Does Sustainability Reporting Affect Firms' Performance? Evidence From The Port Sector

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Abstract
Given that stakeholders are paying more and more attention to the firms' environmental, social, and governance (ESG) policies, the objective of this paper is to study the effect of ESG disclosure on firm performance, focusing on the shipping sector and precisely on companies involved in port activities. This study discovers that a positive relationship between ESG disclosure, firm value and firm performance exists, as determined by market-to-book ratio and Q ratio respectively. It considers a panel regression examination, by means of a sample of publicly listed ports, and considering a time period of 5 years. This study will benefit scholars, decision-makers, legislators, and stakeholders of ports through improving their comprehension of how ESG disclosure affects the firm's performance in general and specifically for each pillar.
Keywords: Sustainability, ESG, ports, shipping, firm performance

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I.   Introduction

Ports are crucial to a nation's economic development because they provide both direct and indirect employment, which is necessary for human welfare. Ports promote and enhance socioeconomic concerns by acting as a social steward for workers and communities. Ports, in addition, are unavoidable hubs in maritime supply systems. There are thousands of seaports that handle seaborne trade and are regarded as the entrance to world trade. Approximately 98,140 ships, or between 60 and 70 percent of the volume and value of global trade, handled 11 billion tons of seaborne goods as of 2018. 4,362,737 port calls were performed by ships of 100 gross tonnage or more alone in 2019. Even during the biggest shocks, like the most recent COVID-19 pandemic, the supply chain network for manufactured goods and components, food, energy, and medical supplies remained intact; shipping and ports played a vital role for this to occur (UNCTAD, 2020).

However, given the scope of port activities, ports always have social and environmental externalities in relation to economic growth since they operate as links in international supply chains. Generally speaking, ports have an impact on the environment through a variety of activities including cargo handling, access to networks for land and sea transportation, to commercial and semi-commercial activities, to logistical and distribution activities, and to operations for the production and distribution of energy. The environment is negatively impacted by these extraneous effects. Ports have a detrimental impact on marine ecosystems, despite the fact that oceans are vital to national and global economies, because they supply food, employment opportunities, and leisure activities (Alamoush et al., 2021).

The need to create enduring policies and make investments to create a viable industry has grown as consciousness of trade responsibility and business ethics has increased. Environmental and social issues have a significant role in attracting both investors and customers since they help to keep shares and products more sustainably produced. As a result, shipping companies align themselves with the goal of sustainable development and competition by incorporating socially responsible elements into their business activities (Tsatsaronis et al., 2022).

Environmental, social, and governance (ESG) ratings have turned into a key component of corporate social responsibility (CSR) for the development of viable policies that affect the commercial performance of transnational organizations. Moreover, it is crucial to categorize ESG performance using ESG scoring in order to give the port society a quick and flexible way to distribute financial resources. Additionally, the ESG score might be included in asset prospectuses and brochures, as well as investment instruction documents, when the investor is notified that the asset has a comprehensive results' evaluation. Stakeholders from all over the world expect firms to be lucrative, communicative with their surroundings, representative of the diversity of society, and ecologically sustainable. All these examined aspects can now be assessed collectively, as suggested in related research, facilitating more sustainable operations and necessitating modifications in ports that perform poorly (Cornell and Shapiro, 2021).

There has been a lot of discussion about the financial viability of sustainability efforts, with both theoretical and empirical approaches being put up to address the issue. Despite the growth of studies in literature, there is still a dearth of information and debate regarding the effects of implementing sustainability measures. Related studies employ Q ratio as a financial performance metric and CSR and ESG as indicators of sustainability performance. Some contend that ESG procedures enhance a company's performance (i.e. Carnini Pulino et al., 2022). However, other research claims that ESG puts up with a negative result on a company's financial results (i.e. Statman and Glushkov, 2009).

This paper examines the company's value and viability performance for a sample of listed companies involved in port activities (hereafter 'ports') in an effort to further the literature on port and shipping services. Three areas of the impact of ESG disclosures are discussed. First, the ESG components are examined to see whether a company's ESG disclosures significantly contribute to the perception of the market-to-book value discrepancy as a symptom of financial struggle. Additionally, it is examined to see if the disclosure of these sustainable measures affects the financial performance of ports. In earlier studies, return on assets (ROA) was used as a proxy for a company's present financial success; however, this study focuses on firm value and Q ratio as financial results' indicators. Q ratio and the market-to-book ratio are useful comparison tools since they consider a company's market value (Ma, 2020). Moreover, to determine if (i) a port company/authority, (ii) a terminal operator/stevedore, and (iii) an integrated carrier need to be studied separately, a listed port type dummy has been defined.

The rest of this study is organized as follows: Section 2 provides a brief assessment of the pertinent literature with an emphasis on the implications for ports' sustainability performance. The pioneer analytical framework for regression equations is developed and explained in Section 3, and the actual findings are presented in Section 4. A summary of the conclusions, limitations, and suggestions for additional research are delivered in Section 5.

II.   Reviewing the Literature

Sustainability in Business

The idea of sustainability and ESG disclosure has recently gained popularity among practitioners and international standard-setters in addition to academia. Most recently, Cek and Eyopoglu (2020) assessed the relationship between the economic effectiveness of the Standard & Poor's 500 companies in the areas of ESG. The impact of ESG effectiveness on commercial results had been quantified using longitudinal data covering the years 2010 to 2015 using structural equation modeling and linear regression. Their results showed that over time, the governance effectiveness of US firms was much better than their environmental and social effectiveness. Regarding governance however, a downward trend could be observed between 2010 and 2012. Additionally, there was an improvement in environmental performance from the same time range. Social effectiveness throughout that time revealed a consistent trend. However, US firms' economic performance fell in 2012. Additionally, governance effectiveness revealed lower standard deviation values than environmental and social performance, proving that while firms' governance was consistent, their environmental and social performance varied considerably. In 2015, economic performance was more consistent than in previous years.

Furthermore, Almeyda and Darmansya (2019) conducted research on real estate companies, as long-term investments in real estate are consistent with long-term ESG objectives. The G7 provided the samples of businesses. The accounting and stock market metrics of ROA, rate of change (ROC), stock price, and price/earnings ratio were used to evaluate financial success. Multivariate regressions were run on the panel data across a five-year period (2014–2018) in order to look for relationships. Their research revealed no statistically significant correlation between the ROA and ROC of the firm and the ESG disclosure, but a statistically significant positive correlation between the ESG disclosure and the stock price or P/E. Furthermore, the authors found a statistically significant positive correlation between the environmental factor and both the stock price and the company's ROC. Lastly, their study resulted in no correlation amongst the organization's financial performance and the social and governance characteristics. The results suggested that increased disclosure of ESG data could lead to better financial performance.

The impact of social arrangements and societal formalization on ESG disclosure processes was also examined by Baldini et al. (2018). Indicators at the national level, such as the political, labor, and cultural systems had a substantial impact on firms' ESG disclosure practices, according to findings from a cross-country sample of 14,174 firm-year observations gathered between 2005 and 2012. Their findings suggest that their impacts could differ by pillar and could be either positive or negative, having a heterogeneous effect. The results revealed a uniformly positive impact on each pillar of firm-level features important to a company's effectiveness, as well as on ESG disclosure.

Sustainability in Ports

Ports provide essential infrastructure that helps the economy and international trade. They come in a variety of sizes, from small docks that handle some hundred tons of freight each year, to outsized transnational seaports, which provide a full range of logistical services. So-called port sustainability encompasses the ideas of reducing port environmental externalities, managing economic growth, and meeting societal demands. Viability includes the triple bottom lines (TBLs), or the aspects of the economy, the environment, and society. The value of sustainable port development in internal operations is equivalent to how ports outspread viability on the outside to landside traffic. It has been established that ports can help speed up environmental improvement, while also greening supply chains and maritime transit. Ports, for instance, assist in reducing GHG emissions from shipping. By doing this, ports advance beyond the conventional environmental activities towards a comprehensive viability that makes preparations for TBLs both nationally and internationally (Laxe et al., 2017).

The existing literature offers a variety of strategies for reducing port externalities, either singly or as part of the "green port" idea. The port sustainability assessment indicators continue to be the main focus, and when they are handled, the measures and activities are dispersed and available in a variety of formats, meaning they are not entirely aggregated into a single instrument. Separating these characteristics could result in a partial examination and a faulty conclusion (Castellano et al., 2020).

Focusing on the most recent studies, Ashrafi et al. (2020) reviewed the factors that influence corporate sustainability (CS) employment on ports and how ports react. Factors of CS at ports were recognized and examined, encouraging a multi-stakeholder viewpoint, through the prism of stakeholder theory. According to authors, finding CS drivers for ports could help create a thorough implementation plan that would effectively advance the organization's goals. In light of each stakeholder's perspective, these drivers' port reactions have been highlighted in the study; these justifications offer information on practical measures ports have made to promote sustainable development in response to various pressures from internal and external stakeholders.

As stated in Hossain et al. (2019), Canadian port authorities were obligated to abide by environmental regulatory bodies and connect with port communities in order to maintain and safeguard the environment where they operate. The majority of Canadian ports acknowledged that Green Marine certification can successfully show environmental sustainability. In comparison to their Canadian counterparts, Ports of Montreal, Vancouver, Quebec, Halifax, and Prince Rupert were determined to be the most proactive in terms of pursuing strategic steps to improve environmental performance. It is noteworthy that through the Green Marine Environmental Program, these ports provided positive performance reports to Green Marine regarding reducing GHG emissions, managing waste, preventing spills, involving the community, and taking environmental leadership. These ports established a number of policies, such as environmental reporting, stakeholder involvement, energy management, animal preservation, research and development, and environmental impact mitigation and monitoring.

At the same year, Ashrafi et al. (2019) published their study which examined port executives' attitudes toward viability strategies and practices and influencing variables for CS implementation at ports henceforward; the study especially examined the CS conditions in US and Canadian ports. The findings revealed that most ports had embraced a variety of CS tactics, including staff training programs for sustainability awareness and reporting, as well as better stakeholder interactions. However, the study revealed that most ports did not completely integrate CS into operations and strategic decision-making, despite the fact that it had been valued in the majority of ports. As a result, it appeared that most ports were lagging behind in adopting definite and ambitious sustainability goals. and implementation plans. Furthermore, the authors identified a number of variables that might influence ports' adoption of CS tactics in the future. Growth, ROI, risk management, and corporate citizenship are some of the motivations/driving factors that had been identified.

Based on the aforementioned studies (inter alia), one may figure out that because there are gaps in both existing research and current practice, revisiting port sustainability studies may be justified. From a scholarly standpoint, the existing literature offers a range of ways for minimizing port externalities, both individually and collectively in the sustainable or green port idea. To the authors' knowledge, this is the first study seeking to individually examine the ESG components in order to determine whether a firm's ESG disclosures significantly contribute to the promotion of the disparity between market-to-book value, as a symptom of financial instability.

Building the Hypotheses

Concerning business sustainability and firm value, there are three main lines of inquiry: the resource-based perspective, the legitimacy theory, and the stakeholder theory (Ma, 2020). To begin with, the resource-based perspective is viewed like one of its advantages. Any assets a company uses to accomplish objectives or attain peak performance in key success factors are considered to be its resources. According to this viewpoint, A firm's means of competitive advantage are a combination of essential tangible and intangible assets that work together to support the achievement of the company's goals; companies may get a competitive benefit by disclosing their ESG pillar score in a rational market (Kramberger, 2016).

Second, the legitimacy theory contends that politics, economics, and society cannot be separated. This means that economic activity must take into account the political, social, and institutional settings. In light of this, it is perilous for a company's long-term existence if shareholders believe that the performance of the company is not sustainable. This suggests that the company's capacity for conducting business is reliant on its standing in society. The majority of investors rely on the ESG pillar ratings offered by sustainability rating agencies as a gauge of a company's legitimacy and moral business practices because they are unable to independently evaluate a company's sustainability. Thus, engaging in ESG actions might be a means employed by the company (Lim and Mali, 2020). Third, the stakeholder theory is concerned with how a company interacts with all parties involved in its market, such as clients, shareholders, the local community, etc. According to this principle, a company must strive to satisfy its stakeholders. Firm sustainability will be attained if it is able to satisfy the needs of its stakeholders (Lekakou et al., 2016)

This study seeks to ascertain if a company's ESG pillar ratings impact its value and financial effectiveness based on prior studies, in the context of the shipping industry and precisely on the port sector. In order to do this, market-to-book ratio has been used (Abdi et al., 2020; Di Simone et al., 2022). The current market and book value of a firm are contrasted using this financial indicator. The market value is represented by the stock price at the moment for all outstanding shares. The remaining sum after the firm liquidates all its tangibles and intangibles and pays off all its obligations is referred to as the book value. To put it another way, the ratio is employed to determine how a company's accessible net assets compare to the stock's market value. (Tzanis, 2021).

One of the most well-known approaches to the problem in asset pricing theory is the Fama-French three-factor model. The Fama-French model looks to three factors to describe stock returns: market risk, small-cap companies' outperformance to large-cap companies, and outperformance of high book-to-market value ones compared to low market-to-book value ones. The approach is backed by the result that small-cap and high-value businesses usually outperform the market as a whole. (Vo, 2015).

The market-to-book impact was first identified as a behavioral oddity using the Fama-French model. Based on this result, companies with low ratios (low stock prices in relation to book value) are more likely to be in constant financial distress. In contrast, persistent high profitability is linked to high value (a high stock price compared to book value). In other words, a decrease in the disparity between book value and market value suggests that an asset may be impaired, particularly if the gap persists over time. However, if the market value exceeds the book value, it indicates the possibility for the company and its shareholders to make good gains or see their investment grow (Lundberg, 2019).

Since companies with superior sustainability records typically have higher market values beyond their book values, market-to-book ratio is anticipated to be positively correlated with ESG disclosures. Rational investors typically favor investing in companies with strong sustainability records and avoid holding stock in those with a poorer social reputation (Henriksson, 2018). On the basis of this and in accordance with Abdi et al. (2020), the following is the first study hypothesis that is put forth:

Hypothesis 1 (H1). *The market-to-book ratio and ESG pillar scores of ports have a positive relationship.*

Furthermore, to assess the way this metric interacts with the viability effectiveness of the company, the Q ratio is utilized as a yardstick of a firm's financial effectiveness. The market value of a physical asset divided by its replacement cost is known as the Q ratio, based on the supposition that the total market value of all publicly listed firms should be about equal to those costs (Lee, 2018). Maximizing shareholder wealth as well as achieving more general society objectives may coexist with environmental and social responsibility. Indicatively, after adjusting for factors that have historically been used to explain firm-level economic effectiveness, poor environmental performance is negatively correlated with a firm's intangible asset value, consistent with Konar and Cohen (2001) research. The average intangible liability for the enterprises in their study was about 9% of the replacement cost of tangible assets.

Moreover, according to Jiao (2010), the positive correlation between stakeholder wellbeing and Q ratio was driven by corporate environmental performance. Even after accounting for firm characteristics, Derwall et al. (2011) found that a firm's eco-efficiency had a positive and significant impact on its Q ratio. Social pressure was found to be adversely connected with Q ratio for a sizable sample, by Baron et al. (2011). In their study of 1,556 finished US mergers between 1992 and 2007, Deng et al. (2013) argued that acquirers with CSR features benefited both the acquiring and target shareholders. Q ratio was dramatically raised by symbolic CSR modifications, as demonstrated by Eccles et al. (2014). In contrast, Jayachandran et al. (2013) discovered that product social performance, but not environmental performance, was related to greater Q ratio. Moreover, there has been a viewpoint contending that these practices are problematic since they frequently represented managerial agency issues within the company (Ferrell et al., 2016). This had been demonstrated empirically in a few studies that produced contentious findings (i.e. Xie, 2019).

As a result, the majority of research shows a correlation amongst ESG ratings and corporate appraisal; higher ESG companies are valued above average. This discussion led to the consideration in this study of a favorable link amongst these classifications. Additionally, it is important to note that enduring effectiveness could increase a company's advantage over better stakeholder connections and lower dispute costs, reputation building, and employee productivity (Lourenco et al., 2012). So, this is how the second hypothesis has been described:

Hypothesis 2 (H2). *The financial performance of ports is favorably correlated with the ESG pillar scores.*

III. Methodology

Data and Sample Selection

Using multiple regression analysis, to explore the effects of sustainability actions on the firm value and effectiveness, this study collected panel data of ports from 2015 to 2020. This approach has been frequently employed in earlier research (i.e. Yang and Baasandorj, 2017)[1]. The Refinitiv Eikon database served as the source of the information used in this study. Based on publicly available data, ESG ratings from Refinitiv are intended to assess relative ESG effectiveness and dedication clearly and impartially, across 10 primary categories (Table 1).

Refinitiv ESG ratings indicate the fundamental ESG records methodology and incorporate and account for business size and industry materiality biases, giving a clear, data-driven appraisal of firms' relative ESG outcome and capacity. Using publicly available, independently verified published data, the score evaluates a company's ESG performance[2].

The obstacles the authors encountered throughout the data search and preparation phase were as follows: in the beginning, as with nearly all time series analyses, the authors ran into variables in the relevant observation that had missing data values. The mean of the observed data for each port was used to replace each missing value using the mean imputation method. This strategy has the benefit of being easy to use and without excluding any observations from the model (Lee, 2018). Second, the authors encountered some data values that differed noticeably from others. These data points were recognized as outliers and were ultimately eliminated from the sample. The statistics are from an uneven panel of 213 publicly listed ports worldwide, issuing sustainability and annual reports (having an environmental policy in place), drawn from Bloomberg database. A variety of factors has been used for this study, including six control variables and metrics for the firm value, financial, and sustainability effectiveness of ports. The following sections provide an explanation of these variables.

Variables
Independent Variables

In this paper, the authors used the market-to-book indicator to investigate the value of ports as a symptom of financial distress. Investors use the market-to-ratio to ascertain the market's valuation of a certain stock. Additionally, it is utilized to assess a firm's net worth to the market value of its stock[3]. Additionally, in line with Abdi et al., (2020) and Yang and Baasandorj, (2017) the authors used the Q ratio, estimated by dividing the market value of assets by book value of assets, to analyze how sustainability metrics and financial performance in the port sector relate to one another. The proportion between a physical asset's market value and replacement value is represented by Q ratio. This ratio is typically employed as a stock market overvaluation or undervaluation indicator[4]. In this study, Q ratio has been estimated by dividing the current closing price of the stock by the most current quarter's book value per share; afterwards the natural logarithm value has been estimated to remove the impact of outliers, in accordance with Xie et al., (2019).

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[1] Yang and Baasandorj (2017) looked at how CSR affected both full-service and low-cost airlines' bottom lines. For the 2006–2015 study period, the panel data analysis fixed-effect model was used.

[2] The underpinning indicators are derived from factors with different consistency, relevance, data accessibility, and industry significance on every industrial category. Based on information that has been made publicly available, they are divided into 10 groups, that together make up the three pillar ratings and the overall ESG grade, which measures the firm's ESG outcome, and engagement. Three pillar scores are created by combining the category ratings (Refinitiv, 2022).

[3] While many investors use the market-to-book ratio to assist them choose which stocks to purchase, they shouldn't rely only on it. Due to a lack of tangible assets, some companies have greater or lower ratios. They might instead possess intellectual property or human assets. Others are valued more highly because of their profitability or fundamental principles. When an investor wants to compare companies within the same business field, the market-to-book ratio is the most useful. It's also quite helpful when looking for projects with a low valuation, nonetheless might perform greater growth potential (Gavalas et al., 2022a).

[4] Due to variations in daily market valuations, obtaining the book value for equity and liabilities is typically simpler than obtaining the market valuation.

Main Variables

The ESG pillar ratings were used as indicators of the viability outcome of ports. The evaluation is established on the rated ESG criteria in the Refinitiv Eikon database for each firm-year. The database analyzes a variety of publicly accessible information sources with the goal of delivering current, unbiased, and all-encompassing coverage. Category weights are used to define materiality. Category importance is estimated utilizing an unbiased and data-driven process to define the relative significance of each theme to each unique business class. According to the values included in every single category, data points performing the appropriate disclosure are employed as a stand-in for business significance. The relationship between themes and data points is exclusive, because each theme has a single data point[5].

The environmental pillar focuses on how a company behaves in relation to the physical environment, taking factors like energy consumption, pollution, the use of natural resources, conservation efforts, animal welfare, and so forth into account. It includes the emission, innovation, and resource use themes. The social pillar focuses primarily on a company's advantages and disadvantages in relation to societal trends, labor, and politics. It covers the themes of workforce, product responsibility, community, and human rights. The governance pillar is affected both by the corporate behavior, as well as internal operations. It includes the CSR strategy, management, and shareholders' themes (Refinitiv, 2022).

The ESG themes covered in each category are detailed in Table 1.

Table 1. Detailed view on the ESG themes covered in each category

Pillars	Categories	Themes
Environmental	Emmission	Emissions
		Waste
		Biodiversity
	Innovation	Environmental management systems
		Product innovation
		Green revenues, research and development (R&D) and capital expenditures (CapEx)
	Resource use	Water
		Energy
		Sustainable packaging
		Environmental supply chain
Social	Community	Equally important to all industry groups, hence a median weight of five is assigned to all
	Human rights	Human rights
	Product responsibility	Responsible marketing
		Product quality
		Data privacy
	Workforce	Diversity and inclusion
		Career development and training
		Working conditions
		Health and safety
Governance	CSR strategy	CSR strategy
		ESG reporting and transparency
	Management	Structure (independence, diversity, committees)
		Compensation
	Shareholders	Shareholder rights
		Takeover defenses

Source: Refinitiv (2022)

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[5] Due to incomplete disclosure, there aren't any data points for some values that may be used to determine their relative importance. Although these topics are featured in ESG disclosure and database, they are not part of the scoring system used to determine the materiality matrix.

Control Variables

This study employs 6 control variables, including leverage, dividend payout ratio, profitability, size, age, and the number of years a port has been releasing an ESG rating, that could impact a firm's value and economic results. In the research studying the influence of sustainability measures on business effectiveness in the broader shipping industry, these control variables are employed. Gavalas et al. (2022a) findings support the idea that the implementation of digital technologies is frequently linked to significantly greater firm-level efficacy, while Gavalas et al. (2022b) employed 25 parameters for 4 viewpoints in order to evaluate the effectiveness and attractiveness of the shipbuilding sector; finance, customers, internal processes, and learning and growth were these dimensions. Precisely, it is recommended to use *ROA* as a stand-in for operating profitability. Regardless of a company's financial structure, it is identified as its operational effectiveness. A company's *ROA* is determined by dividing net income by average assets. Profitable companies are more likely to experience increased market performance, which gives them more opportunity to make investments in environmental sustainability (Nam et al., 2017; Del Gaudio, 2018).

Different industries often recommend using debt/assets ratio (*DAR*) to manage a firm's financial structure. The capital structure of a company has an impact on its performance. According to trade-off theory, low-growth companies with predictable cash flows and tangible assets should be concerned about acquiring additional debt since this results in utilizing tax shelters and paying less, in case they ran into financial difficulties (Kang et al., 2016; Ioannidis, 2021).

The dividend pay-out ratio (*DPR*), in a similar sceptic, has been suggested to have an impact on a company's financial choices. It denotes the ratio of the company's total dividend payments to its net earnings for a given time. It is essentially the proportion of earnings that have been distributed as dividends to shareholders. This is due to the fact that shareholders-investors have less information than insiders of the company. This asymmetry creates a potential mistake in the market's price of the company's capacities, which benefits corporate financing decisions. Investors become wary of making investments in situations where there is incomplete information because of the prospective rise in economic uncertainty. The payout system has been proposed in corporate finance as a warning indicator of a company's effectiveness and financial status with the intention of reducing such investment risk (Gavalas, 2016). As a result, the authors of this study predict that performance and dividends will be positively correlated. From an empirical perspective, the debt ratio, which is defined by dividing total debt by total assets, is employed to evaluate a firm's leverage. That is consistent with Chasiotis et al. (2021) whose study demonstrates that the propensity to pay dividends and dividend ratios are positively impacted by profitability, growth possibilities, firm age, and firm efficiency; contrarily, the relative effects of leverage, business size, cash flow volatility, and market competitiveness are detrimental.

The authors additionally included firm size (*SI*) in control variables, which is in accordance with Liu et al., (2022), Gavalas et al. (2022a), and Ahrends et al. (2018). According to the principle of economies of scale, more manufacturing units are used to spread out the cost of production, both fixed and variable expenses included. Larger companies have a competitive advantage over smaller ones due to economies of scale, because their cost per unit is cheaper as they grow larger. Due to the potential emergence of economies of scale in connection with investments and efforts that are socially and environmentally conscious, this control variable should be especially important. Different proxies for firm size have been developed; in this analysis, the authors followed Abdi et al. (2020) and Lee (2018) and used the natural log of total assets.

Firm age (*FA*) has also been employed, based on Gavalas et al. (2022a) to determine the impact of effectiveness actions on ports economic outcome. The base year used to determine the firm's age was the year the company began operations. Two initiative factors were also utilized in this analysis to control for the duration of the ports participation in sustainability practices (*ESG_Rep*) and to test for port type (*SegDummy*), namely whether the port belongs to one of the following types: (i) port company/authority, (ii) terminal operator/stevedore, and (iii) integrated carrier. For the purposes of the current study, *ESG_Rep* (the number of years the port has been stating ESG ratings) is considered to be a significant determinant. *SegDummy*, however, is a dummy variable used to examine the impact of port type. Such dummy seems crucial because it has been demonstrated that the performance of ports depends on the segment they operate in (UNCTAD, 2021). The complete list of variables used in this study is summarized in Table 2.

Table 2. Detailed description of variables

Variable	Definition	Description
Dependent Variables		
MaBo	Market-to-book ratio	The market to book ratio is calculated by dividing the current closing price of the stock by the most current quarter's book value per share.
QRa	Q Ratio	Q Ratio is calculated by dividing the market value of assets by book value of assets (replacement cost).
Explanatory Variables		
EPS	Environmental pillar score	Refinitiv score for environmental disclosure.
SPS	Social pillar score	Refinitiv score for social disclosure.
GPS	Governance pillar score	Refinitiv score for governance disclosure.
ROA	Return on assets	ROA is calculated by dividing a company's net income (equal to net earnings or net income in the year) by average assets (equal to ending assets minus beginning assets divided by 2).
DPR	Dividend pay-out ratio	DPR is calculated by dividing dividends per share by earnings per share.
DAR	Debt-to-Assets Ratio	Debt-to-Assets Ratio is calculated by dividing a company's total debt by total assets.
SI	Firm size	Firm size is the natural logarithm of total assets.
FA	Firm age	Firm age is the number of years since company's foundation (start doing business).
ESG_Rep	ESGs reporting	ESGs reporting is the number of years the company has been reporting ESG scores.
SegDummy	Segment dummy	Segment dummy is the dummy for the type of listed companies involved in port activities, i.e. whether it is a port company/authority, a terminal operator/stevedore, or an integrated carrier one.

Specifying the model

Three ESG sustainability performance indicators were analyzed to see how they would affect financial distress as defined by the market-to-book ratio and company economic performance, using Q ratio, in order to advance the research hypothesis and fulfill the purposes of the study. In the following empirical models, two separate regression equations were created based on the aforementioned hypotheses, containing the dependent and explanatory variables as follows:

$$Model\ A:\ MaBo_{it} = a + \beta_1 EPS_{it} + \beta_2 SPS_{it} + \beta_3 GPS_{it} + \beta_4 ROA_{it} + \beta_5 DPR_{it} + \\ + \beta_6 DAR_{it} + \beta_7 SI_{it} + \beta_8 FA_{it} + \beta_9 ESG\_Rep_{it} + \beta_{10} SegDummy_{it} + \varepsilon_{it}$$

$$Model\ B:\ QRa_{it} = a + \beta_1 EPS_{it} + \beta_2 SPS_{it} + \beta_3 GPS_{it} + \beta_4 ROA_{it} + \beta_5 DPR_{it} + \\ + \beta_6 DAR_{it} + \beta_7 SI_{it} + \beta_8 FA_{it} + \beta_9 ESG\_Rep_{it} + \beta_{10} SegDummy_{it} + \varepsilon_{it}$$

Based on Lee (2018), a methodology was used to choose the prediction that fits each model best. Models were fitted using tools from the EViews 13 Standard Edition. Based on a panel of 213 ports from 2017 to 2021, the dataset was created. In order to compare two estimators, both fixed and random effect models were estimated. Findings show p-values greater than 0.05 ($P \geq 0.05$) for the two models utilized in this study. As a result, the null hypothesis cannot be ruled out, and the random individual model was determined the most effective tactic for achieving the study's objectives.

IV. Empirical Results

Descriptive Statistics

The variables of the study are summarized statistically in Table 3. *MaBo* has a range of 0.31 to 3.68, with a mean value of 1.53. This indicates that ports stocks are pricey and that the assets' current market value differs from what is shown on balance sheets. Another rationale due to the intangible assets, which are typically disregarded in book value, for this high ratio. With a mean of 0.41 and a standard deviation of 0.28, the range of *QRa* is spread between 0.04 and 1.74. This shows that the investigated ports' replacement costs are larger than the value of their assets. With a mean value of 0.02, *ROA* is low and demonstrates how poorly the tested companies succeeded at converting invested capital into operating profit. It should be figured out that the combined mean of the sustainability ESG pillar ratings is 48.48. After the government pillar, the social pillar is rated second with an average score of 51.31. This suggests that board members and management should prioritize serving the long-term interests of shareholders.

The environmental pillar's average score is 41.46, which indicates a weakness of initiatives to integrate environmental management systems and policies. It is noteworthy that even while the minimum and maximum scores for each domain are 0 and 100, respectively, the sample firms' minimum (maximum) scores for the full time are 0.18, 1.49, and 6.43 (93.16, 91.12, and 95.47), respectively. This demonstrates the wide range in ports

sustainability performance. *DAR* has a mean value of 0.61 and a minimum (maximum) value of 0.00 (1.14) whereas *DPR* has a mean value of 0.14.

Table 3. Descriptive statistics summary

Variable	MaBo	QRa	EPS	SPS	GPS	ROA	DPR	DAR	SI	FA	ESG_Rep
Mean	1.53	0.41	41.46	51.31	52.69	0.02	0.14	0.61	15,241	26	7.6
Median	1.43	0.29	47.63	51.73	52.91	0.02	0.16	0.74	13,421	29	7.2
Max	3.68	1.74	93.16	91.12	95.47	0.15	0.64	1.14	23,124	33	16
Min	0.31	0.04	0.18	1.49	6.43	-0.04	0	0	2,124	3	1
Std. De	0.69	0.28	21.46	19.47	23.65	0.01	0.14	0.21	9,435	21	3.56
Skewness	0.77	1.51	-0.24	-0.31	-0.11	0.18	0.79	-0.69	0.74	0.06	0.24
Kurtosis	0.11	2.58	-0.63	-0.07	-0.12	-0.01	0.08	1.24	0.16	-1.03	-0.57

V.   Discussing the Findings

Robustness tests required to be run in order to find probable endogenous variables before choosing which panel regression model to utilize. The study variables' correlation matrix was initially created. The correlation matrix for *MaBo* and *QRa* panels is summarized in Tables 4 and 5. It is clear from the information that there is a strong association between the ESG dimensions; the social and environmental pillars are the most important. This comes in line with previous studies, which even though using different methodologies and focusing on various dimensions and samples, they contend that, given the scope of port operations, ports inevitably produce social and environmental externalities in relation to economic growth as nodes in worldwide supply chains. These externalities, which result from port activities and expansion along with shipping and land transportation, have negative environmental effects (Darbra et al., 2009; Lirn et al., 2013; Yap and Lam, 2013; Chiu et al., 2014). With the exception of that, neither of the model variables' absolute values are greater than 0.5, which denotes the absence of a substantial association between some of the variables.

Table 4. Matrix of correlation with MaBo as the dependent variable

	MaBo	EPS	SPS	GPS	ROA	DPR	DAR	SI	FA	SegDummy
MaBo	1									
EPS	-0.072 (0.22)	1								
SPS	-0.049 (0.356)	0.75 (7.54E-34) ***	1							
GPS	0.14 (0.00368)	0.29 (0.00001) ***	0.29 (0.00001) ***	1						
ROA	0.33 (2.74E-05)	-0.31 (0.00001) ***	-0.29 (0.00001) ***	-0.079 (0.21)	1					
DPR	-0.08 (0.126)	-0.08 (0.157)	-0.08 (0.0521)	-0.049 (0.435)	0.01 (0.346)	1				
DAR	0.05 (0.254)	0.28 (0.00001) ***	0.33 (2.51E-04) ***	0.08 (0.0516)	-0.41 (1.28E-07) ***	-0.31 (0.00001) ***	1			
SI	0.069 (0.286)	0.38 (6.11E-8) ***	0.31 (0.00001) ***	0.11 (0.0184) *	0.014 (0.717)	-0.08 (0.121)	0.31 (9.38E-07) ***	1		
FA	-0.24 (0.0000287)	0.41 (3.24E-8) ***	0.28 (0.000001) ***	-0.064 (0.264)	-0.054 (0.324)	-0.07 (0.129)	0.031 (0.543)	0.27 (0.000001) ***	1	
SegDummy	0.031 (0.632)	0.42 (9.41E-7) ***	0.36 (8.52E-8) ***	0.21 (0.00005) ***	0.056 (0.321)	0.067 (0.257)	0.01 (0.865)	0.18 (0.00176) ***	0.36 (7.24E-11) ***	1

Note: ***, ** and * correspond to $p<0.01$, $p<0.05$ and $p<0.1$ respectively.

Table 5. Matrix of correlation with QRa as the dependent variable

	QRa	EPS	SPS	GPS	ROA	DPR	DAR	SI	FA	SegDummy
QRa	1									
EPS	-0,41 (9.64E-11) ***	1								
SPS	-0,38 (2.14E-10) ***	0,75 (7.54E-45) ***	1							
GPS	-0,01 (0.746)	0,29 (0.00001) ***	0,28 (0.00001) ***	1						
ROA	0,48 (4.46E-17)	-0,28 (0.00001) ***	-0,28 (0.00001) ***	-0,081 (0.21)	1					
DPR	0,18 (0.00548) **	-0,08 (0.14)	-0,11 (0.0513)	-0,048 (0.467)	0,02 (0.364)	1				
DAR	-0,28 (0.000001) ***	0,28 (0.00001) ***	0,32 (1.68E-07) ***	0,11 (0.0618)	-0,31 (1.25E-09) ***	-0,31 (0.00000) ***	1			
SI	-0,12 (0.00976) **	0,41 (5.24E-11) ***	0,32 (0.00001) ***	0,11 (0.0176) *	0,012 (0.747)	-0,07 (0.141)	0,32 (9.38E-08) ***	1		
FA	-0,25 (0.00001) ***	0,35 (3.85E-11) ***	0,32 (0.000000) ***	-0,069 (0.246)	-0,062 (0.308)	-0,11 (0.137)	0,034 (0.437)	0,26 (0.000000) ***	1	
SegDummy	-0,0088 (0.876)	0,36 (8.46E-11) ***	0,34 (7.68E-10) ***	0,21 (0.00005) ***	0,061 (0.341)	0,076 (0.254)	-0,07 (0.866)	0,14 (0.00157) ***	0,36 (6.57E-10) ***	1

Note: ***, ** and * correspond to $p<0.01$, $p<0.05$ and $p<0.1$ respectively.

The results of *MaBo* model being the dependent variable are shown in Table 6. It is suggested that the introduction of sustainable criteria may have an effect on the disparity between book and market prices. The primary explanatory variables in this model are the *EPS*, *SPS*, and *GPS*.

Table 6. Descriptive statistics summary for MaBo

Variables	Coefficients	z-Value	p-Value
EPS	0,0004	0,1563	0,8145
SPS	0,0051	1,6432	0,0863
GPS	0,0031	1,5642	0,0613
ROA	-0,0814	-0,0746	0,8441
DPR	-0,1012	-0,4331	0,6011
DAR	0,3124	1,4451	0,1411
SI	0,0323	1,0012	0,2846
FA	0,0012	0,3097	0,6604
ESG_Rep	0,0043	0,2544	0,7218
SegDummy	-0,0184	-0,0546	0,8871

Note: ***, ** and * correspond to $p<0.01$, $p<0.05$ and $p<0.1$ respectively.

According to the findings, *EPS, SPS* and *GPS* are positively but insignificantly correlated with a company's *MaBo*, suggesting that a growth in either or all pillars will result in a higher ratio. These results provide evidence in favor of H1, which states that each of the ESG components has a favorable connection with *MaBo*. The greater ratio shows that investors may view a port's efforts to increase *EPS, SPS* and *GPS* as a viable chance for profit-making. This is due to the fact that a high *MaBo* indicates that The port is seeing an increase in earnings and a favorable *ROA*, which is sufficient justification to purchase its stock. The port is also expected to maintain its profitability. Furthermore, investing in one's image has a positive and major social disclosure, which indicates that doing so might result in ratio uplift. Given the overwhelming capital market implications of social effectiveness and transparency - suggesting that investors typically give ports that are considered as more efficiently fulfilling social accountabilities a relatively high rating - this result is consistent with studies arguing that firms with strong social pillar benefit from reputational insurance to lessen the impact of any transgressions, and may be better able to attract and retain talented employees (e.g. Greening and Turban, 2000; Peloza, 2006).

However, not all academics have agreed that strong social performance benefits businesses financially. It's probable that the relationship between social disclosures and profitability has evolved through time, as stakeholders have grown to view formerly acceptable socially irresponsible corporate practices as unacceptable as both the legal environment and societal expectations have increased. Results might not be the same, for instance, if this study's sample period was five years earlier (i.e. from 2010 to 2015). If resources spent on CSR efforts do not result in higher revenues and instead divert managers from developing the company's main business, there would be a negative correlation between such expenditures - both financially and in terms of managerial time and focus. According to Campbell's (2007) research, firms having an excess of available resources may be more likely to invest part of them in CSR-related endeavors. In accordance with Qiu et al. (2016), lucrative companies are likely to make social disclosures or disclosures that include both social and environmental factors the following year.

Moreover, there has been no discernible statistical impact on *MaBo* for the control variables. This variable is negatively impacted by *ROA* and *DPR*; *DAR*, *SI*, and *FA*, on the other hand, are discovered to perform a favorable connection with the dependent variable. Lastly, the *SegDummy* is insignificant, demonstrating that port segmentation into port company/authority, terminal operator/stevedore, or integrated carrier one, is not required.

It goes without saying that port economic activities support environmental and social sustainability while maintaining port profitability and facilitating trade. Table 7 presents the effects from the panel with *QRa* as the dependent variable. It examines the relationship between business efficiency and sustainability efforts.

Table 7. Descriptive statistics summary for QRa

Variables	Coefficients	z-Value	p-Value
EPS	0.0074	2.5462	0.0074 **
SPS	-0.0155	-2.4751	0.0025 **
GPS	0.0029	1.3111	0.1844
ROA	-1.6263	-1.3862	0.1507
DPR	-0.1596	-0.6024	0.4754
DAR	-0.0574	-0.2033	0.8004
SI	0.0406	1.1672	0.2305
FA	-0.0027	-0.5311	0.5044
ESG_Rep	0.0151	0.8455	0.3544
SegDummy	0.1108	0.2745	0.7067

Note: ***, ** and * correspond to $p<0.01$, $p<0.05$ and $p<0.1$ respectively.

EPS, SPS and *GPS* show a positive correlation with a port's financial performance, suggesting that the advancement in these sustainable directions will benefit the port's bottom line. Therefore, H2 of the study seems to be supported by these elements, which have a direct impact on how profitable ports are. This finding suggests that ESG-conscious ports are typically more effective. This is consistent with earlier research, which, despite utilizing different approaches and concentrating on different dimensions, claims that improvements to port profitability and competitive advantage include investments in port infrastructure and luring foreign investment. The trade facilitation measures also increase supply chains' and stakeholders' economic advantages, making them more profitable to operate and connected to economic growth (Lam and de Voorde, 2012; Asgari et al., 2015; Castellano et al, 2020).

VI.   Conclusions

A revolution in the role of the average investor was sparked by the expansion of asset accessibility, the expansion of 'angel' stockholders' access to diverse markets, and the extensive accessibility to long-term financing. To obtain these resources, companies had to make commitments to the widest range of societal interests and concerns. Several investor concerns were emphasized by this adaption, including those relating to credit, reputation, systemic risk, and liquidity. Asset managers have been looking for ways to use hedging techniques to safeguard their clients' cash during the past decade. The idea of ESG, which investors employ in their choice of socially responsible investments, has evolved recently in an effort to reduce such risks (dos Santos and Pereira, 2022).

Investments in ports are riskier than those in other parts of the economy because they are sluggish to adopt new technology and have a long history of conflict with urban areas. Initiatives for port sustainability are intermittent, small-scale, and largely used in the ports of large developed countries. On the contrary, while port sustainability information is expanding quickly, it is still dispersed, making it challenging to evaluate different studies as a whole. In order to maintain sustainable operations, rules are being scrutinized and tightened for maritime transport, including ports. Examples include decarbonization, climate change adaptation, labor rights, and expedited operations using digital technology (World Ports Sustainability Program, 2020).

The critical question this study attempts to answer is whether incorporating ESG disclosures helps a port's financial performance. The sample being used and the time frame considered has shed some light on this and has expanded the literature. The findings only apply to a subset of ports, based on the available ESG pillar-data in the Refinitiv Eikon platform. This study's relatively modest sample size might increase by including more ports in the future. By separately linking three sustainability performance aspects to their worth and effectiveness, a new area of research has been established. This study has looked into any connections that might exist between sustainability efforts and firm value and financial performance outcomes. However, the fundamental process of the association is yet inadequately recognized.

The empirical findings demonstrate that, for the representative ports taken into consideration in this study, the market-to-book ratio (MaBo) and Q ratio (*QRa*) of a port are positively correlated with the ESG pillars. A greater *MaBo* and better financial results for ports are correlated with an increase in all pillar disclosures. Based on this finding, a port is more appealing to investors if it invests in ESG activities, namely scoring high in emission, community, innovation, human rights, resource use, product responsibility, workforce, CSR strategy, management, and shareholders categories. As a result, researchers might use such findings to examine various samples of ports across time in order to determine whether the results are consistent.

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