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The Effects of ESG Combined Score on Business Performance of Enterprises in the Transportation Industry

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Abstract: A plethora of present studies has the purpose of analyzing the connection related to the effect of environmental, social, and governance (ESG) on business performance. However, it has still not been able to bring out comprehensive results because of using a single metric to measure performance. Due to that, this research will: (i) use the data envelopment analysis (DEA) method to measure transportation firms' performance and (ii) use OLS regression to explore the relationship between ESG combined score and business performance. In the first stage, we found out that 43 out of 56 firms work inefficiently. The managers of those companies should utilize their resources and refer to the benchmarking as a sample to follow. The environmental and social scores positively affect business performance in the second stage. Thus, managers should consider ESG as an investment, primarily when transportation is categorized as an "environmentally sensitive industry". Besides, investors should pay more attention to a company that has ESG activities because that firm has the chance to improve its business performance and deal with its commitments.

Keywords: data envelopment analysis; ESG; business performance; transportation industry



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1. Introduction

The transportation industry plays an essential role in today's economy and society and significantly impacts growth and employment. The transportation sector directly employs around 10 million people and amounts to approximately 5% of gross domestic product (GDP), making it one of the most popular and rapidly developing sectors [1]. Due to that importance, estimating the overall performance of enterprises operating in the transportation industry is exceptionally critical. The result could provide more insights to decision-makers or boards of directors seeking to improve performance [2], creating benefits for investors and stakeholders. In addition, we suggest that inefficient companies can follow influential companies to enhance their performance.

However, such rapid development will include negative consequences, which are recorded at a high level of degradation for both the human habitat and the environment. For example, consistent with a report from the International Energy Agency in 2011, the global transportation industry has grown to be the second-most-significant greenhouse-gas-emitting sector in the world, accounting for 22% of the world's CO₂ emissions [2]. China was the second-biggest transport-related CO₂ emitter, with 623.3 million metric tons of CO₂ emissions in 2011, just behind the United States [3]. Severe environmental influences have already become important problems for economic growth and sustainable development. Each developed and developing economy has drawn exceptional interest from authorities, regulators, company decision-makers, and the general public. That disadvantageous effect may only be eased by progressively implemented sustainable policies [4]. With the deepening of public awareness about environmental issues, an increasing number of environmental policies have emerged. Remarkably, China has changed its strategies. In

2019, the Shanghai Stock Exchange's "Science and Technology Innovation Board Stock Listing Rules" set forth obligatory ESG-associated statistics-disclosure requirements. In 2020, the Hong Kong Stock Exchange revised "How to Prepare Environmental, Social and Governance Reports" and "The Green Finance Regulations of Shenzhen Special Economic Zones", which call for companies to reveal environmental statistics [5]. Besides that, the USA authorities departments and regulatory corporations attach great importance to ESG policy regulations and guidelines. According to Ruan and Liu [5], the USA's Nasdaq Stock Exchange issued "ESG Reporting Guide 1.0" and "ESG Reporting Guide 2.0" in 2017 and 2019, respectively, aiming to offer guidance on ESG statistics disclosure of listed corporations and encourage the ESG engagement of small- and medium-sized corporations. Stakeholders such as customers, investors, governments, and regulators have shown increased interest in ESG issues [6,7]. For that reason, ESG practices have become an inevitable part associated with business' sustainable-growth plans aiming toward prolonging firm survival and setting up a positive relationship with society and investors' trust. The increase in ESG's global prominence recently has shown us the significance of studying the effect of ESG on business performance, but the results of empirical studies on its impact on corporate business performance and firm value are mixed [8–13].

Most studies on ESG scores have so far focused on developed countries, such as the U.S. and other advanced countries in Europe [14,15]. Studies that concentrate on emerging markets are still limited [16–18]. Emerging markets such as China are still in the early stages of economic development. They are typically inclined to utilize the scale and speed of economic growth, which regularly fails to care about ESG issues. For that reason, different economies would lead to a difference in the outcomes of ESG practices. Due to the significance of measuring a company's overall performance in the transportation industry, a series of articles about this issue were conducted. However, previous research has still not been able to bring out comprehensive results because of using only one metric to measure efficiency. For instance, Lee, Cin [19] have utilized financial ratios such as return on equity (ROE) and return on assets (ROA) to assess financial performance. Boğan and Dedeoğlu's [20] method was accomplished by sending questionnaires using the Likert scale. Chiu, Lin [21] only used Tobin's Q of listed firms in China to explore the relationship between pollution-reduction expenditure and firm performance. Research on simple indexes still does not bring out comprehensive outcomes. Our study would make up for these gaps by suggesting the data envelopment analysis (DEA) method, which has been widely based employed to study efficiency because different inputs and outputs can be considered simultaneously in evaluating relative efficiency [22]. An advantageous aspect of applying this method is the use of multiple inputs and multiple outputs to measure business performance, enabling us to accomplish more comprehensive results.

A broad range of studies has aimed to analyze the connection related to the effect of ESG on business performance. Some authors such as Yoon, Lee [18] used the valuation model presented by Feltham and Ohlson [23] to examine how each pillar of ESG affects the market value of firms. Others measure market performance and have captured the perception of overall ESG performance via the connection between ESG ratings and firms' market value measured by Tobin's Q [24]. There are also some extents about operating performance. Nevertheless, existed researchers claim that the ESG–financial performance relationship results are ambiguous, inconclusive, and contradictory [25]. Applying different performance-measurement methods to previous studies has caused the research results to be separated [26]. Therefore, in this study, we will help cover the last gaps by measuring the financial and market efficiency and examining this relationship. To investigate the business performance, we use the DEA method to find out the benchmark of the transportation industry. To explore the relationships between ESG combined score and business performance, we rely on dimensions of ESG combined score extracted from the Refinitiv database instead of ESG data collected through questionnaires or other databases. Refinitiv is one of the largest ESG data suppliers [27,28]. It assesses over 500 ESG metrics

at the business level, with a selection of 186 of the most relevant and concrete measures per industry being utilized for the entire company evaluation and grading process; by utilizing a common database for ESG research, the outcomes of the study are comparable to those of the preceding literature because the research involves factors and data for a large number of companies that would be difficult to obtain with any method. In the era of pursuing high-quality growth and sustainable development, ESG has become the focus of everyone. In practice, the ESG score is widely used as a significant index to understand a firm's overall corporate social responsibility (CSR) performance [18].

In the first step, we employ Charnes, Cooper's [29] data envelopment analysis (DEA) approach to assess enterprises' business performance in the transportation industry. For the second step, we analyze the connections between ESG performance and business performance using ordinary least squares (OLS) regression [30].

Our study has contributed two aspects. First, we used DEA methods that considered multiple input and output indicators to estimate the business performance of transportation firms in China and the United States. We did not utilize simple financial ratios such as ROA or Tobin's Q but instead used three inputs and two outputs to arrive at a thorough value. The result produces the benchmark of the transportation industry, which less-effective firms can refer to, to improve their performance. Second, the study highlights the relationship between ESG combined score and business performance. The results offer implications for practitioners.

The remainder of this research is organized as follows. The Section 2 contains references to the relevant literature. This study's data collection and research strategy are described in Section 3. Section 4 examines the findings, while Section 5 wraps up the report by outlining the study's limitations and making suggestions for further research.

2. Hypothesis Development and Proposed Model

There are many papers suggesting that ESG activities have a positive influence on firms' market value and performance. In the aspect of social activities, Miller, Eden [31] argued that a firm would increase their profit if they gain a CSR reputation. Cho, Chung [32] found a positive link between social contribution and the growth rate of the total assets of Korea's listed companies. In environmental pillar, Kong, Liu [33] and Yadav, Han [34] conductors in China and the United States brought the results: environmental activities and improvement enhance market values Kong, Liu [33]. For travel and tourism companies in the USA, Ionescu, Firoiu [26] showed governance score has a positive effect on market value.

ESG scores are reformulated from the three above pillars by the Refinitiv database. Some recent articles used ESG scores to measure firm performance. For instance, Velte [35] used ESG scores to find out that governance performance has the greatest influence on a company's financial performance. Our goal is to explore the relationship between ESG combined score and business performance.

In this chapter, besides mentioning the previous research, we build the hypothesis based on theories (including resources-based theory, stakeholders, shareholder views, and agency theory) to bring the most prosperous possible understanding.

Some activities in ESG investment are related to resources management, and many scholars have explored the relationship between ESG score and performance using Barney's resources-based theory. Barney revealed that if a firm wants to gain a sustained competitive advantage, its resources must be valuable, rare, difficult to imitate, and non-substitutable [36]. In ESG activities, a firm can consider engaging as a strategic investment. For example, Branco pointed out that a firm that joins in CSR activities will get internal benefits such as developing new resources, improving productivity, and lowering the cost of compliance. Moreover, the reputation, known as external benefits, will bring more revenue to the company [37].

Engaging with ESG creates two opposing opinions. The first view belongs to the stakeholders, which supports ESG activities. They suggested that following environmental and social responsibility is a win-win strategy: solving the stakeholders' concerns while still maximizing the shareholders' values. In the second perspective, the shareholders do

not think that. They argued that CSR engagement is not in their interest, so if any benefits to stakeholders come from the firm's cost, then the revenue cannot be maximized [38].

The agency theory is on the same page with the shareholders' view. According to agency theory, managers who engage in ESG activities are pursuing their wishes and benefiting themselves at the expense of the shareholders [38,39]. More CSR is not always better because agency problems can drive some CSR-related corporate policies [40].

2.1. Environmental Score and Business Performance

As public awareness of environmental issues has grown, a considerable number of environmental policies have evolved. The implementation of long-term strategy and investments to ensure the industry's long-term viability contributes to the increasing focus of recent studies on explaining and demonstrating the role of environmental performance and its impact on corporate value. Environmental performance refers to corporate environmental management, including pollution control and prevention [41]. Empirical studies have been conducted based on various industries, such as transportation [42], banking [43], hospitality, and tourism [44]. Many types of research have been undertaken to determine the existence of environmental performance in the transportation industry in the linkage between environmental performance and business performance. On the other hand, the research findings are divisive and split into two ways of analysis. The researchers in the first strand demonstrated a significant association with business value, whereas the researchers in the second strand demonstrated that it was not. Abdi, Li [42] found that the environmental pillar score has a significant relationship with business performance after separating the variables' environmental pillar score, social pillar score, governance pillar score, and their related effects on firm performance in the air-transport industry. Another study also showed that corporate performance and environmental score have a significant and positive relationship [45]. In the second strand, there is no significant relationship between environmental score and corporate performance at the upper-middle disclosure level. As a result, when it comes to firms' environmental performance, research findings are still mixed and controversial.

Our outcomes will then support the first strand, especially in the transportation industry context. Following the prior literature and resources-based theory, we propose the following hypothesis.

Hypothesis 1 (H1). *Environmental score positively affects business performance.*

2.2. Social Score and Business Performance

Belonging to Miralles-Quirós and Miralles-Quirós [41] definition, social performance refers to the management of crucial stakeholders such as employees, customers, and society. This essential role has led companies to focus on social performance to analyze its influence on companies' performance. Along with the trend, there is a growing interest in environmental and social issues among a wide range of corporate stakeholders, including socially responsible investors, employees, customers, regulators, and government officials. The trade-off hypothesis suggests that businesses aimed at achieving social goals may increase firm costs and prevent profit maximization. However, in terms of social activities, good corporate social performance, such as charitable giving, will have a long-term positive effect on financial performance. Due to these conflicting interests, the debate over the impact of the social pillar score continues, with ambiguous and contentious results. Some studies, for example, suggest that there is a significant relationship between social pillar score and business performance [42,46,47]. To reinforce the results of the above similar studies and based on stakeholder theory, we propose the following hypothesis.

Hypothesis 2 (H2). *Social score positively affects business performance.*

2.3. Governance Score and Business Performance

The corporate-governance criteria represent a company's capacity via the use of methodologies and creative practices to command and regulate its rights and responsibilities through the development of incentives as well as checks and balances in order to generate long-term shareholder value [42]. Due to budget deficits, many companies prioritize governance and economic issues while reducing or deferring more stringent environmental and social concerns. Business governance is still the most critical aspect of corporate management today [47]. There have been a few studies that discuss the importance of governance performance in determining a company's performance. Compared to good-governance businesses, weak-governance firms obtain lower equity returns, poorer operating performance, and lower company value. Several studies reveal that governance-pillar scores have a negative association with corporate performance [48–50]. Depending on shareholders' perspectives, agency theory, and existing studies, we propose the following hypothesis.

Hypothesis 3 (H3). *Governance score negatively affects business performance.*

2.4. Proposed Research Framework

Figure 1 shows the research framework, which involves two steps. In the first step, we applied the DEA method with three inputs and two outputs to estimate the business performance of companies in the transportation industry. Table 1 shows the list of input and output variables collected in the existing literature.

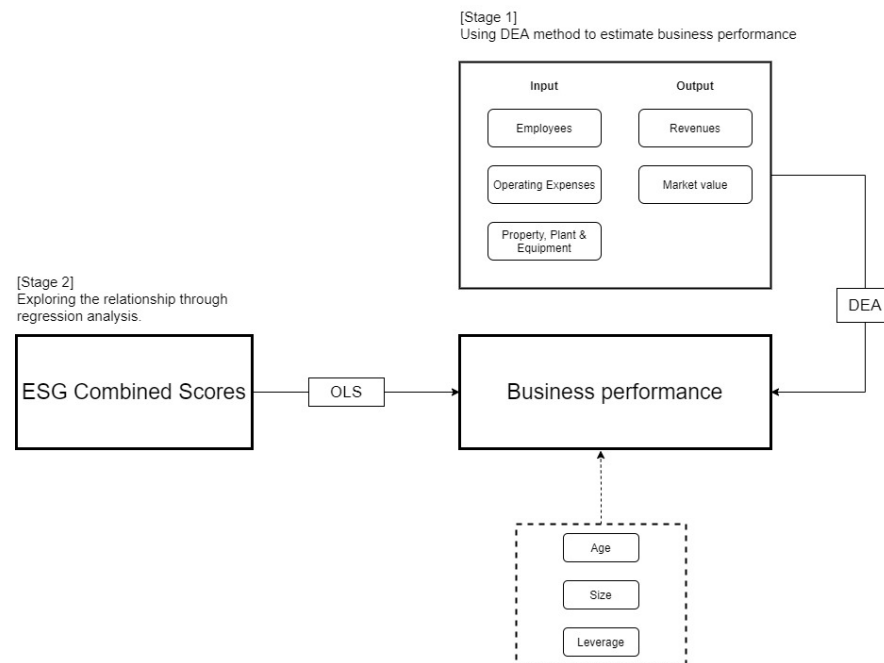


Figure 1. The research framework of this study.

Table 1. Input and output definitions.

Input/Output	Factors	Definitions	Sources
Input	Employees (people)	Represents the number of both full-time and part-time employees of the company.	[45,51]
	Property, Plant, and Equipment (in thousand USD)	Represents gross property, plant, and equipment less the accumulated reserves for depreciation, depletion, and amortization.	[51,52]
	Operating Expenses (in thousand USD)	Represents the sum of all expenses related to operations	[52,53]
Output	Revenues (in thousand USD)	Represents gross sales and other operating revenues less discounts, returns, and allowances.	[45,54]
	Market Value (in thousand USD)	Represents market capitalization at the fiscal year-end date plus preferred stock plus minority interest plus total debt minus cash.	[55]

Employees; property, plant, and equipment; and operating expenses are three inputs that were primarily used in previous research. For example, Xie, Nozawa [45] used employees as an input variable to explore whether ESG activities can improve a firm's financial performance. Bayyurt, Gokhan [51] used both employees, and property, plant, and equipment (PPE) as inputs in the DEA model to measure manufacturing performance in Turkey and China. The Harrison and Rouse [52] handbook used PPE and operating expenses to guide how to measure accounting performance by DEA.

For output variables, revenues and market value are widely used by scholars. Xie, Nozawa [45] also used revenues for their research, while Io Storto [54] used it to analyze the cost–revenue production-cycle efficiency of Italian airports. Along with market value, Chen, Wang [55] used to analyze the performance of IT industry in China.

In the next step, we investigated the connections between ESG performance and business performance by using ordinary least squares (OLS) regression. ESG performance is measured by the ESG combined score, which overlays the ESG score and ESG controversies. Refinitiv [56] divided their captured data into 10 categories to calculate the ESG score, following up on companies' scandals around the world to estimate ESG controversies and give a comprehensive evaluation.

2.5. Control Variables

There are three control variables added to support the study (age, size, and leverage) along with the hypothesis variables to operate the ordinary least squares (OLS) regression [57]. The number of employees in an organization is usually referred to as its organizational size [58]; some authors have demonstrated the effect of the number of the employees variable on business performance [59,60]. Several pieces of research have described the logarithm nature of the number of employees across organizations, which we are supposed to use as one of the control variables in this study. We aggregated the logarithm nature of the number of employees of enterprises to operate the regression calculation. Firm age has been used as a variable to study the impact on business performance in previous studies [61–64]. Investigating the relationship between company age and performance indicates if businesses can execute suitable strategies to stay relevant and discover ways to renew themselves, thus maintaining their commercial performance continually. In this study, the company's age is collected as the difference from the year of establishment of the company to the year 2020. The variable leverage represents the result of the expression of total liabilities divided by equity. This study uses those measures because the debt-to-equity ratio is the most important measure for assessing financial risk [65]. With the company's financial pressure, the manager will better consider the operating options to increase the company's productivity, so that the leverage can affect the business performance [66,67].

3. Research Design and Methodology

3.1. Data

We gathered data on the transportation industry in China and the United States in 2019 from Refinitiv. Its database provided ESG scores and financial information. After collecting and cleaning data, 14 companies in China and 42 firms in the United States were chosen to be analyzed.

In the first stage, the financial data of 56 companies were used to estimate business performance for each firm. We used employee, operating expenses, and property, plant, and equipment as inputs for the DEA method. In terms of output, revenues and market values are selected. Table 2 shows the descriptive statistics of these variables.

Table 2. Descriptive statistics of input and output.

Type	Indicator	Unit	Mean	Min.	Max.	Std.	K-S Test ^a
Input	Employees	Person	16,475.18	8.00	239,000.00	35,897.70	$p < 0.01$
Input	Operating Expenses	thousands of USD	4,383,261.05	61,342.00	64,907,000.00	9,314,310.26	$p < 0.01$
Input	Property, Plant, Equipment	thousands of USD	4,523,949.50	20,127.00	55,728,000.00	9,418,345.73	$p < 0.01$
Output	Revenues	thousands of USD	5,007,733.14	113,285.00	69,693,000.00	10,171,638.73	$p < 0.01$
Output	Market value	thousands of USD	7,848,691.14	63,722.00	125,124,877.00	18,634,345.91	$p < 0.01$

Note: ^a The Kolmogorov–Smirnov test.

In the second stage of OLS regression, three pillars of ESG scores are used to explore the relationship between ESG scores and business performance. The first pillar is the environment (environmental score), which is calculated based on aspects such as resource use, emissions, and innovation. The second is the social pillar (social score), which is reformulated into four categories: workforce, human rights, community, and product responsibility. The last one is the governance pillar (governance score), which is captured through three criteria: management, shareholders, and CSR strategy. All 10 categories described above are a reflection of the enterprise's ESG performance, commitment, and effectiveness [48].

Table 2 presents descriptive statistics of input and output variables. To ensure that inputs' and outputs' data are fit to use in the DEA method, we applied a non-parametric Kolmogorov–Smirnov test. As shown in Table 3, all input and output are significant ($p < 0.01$). Thus, we rejected the null hypothesis and confirmed that data do not have the same distribution.

Table 3. Correlation matrix of input and output.

	(1)	(2)	(3)	(4)	(5)
1. Employees	1				
2. Operating Expenses	0.924 ***	1			
3. Property, Plant, Equipment	0.488 ***	0.551 ***	1		
4. Revenues	0.361 ***	0.407 ***	0.934 ***	1	
5. Market Value	0.921 ***	0.993 ***	0.639 ***	0.509 ***	1

Note: *** indicates the statistical significance at the level of 1%.

Table 3 shows the correlation matrix of input and output variables. All beta has a positive value at a 5% significance level, suggesting that inputs and outputs positively correlate. The strength varies from moderate to strong correlation, implying that they are interdependent and positively impact each other.

3.2. Methodology

3.2.1. Data Envelopment Analysis (DEA)

We use DEA method to evaluate the business's performance. Since Charnes et al. (1978) introduced their method, it was widely used to estimate both profits (e.g., bank [68], supply chain [69]), and non-profit organizations (e.g., hospital [70], library [71], farm [72]). In the business section, a plethora of scholars used this method to measure business performance (Shang, Hung [73], Ouenniche and Carrales [74])

The name of DEA partially shows how it works—"envelops" the observations to identify the "frontier" (based on Farrell's Efficiency Theory) that is used to evaluate observations and reflect the performance of entities considered [75]. One of the most basic DEA models is the CCR model, which was built on the assumption of constant return to scale (CRS) by Charnes, Cooper [29]. In addition, Banker, Charnes [76] proposed the BBC model as an expansion of the CCR model, which led to a variable return to scale (VRS).

The DEA users may choose any of two orientations. Input orientation, which was implied in this study, shows how decision-making units (DMUs) can reduce the inputs while outputs change nothing. In contrast, output orientation aims to identify the amount of output that can be increased but input change nothing.

In the CCR model, we use x_p to denote the inputs while y_q representing the outputs of DMU t . In Equation (1), θ^* is the efficiency of each DMU and has a value from 0 to 1. If $\theta^* = 1$, the DMU is called efficient, became benchmarking, and could not curtail input more. In contrast, if $\theta^* < 1$, the firm is less efficient than benchmarking and should be reduced to become more efficient.

$$\begin{aligned} \theta^* = \min \theta \text{ subject to} \\ \sum_{i=1}^m \lambda_i x_{pi} - \theta x_{pt} \leq 0, \quad p = 1, 2, \dots, s; \\ \sum_{i=1}^m \lambda_i y_{qi} - y_{qt} \geq 0, \quad q = 1, 2, \dots, v; \\ \lambda_i \geq 0, \quad i = 1, 2, \dots, m \end{aligned} \quad (1)$$

3.2.2. OLS Regression

Ordinary least squares regression (OLS) analyses were applied to test whether the ESG combined score impacted business performance and the relationship between two variables.

$$BP_i = \beta_0 + \beta_1 E Score_i + \beta_2 S Score_i + \beta_3 G Score_i + \beta_4 Size_i + \beta_5 Age_i + \beta_5 Leverage_i + \varepsilon_i \quad (2)$$

In the regression model, BP_i is the business performance. The coefficients β_i explain how business performance is related to the ESG combined score. $E Score$ is environmental pillar scores, $S Score$ is social pillar scores, and $G Score$ is governance pillar scores. ε_i is the error term, and i is the firm. $Size$ is the logarithm of employees, $Leverage$ is the leverage ratio of the company, and Age is the age of the company, which is the number of years since the company's founding.

4. Results and Discussion

4.1. Business Performance in the Transportation Industry

4.1.1. DEA Result and the Creation of Reference Group

In this paper, we used the CCR model to analyze the technical efficiency of 56 transportation companies in both China and the USA. The result is presented in Table A1. Among 56 firms considered, 13 firms have a 100 percent efficiency rate, accounting for 23.2% of all surveyed subjects. Covenant Logistics is the firm that has the lowest efficiency with only 63.99%.

Furthermore, we provided the reference groups as shown in Table A1. The DEA method has the advantage of providing benchmarking DMUs for inefficient DMUs. Under the DEA analysis, the reference groups are created by comparing the total number of benchmarks from inefficient DMUs to DMUs with a 100 percent efficiency rate. Despite

13 enterprises producing a 100 percent efficiency rate, only eight companies contribute to the reference groups. It was 35 times for Zhejiang Expressway (China), 31 times for Union Pacific Corp (United States), 30 times for Landstar System Inc. (Jacksonville, FL, USA) etc.. As a result, Zhejiang Expressway was the most often referred, and, hence, had the highest reliability rate among the reference group's participants.

4.1.2. Proposal for Inefficient DMUs

After measuring 56 companies by the DEA method, we explored the characteristics of these DMUs from a return-to-scale perspective that included Constant, Decreasing, and Increasing. Table A1 shows that 13 companies, which are 100% efficient, belong to the Constant Return to Scale category. These companies do not change anything and become the benchmark for inefficient firms. Twenty enterprises were classed as having a Decreasing return to scale, which means that increasing the input for these DMUs will cause the output to drop. On the opposite side, the remaining 23 companies were sorted in the Increasing return-to-scale group, and, thus, they should expand the scale of input to become more efficient.

Another great feature of the DEA method is it provides the scale of inputs and outputs that need to change to gain efficiency for inefficient DMUs. Tables A2 and A3 indicate the present input and output values of inefficient DMUs and the standard input and output values recommended for business efficiency.

4.2. OLS Regression

4.2.1. Variables Characteristics

Table 4 shows the descriptive statistics of the dependent, independent, and control variables used in this study. The results show that the firms fluctuated between 0.63 and 1.0, in which firms recorded a 1.0 CRS score, practiced good business performance, and, thus, were considered a benchmark for others. Almost all firms achieved around 0.8 CRS score, which means that the company must mirror the benchmark to improve business.

Table 4. Descriptive statistics of variables in OLS regression.

	Min	Max	Mean	Std.	VIF
Business Performance	0.64	1.00	0.83	0.12	
Environmental Score	0.00	83.10	25.54	22.68	1.696
Social Score	12.28	88.29	48.63	20.48	1.272
Governance Score	5.55	88.70	32.82	19.14	2.275
Age	1.79	5.64	3.53	0.83	1.267
Leverage	5.15	7.22	1.54	1.65	1.060
Size	2.08	12.38	8.20	2.33	1.489

We also do a variance inflation factors (VIFs) test to discover the presence of multicollinearity in the regression analysis (Table 4). VIF ranges from 1 upwards, and the higher the value, the less reliable the regression model is. All VIF values are below 3 (the greatest VIF obtained in running regressions is 2.275), which demonstrates that there is a high tolerance value and, thus, a low degree of multicollinearity. In other words, the results indicate that the independent variables collectively have no substantial amount of shared variance and verify the reliability of the regression analysis [77].

4.2.2. Relationship between ESG Combined Score and Business Performance

To test whether ESG dimensions impacted business performance, an OLS regression analysis was performed. In Table 5, three control variables and three independent variables were entered into the regression.

Table 5. Regression analysis on relationship between business performance and ESG combined score.

Variable	OLS Regression
<i>Control Variables</i>	
Size	−0.431 ***
Age	−0.077
Leverage	−0.135
<i>Independent Variables</i>	
Environmental Score	0.342 **
Social Score	0.373 **
Governance Score	−0.241 **

Note: ** and *** indicate the significance level of 5% and 1%, respectively. The dependent variable is business performance.

The employees variable was significantly related to business performance ($\beta = -0.431$, and $p < 0.01$). The standardized regression coefficient was significant for all three independent variables: environmental score, social score, and governance score ($\beta = 0.342, 0.373$, and -0.241 and $p < 0.05, p < 0.05$, and $p < 0.10$, respectively). Therefore, our three hypotheses were supported.

5. Discussion

This study used a sample of 56 listed companies in the United States and China, and the linear regression models highlighted the positive and significant relationship between ESG combined score and business performance. We used three dimensions of ESG combined score to comprehensively explore the relationship between ESG combined score and business performance. As a result, we may have been able to reduce potential estimation errors caused by just estimating the ESG combined score. This supports and extends the findings of studies that have found a positive relationship between ESG combined score and business performance [42,45].

The findings show that environmental score positively impacts business performance ($\beta = 0.342; \rho < 0.05$). Thus, Hypothesis 1 was supported. The results imply the necessity of implementation of ESG activities in business operations. Firms with good environmental performance, for example, maintain advanced levels in implementing pollution prevention and control strategies, so can obtain a good business performance. Although adopting green practices requires more investments and expenditures [45,78], environmental supply-chain management (one of the ecological quality-management policies) is positively related to company performance. It could be a source of competitiveness for businesses, allowing them to operate more efficiently and, thus, enhance business performance [78,79]. This can be explained from the perspective of resources-based theory. When a company pursues environmental responsibilities and the resources are managed efficiently, the company's performance can be enhanced through lower costs and higher revenue by having a good reputation. Managing resource efficiency can bring sustained competitive advantages, according to the VRIO framework [80].

This paper has found that social scores positively affect business performance, so Hypothesis 2 was verified at a level of 5% significantly. Firms with good corporate social performance refer to the management of key stakeholders such as employees, customers, and society, and operating corporate governance at high levels can generate positive business performance. For example, implementing charitable giving, which may enhance business performance by improving a firm's reputation, demonstrating that reputation is accumulated through stakeholder judgment [81,82], or nurture worker morale resulting in increased productivity, in turn, improves business performance, which benefits business performance in the long term [83]. Therefore, the implementation of charitable giving rather than a type of strategic advertising, may serve as a reputation builder or an efficiency improvement [84]. Regarding reputation that attracts employees, firms can implement equal opportunity and training policies, which were demonstrated to be positively associated with corporate efficiency, or social activities that can enhance corporate reputation and

attract employees with little additional costs, which were positively related to corporate efficiency [45]; trained workers performed better than workers who did not participate in training programs [85]. Firms that follow employee career-development strategies and provide equal work conditions may improve their company reputation and attract more productive employees [86].

At a significant level of 5%, Hypothesis 3 was supported, so governance score negatively affects business performance, which is consistent with previous studies [48–50] and the two theories mentioned above. In Bénabou and Tirole's [87] research, the CSR activities that do not enhance the firm value are called insider-initiated corporate philanthropy. In this interpretation, CSR activities are neither initially from stakeholders' concerns nor their willingness to sacrifice money for a good cause but instead originate from the members of the board of directors desires. This directly affects shareholders and may lead to the agency problem. Not only by wasting money (which comes from shareholders) for unjustified purposes but also by expensing the agency cost, the firm value cannot be enhanced.

About control variables, only the employees variable that served as a control variable connected significantly to the relationship, which is consistent with the findings of Hancock, Allen [59]. The operating revenues of firms positively correlated with the company size (measured by the number of employees), which means with a large number of employees, the transportation services firms can carry and profit from incremental investment of staff (hiring more expensive people) [58]. Leverage and firm age variables have a nonpositive relationship with business performance, which is consistent with the findings of Carmeli, Schaubroeck [62] and Hofmann and Lampe [67]. The control variables produce consistent findings for all three ESG activity-analysis parameters.

6. Conclusions

6.1. Implication

In the first part of the research, we used the DEA method to explore the business performance of transportation enterprises in both the United States and China. The result reveals that most companies involved in the research are not efficient. Specifically, 43 out of 56 firms work inefficiently. The managers of those companies should utilize their resources as we proposed above. Moreover, they should refer to the benchmarking as a sample to follow. In the second part, the OLS regression shows that only the environmental score and social score positively affect business performance. From the managers' point of view, they should not regard ESG activities as an enormous cost that the company must face. Instead, managers should consider ESG as an investment, primarily when transportation is categorized as an "environmentally sensitive industry". In the beginning, there is a plethora of requirements and commitments to be met, but in the long-term, they will enjoy the benefits. They will have a more positive effect on business performance and a good reputation, thus increasing their competitive power against competitors. Moreover, the enterprise will have reductions and exemptions related to taxes, instead of engaging in CSR activities such as charity and donations to reduce cost, which can cause a negative effect on firm performance. From the view of investors, they should pay more attention to a company that has ESG activities, because that firm not only has the chance to improve its business performance but also can deal with its commitments.

6.2. Limitations and Future Research

Although using the DEA method brings more comprehensive results than other measuring-efficiency methods, this research still has limitations. Firstly, the data used in this study were limited to 2019. It does not bring the whole picture of transportation in the United States and China. Future researchers should use panel data to explore the most objective result, especially in the cross-national-research context. Secondly, this research has a differentiation in sample size. The research that conveys in a cross-national environment should have a similar sample composition in each country [88]. However, China's low transparency affected us in collecting data from this country. China has 6

out of 10 transparency grades for energy and environment and just 5 out of 10 for human rights [89]. Refinitiv extracts data from public sources, so we just collected data from 16 firms in China and are not able to make a comparison between firms in China and the United States. In future studies, authors should approach more databases to get more data on China and provide insight into the two countries' differences. Finally, we only used the one-stage DEA method to estimate business efficiency, which is more, but not totally, comprehensive than others. In the aspect of methodology, future research can consider using the two-stage DEA method to bring more comprehensive results.

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Appendix A

Table A1. Business efficiency rate and reference group.

DMU	Company Name	Technical Efficiency (%)	No. of References	No. of Reference Groups	Reference Groups			Return to Scale	
D01	Cosco Shipping	82.40	0	3	D14	D15	D30	Decre	
D02	Shanghai International Port	100	0	0				Const	
D03	ZTO Express	95.55	0	2	D09	D15		Decre	
D04	Daqin Railway	73.60	0	2	D14	D44		Decre	
D05	China Merchants	76.06	0	3	D14	D15	D30	Incre	
D06	Cosco Shipping Energy	65.61	0	3	D14	D36	D44	Decre	
D07	Guangzhou Baiyun International Airport	70.97	0	3	D14	D15	D16	Incre	
D08	Ningbo Zhoushan Port Group	71.19	0	3	D14	D15	D30	Decre	
D09	Shenzhen Expressway Group	100	3	0				Const	
D10	Tangshan Port Group	84.70	0	3	D14	D15	D30	Incre	
D11	Best Inc.	83.17	0	3	D14	D15	D30	Decre	
D12	Liaoning Port Co Group	72.04	0	3	D14	D16	D44	Incre	
D13	Sinotrans Limited Company	80.12	0	3	D14	D30	D39	Decre	
D14	Zhejiang Expressway	100	35	0				Const	
D15	Union Pacific Corporation	100	31	0				Const	
D16	CSX Corporation	100	3	0				Const	
D17	FedEx	78.06	0	3	D14	D15	D30	Decre	
D18	Old Dominion Freight Line	89.68	0	4	D09	D14	D15	D30	Decre
D19	Kansas City Southern	94.25	0	3	D15	D16	D44	Decre	
D20	Expeditors	100	0	0				Const	
D21	J. B. Hunt Transport Services	80.23	0	3	D14	D15	D30	Decre	
D22	Ardmore Shipping Corporation	81.33	0	3	D15	D30	D36	Incre	
D23	C.H. Robinson	100	0	0				Const	
D24	Air Transport International	78.97	0	3	D14	D15	D30	Incre	
D25	Dorian LPG	74.05	0	3	D15	D36	D44	Incre	
D26	Forward Air Corporation	81.75	0	3	D14	D30	D39	Incre	
D27	Golden Ocean	84.32	0	3	D30	D36	D42	Decre	
D28	Hub Group	88.87	0	3	D14	D15	D30	Decre	
D29	Knight-Swift Transportation Holding	72.14	0	3	D14	D15	D30	Decre	
D30	Landstar System Inc.	100	30	0				Const	
D31	Macquarie Infrastructure Holdings	92.63	0	3	D15	D30	D36	Decre	
D32	Matson	87.73	0	3	D14	D15	D30	Incre	
D33	Safe Bulkers Inc	72.92	0	2	D14	D44		Incre	
D34	Saia Inc	68.00	0	3	D14	D15	D30	Incre	

Table A1. Cont.

DMU	Company Name	Technical Efficiency (%)	No. of References	No. of Reference Groups	Reference Groups			Return to Scale
D35	Schneider National	78.68	0	3	D14	D15	D30	Decre
D36	SFL Corporation	100	8	0				Const
D37	Werner Enterprises	70.89	0	3	D14	D15	D30	Decre
D38	XPO Logistics	75.36	0	2	D14	D39		Decre
D39	Corporacion America	100	6	0				Const
D40	Covenant Logistics	63.99	0	3	D14	D15	D30	Incre
D41	Daseke Inc	75.03	0	3	D14	D15	D30	Incre
D42	DHT Holdings Inc	100	0	0				Const
D43	Eagle Bulk Shipping	64.19	0	3	D14	D15	D30	Incre
D44	FLEX LNG	100	7	0				Const
D45	Heartland Express	67.81	0	3	D09	D14	D15	Incre
D46	Marten Transport	70.96	0	3	D14	D15	D30	Incre
D47	Nordic American Tanker	99.05	0	3	D30	D36	D42	Incre
D48	Overseas Shipholding Group	72.80	0	3	D15	D30	D36	Incre
D49	P.A.M. Transport	67.11	0	3	D14	D15	D30	Incre
D50	Radiant Logistics	100	0	0				Const
D51	Teekay Corporation	78.49	0	3	D14	D15	D30	Incre
D52	Textainer Group Holding	83.39	0	3	D14	D36	D44	Decre
D53	U.S. Xpress	68.44	0	3	D14	D15	D30	Incre
D54	Universal Logistics	77.26	0	3	D14	D30	D39	Incre
D55	Usa Truck, Inc.	71.89	0	3	D14	D15	D30	Incre
D56	Yellow Corp	74.77	0	0	D14	D39		Decre

Note: Incre, Const, and Decre stand for Increasing, Constant, and Decreasing, respectively.

Table A2. Actual input and recommended input for inefficiency DMUs.

DMU	Operating Expenses		Property, Plant, and Equipment		No. of Employees	
	Actual	Expected	Actual	Expected	Actual	Expected
D01	20,608,062	16,981,694.24	19,765,118	16,287,081.75	27,286.98	33,114
D03	2,469,057	2,359,087.27	1,920,576	1,835,035.15	17,738.67	19,009
D04	8,917,483	6,563,617.08	11,598,395	8,536,873.42	49,642.80	96,995
D05	1,761,305	1,339,694.58	5,600,108	4,259,588.40	3574.94	4700
D06	1,730,575	1,135,445.66	7,313,281	4,798,308.76	4546.18	6929
D07	938,476	666,074.22	2,984,318	2,118,090.69	2924.45	12,888
D08	2,924,680	2,081,996.97	5,249,638	3,737,068.82	11,944.50	16,779
D09	637,542	637,542.00	425,454	425,454.00	4889.00	4889
D10	1,344,583	1,138,891.36	1,884,445	1,596,166.34	3258.49	3847
D11	5,145,618	4,279,861.85	1,051,037	874,198.82	7005.82	8423
D12	766,149	551,906.10	3,078,197	2,217,422.06	2395.10	6607
D13	10,945,314	8,769,756.20	2,363,195	1,893,471.86	27,042.44	33,751
D17	64,907,000	50,664,111.84	30,429,000	23,751,802.72	186,554.96	239,000
D18	3,290,405	2,950,964.77	3,034,135	2,721,131.75	18,030.96	20,105
D19	1,810,900	1,706,854.05	8,964,700	8,449,629.73	4792.07	7040
D21	8,431,433	6,764,718.94	3,746,366	3,005,789.53	23,312.25	29,056
D22	213,875	173,943.86	663,486	539,611.06	41.48	51
D24	1,275,186	1,007,068.17	1,810,322	1,429,687.64	3459.07	4380
D25	158,451	117,325.34	1,478,681	1,094,892.16	51.83	70
D26	1,291,572	1,055,837.20	364,688	298,125.97	4479.80	5480
D27	607,226	512,028.83	2,589,593	2,183,612.49	31.20	37
D28	3,515,445	3,124,283.53	704,578	626,180.03	4443.65	5000
D29	4,380,126	3,159,955.43	3,020,145	2,178,823.98	17,170.04	23,800
D31	1,428,000	1,322,758.04	3,538,000	3,277,253.47	842.01	909
D32	2,094,800	1,837,862.14	1,854,200	1,626,772.96	1744.16	1988
D33	154,039	112,326.92	963,199	702,375.20	586.76	952
D34	1,634,552	1,111,550.70	1,156,489	786,451.67	7072.35	10,400
D35	4,440,900	3,494,290.02	1,851,600	1,456,918.06	12,314.09	15,650
D37	2,238,229	1,586,597.73	1,537,652	1,089,984.61	9028.08	12,736
D38	15,679,000	11,816,139.36	4,949,000	3,729,706.85	71,669.79	100,000
D40	876,794	561,099.57	517,203	330,981.26	3551.69	5550
D41	1,723,400	1,293,110.06	560,200	420,332.05	4442.67	5921
D43	288,925	185,448.59	857,110	550,142.23	625.17	974
D45	533,881	362,000.08	526,287	356,850.94	2671.69	4050
D46	775,453	550,238.41	641,572	455,240.43	2900.01	4087
D47	285,249	236,783.72	901,474	892,906.41	19.81	20
D48	325,615	237,051.88	1,023,681	745,252.84	519.07	713
D49	501,047	336,228.42	387,275	259,881.53	1778.96	2651
D51	1,558,999	1,223,602.23	5,033,130	3,950,322.67	3963.56	5050
D52	493,634	411,625.30	4,168,555	3,476,022.08	141.76	170
D53	1,678,222	1,148,618.58	768,401	525,913.54	5866.90	8572
D54	1,446,618	1,117,708.87	427,032	329,940.22	5053.81	6541
D55	519,584	373,528.66	260,444	187,233.05	1473.74	2050
D56	4,859,600	3,633,753.60	1,156,300	864,620.40	20,613.89	29,000

Table A3. Actual output and recommended output for inefficiency DMUs.

DMU	Revenue		Market Value	
	Actual	Expected	Actual	Expected
D01	21,346,230	21,346,230.00	9,161,200.00	52,887,208.76
D03	3,204,620	3,265,690.42	13,446,038.00	13,446,038.00
D04	11,331,997	11,331,997.00	17,307,246.00	27,167,493.18
D05	2,064,058	2,064,058.00	7,894,326.00	10,044,719.94
D06	1,945,619	1,945,619.00	3,647,643.00	5,897,064.52
D07	1,115,936	1,115,936.00	5,120,245.00	5,120,245.00
D08	3,448,794	3,448,794.00	7,097,916.00	11,649,396.93
D09	877,132	877,132.00	3,556,111.00	3,556,111.00
D10	1,589,146	1,589,146.00	2,184,728.00	4,806,100.05
D11	5,098,393	5,098,393.00	1,393,605.00	7,324,123.87
D12	942,371	942,371.00	3,711,670.00	3,711,670.00
D13	11,010,563	11,010,563.00	4,470,500.00	15,371,616.29
D17	69,693,000	69,693,000.00	39,436,840.00	134,812,275.75
D18	4,109,111	4,109,111.00	15,123,256.00	15,123,256.00
D19	2,866,000	2,866,000.00	14,721,076.00	14,721,076.00
D21	9,165,258	9,165,258.00	12,403,543.00	17,335,404.84
D22	230,042	230,042.00	299,535.00	564,277.46
D24	1,452,183	1,452,183.00	1,391,868.00	4,412,608.34
D25	158,032	202,719.92	853,996.00	853,996.00
D26	1,410,395	1,410,395.00	1,948,124.00	2,148,533.60
D27	705,799	705,799.00	832,443.00	1,729,002.61
D28	3,668,117	3,668,117.00	1,744,691.00	5,174,857.38
D29	4,843,950	4,843,950.00	6,117,458.00	10,943,472.07
D31	1,727,000	1,727,000.00	3,709,957.00	4,755,867.97
D32	2,203,100	2,203,100.00	1,750,320.00	5,200,669.66
D33	198,184	198,184.00	177,060.00	614,997.65
D34	1,786,735	1,786,735.00	2,415,210.00	4,116,869.71
D35	4,747,000	4,747,000.00	3,864,704.00	8,836,415.42
D37	2,463,701	2,463,701.00	2,519,808.00	5,577,872.85
D38	16,648,000	16,648,000.00	7,332,400.00	24,396,216.46
D40	894,528	894,528.00	239,308.00	1,950,779.28
D41	1,737,000	1,737,000.00	204,101.00	3,022,660.90
D43	292,378	292,378.00	328,910.00	1,345,707.97
D45	596,815	596,815.00	1,726,689.00	1,726,689.00
D46	843,271	843,271.00	1,175,578.00	2,027,226.31
D47	317,220	317,220.00	724,375.00	724,375.00
D48	355,547	355,547.00	197,141.00	1,734,630.97
D49	514,177	514,177.00	331,769.00	1,206,114.44
D51	1,945,391	1,945,391.00	536,173.00	9,441,618.08
D52	707,481	707,481.00	608,520.00	2,689,872.83
D53	1,707,361	1,707,361.00	246,476.00	3,397,580.82
D54	1,511,998	1,511,998.00	517,271.00	2,329,831.67
D55	522,631	522,631.00	63,722.00	1,038,460.18
D56	4,871,200	4,871,200.00	85,972.00	5,989,297.96

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