Exploring the Quality of ESG Reporting of Maritime Listed Companies in Response to the Announcement of Regulation on Decarbonization

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Abstract

The issue of how effectively companies embrace and adopt ESG regulation is currently at the focus of both the academic and the policy making communities. The maritime industry was selected as one of the key polluting industries globally, regulated on its environmental footprint by a single governing body, the International Maritime Organization, (IMO), irrespective of national boundaries. Using a sample of all listed NYSE maritime companies, I explore whether companies improve the quality of their ESG disclosures, through constructing an index capturing the quality of ESG reporting based on content analysis of 34 listed maritime companies over the 2015-2021 period. Specifically, I am interested in companies' response following the announcement of the Initial Greenhouse Gas (GHG) Strategy, a regulation to achieve the gradual decarbonization of the shipping industry, announced in 2018 and set to become 'mandatory' in January 2023. I estimate my panel with robust errors random effects, with year fixed effects, taking care of endogeneity issues, and my findings are twofold: First, I detect a strong positive association between the announcement of the Strategy in 2018, and ESG reporting quality two years after the announcement, that is years 2020 and 2021. This implies the industry is determined and preparing to meet the expectations of this new era of environmental and social compliance. Second, I reveal a negative association between company financial performance and ESG reporting's quality. Financially successful firms may think that they do not need it since they have achieved profitability otherwise or that firms with lower profitability are more likely to engage in ESG reporting as a green-washing strategy or to secure external financing. Whichever the case, our findings might indicate reluctance on the part of more profitable companies to fully embrace quality ESG reporting as long as the regulation is still in a 'voluntary compliance' state.

1. Introduction

In response to global calls to action with regards to climate change (IPCC, 2018) different countries, regions, and industries have introduced their own mandatory requirements for disclosing ESG-related information. The purpose of this study is to explore the global shipping industry's response vis-à-vis the implementation of the announced regulation towards the decarbonization of the industry. The context of the shipping industry has been selected as it is responsible for 2.5 percent of global CO_2 emissions and major environmental spills like the Exxon Valdez Oil Spill (1989), the accident of MT Haven (1991) as well as the Gulf of Mexico's Oil Spill (2010). I ask the question if a key environmental regulation announced in 2018 and soon to become mandatory, on January 1st 2023, is associated with improving ESG reporting's quality for all NYSE listed maritime companies. Furthermore, I explore whether specific company characteristics (financial performance, leverage, size and age) are associated with an increase in quality of ESG reporting. Following Michelon et al. (2015) I construct an index capturing the quality of ESG reporting which includes characteristics such as the presence of an assurance statement and/or the employment of a mainstream standards framework such as the Global Reporting Initiative (GRI) reporting framework and collect data on all listed maritime companies on NYSE between 2015-2021 from Compustat and companies' annual disclosures. The construction of the index is based on content analysis of stand-alone ESG reports or sections on ESG reporting published annually by each company, with information accessed and retrieved manually from their websites. In total I have included 34 companies for seven years, i.e 238 firm year observations.

My findings are twofold: First, a strong positive association (significant at one percent level) is detected between the announcement of the IMO ESG regulation in 2018, and ESG reporting's quality two years after the announcement, that is years 2020 and 2021. Some response is also documented in year 2019, starting a few months after the regulation announcement by IMO, in April 2018. This implies that maritime companies are preparing and have responded towards the right direction in expectation of imminent mandatory ESG regulation.

Second, a negative association between company financial performance, (measured by ROA and/or ROE) and ESG reporting's quality is found. The bulk of the extant literature reports a positive relationship (Whelan et al. 2021). My perception of this finding is the following: The more profitable companies with lower leverage (lower bank dependence) given the current voluntary nature of ESG reporting, do not allocate or feel the need to allocate additional funds onto increasing the quality of ESG reporting. On the contrary, companies with lower

profitability, and in need of external financing like debt, allocate funds in improving their quality of ESG reporting, despite the potential expense. Raimo et al. (2021) find a negative relationship between ESG reporting and the cost of debt financing, meaning that companies who report on their ESG performance can potentially benefit through more favourable conditions when it comes to issuing debt. Similarly, with regards to accessing equity capital, Fu et al. (2022) found that companies who want to access equity capital through making an initial public offering (IPO), still invest in ESG reporting despite the additional expense, as voluntary ESG reports decrease the possibility of IPO failure in the short run, while being also indicative of prosperous long-term performance. Despite ESG thus being pursued partly due to a non-financial driver such as the global vision and urge to achieve sustainable development (expressed through the United Nations 2030 Agenda for instance), Huang (2019) finds a positive and statistically significant relationship between ESG performance and firms' financial performance.

Section 2 of my study provides an overview of the international marine transportation sector to explain why it constitutes an appropriate setting for my research. Section 3 contains the literature review regarding ESG disclosure practices examined through the lens of legitimacy theory to provide the appropriate theoretical framework to approach my research question, while I develop my hypotheses to be tested based on the extant literature in Section 4. In Section 5, I outline my research methodology and describe my dataset. In Section 6 I present and discuss my results, while Section 7 contains my conclusions regarding ESG reporting's quality as well as implications for the shipping sector. The limitations of my study, alongside with some recommendations for further research are also presented.

2. Overview of Selected Industry

2.1 The Global Marine Transportation Industry

As of early 2019, there exist 95,402 ships sailing across the world with different types of vessels designed to serve different purposes (UNSTAD, 2020); for instance, dry cargo carriers carry dry cargo in bulk like iron ore, wheat or coal, tanker carriers carry liquid cargo like crude oil or refined oil products, container carriers can carry various consumer goods in boxes including durables like appliances, while cruise ships carry people for recreational purposes. Due to their typically larger transportation capacity, vessels are the most carbon-efficient means of commodities transportation, compared to the more limited capacity of planes and trains for

instance (Chircopp, 2019). Nevertheless, global seaborne transportation emits approximately 1,056 million tons of CO_2 annually whilst also accounting for around 2,89 percent of GHG emissions (Fourth IMO GHG study, 2021), projected to increase significantly over the next few years unless significant steps are adopted to mitigate the issue. It occurs that larger vessels due to larger mechanical power generated thus pollute the most, with oil tankers, container ships and bulk carriers emitting 60 percent of all GHG emissions from the global fleet currently in use (European Maritime Transport Environmental Report, 2021). Notably, although cruise ships make up only a small fragment of the global fleet, they emit around six tonnes per vessel, on a typical journey, of total GHG emissions from shipping operations, making them the most environmentally harmful type of vessel in use. In contrast, despite container ships emitting relatively less per vessel (around 3.5 tonnes), due to the global container carrier fleet being much larger than the much smaller global cruise fleet of 314 ships (for context, 5,534 container vessels sailed worldwide in 2021 according to Statista, 2021) pollute more. Consequently, container vessels' carbon footprint is much larger, accounting for 26 percent of global CO_2 emissions generated from seaborne transportation (Statista, 2021).

It should thus come to no surprise that the global shipping industry is no exception to increasing regulatory requirements regarding environmental protection and mitigation of climate change impacts (PWC, 2022). In line with the United Nations' (UN) goal of carbon-neutrality by 2050, the International Maritime Organization (IMO) (a United Nations specialized branch overseeing international compliance with regulation for vessels globally) is committed to reduce greenhouse gas (GHG) emissions by 50 percent (i.e. halve them), compared to 2008's global GHG emissions levels by 2050. This impending regulation is part of the recent trend regarding sustainability, and ESG performance gaining momentum with the recent trend of investors prioritizing sustainability through their capital markets investments as well as shipping companies' ability to access external financing. Shipping companies, to comply, have thus embarked on a new era of monitoring and reporting on their environmental performance, as well as form strategic plans to mitigate the environmental impact of i.e. climate change from their operations (such as extreme weather conditions' impact on delays caused by climate change) or regulatory impact (i.e. compliance with regulation prior to its date of implementation).

According to PWC (2022), it would require about one trillion dollars to invest in the shipping sector to finance its necessary transition to net zero. This would cover expenditure on R&D for less polluting fuels, the testing of modern technologies, altering existing vessels, as well as

designing, and constructing new infrastructure in ports. Such significant changes pose an important transition risk for the industry, resulting in investor uncertainty (PWC, 2022). Meanwhile, financial contracts are increasingly going to explicitly include ESG-related clauses with which companies will have to comply to access financing, i.e. the goal would be to, apart from estimating the Return on Investment (ROI) before making a decision, to also consider ESG-related factors such as selecting the most efficient project in terms of both carbon emitted and profitability. In the case of the shipping sector, industry-specific sustainable finance products are already becoming available, including the facilitation for instance of financing LNG powered vessels (more sustainable environmentally compared to fossil fuel powered vessels) as well as the incentives to opt for 'green' retrofitting programs (i.e. the process of installing new or modified parts of equipment in a vessel following its construction) (HSBC, 2021).

Consequently, investors actively seek the integration of ESG-related risk factors when assessing a potential investment process, alongside 'traditional' risk factors. The changing culture of investing increasingly gravitates towards ESG-based performance, with investors looking to align ESG performance to sustainable growth and development, while also managing uncertainty risk (HSBC, 2021). Shipping companies thus also adapt by increasingly viewing their collected ESG data as 'assets' formulated and delivered through targeted messaging (i.e. publishing voluntary ESG disclosures) aimed to the relevant stakeholders in pursuit of their company's performance management. Typically, a shipping ESG report should thus address maritime specific topics such as air pollution and safety at sea, while reporting frameworks such as the GRI or SASB can form the foundation on which topics to include and address within the report. Nevertheless, the topics covered should also reflect the industry's unique challenges and opportunities (i.e. effect of extreme weather conditions provoked by climate change on vessel delays or the effect of key rivers water level dropping alarmingly and thus preventing vessels from being able to sail through them). For this reason, reports should clearly reflect the strategic action plans the company adopts with regards to decarbonizing its operations (which is key considering the excessive costs involved in developing a sustainable fleet). Consequently, it is increasingly crucial to hold the quality of ESG disclosures' content to a high standard, as non-credible information can now hinder the company's ability to access financing.

2.2 History and Purpose of the IMO – a United Nations Specialised Agency The International Maritime Organization (IMO) is a governing body that was first established in

Geneva in 1948 and later on, since 1959, headquartered in London and meeting twice a year. It includes 175 member states as of May 2022. In the time interval between the two meetings of the Assembly, a council, made up of 40 member states, acts as the governing body. The member states of the council are elected and authorised by the Assembly to govern over a specific period of time. The IMO has brought under regulation major areas of interest both with regards to the environment and safety at sea. Specifically, IMO regulation concerns the prevention of accidents, the establishment of safety standards for ships and maintaining adherence of member states to the established treaties of safety and security, as well as the prevention of pollution and all sorts of human catastrophe (Ahmed, 2022).

The IMO first started discussions on emissions control derived from the international marine transportation since 1997, when the United Nations Framework Convention on Climate Change (UNFCCC) signed the Kyoto Protocol. Back then, the IMO was assigned with the responsibility to regulate GHG emissions from international shipping. In 2015, the Paris Agreement did not set any reduction targets for GHG emissions from both international shipping and aviation, the reason being the absence of national borders and therefore inability for compliance inspection on a national level. The IMO and its sister organization for international air transportation, the International Civil Aviation Organization (ICAO) were held responsible, to form and implement a compliance mechanism within their respective industries on behalf of the Paris agreement.

It is well known that CO_2 emissions from burning fuel to operate vessels generate the most air pollution in the maritime industry. Even though GHG emissions include other air pollution such as sulphur and nitrogen oxides, CO_2 is overwhelmingly the most important contributor to air pollution from the shipping industry (ICCT, 2018). The long-term decarbonization of shipping constitutes one of the greatest challenges the IMO has faced since it first embraced the environmental mandate in the late 1960s and early 1970s (Chircop and Shan, 2020).

For this reason, since 2000 the IMO has been publishing a series of GHG ‘studies’, with their purpose being to monitor and keep track of emissions resulting from shipping’s activity. In 2000, international trade accounted for around 1,8 percent of global CO_2 emissions (First IMO GHG Study, 2000). The emissions grew to 2,7 percent by 2007 (Second IMO GHG Study, 2009), while the third IMO GHG Study, published in 2014, estimated that, as a result of the 2008 global financial crisis (Olmer et al., 2017; Smith et al., 2015), emissions fell from 2.7 to 2.2 percent, with the reduction being attributed to less traffic at sea directly affected by a fall in demand globally (Third IMO GHG Study, 2014). In the latest IMO GHG Study however,

international shipping emitted 1,056 million tonnes of CO_2, accounting for 2.89 percent of the global CO_2 emissions (IMO, 2020). Furthermore, the study issues a warning that emissions from international shipping could grow between 90 percent and 130 percent by 2050 compared to base year 2008 if no action is taken. This will be attributed solely to the growth in international trade. Provided no external shocks occur such as the financial crisis of 2008 or the COVID19 pandemic, international trade is set to grow by 39 percent by 2050 (DNV, 2021). As a result, the IMO has announced in 2018 the introduction of a regulation effective from January 1st, 2023, titled 'Initial GHG Strategy', the first formal address of the IMO regarding plans to cut down the emission of CO_2 emissions from seagoing vessels.

2.3 The Regulation: Initial IMO GHG Strategy

The purpose of the IMO's Initial Greenhouse Gas (GHG) emissions strategy is to decrease the international shipping sector's carbon footprint in line with global decarbonization efforts to prevent climate change. Indeed, during the 72nd meeting of MEPC (the IMO's Marine Environment Protection Committee), it was decided that the IMO would take substantial steps towards decarbonization. The resolution, named the 'Initial Greenhouse Gas Strategy' (hence referred to as 'the Strategy'), represents the first international GHG framework for marine transportation, and sets out clear quantitative targets to be reached by 2050, alongside a set of proposed measures and policies to be adopted by ship owners in the short (2018-2023), mid (2023-2030) and long term (2030-), as set by MEPC. According to the Strategy, global marine transportation would be thus consuming between 3.8-5.8 percent of the Paris Agreement's remaining global carbon budget in total, an increase by 1.5-3.5 percent from 2015, the year of signing the Paris Agreement. To meet the ambitious target of decarbonization by 2050, ship owners are thus encouraged to substantially ameliorate their vessels' fuel efficiency (i.e. by renewing their fleets), as well as seek to employ low or even zero carbon fuels, alongside emerging propulsion technologies that improve the vessel's operating efficiency (ICCT, 2018).

Environmentally related regulations prior to 2018 included the announcement in 2011 of vessels having to report their Energy Efficiency Design Index (EEDI) annually, and all ships weighing more than four hundred in gross tonnage, further having to also adopt the Ship Energy Efficiency Management Plan (SEEMP) regardless of the flag they were registered with (Lim, 2017). Since the 1997 Kyoto Protocol, this was the first binding climate agreement for shipping and came into force since January 2013 (i.e. became mandatory after being announced two years prior). At MEPC 70 (2016), the IMO approved a strategy to reduce GHGs from ships,

which lead to the endorsement of the 'Initial IMO GHG Strategy', during MEPC 72 in April 2018 (IMO, 2018). This Strategy was formed and based on the response of the shipping sector stakeholders to the goals set out in the Paris Agreement (December 2015) for maintaining a global average temperature increase to 'well below' 2 degrees Celsius and aiming for 1.5 degrees. Specifically, this Strategy aims to reduce total annual GHGs from shipping by at least 50 percent by 2050 compared with 2008 levels, and if possible, to eliminate them altogether.

This strategy also aims to reduce the sector's average carbon intensity by at least 40 percent until 2030, and 70 percent by 2050 (relative to 2008 levels) and at the same time it helps the shipping community to envision within the IMO rational how an additional list of measures can decisively contribute to achieving these goals. The additional measures suggested include short-term, mid-term, and long-term plans which would lead to a more conservative revision of this strategy by 2023. The short-term (2018-2023) refers to logistics-based measures with the purpose of improving the operational efficiency of ships and include speed optimization, weather routing, and fleet management techniques. The medium-term (2023-2030) refers to market-based mechanisms (MBMs) based on the "polluter-pays" principle and this way, internalizing the external cost of the GHG emissions. Long-term (2030) refers to technological measures concerning use of low carbon or biofuels, ammonia, and hydrogen, along with exhaust heat recovery systems and wind-assisted propulsion (Lagouravdou et al., 2020). The final version of the proposal, titled 'initial GHG strategy', was accepted as a resolution in April 2018, during MEPC 72 and will become mandatory on January 1st, 2023.

The Strategy's proposals made in 2018, were not yet mandatory; Typically, the IMO, given the large costs associated with operating vessels in general, announces the intention to introduce a regulation in the near future, leaving enough time for companies to have time to adapt. In the Strategy's case, it is thus five years before the Strategy enters into mandatory effect, as in 2021 the IMO announced that the Strategy would officially become a requirement of all sea-going vessels on January 1, 2023 (IMO, 2021). In other words, companies have had five years (20182022) to make the necessary amendments to their fleet and operations to reduce their GHG emissions and thus be able to comply with the regulation once it becomes mandatory.

More specifically, vessels, will be required to report on two energy-efficiency specialized indices, the Energy Efficiency Existing Ship Index (EEXI) (already in use since 2011) and an annual operational carbon intensity indicator (CII) (a new index). The latter, CII, will also respond to a CII rating, with a vessel scoring a CII of either A, B, C, D and E, with A being the

most energy efficient, i.e. least GHG emissions incurred for the amount of cargo transported over the distance travelled by the vessel. Beginning reporting in 2023, the first ratings will thus be issued in 2024. Vessels failing to be rated with at least a C, B or A for three consecutive years (i.e. still scoring D or E in 2026) will be penalised by having to submit an immediate correction plan to score above C (a potentially costly procedure) or otherwise will be unable to sail altogether (i.e. unable to enter in ports as its certificates will not be accepted by port authorities). In other words, the value of the vessel as an asset will immediately become a liability for the shipowner, if their ship cannot enter any port due to being energy inefficient. This marks the first time in its history that the IMO implements a vessels' formal GHG emissions rating system. Its effectiveness as a mandatory measure will be reviewed by the end of 2025 at the latest to determine if more measures have to be adopted to be in line with the Strategy's reduction goal of reducing GHG from all ships by 40 percent by 2030 compared to 2008 levels (IMO, 2021).

Overall, the Strategy, despite not becoming mandatory until January 1st 2023, urges shipping companies to adopt immediate measures within their operations so that their GHG emissions currently peak and then begin to drop significantly, aspiring to reduce them by at least 50 percent by 2050 compared to 2008, and/or phasing them out to also achieve the Paris Agreement's temperature targets. The diagram above, titled 'Figure 1', retrieved from Rutherford and Comer (2018), illustrates strategy's cumulative effect in reducing GHG emissions (in blue and green) compared to a 'Business as Usual' (BAU) scenario for international shipping, i.e. if the Strategy is not adopted (black line on Figure 1). Based on the diagram, the blue line represents the minimum ambition, with absolute emissions halving by 2050 (i.e. 85 percent reduction in carbon intensity compared to 2008's base levels). The green line illustrates the effect of pursuing the maximum ambition of the strategy, which is consistent with the Paris Agreement targets (i.e. full decarbonization

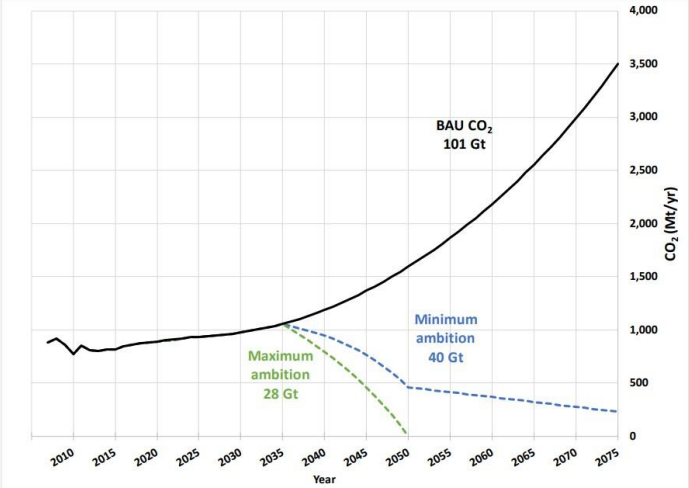

Figure 1
Source: Rutherford and Comer (2018)

from international shipping by 2050). Overall, the Strategy implies cumulative CO_2 emissions for the period 2015-2075 of 28-40 gigatonnes generated from all international shipping operations, compared to the BAU scenario where that would be 100 gigatonnes, i.e. 72-60 gigatonnes in net CO_2 emissions savings for that same period. This diagram has been prepared by the ICCT (2018) and is based on historical demands for international shipping, as well as projected future demand derived from UNCTAD (2017) and the International Transport Forum (ITF, 2017). With regards to possible barriers towards decarbonization efforts within this industry centre around the long-term approach adopted. The traditional resistance to change in this industry (due to the long amortization period of vessels, typically after 25 years), combined with current technological barriers given the lack of available low or carbon emitting fuels posit the two most important challenges (Sera and Fancello, 2020). Nevertheless, most stakeholders, including shipowners seem to agree on the need to decarbonize their operations, with a few critical stances heard from mainly environmental NGOs, criticising the long-term approach given the urgency of the climate change crisis (Doelle and Chircop, 2019).

2.4 Why Choosing to Focus on this Industry

The Paris Climate Conference (COP 21) (2015) during which the Paris Agreement was signed, assigned the IMO with the task of regulating the international marine transportation sector; this was due to its aterritorial nature, as most trade occurs outside of national borders. Furthermore, vessels' nationality can be altered with relative ease; For instance, despite a significant percentage of the global fleet being owned by Greek ship owning families, few vessels actually sail under the Greek flag. This is due to the presence of the so-called 'flags of convenience', i.e. flags of small states like Panama or groups of islands like the Marshall Islands allowing shipowners to sail under their flag to benefit from favourable taxation and employment regulation in exchange of a fee serving the local economy (BBC, 2014). So, unlike national environmental regulation which is country-specific and also affected by other factors such as a country's unique environmental regulation laws, gross domestic product performance, culture and levels of transparency and corruption, I am able to study this industry without adjusting for country-specific characteristics; the IMO's regulation is implemented irrespectively of any other national/regional regulation that may already be in effect.

The shipping industry is also unique to study, given that it is a pollution-intensive industry in urgent need of decarbonization which without any market intervention power through regulation would take a long time to achieve if left to its own devices, given that vessels are expensive assets to obtain with long amortization periods (typically sailing for 25 to 30 years),

thus naturally inert to any kind of transition in general. Case in point, one of the key measures proposed by the Strategy focus on fleet renewal, i.e. incentivizing shipowners to 'update' their fleet with newer vessels that are far more energy efficient thanks to technological advancements compared to existing older vessels in operation today (which are after all cheaper to acquire due to their shorter remaining trading 'life') (Chircop, 2019). Regulation thus actively aims to disincentivize the investment in older, energy-inefficient vessels through the impending regulation implementation in 2023. Pollution-intensive firms in general are found to be more highly scrutinized and pressured to address their operations' impact on climate change due to their greater carbon footprint (Perez-Batres et al., 2012).

I further argue that by studying this industry I can gain insights into the effects of having to comply with an international environmental regulation in unison, fitting in with the latest COP26's key takeaway regarding the joint global effort to mitigate the effects of climate change (COP26, 2021). More specifically, the IMO, through acting as an UN-specially appointed stand-in regulatory body, oversees compliance of vessels with regulation across all countries: for each member state or country of the IMO, local authorised personnel (also known as 'surveyors') are tasked with overseeing compliance on behalf of the IMO. Inspections typically occur unexpectedly, during the vessel's stay at a port for loading or unloading the cargo it carries; shipowners are incentivised to comply with IMO regulation, as the ship runs the risk of being detained due to numerous deficiencies or even not being admitted in a port due to not having all of its documents and certificates in place to prove compliance; This translates to fewer days of trading at sea, resulting in lower revenues to the shipowners. Unless the vessel complies with regulation or showcases an immediate action plan for compliance, it is not allowed to sail again due to its port detention. In the meantime, however, the vessel still has to incur significant daily fixed costs (i.e. crew wages, insurance, procurement), which is also financially harmful to shipowners in terms of forgone income. Particularly in times of high demand for goods transported (which has mostly been the case over the past decade with the exception of the 2008 financial crisis and a brief slowdown dure to the COVID19 pandemic outbreak in late 2019), shipowners are thus heavily incentivised to comply with regulation to minimise the risk of port detention (Chircop, 2019).

This international industry is unique to study, given the fact that most transportation occurs outside of national borders, hence raising the issue of whether a vessel's environmental regulation compliance levels should be a matter of the jurisdiction it enters (thus leaving out huge parts of the oceans not belonging to entry country legally) or the vessel's flag or even the

vessel's owners' nationality. The role the IMO plays here is crucial as GHG occurring on international waters contribute to climate change but technically do not belong to any national jurisdiction in particular. Compliance is thus crucial, as 99 percent of the world's approximately 95,000 vessels must comply with IMO regulation to be able to sail (inspections typically take place during a vessel's stay at the port, and if found to fail in certain types of compliance it is detained until it corrects/fixes its shortcomings) (IMO, 2018). This is economically detrimental for the vessel's company, as not only is it charged daily thousands of dollars for its unwanted stay at the port, but also loses out through forgone income for the days it could have been at sea, chartered to carry out a delivery. Consequently, firms are heavily incentivised to comply with regulation. The Initial IMO GHG Strategy was announced in 2018 (IMO, 2021).

Since the empirical research on ESG reporting's quality is not yet extensive (Xie et al., 2019; Leong and Hazelton, 2019; Aureli et al., 2020), the purpose of my analysis is, through an accounting lens, provides valuable insights for both internal and external stakeholders of marine transportation firms when it comes to assessing the quality of ESG reporting in the shipping industry. Drawing on the above, the purpose of this dissertation is to study whether the announcement of the IMO Initial GHG Strategy is associated with an increase in the quality of ESG reporting in the shipping sector, as well as identify those firm-specific characteristics from my sample that are associated with increasing the quality of their ESG reports following the announcement of the impending regulation in 2018.

3. Literature Review

3.1 Theoretical framework

Corporate disclosures ought to enable communication between a company's internal and external stakeholders regarding its true financial performance (Healy and Palepu 2001). The financial crisis of 2008, put environmental, and social governance (ESG) practices, at the center of interest (Arvidsson and Dumay 2021). In line with legitimacy theory, supporters of voluntary ESG disclosures originally supported the notion they could be used to positively affect their corporate legitimacy, as they could be used to 'connect' a company's internal and external stakeholders (Neu et al., 1998). According to Suchman (1995), companies engage in certain practices to accommodate shifting social expectations; This way, they can either strive to gain or maintain their legitimacy, since otherwise they risk of losing it (DiMaggio and Powell, 1983).

Consequently, given that ESG disclosures are the means through which the company reports on its non-financial performance to the public as well as its strategy to i.e. tackle climate change, they are key in establishing legitimacy. Quality thus is crucial to achieve when it comes to ESG reporting, to ensure the provision of useful and credible information. However, according to legitimacy theory, while the substantive approach involves the enforcement of actual changes in corporate practices to serve a company's strategic plan when it comes to i.e. climate change management, policies and actions with external social conditions and expectations, the symbolic approach strives to cultivate a favorable perception of the firm to relevant stakeholders (Ashforth and Gibbs, 1990). A company could for instance, actively invest resources to foster a 'green' image of itself instead of adopting more sustainable practices (Chen and Roberts, 2010; Rodrigue et al., 2013; Walker and Wan, 2012).

Within the context of the shipping sector, the majority of the actions to be adopted to achieve legitimacy would thus be substantive in nature, as they primarily involve a significant financial investment in capital expenditure to assist the maritime industry's transition to decarbonization. Such actions, as identified from literature, would for instance include the employment of alternative fuels such as biofuels (an area still in need of R&D expenditure) (Foretich et al., 2021), travelling at lower speed (Degiuli et al., 2021), investing in infrastructure like scrubbers (Sigalas, 2022), even larger vessels (Lai et al., 2013) or actively try and capitalize their GHG reductions per vessel as company resources to be 'traded' on the EU's Emission Trading System (ETS) (Lagouravdou et al., 2020).

However, when it comes to how to disclose such information within an ESG report, the social accounting literature has been critical of ESG reporting's shortcomings, given that some scholars argue ESG disclosures rather serve the symbolic approach of legitimacy theory and thus fail to increase accountability (Boiral, 2013). Indeed, some view them as 'reputation management' mechanisms employed by companies to remain favorable in the eyes of key stakeholders, such as managing public scrutiny i.e. from the media in the aftermath of a corporate scandal (Owen and Cooper, 2007; Thorne et al., 2014). Researchers have also attributed these shortcomings to ESG disclosures' proneness to managerial capture; According to Cho et al., (2010), they can often represent little more than a carefully curated rhetoric aimed to manage the public's perception of the company, by i.e. purposefully avoiding to report on negative performance and instead highlight or present them as positive actions (otherwise referred to as 'greenwashing'), thus going against basic qualitative criteria of traditional financial reporting such as completeness and materiality. A number of researchers including

Gray (2010) and Boiral (2013) has challenged the motivation behind engaging in ESG disclosures, arguing that managers do not employ them necessarily to effectively communicate with stakeholders, but in pursuit of the company's -and thus their own- self-interest. More specifically, critics of corporate sustainability reporting like Gray (2010) argue that ESGrelated disclosures serve as little more than a 'marketing ploy' or a 'façade' (Cho et al., 2015) aimed to increase symbolic rather than substantive legitimacy to a company's operations (in line with legitimacy theory) (Suchman, 1995, Mori Junior et al., 2014). The primary motivator behind this purposeful 'manipulation' would be to influence key stakeholder groups involved with enabling the access to obtaining financial capital (Healey and Palepu, 2001).

This debate has been further fueled by the growing diffusion observed between the increasing number of companies embarking on ESG reporting in the last decade and the relative stagnation of ESG performance (Michelon et al., 2015; Ardvisson and Dumay, 2021). This could suggest that there is a case to be made regarding the symbolic rather than substantive corporate legitimacy purpose they serve (Cho et al., 2012). Berrone et al. (2009) identify a series of sustainability related activities and then proceed to define symbolic as those actions aiming to influence societal perceptions of an organization (i.e. participation in voluntary environmental programs). In contrast, substantive actions are defined as those requiring important changes to be made across the company's operations, ultimately resulting in substantial change to take place (i.e. investing through R&D in environmental innovations, adopting pollution prevention strategies which can often be costly). Similarly, Boiral (2013) examined how sustainability reports, through fixating on the quality of information and the adoption of GRI reporting guidelines (a harmonization-aiming initiative of non-financial information reporting to improve ESG disclosures' quality) essentially 'glossed over' real sustainable issues. However, Chauvey et al. (2015) claims that the guidelines do not necessarily improve one of the key criticisms attributed to undermine the quality of ESG reporting regarding the lack of uniformity, thus failing to establish consistency and objective comparison of ESG performance both for a company across time as well as compared with its contemporary competitors in the industry.

Due to the lack of strict reporting standards in some regions such as the US, companies have more scope to engage in 'impression management techniques' to present the company's information in a positive light (Larrinaga and Bebbington, 2021), something that cannot be done to such an extent when it comes to traditional financial performance reporting. Eccles et al. (2017) highlight that a key barrier in the study of ESG disclosures is the questionable quality

of the reports published due to the absence of a standardization mechanism to facilitate comparisons. Voluntary ESG disclosures may even be preventing any real changes from taking place (i.e. implement regulation) as public pressure for legislation to be introduced by governing bodies will remain low if these 'techniques' are found to be effective, i.e. convincing the public that the company is sustainable and thus there is no need for market interventions through regulation (Deegan and Islam, 2012). Indeed, some scholars have even suggested that transparency and ESG's reporting quality will not occur unless mandatory regulation is put in place to 'correct' this market imperfection or negative externality, which would limit this 'flexibility' (Adams and Abhayawansa, 2022).

With regards to research in the quality of ESG disclosures of shipping companies however, only one notable report so far has been published by Lloyd's List (the most important daily newspaper reporting on shipping-related news) to my knowledge in 2021, characterizing the rising number of ESG reports published by shipping companies to lack 'clarity and context';

Indeed, while most of the reports studied reported on 'green credentials', they mostly failed to tie their progress against regulatory targets (Bockmann, 2021).

Overall, ESG-related information has been consistently undermined by both investors and critics alike, and justifiably; it is often found to lack fundamental qualitative aspects such as credibility and comparability, while the information presented is rarely value relevant (i.e. assist decision makers in their decision making) (Abhayawansa et al., 2019; Arvidsson, 2014). The reason why ESG related information and reporting has grown in the last decade has also been influenced by the growing scepticism exerted by key stakeholders such as investors and other market participants, potentially even raising the cost of capital for these companies (Fink, 2020). Hence, it can be argued that access to capital has been the ultimate driving force of this transformative period from profit maximization to triple bottom line rhetoric (i.e. social and environmental alongside financial results) (Elkington, 1994). According to Bebbington and Unerman (2018), companies run the risk of failing to survive in the transition to a lower-carbon economy, therefore calling for researchers to study the effects of ESG-related reporting practices and disclosure.

3.2 Assessing the Quality of ESG Reporting

ESG issues now heavily influence a company's strategy and performance with regards to ESGrelated issues, such as the implementation of environmental regulation, obtaining access to capital, growing pressure from the public to tackle climate change. This has resulted in more

companies than ever producing voluntary ESG reports (Threlfall et al., 2021), however research is limited when it comes to determining what constitutes a qualitative ESG disclosure.

While traditional financial information reporting's qualitative characteristics include timeliness, relevancy, materiality, credibility, balance and comparability, even though these refer to financial reporting standards, companies do not always seem to apply the same principles when it comes to improving ESG reporting's quality. However, improving ESG's quality of reporting is crucial for investors to identify and direct capital flows towards investments aiming to tackle the issue of climate change as well as achieve corporate sustainability (Arvidsson and Dumay, 2021). These issues have been further heightened in the aftermath of COVID19 (a social and potentially environmental issue), further urging companies to consider their environmental and social performance alongside financial performance, thus also highlighting the need for reliable ESG-related information to be disclosed to track that performance (Wood, 2020; Barker and Eccles, 2018). Indeed, investors (including shareholders) are currently driving the demand for further ESG performance information (Puthucherril and Doelle, 2021). Case in point, the world's largest investment fund (BlackRock) is actively working to promote a sustainable investment portfolio, given that investors increasingly view climate change risk as investment risk (Fink, 2020). That risk can manifest for instance through no longer investing in energy-inefficient assets due to technological developments essentially transforming them into liabilities (Bos and Gupta, 2019). Blackrock has for instance intentionally rejected investment opportunities in ExxonMobil due to its ties to fossil fuels production which goes against the fight to mitigate climate change's impact on the planet (Mooney, 2020).

3.3 Drivers of Voluntary Disclosures

Research on voluntary disclosure has historically focused on financial information reporting for capital markets (Healy and Palepu, 1995). There, several forces have been identified to be affecting managers' disclosure decisions for capital markets. These, according to Healey and Palepu (2001) include litigation, corporate control interests, stock compensation, capital market transactions and even signaling senior management's talent (Healey and Palepu, 2001). Indeed, some scholars like Watts and Zimmerman (1990) and Skinner (1993) consider accounting information in lending and compensation contracts to be endogenous. Corporate disclosure is a type of communication of information between public firms and external stakeholders. To have effective communication, disclosure should include information about corporate social and environmental policies (Healy and Palepu 2001). Indeed, if there were no market

externalities (such as information asymmetries), companies would ideally produce the optimal level of information for both internal and external stakeholders to the organization. Other market imperfections apart from information asymmetries have been identified by researchers to justify the reasoning behind the implementation of disclosure regulation in the course of the history of capital markets globally. Thus, accounting information can be viewed as a public good under this lens, since current stakeholders end up paying indirectly (through acquiring stock in a company) to produce financial information which in turn is viewed by potential new investors free of charge (Leftwich (1980), Watts and Zimmerman (1986), and Beaver (1998). In short, accounting information constitutes a widely and freely available piece of information to all stakeholders interested apart from the directly affected shareholders (i.e. thus allowing potential shareholders to free-ride on 'consuming a 'good' paid for by existing shareholders). This ultimately results, if left unattended by legislation, to underproducing publicly available financial information. Legislation also serves to, apart from amending the free-riding problem, to also reduce information asymmetry by establishing minimum disclosure requirements (Watts and Zimmerman (1986). For instance, Searcy and Buslovich (2014) have criticized ESG-related information for being too ambiguous and not enabling comparisons across inter- and intra-companies. Moreover, these issues can be intensified as a result of the plethora of available voluntary reporting frameworks and guidelines (Bartels et al., 2016). Nevertheless, given that stakeholders such as investors and financial analysts require more ESG information to assess ESG performance as part of their valuation process, both the quality of voluntary as well as regulated ESG reporting should be studied in relation to corporate performance (Krasodomska and Cho (2017); Barker and Eccles, 2018). Furthermore, there is an increased coverage of firms by financial analysts that report on their ESG performance (Hinze and Sump, 2019) Meanwhile, the Securities and Exchange Committee (SEC) announced in March 2022 that it would introduce mandatory requirements for US-listed companies to produce detailed accounts of climate related information, with the aim of enhancing and standardizing ESG-related disclosures and enhance the information quality regarding ESG-focused funds (i.e. compare projects' carbon footprint) (Gez et al., 2022). Meanwhile, already existing regulation such as the EU Directive in the European Union (EU, 2014; 2019) requires mandatory disclosure of ESG-related information for publicly listed firms within EU member states. Companies thus across several industries and countries have begun to engage in voluntary ESG reporting, to either adapt to regulatory requirements or in expectation of their mandatory implementation (as is the case with the IMO's Strategy).

3.4 Quality vs Quantity in ESG Reporting

Given the ever-growing importance of ESG-related information disclosures when assessing the firm's long-term performance prospects, it is becoming increasingly evident that not only companies ought to provide more ESG-related information, which also meets qualitative accounting information characteristics including relevancy, timeliness, comparability, and materiality, i.e. analogous to fulfilling quality criteria for reporting on traditional financial information (Barker and Eccles, 2018). However, research on ESG quality seems to focus on quantity rather than quality, assuming that the quantity of reports is also indicative of higher quality by providing more accuracy and transparency (Michelon et al., 2015, Helfaya and Whittington, 2019). Indeed, quantity does not necessarily translate to quality as well; case in point, Helfaya et al. (2019) find that quantity is not viewed as the most important determinant of quality while types of information presented, measures adopted and themes covered, the adoption of reporting guidelines or standards, including an assurance statement as well as employing visual tools are associated with higher quality. Notably, the presence of an assurance statement is also positively associated with both ESG quality and quantity (Crifo et al., 2016).

The issuance of ESG-related disclosures reports has now become mainstream among the world's largest corporations. Stand-alone reports particularly tend to be perceived as representative of clear corporate engagement with ESG-related issues affected by their operations (Gray and Herremans, 2011). Indeed, merely issuing a stand-alone report in the past has even been employed in the past (prior to ESG reporting growing in popularity) as a proxy measure of ESG disclosure quality (Dhaliwal et al., 2012; Dhaliwal et al., 2014). Voluntary ESG stand-alone reports are typically thought to signal a more engaging commitment on behalf of the firm with the environmental and social issues it faces or causes (Mahoney et al., 2013). Indeed, at least it reveals that the company has actively invested time and resources to prepare this report: Michelon et al., (2015) findings suggest that issuers of stand-alone reports are likely to provide more disclosure than firms who i.e. release some limited ESG information within their company's annual report. However, the authors do not find that this also necessarily translates to greater quality of disclosure.

Regarding the issue of integrated reporting (i.e. linking ESG-related issues to potential financial risks or opportunities for the company), the International Integrated Reporting Council (IIRC, 2021) supports that this information is of higher quality since it allows capital providers to make more efficient capital allocation decisions. To this effect, both the presence of SASB and GRI reporting frameworks indicate higher quality of ESG-related information disclosures; the

Sustainability Accounting Standards Board (SASB, 2021) for instance offers a framework of ESG reporting standards but still oriented towards accommodating the investor's financial perspective. Meanwhile, the more stakeholder inclusive Global Reporting Initiative (GRI) standards offer a more holistic view of ESG from multiple stakeholders' perspectives, while also aiming to ameliorate comparability through harmonization of ESG disclosures globally. Thus, both reporting frameworks when adopted tend to increase both the quantity as well as the quality of the reported information (de Villiers and van Staden, 2006).

Major crises like the 2008 global financial crisis and events disrupted the status quo of the time, triggering a major wave of distrust of capital market institutions such as banks, insurance companies and hedge funds (Elali, 2021). In the aftermath, these institutions, in an effort to 'reinvent' themselves and re-establish their corporate legitimacy, these institutions embarked on embracing sustainability and ESG reporting, as through aligning funds with sustainable investments would assist them to be no longer thought of as greedy and corrupted but ethical and conscious of the existential threat faced by humanity on this planet if no measures are adopted to tackle climate change, while also (El Khoury et al., 2021). In other words, capital markets actively attempt to restore corporate legitimacy by embracing the sustainability agenda and other social justice related causes, considering the needs of multiple stakeholder groups as opposed to that of the shareholder, as was the prevailing belief in the past).

An emerging strand in the social accounting literature attempts to address the determinants of ESG reporting. It might obviously be due to its becoming a legal requirement regionally (i.e. EU Directive, 2014) however the 2020 KPMG survey shows that 96 percent out of Fortune's 250 largest companies worldwide by revenue, now voluntarily disclose ESG-related information to their operations (Threlfall et al., 2021). This suggests that it has evolved into a well- established business norm. Indeed, some researchers like Walker and Wan, (2012) wonder, particularly with regards to voluntary ESG disclosure, whether it serves to mask negative performance by companies in specific social or environmental areas, distract from financial performance failure, or simply to manage reputation through appeasing various stakeholder groups. They may also engage in the practice of ESG voluntary disclosures to forestall legal regulation from being passed, which would call for actual and substantial change in their operations, while with voluntary ESG reporting companies at least can invest in keeping up the appearance of social responsibility, in line with the symbolic branch of legitimacy theory (Ashford and Gibbs, 1990). El Khoury et al., (2021) for instance employ panel regression to study country- and firm-level's effects on the overall ESG performance 'score' of banks in the

Middle East and North Africa during 2011-2019 to find that banks' ESG performance 'scores' are positively affected by size but negatively affected by financial performance.

Arvidsson and Dumay (2021) explore three key questions regarding ESG reporting, namely whether ESG reporting has increased in quantity, and if so whether this means that it has also increased in terms of quality, as well as actual improvements in ESG-related performance. They find that, within their sample of Swedish firms, the quality of ESG reporting has generally increased, although more could be done to address how to improve ESG performance through timelier, more relevant, credible and comparable information instead of improving ESG reporting regulations, in order to assist investors to better allocate resources to worthwhile investments, both financially and environmentally for instance. Indeed, the corporate world has significantly changed in the last few years in terms of how ESG-related issues and performance are treated and reported on (Barker and Eccles, 2018). After all, it is primarily shareholders and capital providers driving the demand for more detailed ESG performance information, through recognising for instance that climate risk may as well turn into investment risk (Fink, 2020). The transition to a lower-carbon economy may actually cause certain assets, such as older vessels in the case of shipping for instance to become too inefficient to operate due to compliance with strict environmental legislation, thus transforming them from assets to liabilities (Bos and Gupta, 2019). To tackle climate change related issues, substantive actions are required to be adopted by businesses, including the development of more energy efficient infrastructure and practices (Hepburn et al., 2020). Few studies to my knowledge have studied the financial effects of complying with IMO regulation. Sigalas (2022), for instance, found that higher prices for fuel that is compliant with IMOs environmental protection requirements had an adverse effect on ship-owners' gross profit margins, while 'slow steaming' could potentially alleviate shrunken profit margins.

4. Hypotheses

A huge transition is underway in the shipping industry due to environmental regulation, which requires huge capital expenditure as the industry is primarily capital intensive. My goal is to investigate how impending regulation is associated with an improvement in ESG reporting's quality of major listed shipping companies, in the context of firm specific characteristics.

On this line of thinking, Hossain and Reaz (2007), point out that scholars should identify and understand the determinants of ESG disclosure's quality. At the same time attention is drawn on the identification of the motives that initiate ESG disclosure's quality. It is generally

accepted that motives can be company-specific as well as market-wide. The issue that arises is if company practices of disclosing ESG-related information aim to merely improve its reputation or reflect enhancement of company strategic goals to include environmental and social awareness. Is it a means to hide weak financial performance or engage in greenwashing? Also, is it the result of mandatory regulation, or is it embraced and adopted voluntarily by the company? To explore the above intriguing questions with respect to the pollution-intensive marine transportation industry, I hypothesize my research questions in the context of legitimacy theory, a solid theoretical framework employed in order to explain ESG disclosure reporting (Dyduch and Krasodomska, 2017; Deegan, 2019). Specifically, I investigate the association of company specific characteristics (size, financial performance, age, leverage) with ESG reporting's quality. The most widely cited factors associated with ESG's quality of disclosure include firm size (Khan, 2010), profitability (Hudaib and Cooke, 2005) and leverage (Reverte, 2009).

Arvidsson and Dumay (2021) find that both mandatory and voluntary regulation have contributed to increasing ESG reporting quality. They argue based on a sample of Swedish firms that improving ESG's quality of reporting is necessary in order for investors to identify investment opportunities related to environmental issues. Adams and Abhayawansa, (2022) show that ESG's reporting quality cannot be improved unless mandatory regulation is implemented. Bockmann (2021), based on a report published by Lloyd's List states that most of shipping companies ESG reports published on ESG reporting improvements do not show any substantial change towards regulatory goals as set by the IMO announcement. On the basis of the above we formulate the following hypothesis.

H1. IMO's Initial GHG Emissions Strategy announcement is positively associated with ESG reporting's quality

With respect to profitability, more profitable companies is expected to be able to allocate more financial resources on ESG activities (Margolis et al., 2007). Seifert et al. (2004) find for example that a company's free cash flows account to a large extent for cash donations to charitable organizations. Therefore, in the context of legitimacy theory, firms are under pressure to justify and legitimize their main profit-generating activities (Campbell, 2007; Khan, 2010; Gamerschlag et al., 2011). Otherwise, they run the risk of being accused of green washing, which could be defined as the discrepancy between substantive and symbolic actions

in line with legitimacy theory (Walker and Wan, 2012). Furthermore, in the context of the theory, it has been shown that, most financially sound companies are highly motivated to report on their ESG performance. Roberts (1992) finds a positive relationship between lagged financial performance and ESG disclosure practices. Other studies though, show no significant link between profitability and ESG disclosure (da Silva Monteiro and Aibar-Guzman, 2010) with Ho and Taylor (2007) even showing a negative relationship. El Khoury et al. (2021), show that bank profitability (ROA) has a significant but negative relationship with ESG disclosure practices, mainly through the 'social' aspect in ESG and for large firms in particular. Furthermore, Eliwa et al., (2021) find that companies with better ESG performance have a lower cost of debt. The insignificant relationship of financial performance and ESG reporting is also consistent with Chih et al. (2010) and Dyduch and Krasodomska (2017).

From the above, the following hypothesis is formed:

H2. In the context of the launching of IMO's Initial GHG Emissions Strategy, I assert that corporate financial performance is positively associated with ESG reporting's quality.

The positive relationship between size and ESG disclosure has been substantiated in the literature in through a variety of theoretical channels. In the context of legitimacy theory, companies are expected to disclose qualitative information with regards to social and environmental activities undertaken, in order to legitimize their existence. A plethora of studies have shown that large companies obtain higher ESG scores, as they disclose more information in order to maintain their reputation or 'legitimacy'. (Branco and Rodrigues, 2008; Hahn and Kühnen, 2013; Meek et al., 1995). Furthermore, large companies are more likely to have (since availability of resources is related rather to profits, than to size) the financial resources to allocate on ESG activities and thus it is less costly to them to maintain high ESG scores. (Ho and Taylor, 2007). Elsewhere in the literature I see that voluntary ESG disclosure is used to effectively reduce companies' political risk (Ghazali, 2007; Watts and Zimmerman, 1978) as larger firms can be at risk for political attacks and therefore to proactively prevent government intervention (Jensen and Meckling, 1976; Watts and Zimmerman, 1978), show proof of social responsibility. It has been shown by Skinner (1994) that large companies purposefully increase their ESG disclosure reporting to minimize any potential litigation costs. Overall, the positive relationship between size and ESG reporting has been well founded empirically in many countries (Gamerschlag et al., 2011;). Hossain and Reaz (2007) find that a firm's size is positively related to ESG disclosure of 38 Indian listed banks while in contrast Roberts (1992) finds that size has no impact on the ESG disclosure practices of Fortune 500 firms. Consistent

with other studies (Bouten et al., 2011; Dyduch and Krasodomska, 2017), show that size has a strong and positive impact on ESG disclosure practices, therefore suggesting that larger banks are determined to increase their ESG scores. As larger firms are more likely to be scrutinized by stakeholders, they willingly undertake voluntary disclosure of ESG information in order to reduce this pressure. Furthermore, larger companies are more important/central to the economy, attracting a larger share of interest from a diverse range of stakeholders and the response to such interest may be associated with higher quality of ESG reporting. I thus form the hypothesis:

H3. In the context of the launching of IMO's Initial GHG Emissions Strategy, a company's size is positively associated with ESG reporting's quality.

Highly leveraged firms are more likely to come under scrutiny by their debtholders. In order to mitigate agency costs, they usually disclose more ESG formation to avoid further scrutiny (Ho and Taylor, 2007). In an interview undertaken by the European Leveraged Finance Association, 72 percent of bondholders said that ESG disclosure reporting is important to them when considering their investment decisions (Ho, 2020). Leveraged companies in Saudi Arabia, have been reported to disclose more ESG information in order to satisfy their creditors (Alsaeed, 2006). Nevertheless, the positive relationship between leverage and ESG disclosure practices was not supported by studies: Branco and Rodrigues (2008) find a negative relationship between leverage and ESG disclosure practices among Portuguese firms, while an insignificant relationship between leverage and ESG disclosure practices was shown for Spanish (Reverte, 2009) and Malaysian companies (Hawani Wan Abd Rahman et al., 2011). However, in several studies, the financial leverage has also been found statistically insignificant (Michelon and Parbonetti, 2012; Reverte, 2009). I thus form the following hypothesis:

H4. In the context of the launching of IMO's Initial GHG Emissions Strategy, a company's leverage is positively associated with ESG reporting's quality.

5. Methods

5.1 Sample and Data Description

My chosen sample is made up of all active maritime companies listed in NYSE in 2022. A list of the companies considered for this dataset can be found in the Appendix section of this study, titled 'Table 6: Names of firms included in my studied dataset'. I have hand-collected my data inputs from the companies' annual disclosures during the period 2015-2021. All information provided on ESG reporting has been used to develop an index which would reflect the quality

of reporting and hence can be used to investigate changes after the IMO regulation was announced in 2018. I have also gathered financial and firm-specific information during the same time. The companies collected are registered under the Standard Industrial Classification (SIC) code of 4412 - Deep Sea Foreign Transportation of Freight and 4400 - Water transportation. From the WRDS Compustat database and companies' annual disclosures on their websites I collected data from 34 maritime shipping companies over the seven-year period that ended in 2021, in total 238 firm year observations. From these companies only 28 reported on ESG, so I ended up with 196 observations, filling in by hand my ESG quality index that assumed values very close to zero instead of omitting them which would result to a drastic reduction of my sample.

5.2 Dependent Variables

ESG Reporting's Quality ***(ESG_{it})*****:** Following Michelon et al., (2015) I have constructed nine factors that are associated with quality reporting and are identified by the literature. I have collected, defined and included nine variables in the construction of the ESG quality index.

Stand- Alone (SA_{it}): A binary variable which assumes the value 1 if a stand-alone ESG report is published, 0 otherwise.

Externally Assured (EA_{it}): A binary variable assuming the value 1 if the ESG report is signed by an auditor or external assurer for ESG reporting, 0 otherwise.

Awards and Ratings (AR_{it}): A binary variable which assumes the value 1if the company has received any awards or ratings on the ground of ESG performance (indicative of relative performance compared to other firms in the industry).

Formal Standard (FS_{it}): A binary variable which assumes the value of 1 if the company has prepared an ESG report in accordance with widely recognized set of reporting standards/guidelines frameworks such as the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB) and the Task Force on Climate-related Disclosures (TCFD).

Risks and Opportunities (RO_{it}): A binary variable assuming the value of 1 if the company has identified and explicitly recognized financial risks and opportunities because of ESG-related issues i.e climate change or cost of transition to efficient fuel use.

Forward or Backward Looking (FB_{it}): A binary variable which assumes the value of 1 if data from previous periods is used to facilitate comparison through time and reflect on progress achieved so far (Michelon et al., 2015). A forward-looking statement would make generalized

pledges regarding future performance and intentions to become more sustainable, thus assuming the value of 0.

Accuracy (A_{it}): To construct this variable I have used three commonly reported indicators in the shipping industry which are CO_2 emissions generated, AER which is an Annual Efficiency Ratio and EEOI, an Energy Efficiency Operational Indicator. Accuracy assumed the value of 1 if any of the three indicators above was reported and justified how the number was calculated. Assumed the value of 0 otherwise.

Comparable (C_{it}): A binary variable which assumes the value of 1 if the company has also presented data from previous years to facilitate comparison, and measure progress. Assuming the value of 0 otherwise.

Reference to Adverse Events (AE_{it}): A binary variable assuming the value of 1if the company also discloses information on its ESG-related shortcomings instead of merely highlighting its positive performance, including reference to adverse events occurring during its operations i.e port detentions, environmental spills, fatal accidents.

The ESG quality index is then defined as

$$ESG_{it} = \frac{1}{9}\sum_{f=1}^{f=9} X_f$$

Where X is each one of the of the nine determinants I have defined above. It should be noted that, since it is not uncommon for the industry for companies, out of those who published voluntary ESG disclosures to not do so annually (i.e. biannually instead). Similarly, many companies within my dataset did not begin reporting on their ESG performance until later, meaning that many values corresponding to earlier years (i.e. 2015, 2016) were also empty. For this reason, I have decided to fill up all my values corresponding to ESG with the nearest available ESG score, apart from the companies who did not produce a single ESG-related disclosure during 2015-2021, therefore receiving the value of 0.

5.3 Independent Variables

Firstly, I employ net income over total assets (ROA) as a measure of financial profitability. Consistent with prior literature on corporate governance and corporate finance, I estimate firm size with the logarithm of a firm's total assets (LTA) (Anderson et al., 2012) and with the logarithm of firm's total revenue (LTR) (Chongyu et al., 2018). Moreover, I measure financial leverage (LEV) as the fiscal year-end ratio of debt to total firm assets (Ghosh and Jain, 2000)).

Debt is defined as the book of long-term debt and debt included in current liabilities as reported in companies' annual accounts. In addition, I collect company's age as the number of years of operation ($LAGE$), and the number of vessels the company owns across all shipping segments (LVS). Finally, I construct a dummy (IMO), indicating the announcement of IMO regulation in 2018 and assuming the value 1 for 2018 and thereafter, and the value of zero for the years before. Initially I plotted ESG against each one of the potential independent variables described above, to observe the strength of association and if needed to clean my data in the presence of outliers. Plots are shown in the Appendix section of the present study, titled 'Ap. 1: Scatter plots of variables collected'. Inspecting the graphs, I made the choice to include the following variables described in Table 1 below, most of the variables were included in logarithms since the relationship both in the plots and in the correlation, matrix appeared to be stronger.

Table 1: Definition of Variables

Variables	***Definition***
$LESG$	The natural logarithm of the ESG reporting's quality Index I have constructed
LTR	The natural logarithm of total revenue
LEV	The ratio of long-term debt over total assets
ROA	The ratio of net income over total assets
$LAGE$	The natural logarithm of the company's years of operation
LVS	The natural logarithm of the number of vessels owned and/or managed by the company across shipping segments
ROE	The ratio of net income over shareholders' equity

In Table 2 below, Panel A shows the descriptive statistics of my data and Panel B shows the Correlation matrix.

Table 2: Descriptive Statistics and Correlation Matrix
Panel A: Descriptive Statistics

Variable	Obs	Mean	Std. dev.	Min	Max
LESG	196	-0.6879	0.4864	-2.1972	0
LTR	232	15.472	1.1370	12.5182	19.1542
LEV	234	0.4279	0.1291	0.1067	0.8117
ROA	237	-0.0029	0.0999	-0.9656	0.2903
LAGE	238	3.0058	0.9091	0	4.9344
LVS	233	3.8275	0.8011	0	4.6249
ROE	233	-0.0059	0.7839	-4.3811	102383

Panel B: Correlation Matrix

	LESG	LTR	LEV	ROA	LAGE	LVS	ROE
LESG	1.0000						
LTR	0.2435	1.0000					
LEV	0.031	-0.2691	1.0000				
ROA	-0.1533	0.1689	-0.0792	1.0000			
LAGE	0.2982	0.6265	-0.3659	-0.0952	1.0000		
LVS	0.0557	-0.1594	0.1719	-0.0814	0.0607	1.0000	
ROE	-0.2092	0.0781	-0.1991	0.8653	-0.0992	-0.1234	1.0000

It appears from Panel A of Table 2 above that on average 42.7 percent of a company's assets are financed by debt, which is a desirable ratio in the sense that it reflects a healthy capital

structure. On the other hand, the average values of return on assets and return on equity were slightly negative with ROE showing much more volatility as expected. Panel B of the Table shows that the number of vessels as well as leverage have very low correlation with my dependent variable and as the number of vessels is a proxy for size, even though I have tested it eventually was chosen to exclude it from estimation. Leverage was kept as theory required its presence in the context of my hypothesis. Next, I detected the presence of outliers from the graphs and through Stata they were identified and excluded, which meant my sample was reduced by 7 observations. Another 10 observations were excluded from my final sample based on missing some financial data and I have ended up with 179 firm year observations.

5.4 Model Specification

I employed balanced panel data analysis to explore the cross-sectional and time series characteristics of ESG in the context of the maritime shipping industry. Panel data is the richest set of data as it allows variation between companies at each time period but also within, each company through time. Depending on which variation is dominant(greater) I select my method of estimation. My model is specified as follows:

$$ESG_{it} = f(ROA_{it}, LTR_{it}, LEV_{it}, LAGE_{it}, LVS_{it}) \text{ and}$$

$$ESG_{it} = f(ROE_{it}, LTR_{it}, LEV_{it}, LAGE_{it}, LVS_{it})$$

Where:

i = number of companies in my study, i.e. 27 companies, and t

= number of years in my study, i.e. 7 years.

Since my primary hypothesis is to investigate the response of ESG reporting's quality to the regulation implementation announcement made by the IMO I run a fixed year effects model where six dummies are included, one for each year; thus, years 2018-2021 assume the value of 1 while the years 2015-2017 assume the value of 0. So, the dummy IMO=1 for years 2019, 2020, 2021 and zero elsewhere is omitted. Year dummies control for any other unobservable factors. If inputted with a single dummy (before-after), IMO, either year dummies are omitted by the software, or the single dummy. So, should use either one, or another. I believe that a more thorough investigation is made by keeping year fixed effects and omitting the dummy, IMO. Next, I run a Hausman test (Wooldridge 2002, p. 288, and Baltagi 2005, p. 66) to ensure

that random Effects is the most appropriate method of estimation. I test the hypothesis that individual company heterogeneity, a_i, and any one of the regressors, x_{it}, are not correlated:

- H_0: $corr(a_i, x_{it}) = 0$ against the alternative that they are correlated.

With $chi2(10) = 10.80, prob > chi2 = 0.3737$ hence I cannot reject the H_0 and proceed with Random Effects (RE) estimation. Even if this is the case which seems plausible, given that ESG through time becomes more important as headed towards mandatory implementation of ESG reporting by the IMO, there can still be endogeneity between any of the above regressors and the error term u_{it}. The error term in panel data, e_{it}, is composite. A part of it is a_i and another part is u_{it}, i.e. $e_{it} = a_i + u_{it}$.

Two potential candidates for endogeneity testing are ROA (Tsionas et al., 2012) and LEV (Cipriani et al., 2019; Johnson et al., 2010). I run the Hausman endogeneity test for both, and I find evidence that LEV is endogenous. Testing the Null hypothesis for LEV,

- H_0: No systematic difference in coefficients (no endogeneity)

With $chi2(9) = 33.79, prob > chi2 = 0.00$, hence I reject the H_0 for LEV. Next, testing the Null hypothesis for ROA,

- H_0: No systematic difference in coefficients (no endogeneity)

With $chi2(9) = 10.7, prob > chi2 = 0.2970$, hence I cannot reject the H_0 for ROA. So, I use Instrumental Variables (IV) estimation and define as instruments the following set of variables: $Z = (LEV(-1), ROA, LTR, LAGE, LVS)$ and re-estimate the model. I can use Z to solve the orthogonality conditions $E(Z_i, u_i) = 0$ in terms of the coefficients of my model. I proceed to estimate my model without IV, with IV, and then IV with robust standard errors (s.e). I choose the version with IV as the s.e. are the smallest and my estimators appear to be consistent.

6. Empirical Results

6.1 Description of Sample Evidence

Table 3 below presents the total sample of 34 maritime companies listed on NYSE by the shipping sector that they engage in. I observe that the majority, 29.4 percent owns and/or manages a diversified fleet across shipping segments, as historically the different segments i.e bulkers and tankers do not share the same length and depth of the different phases in the shipping cycles. This way, the owners manage to diversify their risk.

Table 3: Maritime Companies by Shipping Segment

Shipping segments	Number of companies	% of total
Dry Bulk	5	14.7%
Crude Oil	6	17.6%
Product Oil	2	5.8%
Liquefied Natural Gas	5	14.7%
Container	6	17.8%
Diversified Fleet	10	29.5%
Total	**34**	**100%**

On the basis of my sample, 82.3 percent or 28 out of the 34 listed companies engaged in ESG reporting and only half of them or 14 companies scored in the ESG quality index above 0.5 (the index ranging from zero to one). It appears that most maritime listed companies from this sector engage in ESG reporting, which is not of 'high quality', at least in terms of my constructed ESG reporting quality index.

6.2 Discussion of Results

Table 4 below presents my estimation results on the drivers of ESG reporting's quality.

Table 4: Estimation Results with RE and Fixed Year Effects (Using ROA)

Dep. Variable: ESG Reporting's Quality

Variable	RE-IV (1)	RE-IV with Robust errors (2)	RE (3)
LEV	(omitted)	0.440*	0.474*
LTR	0.149***	0.149***	0.107***
ROA	-0.774**	-0.774**	-0.599**
LEV	0.441	(omitted)	
LAGE	0.018	0.019	0.006
year			
2016	(base)	(base)	-0.018
2017	0.050	0.050	0.013
2018	0.056	0.056	0.027
2019	0.143**	0.143*	0.112
2020	0.282***	0.282***	0.259***
2021	0.377***	0.377***	0.347***
LEV			(omitted)
_cons	-3.336***	-3.335***	-2.623***
N	151	151	179
r2_w	0.333	0.333	0.327
r2_b	0.308	0.308	0.256
r2_o	0.370	0.370	0.309

Legend: * p<0.1; ** p<0.5; *** p<.01

My choice is model (2), Random Effects (RE) estimation with robust errors. It appears that my first hypothesis, *H1*, that IMO's GHG emissions strategy announcement is positively associated with the quality of ESG reporting, is strongly supported by my findings; Less than a year after the IMO announcement, listed maritime companies started to improve the quality of their ESG reporting. The second hypothesis, *H2*, is rejected as financial performance proxied by ROA is negatively associated at the five percent level of significance with ESG reporting's quality. This finding is in corroboration with El Khoury et al. (2021) which derived a similar result on banks financial performance (ROA) having a significant but negative impact on ESG disclosure. My third hypothesis *H3* is strongly supported by the findings and corroborates the findings of Branco and Rodrigues (2008), Hahn and Kühnen, (2013) and Meek et al., (1995) which have found that larger corporations might be more likely to disclose ESG reports of higher quality as they are subject to closer scrutiny from the public and are under pressure to disclose more information to gain legitimacy. Finally, the fourth hypothesis *H4* is weakly supported by my findings at the 10 percent level of significance, but it shows positive association with the ESG reporting's quality. Literature shows that for companies to reduce agency costs, they are inclined to disclose more ESG formation as an assurance to creditors (Ho and Taylor, 2007). Table 5 below re-estimates the model by proxying financial performance with ROE. The estimation results are close to those of Table 4, only the magnitude of the association of ROE and ESG reporting's quality is smaller and financial leverage is statistically insignificant.

Table 5: Estimation Results with RE and Fixed Year Effects (Using ROE)

Dep. Variable: ESG Reporting's Quality

Variable	RE-IV (1)	RE-IV with Robust errors (2)	RE (3)
LEV	(omitted)	0.411	0.379
LTR	0.138***	0.138***	0.115***
ROE	-0.225**	-0.225**	-0.265***
LEV	0.412	(omitted)	
LAGE	0.024	0.024	-0.004
year			
2016	(base)	(base)	-0.018
2017	0.053	0.053	0.015
2018	0.053	0.053	0.024
2019	0.134*	0.134*	0.102
2020	0.280***	0.280***	0.252***
2021	0.350***	0.350***	0.322***
LEV			(omitted)
_cons	-3.171***	-3.169***	-2.688***
N	151	151	179
r2_w	0.334	0.333	0.340
r2_b	0.325	0.325	0.210
r2_o	0.362	0.362	0.301

Legend: * p<0.1; ** p<0.5; *** p<.01

7. Conclusion

In the present study I have attempted to explore if the maritime listed companies in the NYSE stock exchange have embarked on improving their ESG reporting's quality and assess the firmspecific characteristics associated with this decision. I have shown that the IMO regulation regarding the decarbonization of the industry, which from January of 2023 is going to be

mandatory, is positively and highly significantly associated with ESG reporting's quality. It appears that the listed maritime companies are prepared and already report on ESG performance in their overwhelming majority. What is of concern though is that the quality of ESG reporting as captured by my ESG Quality index has not gained substantial ground yet, among the listed companies. This suggests that, for this industry at least, more research is needed to establish whether quality in ESG reporting is truly lacking in this pollution-intensive industry. More research and scrutiny in particular is needed in pollution-intensive industries' ESG reporting due to the higher responsibility they bear with regards to their carbon footprint.

Furthermore, it is shown based on empirical findings that company profitability however measured, through ROA or ROE is negatively associated with ESG reporting's quality. This finding corroborates with the findings of Whelan et al. (2021), where the relationship between ESG and financial performance was examined in a meta-analysis of more than 1000 research papers between 2015 and 2020; in 13 percent of these studies, a negative relationship was reported, while in contrast, 58 percent of the studies reported a positive relationship. Moreover, it has been found that leverage, even though statistically insignificant, has a positive association with ESG reporting's quality. This finding draws attention to the potentially compelling nature of ESG requirements when a company resorts to debt financing.

My findings offer significant insights as far as the response of listed maritime companies to ESG reporting's quality is concerned. Even though regulation seems to be associated with shaping responses and contributing towards a new way forward with transparency and social responsibility, it will take time for companies to fully embrace it. If major shareholders and company managers realize the need to walk on the path of ESG reporting's quality as paving the way to a brighter future, they should make sure that enough resources especially in periods of higher profitability are devoted on improving ESG reporting's quality. Whelan et al. (2021) findings assert that higher ESG performance is after all increasingly linked to long-term financial performance.

Admittedly this study is subject to methodological limitations. The number of companies included is relatively low, compared with the total number of maritime listed companies in the global stock exchanges, which is about two hundred and fifty by market estimates. Nevertheless, involving different stock exchanges requires special treatment regarding laws and regulations, or the absence of them, with regards to ESG reporting's quality. An extension

of my work in this study, apart from expanding the data set, would be to conduct interviews with industry stakeholders to register their views, ideas and worries about the process of implementation of ESG in shipping, so that qualitative results would support my findings and perhaps shed more light into the coming developments in a global industry that has just begun to feel the effect of regulation and needs to find the best way to absorb it and grow better on it.

Appendix

Figure 2: Scatter plots of variables collected, generated using STATA software.

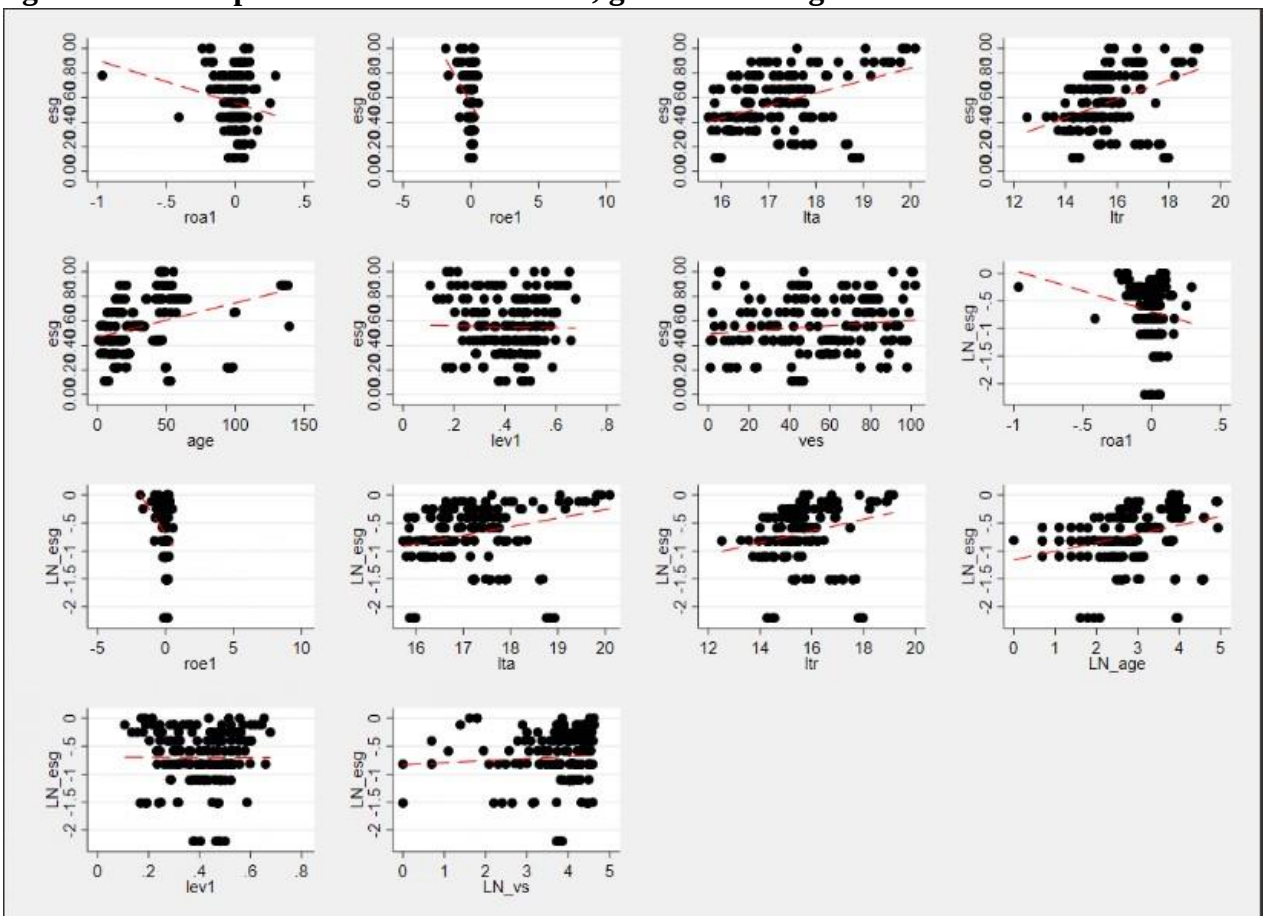

Table 6: Names of firms included in my studied dataset

1	Ardmore Shipping Corporation
2	Atlas Corp.
3	Carnival Corporation
4	Costamare Inc.
5	D/B/A Royal Caribbean Cruises Ltd.
6	Danaos Corporation
7	DHT Holdings Inc.
8	Diana Shipping inc.

9	Dorian LPG Ltd.
10	Euronav NV
11	FLEX LNG Ltd.
12	Frontline Ltd.
13	GasLog Ltd.
14	Genco Shipping & Trading Limited
15	Global Ship Lease Inc
16	Hoegh LNG Partners LP
17	International Seaways Inc.
18	Kirby Corporation
19	KNOT Offshore Partners LP
20	Matson Inc.
21	Navigator Holdings Ltd.
22	Norwegian Cruise Line Holdings Ltd.
23	Safe Bulkers Inc
24	Scorpio Tankers Inc.
25	SEACOR Holdings Inc.
26	SFL Corporation Ltd
27	Teekay Corporation
28	Tidewater Inc.
29	Dynagas LNG Partners
30	Navios Maritime Acquisition
31	Navios Maritime Holdings
32	Navios Maritime Partners
33	Nordic American Tankers Ltd
34	Tsakos Group

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