 99% and 95% confidence level, respectively. Referring to both models, REV positively affects all financial performance measurements, including MV, EPS, ROA, and ROE, at 99% confidence level. Furthermore, EXP has a negative impact on EPS at the statistical significance level of 0.01 in model 1 and model 2.

Table 7 Results of Model 1 and Model 2

	Model 1				Model 2			
	MV (1)	**EPS (2)**	**ROA (3)**	**ROE (4)**	**MV (1)**	**EPS (2)**	**ROA (3)**	**ROE (4)**
ESG	-0.0062	-0.0146	-0.0098	-0.0895				
(Prob.)	(0.1556)	(0.8207)	(0.8160)	(0.4393)				
ENV					0.0007	0.0091	0.0214	0.0828
(Prob.)					(0.6918)	(0.7148)	(0.2010)	(0.0776)
SOC					-0.0019	-0.0031	-0.0510	-0.1103
(Prob.)					(0.6933)	(0.9630)	(0.2930)	(0.4087)
GOV					-0.0017	-0.0282	0.0615***	0.1245**
(Prob.)					(0.4680)	(0.4030)	(0.0071)	(0.0500)
DE	-0.0025***	-0.0034	-0.0137**	-0.0042	-0.0022***	-0.0087	-0.0141**	-0.0150
(Prob.)	(0.0000)	(0.6985)	(0.0155)	(0.7834)	(0.0003)	(0.2973)	(0.0135)	(0.3434)
REV	0.3551***	2.6429***	1.4419***	4.1055***	0.4001***	2.3875***	1.7933***	5.1606***
(Prob.)	(0.0000)	(0.0003)	(0.0021)	(0.0015)	(0.0000)	(0.0013)	(0.0007)	(0.0005)
EXP	0.0202	-3.0977***	-0.4654	-1.1674	-0.0029	-2.8127***	-0.5995	-1.3079
(Prob.)	(0.7028)	(0.0002)	(0.3722)	(0.4167)	(0.9581)	(0.0004)	(0.2633)	(0.3831)
IND	0.1560	-1.5598	1.0277	4.6880	0.2443	-2.2708	1.2827	6.4307
(Prob.)	(0.2685)	(0.4523)	(0.4428)	(0.2038)	(0.1046)	(0.2921)	(0.3781)	(0.1149)
LAGROA			0.1913**				0.2130**	
(Prob.)			(0.0261)				(0.0239)	
LAGROE				0.3703***				0.4650***
(Prob.)				(0.0000)				(0.0000)
Intercept	17.3996***	10.8757	-19.9771	-63.3501**	16.4408***	10.8436	-22.5957	-84.6325***
(Prob.)	(0.0000)	(0.5418)	(0.0819)	(0.0454)	(0.0000)	(0.5163)	(0.0512)	(0.0096)
R-Square	0.4864	0.6503	0.3833	0.5276	0.8136	0.1564	0.4626	0.5952
F-Statistic	23.4820***	12.2541**	3.8330***	6.8865***	22.2862***	2.8872***	4.1311***	7.0591***
(Prob.)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0083)	(0.0000)	(0.0000)
Hausman Test (Prob.)	0.1076	0.0191	0.0000	0.0001	0.0007	0.3272	0.0000	0.0005
Model	Random	Fixed	Fixed	Fixed	Fixed	Random	Fixed	Fixed

Note: ** $p < 0.05$, *** $p < 0.01$

Table 8 presents the results of model 3 and model 4. By adding IND as a moderator, model 3 shows that the interaction term between ESG and IND has a negative impact on MV at the statistical significance level of 0.05. Additionally, IND positively affects MV at the statistical significance level of 0.01. In model 4, GOV has a positive impact on ROA at the statistical significance level of 0.01. Moreover, the interaction term between each of the ESG pillars and IND shows no impact on all financial performance measurements. According to both models, DE negatively affects MV and ROA at 99% and 95% confidence level, respectively. Furthermore, in both models, REV has a positive impact on all financial performance measurements at the statistical significance level of 0.01. In addition, EXP has a negative impact on EPS in model 3 and model 4 at the statistical significance level of 0.01.

Table 8 Results of Model 3 and Model 4

	Model 3				Model 4			
	MV (1)	**EPS (2)**	**ROA (3)**	**ROE (4)**	**MV (1)**	**EPS (2)**	**ROA (3)**	**ROE (4)**
ESG	-0.0084	0.0224	-0.0206	-0.1086				
(Prob.)	(0.0556)	(0.7303)	(0.6291)	(0.3566)				
ENV					0.0014	0.0123	0.0237	0.0841
(Prob.)					(0.4294)	(0.6301)	(0.1674)	(0.0794)
SOC					0.0005	-0.0224	-0.0526	-0.1193
(Prob.)					(0.9081)	(0.7499)	(0.2908)	(0.3798)
GOV					-0.0013	-0.0353	0.0668***	0.1294
(Prob.)					(0.5933)	(0.3285)	(0.0060)	(0.0540)
ESG*IND	-0.0373**	0.1295	-0.2022	-0.3440				
(Prob.)	(0.0111)	(0.5504)	(0.1475)	(0.3712)				
ENV*IND					0.0027	-0.1206	-0.0212	-0.2071
(Prob.)					(0.7950)	(0.4263)	(0.8355)	(0.4600)
SOC*IND					-0.0339	-0.2839	-0.4216	-0.9470
(Prob.)					(0.2471)	(0.5033)	(0.1349)	(0.2279)
GOV*IND					0.0037	-0.0879	-0.0511	-0.3376
(Prob.)					(0.7275)	(0.5702)	(0.6238)	(0.2389)
DE	-0.0023***	-0.0088	-0.0121**	-0.0016	-0.0022***	-0.0061	-0.0137**	-0.0146
(Prob.)	(0.0002)	(0.3124)	(0.0345)	(0.9186)	(0.0003)	(0.4742)	(0.0166)	(0.3569)
REV	0.3974***	2.3672***	1.4526***	4.1262***	0.3568***	2.7345***	1.9227***	5.6185***
(Prob.)	(0.0000)	(0.0006)	(0.0019)	(0.0015)	(0.0000)	(0.0008)	(0.0004)	(0.0002)
EXP	-0.0387	-2.2538***	-0.5932	-1.3851	0.0209	-3.5798***	-0.7977	-1.8952
(Prob.)	(0.4818)	(0.0038)	(0.2602)	(0.3428)	(0.7047)	(0.0000)	(0.1504)	(0.2203)
IND	2.8665***	-10.2762	15.8098	29.8186	3.1539	25.9704	39.3804	97.6692
(Prob.)	(0.0082)	(0.5207)	(0.1248)	(0.2931)	(0.2111)	(0.4775)	(0.1051)	(0.1496)
LAGROA			0.1997**				0.2092**	
(Prob.)			(0.0200)				(0.0304)	
LAGROE				0.3728***				0.4642***
(Prob.)				(0.0000)				(0.0000)
Intercept	17.7837***	-3.4359	-16.8368	-57.9621	16.8208***	20.9257	-21.1225	-81.9172**
(Prob.)	(0.0000)	(0.8396)	(0.1468)	(0.0719)	(0.0000)	(0.2349)	(0.0712)	(0.0129)
R-Square	0.7937	0.1110	0.3950	0.5310	0.5174	0.7317	0.4782	0.6091
F-Statistic	23.7278***	2.5599**	3.7801***	6.5551***	11.3621***	11.6527***	3.7061***	6.2996***
(Prob.)	(0.0000)	(0.0227)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Hausman Test (Prob.)	0.0002	0.0645	0.0001	0.0001	0.2676	0.0000	0.0001	0.0006
Model	Fixed	Random	Fixed	Fixed	Random	Fixed	Fixed	Fixed

Note: ** $p < 0.05$, *** $p < 0.01$

Conclusion and Discussion

This study investigates the impact of ESG and its three pillars on financial performance of Thai listed firms in Dow Jones Sustainability Indices (DJSI) and examines whether industry type acts as a moderator on the impact of ESG performance on firm financial performance. By employing OLS with the tests for random and fixed effects on the secondary data of 25 Thai listed firms in Dow Jones Sustainability Indices (DJSI) during 2012–2022, the results can be concluded and discussed as follows.

The null hypotheses 1, 2 and 3 are failed to reject. Therefore, ESG score, environmental pillar score, and social pillar score have no impact on financial performance. The insignificant impact of ESG aligns with Al-Tarawneh et al. (2024), which find no significant relationship between ESG score and return on total assets (ROA), and Pumiviset and Duangtong (2024), which find no impact of ESG rating on return on total assets (ROA). However, the insignificant impact of ESG on financial performance contradicts previous studies conducted by Ahmad et al. (2021), Atz et al. (2022), Chen et al. (2023), Díaz-Peña et al. (2022), Friede et al. (2015), Khan (2019), Sirathavornvong et al. (2024), and Weston and Nnadi (2021) which find positive and significant relationships between ESG and firm performance.

One of the reasons may be because ESG score used in this study is ESG combined score from LSEG database. The ESG combined score is calculated from a company's ESG performance based on the reported information in each ESG pillar adjusted with ESG controversies, which will discount the ESG performance score when the company engages in negative media news. In addition, the financial benefits of ESG implementation may not be thoroughly acknowledged or may depend on other factors such as firm size and stakeholder engagement.

Moreover, the lack of significant impact of the environmental pillar and social pillar scores on financial performance suggests potential variations in how environmental and social initiatives are valued across industries and markets. Particularly, environmental initiatives often involve long-term payoffs that may not instantly appear in financial prospects. Also, social initiatives might give intangible benefits that are not immediately reflected in financial prospects.

The rejection of null hypothesis 4 shows that the governance pillar of ESG positively and significantly affects financial performance. This finding aligns with Ahmad et al. (2021), Díaz-Peña et al. (2022), Friede et al. (2015), Khan (2019), and Sirikanerat (2022). Effective governance mechanisms lead to competent decision-making, better risk management, and enhanced investor confidence. As a result, firms will have superior financial outcomes. Therefore, firms should reinforce governance structures as a core component of their ESG strategies.

In addition, the rejection of null hypothesis 5 indicates that industry type (IND) moderates the relationship between ESG and financial performance. In particular, the interaction term between ESG and IND negatively and significantly affects market value (MV), which is one of the financial performance measurements. This suggests that the effect of ESG on financial performance is not the same across industries. The service industry (IND = 1) obtains fewer benefits from ESG initiatives. One of the possible reasons is that firms in the service industry, including technology, services, and financials, must follow a lot of rules and regulations specified by the relevant authorities. Thus, the three governance categories,

comprising of CSR strategy, management, and shareholders, have less impact. Because of the variation in industry-specific operational and regulatory factors, customizing ESG strategies to the unique contexts of different industries is very important.

Furthermore, for control variables, DE and EXP are negatively and significantly associated with firm financial performance. Because of the capital structure with a prominent level of debt, firms must pay high interest expenses, leading to lower profit. Also, firms with large capital expenditures compared to sales have less profit. However, REV and IND are positively and significantly associated with firm financial performance. Firms with high revenue have high profit. Moreover, firms in the service industry have better financial performance.

Recommendations

The findings of this study can be added to the ESG literature in developing countries in Southeast Asia. Additionally, various parties also benefit from this study. For example, investors should consider companies' participation in environmental, social, and governance pillars of ESG as one part of the fundamental analysis before selecting stocks to trade. Next, to increase financial performance, companies should engage more in activities involving governance pillar of ESG. Finally, the government should establish a sustainable business environment by encouraging companies to implement more features of each of the three pillars of ESG. The government should also implement industry-specific ESG guidelines to ensure relevance and effectiveness.

Recommendations for Future Research

Since this study focuses on only 25 Thai firms listed in the Dow Jones Sustainability Indices (DJSI), future research may employ a larger sample size and expand to firms across different regions to increase the generalizability of findings and generate a more comprehensive understanding of ESG impacts globally. Moreover, future research may use a longitudinal analysis to capture long-term impacts of ESG practices, particularly for environmental and social dimensions that often require extended timeframes to realize financial benefits. Besides the conventional financial performance matrices, future studies may apply non-financial performance matrices such as reputational gains, risk mitigation, employee satisfaction, and customer loyalty.

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