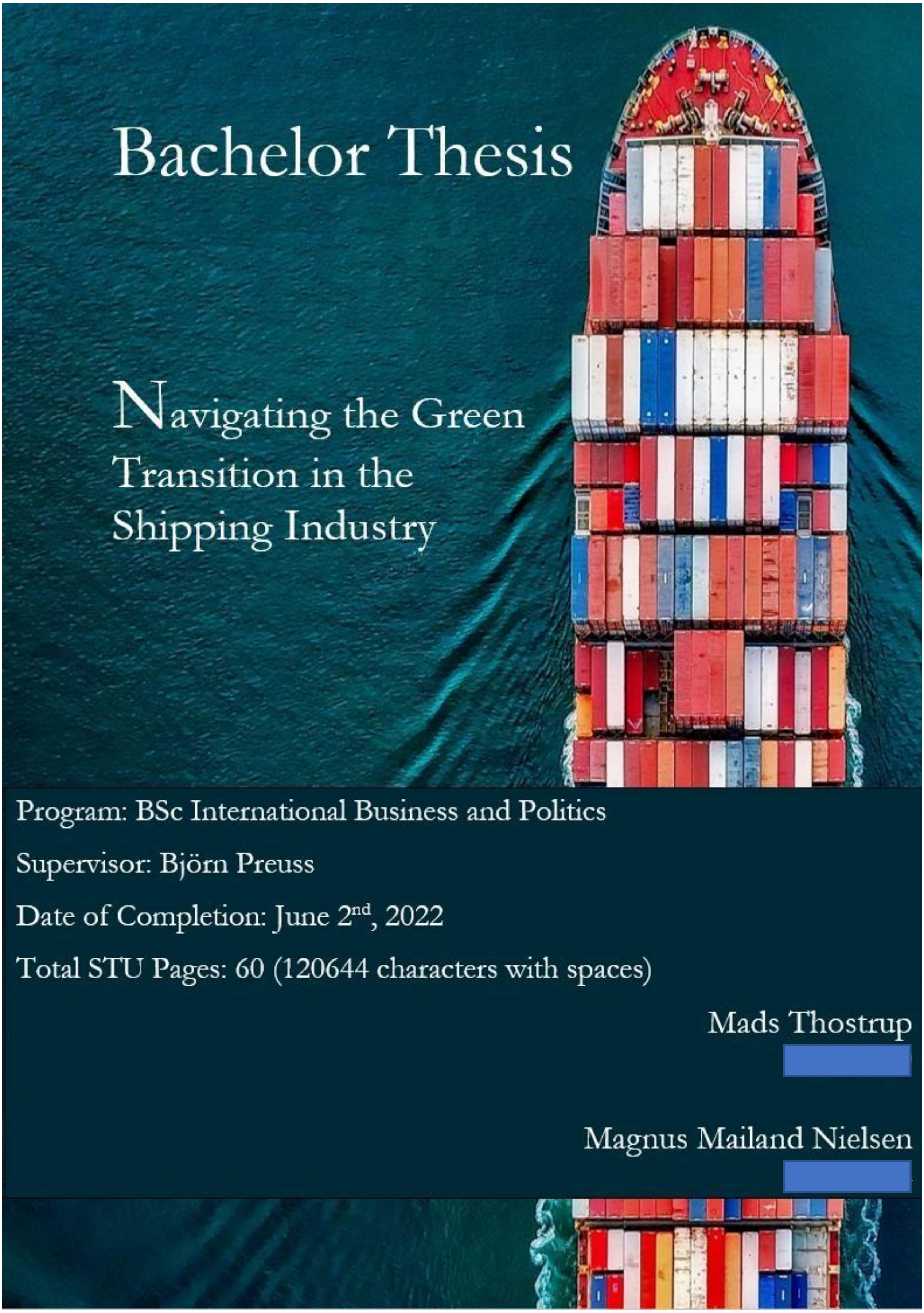

Bachelor Thesis

Navigating the Green Transition in the Shipping Industry

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Abstract

To reduce carbon emissions, the European Union has decided to include the shipping industry in the

European Green Deal. For the shipping industry, this means that a tax will be put on fuel consumed in Europe and that EU allowances will be required for greenhouse gas emissions. This thesis will uncover whether this tax will lead to reduced carbon emissions and increased uptake of renewable and low carbon fuels. Whether this is the case depends on the strategic response of the shipping industry to the taxes that EU imposes. Four strategic responses to the tax were identified; 1) Status Quo, 2) Scale in Logistics & Services, 3) Scale in e-Methanol consumption and 4) Implementing the IMO tax. The thesis finds evidence that Status Quo will be pursued as a strategic response since this strategy yields the highest shareholder wealth. Since Status Quo entails no efforts to decarbonize, the thesis concludes that the initiative of including the shipping industry in the European Green Deal has been insufficient to have an impact on carbon emissions in the industry.

1.0 Introduction

It is becoming well-known that the world is in a state of climate crisis. Globalization has led to growth and prosperity in production for many countries, but much of this is associated with excessive pollution that endangers our climate, disturbs ecosystems, and puts the future of the globe at significant risk (United Nations, 2022). It is a critical question how we best curb the increasing levels of carbon emissions. While most people agree that a solution must be found, the means to solve the problem is heavily debated.
Some argue that political institutions should internalize external costs by taxing polluting sectors (Boqiang Lin, 2011). Others argue that green sectors should be subsidized to promote decarbonization (Qadir, AlMotairib, Tahirc, & Al-Fagihcd, 2021). Still others claim that continuous progression in technology and innovation will solve the climate challenge in itself (Dwivedi et al., 2022). The EU has a suggestion. They have formed the European Green Deal (EGD) that contains an array of hard and soft carbon related regulations and attractive green financing made available by the ECB. In this context, the EU has adopted the 'Fit-for-55' package with concrete measures to achieve a 55% reduction in GHG emission compared to 2008 levels in 2030 and go net zero by 2050 (European-Council, 2021). This is to be achieved through higher fuel taxes and Emissions Trading Systems (ETS) for operations in the EU.

An industry of particular importance for decarbonization is the shipping industry which has both enjoyed globalization as a source of growth but also exploited it with extraordinary pollution (Wan, el Makhloufi, Chen, & Tang, 2018). In fact, the shipping industry constitutes about 3% of global emissions (Irfan, 2022). If the shipping industry were a country, it would rank as the sixth biggest contributor to Green House Gas (GHG) emission. However, it is by far the most cost effective and reliable mode of cargo transportation and will likely continue as the backbone of our globalized economy (Mallouppas & Yfantis, 2021). If left unchecked by policymakers, GHG emission in the shipping industry could grow 50-250% by 2050 and ultimately account for as much as 17% of global GHG emission (Smith, et al., 2014).

1.1 Research Question and Approach

Regardless of what policy tools are used to solve the climate crisis, the important thing is that our actions have an impact on the climate. Recently, the EU included the shipping industry in the 'fit-for-55 package' of the EGD. For this initiative to be successful, it must have a concrete impact on how companies in the EU operate. In other words, it must fulfill its official goal of *"increasing the uptake of renewable and low carbon fuels (RLF)…"* (Tuominen, 2022). In this thesis, we want to evaluate the legislation by uncovering whether this goal is achieved. If the shipping industry chooses a strategic response that pollutes less and increases the uptake of RLF, the legislation can be deemed successful. To find out if this is the case, we pose the following research question:

What strategic response to the inclusion in the European Green Deal will the shipping industry pursue?

The criteria of success for the inclusion of the shipping industry in the European Green Deal is whether the pursued strategic response entails an increase in the uptake of RLF. In the initial impact assessment (IA) of the 'fit-for-55 package', the EU commission states that *"This initiative is aimed at 'increasing the uptake of renewable and low carbon fuel (RLF) in EU maritime transport with a view to reducing emissions from the sector, both in navigation and at berth and thereby contribute to achieving EU and international climate objectives'* **(general objective) (IA, p. 30)***"* (Tuominen, 2022).

Whether the uptake of RLF is increased depends on the consequent pursued strategy of the shipping industry. Sprengel and Busch (2011) identifies four different possible strategic responses to green institutional pressure: Minimalist, Pressure Management, Emission Avoider and Regulation Shaper. If a strategy that resembles Emission Avoider is pursued, the inclusion of the shipping industry in the EGD is successful because this strategy entails less pollution and high uptake of RLF.

To make this assessment, this thesis is informed by the Friedman Doctrine. Based on Friedman's doctrine and the logic of Rational Choice Institutionalism, the strategy that will be pursued depends on which one yields the highest enterprise value for the firm. According to Friedman's doctrine and the notion that *"the social responsibility of business is to increase its profits"* (Friedman, 1970), financial motivations should guide corporate strategy, and corporations should aim to maximize total enterprise value to benefit shareholder wealth. This idea is in line with Rational Choice Institutionalism and the assumption that actors are utility maximizing agents and that institutions subsequently shape rational behavior by setting "the rules of the game" (Shepsle, 2006). Based on these overarching principles as a theoretical framework, the shipping firms are expected to choose the strategic response that yields the highest enterprise value to the benefit of their shareholders. The limitations that this theoretical framework has for the validity of our findings will be discussed later.

1.2 Object of Investigation

The analysis will be carried out with A.P. Moller Maersk A/S as the object of investigation. First, a regular financial valuation of Maersk will be performed to provide a benchmark enterprise value. Then, the valuation will be adjusted to account for *1) the inclusion of the shipping industry in the European Green Deal* and *2) different strategic responses for Maersk to pursue*. In total, four different operating scenarios will be compared to the base valuation. Thus, the intention of the thesis is to uncover **the relative impact** of the inclusion and subsequent strategic responses on the intrinsic value. Narrowing down the unit of empirical observation to a single firm in the shipping industry is done to induce more internally valid findings.

1.3 Outline of the Thesis

We will first provide a literary review of the current regulatory landscape, methods for evaluating the effectiveness of green policies and strategic responses of business to green policies. Second, the theoretical framework of the assignment will be explained and discussed. Third, we will illuminate the methodology of the thesis which is characterized by a positivist philosophy of science and a financial valuation tool developed by (Rosenbaum & Pearl, 2014). Then, the thesis dives into the analysis and presents the results. Subsequently, results are discussed and put into perspective. Finally, the answer to our research question is reiterated as the findings are concluded.

2.0 Literary review

The literature on the impact of carbon taxes is thick. Many scholars, consulting firms and public institutions have provided reason to believe that carbon taxes are efficient for reducing carbon emissions (Azhgaliyeva, Kapsaplyamova, & Low, 2018). The efficiency of including the shipping industry in the European Green Deal specifically has also been investigated thoroughly and, based on technological capacities etc., this inclusion is expected be very successful in terms increasing the uptake of RLF in the industry (Tuominen, 2022). Our thesis intends to build upon this literature by predicting whether the goal is feasible from a rational choice perspective of the firms in the industry. In the following sections, we will describe the existing research on the topic as well as outline the context of the European Green Deal and its taxation of carbon emission.

2.1 Literature on Business and Political Strategy

On the question of what guides business and political strategy, much literature indicates that executive decisions today are characterized by financialization of the market economy (Davis & Kim, 2015; Palley, 2007; Epstein, 2006). Financialization refers to the increasing importance of finance, financial markets, and financial institutions to the workings of the economy. To illustrate financialization, Palley (2007) highlights the increasing indebtedness of household and corporate actors. Also, the growing share of financial sectors in the economy substantiates the claim that finance has an increasing importance. In terms of politics, financialization has caused elites and businesses to gain noteworthy influence over economic policy making (Epstein, 2006). Therefore, financial motives increasingly guide political decision making and regulation. Similarly, in terms of business, financialization causes a short-term orientation toward shareholder value that leads to substantial changes in corporate strategies (Davis & Kim, 2015). This short-term orientation causes short-term gains to be consistently prioritized over long-term gains when deciding on a corporate strategy. Consequently, firms increasingly favor financial investments with high yield, short-term payoffs over long-term investments in underlying growth assets. Short-termism can be ascribed to performance compensation of managers which incentivize them to prioritize improvements in short term performance (IBID).

2.2 The Regulatory Landscape

Currently, the context of carbon regulation is characterized by low taxes and expensive green alternatives to oil. From a business perspective, the green transition appears challenging to the profitability of shipping firms (Lagouvardou, Psaraftis, & Zis, 2020). Despite the current surge in prices, oil remains by far the most cost-effective source of energy to power cargo ships since the price of alternative fuels like hydrogen is three times as expensive. Many scholars argue that the gap between the urgent need to convert to zero-emission fuels and the financial incentives to do so can be closed by carbon taxes (Meltzer, 2014; Azhgaliyeva, Kapsaplyamova, & Low, 2018). However, it seems that we are far behind on implementing political regulation that will fill up this gap in the shipping industry. The governing institution of the industry, The International Maritime Organization (IMO), has traditionally been characterized by endless discussion and disagreement (Wan, el Makhloufi, Chen, & Tang, 2018). The current strategy outlined by the IMO in 2018 mandates a 50% reduction in GHG emission compared to 2008 levels in 2050 and will be revised every 5 years. Yet, this target is far less ambitious than what is required to be aligned with the Paris agreement (IMO, 2018). Furthermore, the strategy lacks a concrete implementation plan, and penalty fines triggered by failure to meet the mandated reduction are poorly defined.

Currently, the most prominent carbon regulation can be found in the European Green Deal (EGD) whose inclusion of the shipping industry we will evaluate. The objective of the EGD is for the EU to become the first climate neutral continent by 2055 (European-Council, 2021). To achieve this target, the European Commission promises to reach the following more detailed targets by 2030: More than 55% cuts in GHG emissions, at least 32% share of renewable energy and above 32,5% improvement in energy efficiency. To be able to reach these targets on time, the European Commission proposes a dedicated action plan known as the fit-for-55 package. For the shipping industry, this action plan includes a tax of $45 per ton of fuel oil (Sørås, 2021). Furthermore, according to the EU Emission Trading System, emitting 1 ton of CO^2 equivalent will require an EU allowance, currently trading at $92 according to the European Energy Exchange (EEX, 2022). The oil tax and ETS will be enforced 100% for voyages within the EU and 50% for voyages arriving at or departing from the EU. The goal of including the shipping industry in the European green deal is to *increase the uptake of renewable and low carbon fuel (RLF) in EU maritime transport (…)* (Tuominen, 2022). In the following sections, it will become evident that economic theory and computational calculations predict that these taxes on fuel consumption lead to reduction in carbon emission on a general level. However, it remains interesting to investigate what concrete strategy will be pursued in response and whether this, in fact, entails an increase in the uptake of RLF.

2.3 Literature on Evaluating Green Policies

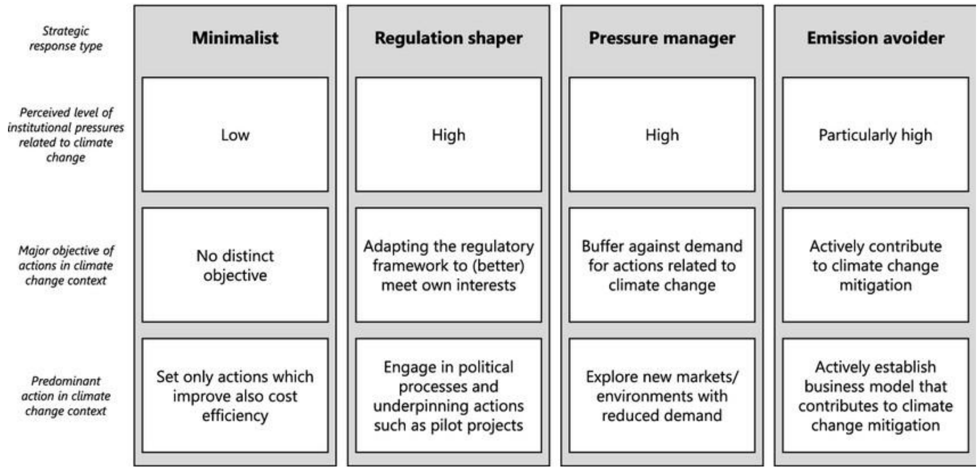
On the question of what impact a carbon tax will have on carbon emission, the literature is also voluminous. It is widely argued that carbon taxes can reduce energy use, improve energy efficiency, and simultaneously promote the development of renewable energy (Lin & Li, 2011). The study by Lin & Li uses Finland as a case study and provide evidence that the carbon tax implemented in the country, on a significant basis, reduced the growth of CO_2 emission per capita by 1,69% compared to what would have been in the absence of the tax. Also, Wang & Li (2022) finds evidence that an ad valorem energy tax will indeed impact the production and consumption of oil in enterprises. Accordingly, a higher tax rate on carbon leads to more pronounced reduction in carbon dioxide emissions. This analysis as well as many other ones is conducted through a Computable General Equilibrium (CGE) model (Colijn & Abettan, 2022; Graf & Görlach, 2021). CGE models are large numerical models that combine economic theory with real economic data to computationally deduce the impacts of regulation or other fiscal tools. In this way, the CGE models aim to capture behavioral response of agents (Computable General Equilibrium modelling: introduction, 2016). The general research on this topic is important because it provides a theoretical basis for carbon taxes which can be used by policymakers to curb carbon emissions. However, it does not predict the concrete actions that we can expect from companies in the light of carbon taxes which, after all, is the crucial part of the green transition.

Previous literature has also intended to evaluate the impact of the European Green Deal in specific. The International Council of Clean Transportation has made a review and evaluation of the European Commission's proposal of amending the CO2 targets for new cars and vans. The report evaluates the EU carbon tax by comparing its reduction in GHG emission with alternative regulation to the EGD. The report finds that the benefits for consumers and society could be increased by a factor of four by introducing higher ambition standards compared to the EU's proposal (Dornoff et. al, 2021). Also, on behalf of the EU, Tuominen (2022) recently wrote a comprehensive impact assessment (IA) report about the inclusion of the shipping industry in the European Green Deal. Regarding environmental impacts, the IA expects fossil fuel savings of about 13 % by 2030 and 89-91 % by 2050. Further, GHG emission reductions are expected to be around -11 % by 2030 and around -78 % by 2050. The calculations are conducted through macro models based on socio-economic and technology assumptions regarding the evolution of the European population, GDP growth, international energy prices, and the development of technologies in terms of performance and costs. We want to build upon this research by providing a prediction of whether the shipping industry is likely to meet the goals of the policy from a rational choice perspective of the individual firm. I.e., while the research emphasizes the feasibility and societal capacities to achieve these goals, we will investigate if firms in the shipping industry find it lucrative from a shareholder perspective.

2.4 Literature on Strategic Responses to Green Polices

On the question of what concrete actions the shipping industry can take to curb their level of carbon emission, the literature and research is also voluminous. Wan, el Makhloufi, Chen, & Tang (2018) give concrete solutions and policy recommendations for companies in the shipping industry. Creating an abatement cost curve for various levers in the shipping industry, they draw the line between economically rational initiatives to reduce carbon emissions and more capital-heavy investments that, in turn, will reduce carbon emissions significantly more (see appendix 9.1). This research is vital for the green transition because it helps firms in the shipping industry to draw out their options of reducing their carbon footprint. However, research indicates that most, if not all economically, efficient abatement levers have already been pulled (Notteboom & Carriou, 2009; Mallouppas & Yfantis, 2021). In other words, carbon efficiency can no longer be optimized in a cost-effective manner for most shipping firms. As a result, only expensive initiatives remain. The lack of cost-effective abatement levers makes it challenging for policy makers to incentivize shipping firms to further decarbonize operations. Therefore, it is interesting to assess the ability of the European Green Deal to solve this challenge. This thesis will try to connect what we know from the most recent carbon regulation with the most recently developed abatement levers and make a prediction of what actual initiatives will be made as a strategic response to the upcoming taxes of the EGD.

Current research upon which our thesis builds is developed by Sprengel and Busch (2011). Sprengel and Busch deduce four different strategies that firms pursue in response to green institutional pressure. The analysis is based on a global survey that includes 141 companies across eight different GHG emissionintensive industries. The research finds that companies can respond with either of the following strategeis as 1) Minimalists, 2) Pressure Management, 3) Emission Avoider and 4) Regulation Shaper. Morever, they find that the organization's level of pollution, measured as its GHG intensity, is correlated with the environmental strategy pursued by each firm (IBID). When GHG intensity is higher, the response straegy will be more inclined towards reducing carbon emissions. What characterizes companies responding with the Minimalist strategy is a status quo appraoch to reducing carbon emissions. The strategy merely informs stakeholders about efforts to reduce GHG emissions. The Pressure Management strategy is about seeking new markets with lower regulation and buying allowances to be able to contintue polluting. Emission Avoider, a more progressive strategy, is when firms respond by reducing production of GHG intensive products and seek to become independent of carbon. Finally, regulation shaper is when a firm engages in the political process of GHG regulation. To evaluate the impact of the green institutional pressure of inclduing the shipping industry in the European Green Deal, we want to build upon this piece of literature by focusing on what specific strategies we expect Maersk to pursue as a response.



3.0 Theoretical framework

The following sections will define our theoretical scope and explicate why it is particularly relevant for answering our research question. Key points for our analysis such as financial valuation and theoretical assumptions will be outlined.

3.1 Theory of Financial Valuation

To determine what strategy will be pursued in response to the inclusion of the shipping industry in the European Green Deal, we will predict what strategy yields the highest enterprise value (EV). With financial valuation and its theoretical assumptions, we can predict what EV Maersk will have under each of four different scenarios investigated. Our financial valuations are based on the theory of 1) Discounted Cash Flow Analysis, 2) Leveraged Buyout Analysis, 3) Precedent Transactions Analysis and 4) Comparable Companies Analysis. The following sections will outline the theory of each analysis and explicate why using them in combination to arrive at fair and valid EV is important.

3.1.1 DCF

DCF analysis estimates the monetary value an acquirer of a company would receive from an investment adjusted for time value of money. Time value of money assumes that a sum of money is worth more now than later because having money now can pay interest in the future if invested (Rosenbaum & Pearl, 2014). DCF analysis finds the present value of expected future cash flows using the discount rate which is the prevailing interest rate assumed in DCF analysis. Thus, by finding the present value of the cash flows, the DCF analysis can be used to determine what the appropriate price of a company is. The investor must make estimates about the size and timing of the future cash flows as well as determine the horizon value of the company, that is, the value when an exit is anticipated. The investor must also determine the discount rate which varies with the risk profile of the acquisition and the market in which it operates. The discount rate is often identified by calculating the Weighted Average Cost of Capital (WACC), that is, the weighted average cost of debt and required return to shareholders (Rosenbaum & Pearl, 2014). Benefits of this analysis are that it is very accurate when projections of cash flows and discount rates are correct. Also, it is market independent, meaning that the analysis is less dependent on bubbles and distressed periods while also being self-sufficient in the sense that it does not rely on having comparable companies to arrive at a value. Limitations of the DCF is that the analyst will have to correctly estimate the future cash flows, which the market during COVID-19 has proven challenging. Also, small adjustments, especially in the discount rate and terminal value of the target, can have significant consequences for the concluded value of a firm (Steiger, 2008).

3.1.2 LBO Analysis

The LBO analysis seeks to determine the enterprise value of a company by determining the total price paid that would generate an appropriate return to the financial buyer who usually obtains between 60% - 80% debt for the acquisition. The theory thus suggests that the enterprise value of the firm is that which a rational actor would be willing to pay considering the expected cash flows coming in return. Typically, the price an investor would be willing to pay yields an internal rate of return of 20% - 30%. To calculate this return, the equity value of the company when the investor exits needs to be calculated. This is usually done based on EV/EBITDA multiples. Thus, in an LBO analysis, the concluded enterprise value depends on the EBITDA projected at exit and the expected common EV/EBITDA multiple in the year of exit (Rosenbaum & Pearl, 2014). The LBO analysis is in theory a good way to establish a floor valuation since it ignores synergies and determines the price that a financial buyer would be willing to pay and thereby benchmarks the price that strategic buyer would have to exceed. However, ignoring synergies could result in an underestimated valuation, and like the DCF analysis, it is sensitive to growth rates in sales, profit margins, capex etc. Furthermore, the concluded enterprise value is sensitive to contemporary financial lending conditions since a large part of the money sourced for the acquisition comes from debt.

3.1.3 Comparable Company Analysis

The comparable company analysis evaluates the company using the multiples of other similar enterprises. The analysis is based on the theoretical assumption that similar companies will have similar valuation multiples (Rosenbaum & Pearl, 2014). The degree of similarity is often based on size, market, whether it is public or private, similar industry and country. The multiples used are often the EV/EBITDA multiple, EV/S or P/E. Again, this valuation assumes that the price taker is rational in the sense he would not pay a higher multiple for a financially similar company to another. The idea is that, if a range of companies are similar, you would want to pay the same price for being entitled to each of their cash flows. The benefit of this analysis is that it is current and market based, which makes it relevant in any market condition (IBID). Also, a strength is its relativity. Assuming actual comparable companies and rational agents, benchmarking ensures realistic valuations. The disadvantage is that it is dependent on the existence of true comparable companies, which are difficult to source if the company is in a niche sector. Also, the model does not consider future risk as does the DCF analysis.

3.1.4 Precedent Transactions Analysis

The precedent transactions analysis is based on the multiples of comparable precedent transactions. The theoretical assumption here is that a company is likely to have the same value as the price paid for similar companies recently. This analysis is useful because it compares actual prices paid instead of predicted prices. For example, premiums from synergies will always be reflected in the prices compared. The disadvantage is that it is inadequate in volatile markets. Changing markets will quickly make precedent transactions too dissimilar to the company at hand (Rosenbaum & Pearl, 2014).

3.1.5 Combining the Analyses

Each analysis poses both strengths and weaknesses in terms of its ability to conclude on an enterprise value. It is often small misinputs or slightly wrong assumptions that can send a valuation in an inaccurate direction. Therefore, to mitigate these risks, the results of each analysis are combined. Individual shortfalls are eliminated and the goal of determining a fair and valid company value can be reached (Rosenbaum & Pearl, 2014). To determine the value of the company at hand, it is suggested to draw out the valuation ranges from each analysis on a football field chart. From this graph, one can derive the concluded value of the company while taking all the considerations from each analysis into account.

3.2 Friedman's Doctrine

Our assignment is based on the theoretical framework of Milton Friedman's doctrine. The theory is a normative theory of business conduct and ethics which states that the social responsibility of businesses is to increase shareholder value (Friedman, 1970). This shareholder primacy considers the shareholder the central part of the organization and the only group to which the firm is responsible. This implies that the sole goal of the organization is to increase its profits and consequent value of the shares in the company. Friedman put this theory in place in his essay in 1970 for the New York Times with the unambiguous title: *A Friedman Doctrine: The Social Responsibility of Business is to Increase Its Profits.* Here, he made it clear how the purpose of the companies to no extent is to adopt social responsibilities or act on behalf of the public or broader society. The only responsibility is to maximize the value of the shareholder's stake in the company. Friedman's theoretical framework provides the basis for the argument that the shipping industry will pursue the strategy that delivers the highest enterprise value.

Friedman justifies this theory by explaining to whom the CEO of a company is responsible. In any stocklisted company the executive is in essence an employee of the business owners. She is, in other words, operating as an agent for principals who own the shares of the company (Friedman, 1970). The responsibility of the executive is therefore strictly to conduct the business in accordance with what is desired by the shareholders. The desires of the shareholders are assumed by Friedman to make as much money as possible while conforming with the basic rule of society. On this ground, Friedmann argues that the business, or the CEO, to no extent has a social responsibility. The executive is a person in her own right and is very likely to have other responsibilities that she assumes voluntarily such as charity, her family, climate change or social justice. But as soon as the executive works for these causes, she works for her own interest and not as an agent for the shareholders. If these causes are "social responsibilities", they are the responsibilities of individuals but not of businesses. The CEO will work in favor of the business whose interests are to make money.

3.3 Rational Choice Institutionalism

In combination with Milton Friedman's doctrine, this thesis is based on Rational Choice Institutionalism as outlined by Mark Pollack in the Sage Handbook of European Union Politics (2007). The rational choice approach uses several key assumptions about the nature of individual actors and the social world in which they exist. Rational choice is chosen because it constitutes a methodological approach to explain individual behavior and outcomes of individual goal-seeking under given institutional constrains (Snidal 2002). In other words, provides a theoretical framework that helps us explain what strategic action the shipping industry will make in response to the EU's inclusion of it in the European Green Deal. Rational choice institutionalism contains three essential elements that provide our thesis this sound theoretical framework. These are the notions of 1) methodological individualism, 2) goal-seeking or utilitymaximization and 3) the existence of various institutional or strategic constraints on individual choice.

Methodological individualism is the fact that rational choice institutionalism considers individuals as the only unit of analysis even in the social sphere. In contrast to more holistic, post-modernist theory that derive individual behavior and characteristics form society, the methodological individualism seeks to explain collective behavior as the aggregation of individual choices. The individualism means that individuals act in accordance with utility functions that are assumed to be endogenous and fixed and independent of dynamic social structures (Pollack, 2007). Methodological individualism is applicable to our case study because the central element is what 'choice' Maersk is expected to make in response its inclusion in the European Green Deal. Furthermore, Maersk choice is methodologically expected to, in a certain extent, represent the aggregate collective choice that would be made in the shipping industry, which correlates with the notion that individual action dictates aggregate behavior.

Utility maximization is the assumption that actors in the analysis will choose whatever leads to most utility given their preferences. Individuals with a set of fixed preferences calculate the expected utility of various decisions and choose the action that positions them best. This neo-institutional logic of consequentialism stands in contrast to the logic of appropriateness from sociological institutionalism where action is guided by norms and conformity to trends and informal rules (March & Olsen, 2011). The notion of utility maximization is applied to our thesis since it assumes that Maersk will pursue the strategy that maximizes its business utility, i.e., its financial value. Alternatively, the chosen strategy could depend on intangible institutional pressure from society but in this case, the sole unit of analysis is Maersk and its preferences which ceteris paribus will be to have a higher enterprise value rather than a lower.

Constraints is the assumption that individuals do not have all imaginary states of the world to choose from and that their resources are finite. In rational choice institutionalism, the institutional constraints are emphasized as constraints that shape the choices of the individual actors. Both formal and informal institutions set rules under which the actor will calculate the choices that yield the highest expected utility (Pollack, 2007). In our thesis, this assumption applies since the legislation of the European Green Deal sets boundaries for the shipping industry within which all companies must seek to maximize their utility by responding with the strategy that yields the highest intrinsic value.

To sum up, the theory of financial valuations helps to predict the strategy that yields the highest enterprise value, and Friedman's doctrine and rational choice institutionalism explains why this strategy will be pursued.

3.4 Alternative Theoretical Perspectives

While the theoretical framework of Milton Friedman and Rational Choice Institutionalism provides a sound basis to infer valid conclusions in our analysis, it also has certain limitations on the scope of our evaluation of the carbon tax. Especially, the notion of methodological individualism that permeates Friedman's doctrine and our RCI analysis is inhibiting. Merely focusing on the individual unit, Maersk, leaves out aspects of reality which may be equally important for predicting its strategic response to the EU tax. One could instead approach the task with neo-institutional logic of appropriateness. The logic of appropriateness ascribes more power to social norms than rational choice calculations in terms of dictating the behavior of actors (Balsiger, 2016). Applying this framework to our case would allow us to consider how, for example, society's increasing expectations of MNCS to comply with ESG and CSR would impact the pursued strategy in response to the EU tax. However, in our research question, we evaluate the tax as a fiscal tool. Such policy instrument is, itself, based on Rational Choice Institutionalism and the idea that you can affect the behavior of individuals by modifying the cost of their choices (Perloff, 2018). Therefore, it is appropriate to evaluate it on the same premise and theoretical framework.

Also, using R. Edward Freeman's stakeholder theory instead of Milton Friedman's doctrine could take more determining factors of corporate behavior into account than merely EV. Freeman's stakeholder theory accounts for several other constituencies than the shareholder such as employees, suppliers, local communities, creditors, not to mention morals and values in business management such as CSR, market economy and social contract theory (Freeman, 1984). Moving beyond Friedman's conceptualization of the enterprise, one could draw on the whole frame of stakeholders and analyze the pressure they put on the shipping industry and what impact this would have on the strategy pursued in response to the carbon tax. While widening the theoretical framework to include all stakeholders and analyzing the institutional pressure of these qualitatively would enhance the validity of our results, this is beyond the scope of the thesis. Stakeholder theory does not provide a delimited framework that identifies the concrete stakeholders involved. Therefore, it would be difficult to operationalize and arrive at valid conclusions in this theoretical basis (Phillips, Freeman, & Wicks, 2015). Furthermore, the framework provided by RCI and the notion that businesses intent to maximize shareholder value is believed to cover enough of reality for our analysis to be a relevant contribution to the literature (Herrnstein, 1990).

4.0 Methodology

According to the theoretical framework outlined above, this thesis employs a deductive research strategy to make a predictive argument about the most likely strategic response to the inclusion of the shipping industry in the EGD. As the research is quantitative, the most appropriate criteria of quality are internal and external validity, reliability, and replicability (Bryman, 2016). First, reliability relates to the consistency of the findings and indirectly the degree to which researchers agree on the interpretation of the findings. Second, replicability relates to the ability of other researchers to replicate the study. Third, internal validity is the confidence with which any causal or predictive argument is concluded. Finally, external validity relates to the generalizability of findings in different contexts. In the following, the philosophy of science, research design, case selection, data collection and research method will be explained. Associated considerations regarding research quality and efforts made to improve it will be discussed.

4.1 Philosophy of Social Science: Positivism

The following section addresses our considerations about the philosophy of science that our study is based upon. With a post hoc strategy we've been able to establish that strong positivism is the philosophical perspective with which our research is most consistent. We will elaborate on the implications this has for our analysis and findings.

4.1.1 Ontology

Our research is based on ontological realism and thus assumes that only that which is observable exists, which is why our research is positive. In our analysis, our data is restricted to phenomena that can be observed, that is, concrete legislation and hard financial data. Moreover, an ontological assumption is that humans have limited agency and a fixed personality (Buch-Hansen, 2021). In our study, this comes to show using legislation and financial theory in combination with an RCI theoretical framework: Using legislation as the premise for our analysis would be futile if we did not assume that human beings would adhere to these laws. Also, if we did not assume that the personalities of human beings were rational, we would neither have a basis for predicting the value of Maersk under each strategy, nor which strategy would be preferred.

4.1.2 Epistemology

Our thesis is based on epistemological assumptions related to the covering law model, which allows for predictive arguments based on theoretical abilities to explain social phenomena. The covering law model is elaborated by scholars such as Hempel (1978) and Buch-Hansen (2021). The covering law model assumes a fundamental symmetry between explaining and predicting phenomena in the sphere of social science and natural science. When two events are deemed causally related, it means that they instantiate regularities of succession that historically have been observed to hold between past events. Thus, because rational choice is based on the covering law model, we can predict the behavior of business in response to the EU tax. Since our thesis generally embraces Hempel's covering law model and the idea of being able to predict through causal relations it is positivist. However, the notion of causality is highly disputed and requires reflections related to validity which we will discuss in the limitations.

4.1.3 Axiology

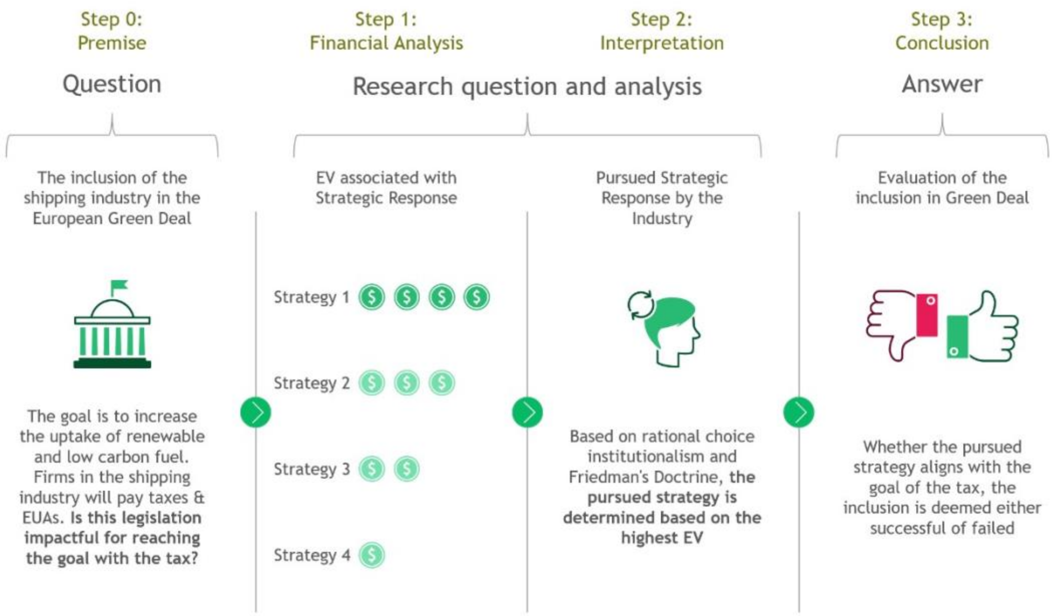
In line with axiological assumptions of positivism, our research is value-free, which enhances the reliability of our findings. As researchers, we restrict our role to objectively examine and describe a certain relationship, that is, the relationship between a piece of legislation and rational economic behavior. Unlike critical realists or constructivists, we abstain from arguing that one strategy is better than the other – only whether it can be expected to meet the goal of the legislation of reducing carbon emissions. This distancing allows us to exclude normative interpretation from our findings, which is what enhances their reliability and replicability. The positivist approach is also reflected in our source selection. Our data is restrained to mostly historical hard data, which calls for little or no normative interpretation when applied in the analysis (Bryman, 2016).

4.1.4 Alternative Philosophy of Science: Critical Realism

In contrast to positivism, critical realism considers both the observable world (intransive dimension) and the theories, discourses, and social structures in it (transive dimension) (Sayer, 2000). Also, critical realism does not have the ontological assumption that humans have limited agency and a fixed personality which positivism relies on. Instead, all objects of investigation have three domains: The Real domain (the deep structures, potential powers, and capabilities of the object), the Actual domain (mechanisms and what could happen when these powers are activated) and the Empirical domain (effect/event or what we observe happening). The possible outcomes from the Actual domain that are observed in the Empirical domain depend on conditions outside the individual. In turn, predictive arguments are often backed up on a broader and deeper basis with this philosophy but require deep understanding of the whole material and non-material setting. However, since our analysis is based on financial calculations, rational behavior and observable events, the philosophy of science is positivist.

4.2 Research Design

The research design is characterized by three steps leading to the evaluation of whether the EU's inclusion of the shipping industry has been successful. The criterion of success is whether this inclusion lives up to its purpose of increasing the uptake of renewable and low carbon fuels (RLF). If the shipping industry responds to the inclusion with a strategy that entails investments in RLF, we consider this purpose fulfilled. Therefore, with the shipping industry as the unit of analysis, we must pose the research question of what strategy it will pursue in response to the legislation. Our research design is illustrated in the figure below.



Our thesis poses a research question whose answer solves an overarching question: Will the inclusion of the shipping industry in the Green Deal be successful?

In step 1, we make a financial analysis of what strategy yields the highest EV. This is based on Maersk as the unit of empirical observation and data collection from Bloomberg and annual reports. In step 2, we determine that the strategy yielding the highest EV is the one that will be pursued. This determination is based on rational choice institutionalism and Friedman's doctrine as outlined in the theoretical framework of the thesis. Finally, in step 3, we make a conclusion of whether the inclusion of the shipping industry in the Green Deal has been successful. This assertation is based on whether the strategy pursued entails investments in RLF and thereby fulfils the goals of the inclusion. In sum, our research design is characterized by an overarching question which is answered by means of analyzing a more concrete research question.

In our analysis of the research question, we have three variables: an independent, a dependent and a control variable. The independent variable is the strategy and the actions that it entails. Ceteris paribus, these have implications for future financial performance such as EBITDA, cash flows and terminal value. The dependent variable is therefore the calculated enterprise value that is found as a function of the financial consequences of each strategy. In the analysis, we compare the independent variables, that is, the enterprise value of each strategy and determine which one is highest. The control variable will be a baseline valuation of Maersk.

The research design is a representative case study of A.P. Moller Maersk A/S, which both enhances and challenges the research quality: while we can make a confident argument about Maersk per se, generalizing the findings is challenging. The research quality is enhanced because a case study design generally strengthens the internal validity (Bryman, 2016). Relating to this thesis, only using Maersk to build a predictive argument about their strategic response enables us to arrive at valid findings about this case specifically. This is because having a single company as unit of empirical observation as opposed to multiple companies enables the thesis to come up with more in-depth and thorough explanations. However, the research quality is challenged since case study designs are harder to generalize than other research designs (Bryman, 2016). In the thesis, this challenge relates to how validly the predictive argument about the most likely strategic response of Maersk can be generalized to hold true for other shipping firms in the industry. For instance, it could be argued that not all shipping firms have a similar exposure to the EU regulation as Maersk. Nonetheless, the business model of shipping firms is rather homogenous in general, which mitigates the case study's inability to generalize findings. Shipping as a service is hard to differentiate and firms merely compete on price. Thus, in terms of profitability, the topline of virtually all shipping firms is heavily reliant on freight rates which are equal for all. Likewise, the cost structure across shipping firms is very similar because fuel constitutes as much as 50-60% of production inputs and since fuel is the same price for all firms (Stratiotis, 2018). To sum up, the internal validity of the predictive argument is strong, and the external validity of the findings are argued to be sufficient to validly generalize to the shipping industry.

4.2.1 Case Selection

A descriptive case selection strategy was used to improve the external validity of the findings. The aim of this strategy is to identify cases that represent a broader category of cases (Bryman, 2016). In this thesis, this category of broader cases is the shipping industry. In our case selection, Maersk was identified as the most appropriate object of investigation to represent the broader indsutry. This is based on several arguments. First, Maersk is a market leader with an approximate 16.7% of total market share in maritime shipping (Statista, 2022). Ceteris Paribus, market leaders, will contribute the most to the total industry GHG emission. Thus, the strategic response of market leaders is arguably the most vital in terms of assessing the effect of the inclusion of the shipping industry in the EGD. Second, Maersk shares many similarities with other market leaders like MSC, CMA CGM and Hapag Lloyd in terms of geographic profile of operations and revenue composition (Maersk, Annual Report 2021, 2021); (Hapag-Lloyd, 2021); (CMA-CGM Group, 2021); (MSC, 2021). The similar cost structure, margins and topline drivers between Maersk and the shipping industry improve the generalizability of the case study.

4.3 Data Collection

All inputs and forecasts used to arrive at the baseline valuation are sourced from standardized Bloomberg estimates, which has both negative and positive implications for the research quality. On the one hand, a positive implication is that using Bloomberg data improves the internal validity of our findings by reducing the margin of error from personal interpretation (Bryman, Chapter 3) Research Design, 2016). Bloomberg estimates and financial forecasts are based on the consensus of leading industry analysts from various financial institutes and investment banks (Bloomberg, 2022). Using consensus estimates mitigates the risk of wrongful interpretation that undermines the validity of the findings. Furthermore, using Bloomberg data improves the reliability of the findings. This is the case because Bloomberg offers standardized measures that ensure consistency in relative financial figures across time and entities. On the other hand, a negative implication of using Bloomberg data is that it challenges the replicability of the study since it's a closed-sourced database (Bryman, 2016). Sourcing the data requires access to Bloomberg terminals thereby challenging the replicability of the study for other scholars. Moreover, using Bloomberg data could challenge the internal validity of the findings. Consensus estimates by analysts have namely been criticized by an optimism bias associated with ”The walk-down to beatable forecasts” (Richardson, Teoh, & Wysosci, 2010). This process involves presenting initial optimistic earnings forecasts followed by gradually lowering estimates to then allow firms to beat expectations. However, research indicates that this issue is most prevalent in forecast of earnings of firms in the financial sector (Serafeim, Horton, & Wu, 2015). Thus, this bias is less likely to be present in forecasting of the shipping industry.

Inputs and forecasts used to adjust the base valuation are sourced from secondary data, which yields several advantages and disadvantages. One the one hand, an advantage of secondary data is that it allows more time to be spent on the analysis, since sourcing secondary data is less time-consuming (Bryman, 2016). More time could be spent improving financial models and analyzing results instead of collecting the actual data. Also, secondary data used in the analysis is open sourced which improves replicability of the study by other researchers. On the other hand, the use of secondary data calls for caution in the sourcing process because we as researchers are not able to influence the quality of the data collected (Bryman, 2016). While secondary data is often based on sufficiently high-quality research, this is not always the case. To minimize this concern, we attempted to limit our sourcing of secondary data to Maersk's own reports on financial performance and sustainability, peer reviewed research and reports from well-established relevant industry experts. In short, the analysis relies on a combination of primary data sources from the Bloomberg database to arrive at the base valuation and secondary data sourced from relevant reports to adjust the base valuation.

4.4 Research Method

The following sections explain how the financial models were built and used in the analysis to arrive at a base valuation of Maersk. Then, the process of adjusting the models to implement the inclusion and identified strategic responses is described. Finally, it is explained how the analysis is used to answer the research question. The research method is in line with Rosenbaum & Pearl's football field approach to financial valuations, based on four different analyses: DCF, LBO, Precedent Transactions and Comparable Companies. To improve the replicability of the study, each valuation model was built in Microsoft Excel following a dogmatic approach to Rosenbaum & Pearl's explicit guide (2014).

4.4.1 Building and Using Financial Valuation Models

4.4.4.1 Screening Comparable Companies and Precedent Transactions

To screen for similar precedent transactions and comparable companies of Maersk, Bloomberg's M&A search criteria tool and Relative Valuation tool were used. First, the use of Bloomberg's M&A search criteria tool, data sourcing on precedent transactions was limited to I) transactions in the maritime shipping industry, II) transactions dating back to 01/01/2003, and III) transactions beyond $1 Billion. Unfortunately, the data on precedent transactions on a similar financial scale to Maersk was very limited (Bloomberg, 2022). Most transactions occurred during 2003-2006, and the only transaction beyond $5 Billion occurred in 2003 as Maersk acquired a competing shipping firm, A/S Dampskibsselskabet Svendborg. Since so few transactions were relevant to compare with Maersk's current market capitalization of $54 Billion, the precedent transaction analysis was excluded as a methodological consideration to improve internal validity. Second, Bloomberg's Relative Valuation tool was used to identify the most comparable companies of Maersk (IBID). The search result exclusively yielded shipping firms and these were sorted into two tiers of most comparable and comparable companies to Maersk.

4.4.4.2 Assumptions and Drivers

The assumptions used across the financial models were similar in terms of projecting income statement, balance sheets and cash flow analysis. First, in terms of income statement assumptions, these were % sales growth, % COGS to sales, % SG&A to sales and % D&A to sales. As no Bloomberg estimate is available beyond 2026, a constant growth rate in sales of 2% is assumed in accordance with contemporary research indicating a sustained future growth in demand of shipping (Shell & Deloitte, 2020). Also, COGS, SG&A and D&A % to sales are assumed constant. Second, in terms of balance sheet assumptions, models take assumptions on current assets and current liabilities to project changes in net working capital. Because normalized accounts of Maersk's current assets and liabilities historically have been very stable, these are assumed constant at 2021 levels (Bloomberg, 2022) Third, in terms of cash flow statement assumptions, capital expenditure is forecasted as % of sales and assumed constant from 2026 and onwards at the average of the value in 2022-2026 forecasts.

However, the LBO did require some additional inputs as the method of approximating enterprise value is distinct. The LBO analysis needs input on leverage ratio, a targeted IRR, and an exit multiple to approximate enterprise value. To improve internal validity, a 70% leverage ratio in buyout structure was assumed as well as a 25% IRR ambition at a five-year exit in 2026. These assumptions are conservative and in accordance with standard LBO practice (Rosenbaum & Pearl, 2014). Also, in accordance with industry standards and Bloomberg's estimates on future EV/EBITDAs in the shipping industry, a fiveyear EV/EBITDA exit multiple of 5 was assumed (Rosenbaum & Pearl, 2014); (Bloomberg, 2022). An entry EV/EBITDA multiple was subsequently found to satisfy the requirements of 25% IRR, which ultimately allowed the model to determine current enterprise value by simply multiplying the entry multiple with current EBITDA.

Also the DCF analysis needs additional inputs to arrive at an enterprise value. Specifically, to calculate the WACC for discounting future cash flows and for determining the terminal value, certain inputs were required. To improve external validity, Maersk's levered beta was based on the mean of unlevered 1-year betas of comparable companies, which was then re-levered according to Maersk's target capital structure and marginal tax rate. As opposed to using Bloomberg's estimate on Maersk's unlevered 1 year beta, this approach limits potential confounding influence of firm-specific risk that is only associated with Maersk (Rosenbaum & Pearl, 2014). Furthermore, the risk-free rate was based on a five-year Danish government bond, and market risk premiums were based on current Danish market conditions (Statista, Average market risk premium (MRP) in Denmark from 2011 to 2021, 2021); (Statbank, 2022). Rosenbaum & Pearl highlights the importance of adjusting WACC with a premium or discount to reflect the market cap (Rosenbaum & Pearl, 2014). Therefore, a size premium to reflect Maersk's large market cap was deducted to arrive at the final WACC which we used to discount future cash flows. Finally, to improve internal validity, an Exit Multiple Method (EMM) using the 5-year EV/EBITDA was chosen to determine the terminal value of Maersk. The EMM method was favored over the Perpetuity Growth Model (PGM). This is because of the PGM's hyper-sensitivity to assumed growth rates when calculating the terminal value (IBID). Using the EMM instead allowed for an implied perpetual growth rate and implied current EV/EBITDA multiple that served as a sanity check of the analysis as it could be compared with the current industry consensus (IBID). The enterprise value could then be calculated as the sum of the discounted future cash flows and the terminal value.

4.4.4.3 Using the Models

By comparing the ranges of EV from each valuation method on a football field graph, the base EV was concluded. The ranges of EV were derived from the output of EV/EBITDA multiples in the analyses. In the comparison, the 2021 52 week high and low enterprise value range was also used as an additional measure. The base valuation of Maersk will serve as a benchmark to determine the effect of the legislation and subsequent strategic responses later in the analysis. As outlined in the section on valuation theory, each method is associated with certain pros and cons. Comparing the calculated EV of each analysis improves the internal validity of the findings by limiting the potential impact of any bias associated with each method.

4.4.2 Adjusting Financial Valuation Models

Adjustments in the financial models to account for legislation and subsequent strategic responses were implemented by adjusting the COGS % of sales while fixing sales growth forecasts.

4.4.2.1 Adjusting for Legislation

The legislation will affect the EV of Maersk in three ways; First, the EV is affected because the inclusion causes a discriminatory tax rate on all classes of fuel: Oil and Diesel, Liquid Natural Gas (LNG) and Renewable or Low carbon Fuel (RLF) (Sørås & Asprou, Siglar Carbon, 2021). Second, the inclusion causes a requirement for an EU Allowance (EUA) to emit 1 ton of CO^2 equivalent. It is important to emphasize that the European Green Deal only requires an EUA for scope 1 and 2 emission, that is, emissions directly from business operations, and does not require EUAs for scope 3 emission (EuropeanCouncil, 2021).

To assess the impact of the legislation, the models need to consider the energy consumption of Maersk. This was done by adding a sheet to the DCF model containing historical information of Maersk's consumption of oil, gas, and renewable energy in '000-ton as well as total scope 1 and 2 GHG Emission in '000-ton CO^2 equivalent (Maersk, A.P. Moller - Maersk ESG data overview 2021, 2021). The projections of Maersk's energy consumption rest on two assumptions. First, it assumes Maersk will continue to operate at full capacity as have been the case most years historically (Shell & Deloitte, 2020). Second, it assumes that the composition of Maersk's fuel consumption is constant, fixed average composition of the past three years. Subsequently, the output of the energy consumption sheet enabled the cost of taxes and EUAs to be implemented in the COGS% of sales. Regarding taxes, the taxes per ton of fuel are assumed constant as no growth rate scheme have been presented by the EU. Regarding the EUA, the current price of an EUA was found at the European Energy Exchange (EEX) and projected using trading prices of forward contracts and a long-term annual growth rate of 1% (EEX, 2022).

4.4.2.2 Adjusting for Strategic Response

The four strategies analyzed in the thesis are conceptualized and defined to resemble those from Sprengel and Busch's categorization. We arrived at the strategies analyzed in the thesis by conducting a trend analysis of Maersk's intentions and ideas of how to respond to green institutional pressure. The trend analysis consisted of reading through sustainability reports, financial and performance reports, M&A activity, public announcements, and signed letters of intent. The intentions and ideas deduced from this material were then bundled into groups so that each group resembled Sprengel and Busch's typology as much as possible. This resulted in four strategies called status quo (SQ), scale of operation in logistics and services (L&S), scale of use of E-methanol (RLF) and getting an IMO Tax implemented (IMOT). The status quo (SQ) resembles the minimalist strategy. The strategy of scaling operations in logistics and services (L&S) resembles pressure management. The strategy of scaling use of e-Methanol (RLF) resembles the strategy of emissions avoidance. Finally, the strategy of getting an IMO tax implemented (IMOT) resembles the strategy of regulation shaper.

To assess the impact of the four strategic responses for Maersk to pursue, an operating scenario for each strategy was added to the model. The first scenario captures the benchmark base valuation of Maersk while the subsequent four scenarios account for the financial implication of their respective strategic response. Each scenario contains a distinct assumption of COGS % of sales to encompass changes in cost and energy consumption of the associated strategy. To sum up, the adjusted financial analyses will compute the different enterprise values of the five different scenarios. Subsequently, these values will be compared to assess the relative impact of each strategic response on EV.

4.5 Limitations

In the following, limitations associated with the methodology of the thesis will be highlighted. The choice of positivism as philosophy of science causes some important limitations. According to the axiological assumptions of positivism, this thesis ignores any impact of beliefs and human emotions (Buch-Hansen, 2021). However, Maersk might favor a strategic response based on a holistic approach rather than rational logic. For instance, decarbonizing their fleet is mentioned as a 'responsibility' numerous times in their 2021 sustainability report (Maersk, 2021). Yet, such ideational motivations will not be considered. Furthermore, the customers of Maersk are expected to be rational, and any ideational impact on willingness to pay is ignored. Recent studies have proven that customers' demand for green products and services has increased substantially in recent years (Shell & Deloitte, 2020). It could be argued that such trends allow shipping firms to push additional expenses associated with greener strategies onto customers through higher freight rates. However, such impacts will not be considered when comparing the enterprise values of the five different scenarios. In general, due to the ontological assumptions of positivism, every input in the model is based on observable phenomena. Thus, any abstract constructs or deeper layers of explanation is not able to be explored. In total, this will limit the internal validity of the study, as non-logical, unobservable explanations can have a significant impact when predicting future strategic responses.

The research design is linked with important limitations as well. First, as primary data for the models are sourced from the Bloomberg database and secondary data was used to adjust the models, we were unable to actively enhance the quality of the data (Bryman, 2016). We attempted to conduct an expert interview with Maersk's Head of Decarbonization, but unfortunately, neither he nor his team could participate (Sterling, 2022). Consequently, efforts were made to ensure sufficient quality of sources as highlighted in the data collection section above. Second, case studies with a single firm as unit of analysis are small-n quantitative studies, and the external validity is therefore reduced (Bryman, 2016). In most case studies, causal inference is difficult to validly generalize to other cases. However, the homogenous and simple business models of shipping firms help to mitigate this challenge. Furthermore, efforts were made during the case selection process to pick a market leader like most other market leaders in terms of regulatory exposure. As market leaders, ceteris paribus, will contribute the most to total industry GHG emission, ensuring generalizability to other market leaders was arguably more crucial than achieving external validity to the entire industry. While the external validity of findings in terms of other hard-to-abate industries is unquestionably challenged, this new approach to evaluate effectiveness of green policies could complement contemporary methods of evaluating to achieve more robust impact assessments.

Finally, the research method presents important limitations to the findings. Perhaps the most substantial limitation is sales growth forecasts being held constant across the different scenarios. First of all, sales are likely to change as a response to the tax because of the Polluter Pay Principal (European Court of Auditors, 2021). In short, this principle places the liability to pay for emission at the entity which causes the emission. This allows shipping firms to proportionately pass on parts of the cost of compliance to customers by increasing freight rates. Second of all, sales are likely to change in response to a tax because of consequent new distribution of market share in the industry. The market composition is, namely, likely to change depending on how adaptive each firm is to the green transition (Wittels, 2021). Differences in carbon intensity that reduce the fuel tax exposure across shipping firms could cause some firms to gain market share by enabling them to offer more competitive prices. Therefore, keeping sales constant across all scenarios limits the internal validity of the analysis. However, accounting for such variations in sales would require too many variables to be included in the model based on exceedingly hypothetical and complex calculations. This was also the opinion of Maersk Head of Decarbonization, when asked about estimated effect on sales of each strategic response (Sterling, 2022). And all else equal, a constant sale assumption across all strategies allows us to validly assess the direct relative impact each strategy on enterprise value.

5.0 Analysis

The analysis consists of five different sections. First, a brief industry overview of the current shipping industry will be provided to provide a background for the inputs in the financial model. Second, a baseline valuation of A.P. Moller-Maersk will be calculated to serve as a benchmark. Third, the energy consumption of Maersk and the inclusion of the shipping industry in the European Green Deal will be implemented in the valuation model. Then, the identified four different strategic responses of status quo

(SQ), scaling operations in logistics and services (L&S), scale the use of E-Methanol (RLF) and getting an IMO Tax implemented (IMOT) will be operationalized and implemented in the model as well. Finally, findings will be compared and summarized to predict the strategic response that Maersk is most likely to pursue. To reiterate, the objective of the inclusion was *"… increasing the uptake of renewable and low carbon fuel (RLF) in EU maritime transport with a view to reducing* emissions *from the sector, both in navigation and at berth and thereby contribute to achieving EU and international climate objectives'* **(general objective) (IA, p. 30)***"* (Tuominen, 'Fit for 55' package: Fuel EU Maritime, 2022). Thus, when interpreting the results, the criterion of success is whether Maersk is predicted to pursue a strategy with increased uptake of RLF instead of oil fuel.

5.1 Industry Overview

In terms of profitability, the market conditions in the shipping industry are exceptionally good which currently causes the EV/EBITDA multiples to be extraordinarily low. In 2021, Maersk achieved a revenue of $61.7bn and a net profit of $18bn to arrive at a profit margin of 29% (Maersk, 2021). In general, valuations in the shipping industry are up by 300% - 400% since 2019 (Bloomberg, 2022). Two key factors have contributed to these historically favorable conditions. First, lockdowns and travel restrictions during the covid-19 pandemic caused demand of services to diminish (McKinsey&Company, 2021). This, combined with comprehensive stimulus checks increased disposable income to spend on retail goods. Since most goods had to be shipped during quarantine, demand for shipping thus increased in turn. Second, several covid outbreaks and subsequent lockdowns at harbors and the Evergreen Block of the Suez Canal caused congestion in shipping supply chains (IBID). Since shipping congestion takes time to resolve, and new ships take time to build, the supply of containerships was temporarily limited. Consequently, freight rates increased to reflect the inability of supply to meet demand. This trend in high freight rates and profitability is expected to continue throughout 2022 whereafter rates are expected to normalize. As rates normalize and profitability declines, the future EV/EBITDA multiple will increase. The current extraordinary market conditions will be reflected in the analysis in relation to differences in past, current and future EV/EBITDA multiples.

In terms of reducing emissions from shipping operations, new efforts are expensive since most costeffective abatement levers are already pulled in response to poor industry performance following the 2009-2011 recession (Mallouppas & Yfantis, 2021). The recession reduced disposable income and pulled freight rates down which squeezed profit margins in the shipping industry. In response, shipping firms made technical adjustments to cruisers and operational adjustments including slower and more frequent sailing to make fuel consumption more effective, which favored both profits and the environment (Notteboom & Carriou, 2009). Consequently, as cost-effective abatement levers have become scarce at this point, decarbonization progress has slowed down. Radical changes like fuel switching are associated with much uncertainty as the new fuel that will replace oil in the future is hard to identify ex ante (Wang, Wang, & Li, 2022). Making the wrong decision could have adverse long-term consequences since most shipping firms' fleet consists of 700-800 cruisers whose expected lifetime is +20 years. Thus, in terms of reducing carbon emissions from shipping operations, we are currently at a critical juncture. The operationalization of the strategies in the analysis will reflect these considerations.

5.2 Operating Scenario 1: Baseline Valuation

To calculate the base valuation of A.P. Moller Maersk, the football field approach outlined by (Rosenbaum & Pearl, 2014) is used with inputs from three different types of financial valuation methods: a Comparable Companies Analysis, a Leveraged Buyout (LBO) analysis and a Discounted Cash Flow (DCF) analysis. Excel files with each financial model are attached as additional appendices. All financial projections in the valuation models are sourced from Bloomberg Professional Services' database based on information available on May 9th, 2022, (Bloomberg, 2022). In the following, the calculations and results of each method are highlighted. Subsequently, results are compared to calculate the base Enterprise Value (EV)

5.2.1 Comparable Companies Analysis (CCA)

To calculate the enterprise value in the comparable companies analysis, data on historical performance and financial projections were used to derive the average multiples for the industry. First, ten shipping firms were identified and sorted into two tiers based on their comparability with Maersk (see appendix 9.2). The purpose of the CCA model is to calculate the average trading LTM EV multiples and estimate the average future EV multiples across the identified firms. To calculate trading EV multiples, historical data on market performance, income statement, cash flow statement, balance sheet and equity structure of each firm were then inserted into the model. To calculate future EV multiples, estimates in Sales, EBIT and EBITDA of each firm were plotted. The output of the model is presented below:

AP Moller-Maersk A/S
Comparable Companies Analysis
($ in millions, except per share data)

Company	Ticker	Current Share Price	% of 52-wk. High	Equity Value	Enterprise Value	Enterprise Value / LTM Sales	2022E Sales	2023E Sales	LTM EBITDA	2022E EBITDA	2023E EBITDA	LTM EBIT	2022E EBIT	2023E EBIT	LTM EBITDA Margin	Total Debt / EBITDA	Price / LTM EPS	2022E EPS	2023E EPS	LT EPS Growth
Tier I: Most Comparable Marine Shipping Firms																				
HMM CO LTD	011200	$23.27	51%	$23,852	$23,268	1.9x	1.8x	2.1x	3.3x	3.0x	4.2x	3.6x	3.3x	5.0x	59%	0.6.x	5.3x	1.6x	3.1x	1%
Yang Ming Marine Transpc	2609 TT	4.29	55%	15,188	9,672	0.8x	0.7x	0.9x	1.2x	1.1x	1.5x	1.3x	1.2x	1.9x	66%	0.2.x	2.6x	2.3x	3.6x	1%
COSCO Shipping Holdings	1919 HI	1.58	70%	25,338	23,100	0.4x	0.4x	0.6x	0.9x	1.0x	1.9x	1.0x	1.1x	2.3x	43%	0.6.x	1.6x	1.8x	3.7x	1%
Hapag-Lloyd AG	HLAG (	425.35	96%	74,777	72,009	2.7x	2.6x	3.6x	5.6x	5.3x	11.2x	6.5x	6.2x	15.8x	49%	0.2.x	7.0x	6.4x	16.8x	-36%
Evergreen Marine Corp	2603 TT	5.02	62%	26,827	21,411	1.0x	1.0x	1.4x	1.0x	1.6x	2.8x	1.1x	1.7x	3.0x	101%	0.2.x	1.5x	2.5x	4.4x	1%
Mean						1.4x	1.3x	1.7x	2.4x	2.4x	4.3x	2.7x	2.7x	5.6x	64%	0.4x	3.6x	2.9x	6.3x	-7%
Median						1.0x	1.0x	1.4x	1.2x	1.6x	2.8x	1.3x	1.7x	3.0x	59%	0.2x	2.6x	2.3x	3.7x	1%
Tier II: Comparable Marine Shipping Firms																				
Wan Hai Lines LTD	FFF	$5.09	100%	$12,420	$12,420	1.5x	1.3x	NA	2.7x	2.5x	NA	2.7x	2.7x	NA	56%	0.0.x	NA	3.4x	NA	0%
Danos Corp	DAC US	80.94	98%	1,651	1,651	2.4x	1.9x	1.8x	3.5x	2.4x	2.2x	4.6x	3.1x	NA	69%	0.0.x	NA	3.2x	3.1x	0%
Orient Overseas INTL LTD	316 HK	27.21	87%	17,706	13,145	0.8x	0.7x	0.9x	1.7x	1.4x	3.4x	1.8x	1.5x	2.6x	47%	0.3.x	2.5x	2.1x	3.6x	0%
Kawasaki Kisen Kaisha LT	9107 JF	65.82	84%	6,141	8,357	1.2x	1.5x	1.5x	13.6x	16.9x	15.4x	36.0x	51.3x	47.7x	9%	4.1.x	1.1x	1.5x	3.5x	0%
Mitsui OSK LINES LTD	9104 JF	25.25	77%	9,146	17,026	1.5x	1.7x	1.7x	12.7x	14.3x	12.1x	29.9x	34.3x	31.4x	12%	4.8.x	1.5x	2.1x	3.7x	1%
Mean						1.5x	1.4x	1.5x	6.8x	7.5x	8.3x	15.0x	18.6x	27.2x	39%	1.8x	1.7x	2.5x	3.5x	0%
Median						1.5x	1.5x	1.6x	3.5x	2.5x	7.8x	4.6x	3.1x	31.4x	47%	0.3x	1.5x	2.1x	3.6x	0%

The analysis yielded a mean multiple in trading LTM EV/EBITDA of 2.4x for the five most comparable companies and 6.8x for the five comparable companies which implies the true EV of Maersk ranges from $57 billion to $163 billion. This EV is based on Maersk's reported LTM EBITDA of $24,036 million. Evident from the output, there was a considerable spread in the multiples of tier II, which was caused by the high multiples of Kawasaki and Mitsui, two Japanese shipping firms. As these are considered the least comparable to Maersk, these values will be treated as outliers. To reflect this consideration, the 40-60 percentile of the distribution in EV/EBITDA multiples were used instead of the mean multiples of the two tiers. The 40-60 percentile in EV/EBITDA multiple was 2.3x - 3.8x which implies that the true EV of Maersk is likely to be within a range of $57 billion to $91 billion.

5.2.2 Leveraged Buyout Analysis

In the LBO analysis, financial data on historical and future performance of Maersk was put into a model, and to derive the EV of Maersk, entry multiples were applied such that the LBO yielded an appropriate IRR. The LBO analysis used the following conditions: a 70% leverage ratio, a targeted IRR of 25% in

2026 with a 5-year exit EV/EBITDA multiple of 5x. The purpose of the model is to calculate the entry EV/EBITDA that would satisfy the condition of a 25% IRR. The entry multiple that satisfies this condition could then be used to calculate the EV of Maersk. To calculate the future value of the firm, future EBITDA is forecasted. This forecast is done by inserting income statement projections over the next five years based on Bloomberg estimates:

Year	2022	2023	2024	2025	2026
Sales (% YoY growth)	22.1%	(19.2%)	(6.0%)	2.1%	8.2%
COGS (% margin)					50.0%

	35.5%	45.0%	49.4%	50.0%	
SG&A (% sales)	22.7%	29.0%	31.6%	32.0%	32.0%
Depreciation (% of sales)	3.6%	4.1%	4.8%	4.7%	5.3%
Amortization (% of sales)	3.6%	4.1%	4.8%	4.7%	5.3%

After 2026, the assumptions are constant at the 2026 estimates, apart from sales which assume a YoY growth rate of 2%. Second, the model assumes that the company is purchased with a loan in accordance with the leverage ratio, that is 70% of total price. The interest of the loan is based on Maersk's average cost of Long-Term Debt. This was calculated to be 4% (Maersk, 2021). Third, to calculate the multiple that satisfies conditions of IRR = 25% and exit multiple = 5x, the model conducts a return analysis (see appendix 9.3). Finally, a sensitivity analysis is performed with 0.5 margins around the calculated multiple to account for uncertainty. The output of the analysis is presented below:

IRR - Assuming Exit in 2026E						
		Exit Multiple				
		4.0x	4.5x	5.0x	5.5x	6.0x
Entry Multiple	1.3x	42.6%	44.7%	46.7%	48.5%	50.3%
	1.8x	31.9%	34.1%	36.2%	38.1%	39.9%
	2.3x	22.6%	25.0%	27.2%	29.2%	31.2%
	2.8x	14.0%	16.7%	19.1%	21.4%	23.5%
	3.3x	5.5%	8.6%	11.4%	13.9%	16.3%

The return analysis found that an entry EV/EBITDA multiple of 2.3x yielded an appropriate IRR of 27.2%, which means that Maersk is valued at $55.28 bn. Like the comparable company's analysis, this EV is based on Maersk's LTM EBITDA of $24,036 Million. In line with expectations from the industry overview, the entry EV/EBITDA multiple is significantly lower than the five-year exit multiple. From the sensitivity analysis, the most confident range of the entry multiple is 1.8x to 2.8x which yields an IRR of 36.2% and 19.1% respectively. The sensitivity range in IRR of 19.1% - 36.2% will be used as a benchmark when adjusting the entry multiple in later sections. These multiples imply that the true EV of Maersk is likely between $43.26 Billion and $67.3 Billion.

5.2.3 Discounted Cash Flow Analysis

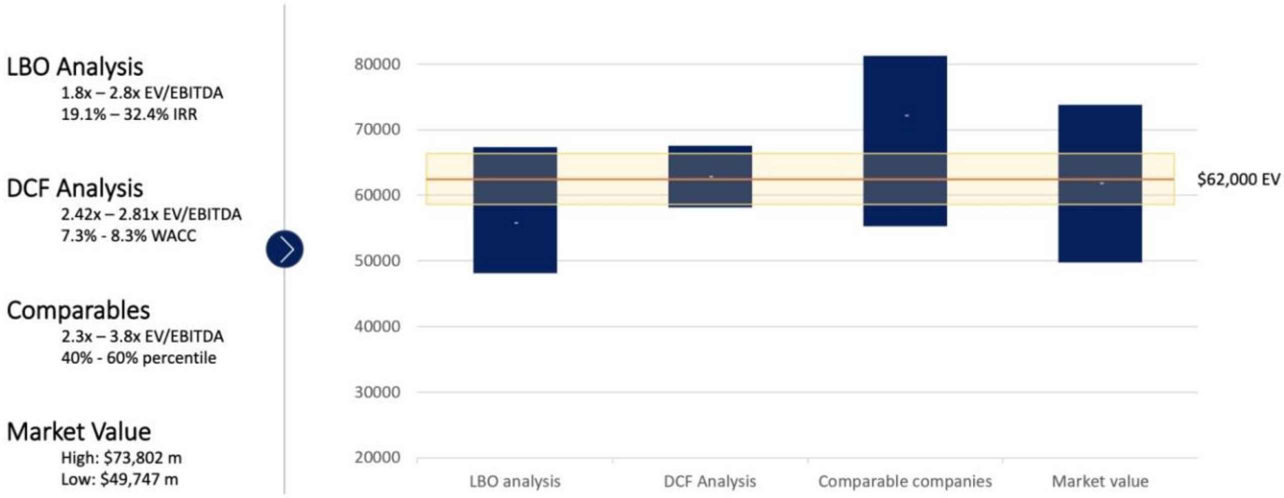
The DCF analysis projects the future free cash flows (FCFs) and terminal value (TV) and discounts these at the WACC to calculate EV. First, to project future FCFs, the same income statement assumptions from the LBO analysis are used. Second, a WACC is calculated using following estimates: a levered beta of 1.39 based on betas of the most comparable companies, a risk-free rate of 1.1% based on the trailing yield of a 5-year Danish government bond and a 5.8% Market Risk Premium based on the current average MRP in Danish capital markets. The calculated WACC was 7.76%. Third, the projected cashflows are discounted at the WACC. Then, to complete the DCF analysis, the exit multiple method (EMM) is used to estimate the terminal value beyond 2026 based on a five-year Terminal Value/EBITDA multiple of 2.5x (see appendix 9.4). Finally, like the LBO analysis, a sensitivity analysis is performed with 0.5 percentage margins around the calculated WACC produce a range of EVs. The output of the analysis is presented below:

Enterprise Value					
	Exit Multiple				
WACC	1.5x	2.0x	2.5x	3.0x	3.5x
6.8%	56,139	60,247	64,354	68,462	72,570
7.3%	55,520	59,533	63,546	67,559	71,572
7.8%	54,916	58,836	$62,757	66,678	70,598
8.3%	54,324	58,155	61,986	65,817	69,648
8.8%	53,746	57,490	61,233	64,977	68,721

The analysis yielded an EV of Maersk of $62.7 Billion. This valuation implies a current EV/EBITDA multiple of 2.61x. This is reasonable as it is within the narrow range derived from the comparable companies' analysis and LBO analysis. Furthermore, this valuation implies a perpetual growth rate of 14.1%. This is reasonable, as profitability is expected to decline and normalize as illustrated in the industry overview. According to the sensitivity analysis the EV of Maersk is likely between $58.2 Billion and $67.559. At an LTM EBITDA of $24,036, this implied an EV/EBITDA multiple range of 2.42x - 2.81x.

5.2.4 Deriving the Enterprise Value

To arrive at the baseline value of Maersk, the ranges of EV from each valuation model are plotted on a football field and used to give a final valuation. In addition to the three financial analyses conducted, the implied EV from the 52-week high and low in stock price of A.P. Moller-Maersk B is plotted. The final plot is presented below:



In line with expectations, the LBO analysis yielded the lowest EV. Also, in line with expectations, the comparable companies analysis yielded the highest and most volatile EV. The final base valuation of Maersk is estimated from comparing the ranges suggested by each valuation method. The final base valuation of Maersk's EV is $62 Billion based on the mean of the four suggested ranges. This is highlighted by the line across the plot around which a 5% margin of error is illustrated. This baseline valuation will serve as a benchmark for the calculated EVs of each strategic response in the final section of the analysis.

5.3 Implementing the European Green Deal

When implementing the effect of the European Green Deal in our analysis, we first calculated total fuel and gas consumed by Maersk, then calculated the total exposure to the legislation and finally calculated the taxes that should be paid in accordance with the consumption of fuel and gas.

5.3.1 Finding the Energy Consumption of Maersk

First, to know how much tax and ETS allowance would be paid, the future energy consumption of Maersk was estimated (see exhibit below). To incorporate fuel tax calculations, Maersk's historical use of oil, gas and renewable energy is inserted in the model (Maersk, 2021). Maersk's fuel consumption is projected based on the assumption that the relative consumption of each fuel type is constant, and they continue to operate at full capacity. Thus, in 2022 and forward, consumption of each fuel type is calculated as the average of the past three years. However, there is one exception to this projection: the introduction of the renewable fuel e-Methanol (IBID). Maersk has already planned to replace twelve large containerships with new ships powered by e-Methanol in Q1 2024. The estimated total annual consumption of e-Methanol is 450,000 ton. E-Methanol is 90% as efficient as Oil (IRENA AND METHANOL

INSTITUTE , 2021). To reflect this difference in energy efficiency, Maersk oil consumption is adjusted accordingly: 1 ton of e-Methanol replaces 900 kg of traditional oil. Likewise, to incorporate the ETS allowance calculations, Maersk's historical scope 1 and 2 GHG emission in CO2 equivalent is inserted in the model (Maersk, 2021). Maersk's projected GHG emission is a function of their projected fuel consumption. Calculations showed that one ton of fuel produces 3.05 ton of GHG emissions, and that 1 ton of gas produces one ton of GHG emissions. This calculation of Maersk's energy consumption provides the foundation to derive the fuel taxes and ETS allowances that will be used in the EV calculation.

A. P. Møller-Mærsk A/S
Energy Consumption
($ in millions, fiscal year ending December 31)

						Regulation		EU Tax
Regulation 1	2019	2020	2021	2022	2023	2024	2025	2026
Energy Consumption ('000 metric tons)								
Fuel oil (% of total consumption)	99.1%	98.8%	98.2%	98.1%	98.1%	94.3%	94.3%	94.3%
Heavy Fuel	11,173	10,368	11,083	10,875	10,875	10,470	10,470	10,470
Marine Diesel oil	639	577	658	625	625	600	600	600
Others	130	120	306	185	185	176	176	176
Total	11,942	11,065	12,047	11,685	11,685	11,245	11,245	11,245
Gas (% of total consumption)	0.1%	0.1%	0.2%	0.2%	0.3%	0.3%	0.3%	0.3%
LNG	0	0	0	0	0	0	0	0
LPG	1	0	8	8	8	8	8	8
Natural Gas	9	11	20	21	22	23	24	26
Total	10	11	28	29	30	31	32	34
Renewables (% of total consumption)	0.8%	1.1%	1.6%	1.6%	1.6%	5.4%	5.4%	5.4%
Biofuel	8	32	81	81	81	81	81	81
Renewable technology*	0	9	21	21	21	21	21	21
Electricity*	84	85	94	94	94	94	94	94
E-Methanol	0	0	0	0	0	450	450	450
Total	92	126	196	196	196	646	646	646
Total Consumption	12,044	11,202	12,271	11,910	11,911	11,923	11,924	11,925
*Converted using carbon eq. calculator								
Total GHG Emission ('000 metric tons CO2 eq)								
Scope 1 (direct)	36204	33902	36863	34,954	34,955	33,642	33,644	33,645
Scope 2 (own use)	287	642	640	713	713	687	687	687
Total GHG emission	36491	34544	37503	35,667	35,668	34,329	34,330	34,331
% Scope 1	99%	98%	98%	98%	98%	98%	98%	98%
% Scope 2	1%	2%	2%	2%	2%	2%	2%	2%
Emission/consumption gas				1	1	1	1	1
Emission/consumption renewables				0	0	0	0	0
Emission/Consumption oil	3.03	3.08	3.06	3.05	3.05	3.05	3.05	3.05

5.3.2 Calculating Exposure to the Legislation

Second, to know how much of Maersk's energy consumption that is taxable due to the legislation, we calculate the proportion of the revenue that comes from operations in Europe and, consequently, is exposed to the taxes. Namely, the legislation only applies to Maersk's maritime shipping operation and is 100% enforceable on routes within Europe and 50% enforceable on routes either departing from or arriving in Europe (Sørås & Asprou, 2021). Findings show that 78% of Maersk's total operating income is derived from operations in the shipping industry as opposed to logistics and other operations on land (Maersk, 2021). Furthermore, 4% of Maersk's routes take place within Europe, while 27% either depart or arrive in Europe. Thus, the taxable proportion of GHG emission and taxable proportion fuel is calculated as the following:

$$
\begin{aligned}
&Taxable\ GHG\ Emission \\
&\quad = Total\ GHG\ Emission \cdot [Shipping\ operationns\ as\ \%\ of\ all\ operations] \\
&\quad \cdot (100\%\ enforcement \cdot [Intra\ EU\ routes\ as\ \%\ of\ all\ routes] + 50\%\ enforcement \\
&\quad \cdot [Extra\ EU\ routes\ as\ \%\ of\ all\ routes])
\end{aligned}
$$

Inserting the numbers defined in the paragraph into the formula gives the following equation. (Note that total GHG emission will vary depending on each strategy pursued).

$$Taxable\ GHG\ Emission = Total\ GHG\ Emission \cdot 78\% \cdot (1 \cdot 0.04 + 0.5 \cdot 0.27)$$

$$Taxable\ GHG\ Emission = GHG\ Emission \cdot 0.1365$$

Thus, 13.65% of Maersk's GHG emission and fuel consumption is taxable by the EGD legislation. This input allows the model to derive the base of taxable GHG emission for EUA calculations and the base of taxable fuel consumption required for further calculations.

5.3.3 Calculating Carbon Taxes Paid

Finally, knowing how much energy was consumed by Maersk and the taxable proportion of the energy consumed, we can calculate what taxes they would be required to pay in both fuel tax and ETS allowances. First, to calculate the total cost of EUAs required, a current spot price of an EU Allowance (EUA) for emitting one ton of CO2 equivalent was found at the European Energy Exchange (EEX, 2022). On May 9th, 2022, the spot price was €86.77 or $92. The projected market prices of EUAs are based on prices of future contracts and a long-term growth rate of 1%. Also, the cost of EUAs reflects the gradual phasing in of the requirement to buy them. In 2023, it is required to have EUAs for 20% of GHG emissions and 100% in 2026 and onwards. The total ETS cost is then found by multiplying total taxable GHG emission and the market price of an EUA (see exhibit below).

A. P. Møller-Mærsk A/S Energy Consumption *($ in millions, fiscal year ending December 31)*						Regulation Scenario EU Tax		
Regulation Scenario 1	2019	2020	2021	2022	2023	2024	2025	2026
ETS*								
% of GHG Emission that require EUA					20%	45%	70%	100%
GHG Emission that require EUA (000' ton CO2 eq)					7,134	15,448	24,031	34,331
Intra EU					223	482	750	1,071
Extra EU					751	1,627	2,530	3,615
Total GHG emission that require EUA (000' ton CO2 eq)					974	2,109	3,280	4,686
Market price EUA (€)		€ 56.00	€ 70.00	€ 86.77	89.99	€ 95.00	€ 99.75	€ 104.74
Growth (%)			25%	24%	4%	6%	5%	5%
Market price EUA ($)		$ 59.36	$ 74.20	$ 91.98	$ 95.39	$ 100.70	$ 105.74	$ 111.02
*Data found at EEX database								
Total ETS cost ($)					92,884,869	212,342,444	346,837,687	520,287,370
Total ETS cost (m$)					93	212	347	520

Second, to calculate the tax that must be paid from fuel consumption, the fuel tax rates of $45/ton of oil, $30/ton of gas and $7.5/ton of RLF from the new EU legislation are put in the model. These prices are assumed constant as no proposal of growth rates have been presented (Sørås & Asprou, 2021). The total fuel tax is then found by multiplying the total taxable fuel consumption of oil, gas and RLF with each associated tax rate. (see exhibits below)

A. P. Møller-Mærsk A/S Energy Consumption *($ in millions, fiscal year ending December 31)*						Regulation Scenario EU Tax		
Regulation Scenario 1	2019	2020	2021	2022	2023	2024	2025	2026
Tax rates on individual fuel types								
Tax/ton Oil								
USD/Tonne					$ 45.03	$ 45.03	$ 45.03	$ 45.03
Growth						0%	0%	0%
Tax/ton Gas								
USD/Tonne					$ 30.02	$ 30.02	$ 30.02	$ 30.02
Growth						0%	0%	0%
Tax/ton RLF								
USD/Tonne					$ 7.50	$ 7.50	$ 7.50	$ 7.50
Growth						0%	0%	0%
Total tax paid from comsumption of each fuel type								
Oil								
Intra EU					16,415,771	15,798,397	15,798,397	15,798,397
Extra EU					55,403,228	53,319,589	53,319,589	53,319,589
Total tax on oil					71,819,000	69,117,986	69,117,986	69,117,986
Gas								
Intra EU					$ 28,144.80	$ 29,177.40	$ 30,261.63	$ 31,400.07
Extra EU					$ 94,988.70	$ 98,473.73	$ 102,133.01	$ 105,975.25
Total tax on gas					$ 123,133.51	$ 127,651.13	$ 132,394.64	$ 137,375.32
RLF								
Intra EU					$ 45,959.62	$ 151,327.01	$ 151,327.01	$ 151,327.01
Extra EU					$ 155,113.71	$ 510,728.66	$ 510,728.66	$ 510,728.66
Total tax on RLF					$ 201,073.33	$ 662,055.67	$ 662,055.67	$ 662,055.67
Total fuel taxation ($)					72,143,207	69,907,693	69,912,436	69,917,417
Total fuel taxation (m$)					72	70	70	70

As a final step, the total ETS expense and total fuel tax expense are summarized and expressed as a percentage of forecasted sales to arrive at the extra expense added to COGS% of Sales (see exhibit below). This result then flows into the assumption of COGS% of sales of each operating scenario in our assumption sheet.

A. P. Møller-Mærsk A/S
Energy Consumption
($ in millions, fiscal year ending December 31)

Regulation Scenario EU Tax

Regulation Scenario	1	2019	2020	2021	2022	2023	2024	2025	2026
Total additional expense from fuel tax and ETS (m$)						**165.03**	**282.25**	**416.75**	**590.19**
Sales (m$)						60,957	57,300	58,503	63,300
Extra expense to COGS % of sales						0.27%	0.49%	0.71%	0.93%

5.4 Implementing Strategic Responses

Identified strategic responses for Maersk to pursue in response to the European Green Deal are the four following: Status quo (SQ), scale of operation in logistics and services (L&S), scale of use of E-methanol (RLF) and getting an IMO Tax implemented (IMOT). In the following, each of the four strategies will be explicated by I) Operationalizing the strategy, II) Implementing the strategy in our analysis and III) Calculating the associated EV as a result of pursuing the strategy. The strategies were identified based on (Sprengel and Busch, 2011)'s typology of different strategic responses to green institutional pressure introduced in the literary review. Specifically, the status quo (SQ) resembles the minimalist strategy. The strategy of scaling operations in logistics and services (L&S) resembles pressure management. The strategy of scaling use of e-Methanol (RLF) resembles the strategy of emissions avoidance. Finally, the strategy of getting an IMO tax implemented (IMOT) resembles the strategy of regulation shaper. In each section, we will elaborate on this parallel. The strategies will also be operationalized, which means that we will explicate their concrete consequences for the inputs in the financial models. The strategies are operationalized based on trend analysis of sustainability reports, financial and performance reports, M&A activity, public announcements, and signed letters of intent.

5.4.1 Operating Scenario 2: Status Quo (SQ)

5.4.1.1 Operationalization

The strategy of SQ consists of continuing business as usual without any actions to decarbonize operations. This strategy largely characterizes the current strategy of Maersk as it is described in their sustainability report and decarbonization timeline (see appendix 9.5). The report contains detailed information about past decarbonization efforts and a target of going net zero across their entire operation by 2040. However, besides the implementation of the twelve new e-methanol vessels, it lacks an action plan to achieve this target. In other words, this strategy entails stalling decarbonization efforts. An explanation of this lack of effort can be derived from the fact that most cost-effective abatement levers have already been pulled as highlighted in the industry overview. Further decarbonization requires extensive investments in R&D, which might be less attractive than other investments in terms of creating shareholder wealth. Despite an extraordinary high degree of profitability and subsequently the high amount of free cash flows generated, Maersk does not invest in R&D as evident from their cash flow statement (Maersk, 2021). Instead, Maersk has gradually increased dividend yields and performed extensive share buyback programs. Both activities are ways of rewarding your shareholders either directly or indirectly. In 2021 Maersk spent more than $5 Billion on share buybacks and has expressed an intention to follow suit in the coming years. To sum up, the strategy of SQ is characterized by continuing business as usual and directing resources elsewhere than towards decarbonization. The operationalization of this strategy therefore entails no adjustments to the financial valuation after the implementation of the European Green Deal.

The strategy resembles the minimalist strategy in Sprengel & Busch's (2011) typology, because the minimalist strategy, as well as the SQ, does not entail any initiative to decarbonize operations. The minimalist strategy is characterized strictly cost-effective initiatives to reduce carbon emissions. For Maersk, there are no more cost-effective initiatives to make because of their efforts in the wake of the recession in 2009. Thus, the minimalist strategy would, de facto, resemble Status Quo where no further efforts are done to decarbonize operations as a response to the tax.

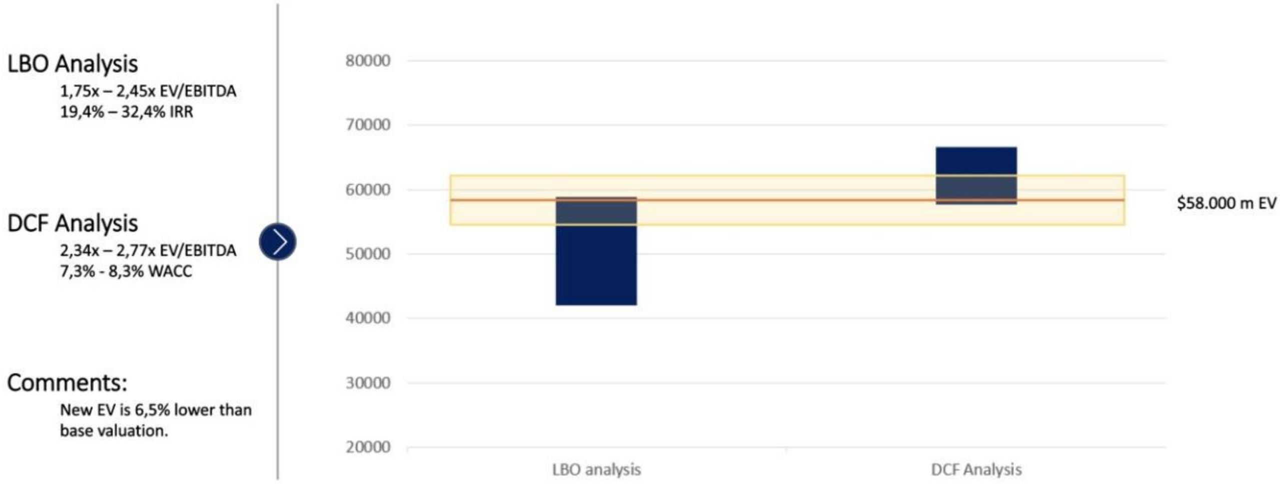
5.4.1.2 Implementation in the Financial Analyses

Implementing the strategy in the financial analysis consisted of leaving the inputs as they were in the valuation of Maersk and only adjusting for carbon taxes. The energy consumption sheet first calculates the total taxable GHG emission and total taxable fuel consumption. Then, the taxable GHG emission is multiplied with the projected market price of EUAs to calculate the total ETS expense. Likewise, the taxable fuel consumption of oil, gas and RLF are multiplied with their respective tax rates to calculate the total fuel taxation expense. Finally, these are summarized and expressed relative to the forecasted sales to arrive at the Extra expense in COGS% of sales. This then flows into the COGS% of sales assumption of operating scenario 2 in our assumption sheet (see appendix 9.6)

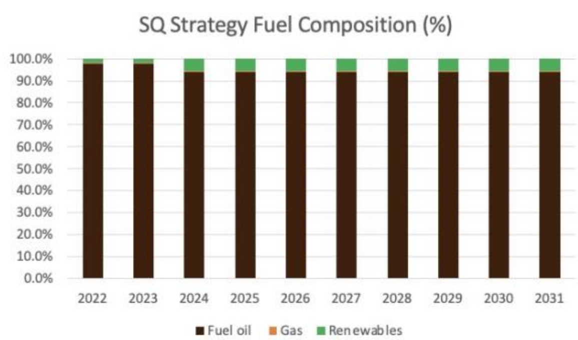
A. P. Møller-Mærsk A/S **Energy Consumption** *($ in millions, fiscal year ending December 31)*						Regulation Scenario EU Tax			
Regulation Scenario	1	2019	2020	2021	2022	2023	2024	2025	2026
Total additional expense from fuel tax and ETS (m$)						**165.03**	**282.25**	**416.75**	**590.19**
Sales (m$)						60,957	57,300	58,503	63,300
Extra expense to COGS % of sales						0.27%	0.49%	0.71%	0.93%

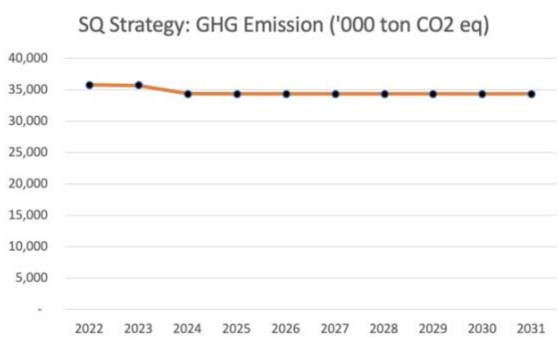
5.4.1.3 Results

Pursuing the SQ strategy yields an EV of $58 Billion, which corresponds to a 6.5% reduction in the EV of Maersk compared to the base valuation. The sensitivity analysis of the DCF model implied that the EV is likely within a range of $56.55 Billion to $65.47 Billion (see exhibits). The range of the LBO model was found by using the previously identified benchmark of 19.1% - 32.4% to adjust the entry multiple. This yielded an entry multiple range of 1.75x - 2.45x or an EV within the range of $41.82 Billion to $58.88 Billion. The ranges provided by the LBO and DCF analysis are plotted below with the calculated EV and a 5% margin of error illustrated.



Furthermore, the fuel composition and total GHG emission following the SQ strategy is plotted as well. This strategy remains heavily reliant on oil fuel and lacks progress in terms of decreasing GHG emission.





5.4.2 Operating Scenario 3: Move operation to Logistics and Services (L&S)

5.4.2.1 Operationalization

The strategy of L&S consists of moving operations from maritime operations to Logistics and Services on land to be less exposed to Green Deal's taxes on shipping. The EU taxes are only applied to shipping operations and not land operations. The strategy of moving operations to land corresponds to small initiatives already carried out by Maersk as seen in their recent M&A activity (Maersk, 2021). In 2021, Maersk announced six acquisitions in Logistics and Services, most notably Hong Kong based LF logistics in a $3.6 Billion transaction. Maersk has expressed the possibility to expand L&S up to 50% of their total operation by 2030 (Maersk, 2022). As L&S currently constitutes 22% of Maersk operation, this segment must be expanded relative to maritime shipping which currently constitutes 78%. Furthermore, since the European Green Deal does not include fuel taxes and ETS in L&S at the time of writing, this will decrease Maersk's exposure to the legislation (EU-Commission, 2019). In sum, this strategy entails a shift in operation from maritime shipping to L&S such that each sector constitutes 50% of operations by 2030.

The strategy resembles the Pressure Management strategy from Sprengel & Busch (2011) because this strategy, as well as L&S, entails entering new markets with less green institutional pressure. Since L&S is not included in the EGD at the time of writing, scaling L&S operations would, in fact, give less exposure to the EU's carbon taxes. Regarding the remaining exposure from the maritime operations, the Pressure Management is aligned with the minimalist strategy in paying fuel taxes and EUAs without further effort to decarbonize.

5.4.2.2 Implementation in Financial analysis

Implementing the strategy in the financial analysis consisted of two things. The model assumes that operations of L&S will constitute 50% of Maersk operations in 2030. Consequently, Maersk's operation in shipping will be gradually reduced to 50% in 2030. This reduces the taxable energy consumption. Secondly, however, the expansion of L&S operations is at the expense of shipping operations, which increases COGS% of sales. This is because L&S has historically been less profitable than maritime shipping, yielding a normalized EBITDA/Sales ratio of 9% compared to 17% for shipping. This means that the weighted average of EBITDA as % of sales in 2022 was 15.24% for all operations. In 2030, when operations are split 50/50 between L&S and shipping operations, the average EBITDA as a % of sales would be 13% instead. The decrease in profitability from moving operations to L&S is reflected by increasing COGS% of sales so that an EBITDA as a % of sales of 13% is achieved in 2030. (see figure below)

Assumptions Page 1 - Income Statement and Cash Flow Statement					
	Year 1 2022	Year 2 2023	Year 3 2024	Year 4 2025	Year 5 2026
Cost of scaling L&S operation to 50% of total operation (m$)					
Additional effect on COGS (%)	0.9%	1.2%	1.2%	1.6%	1.9%

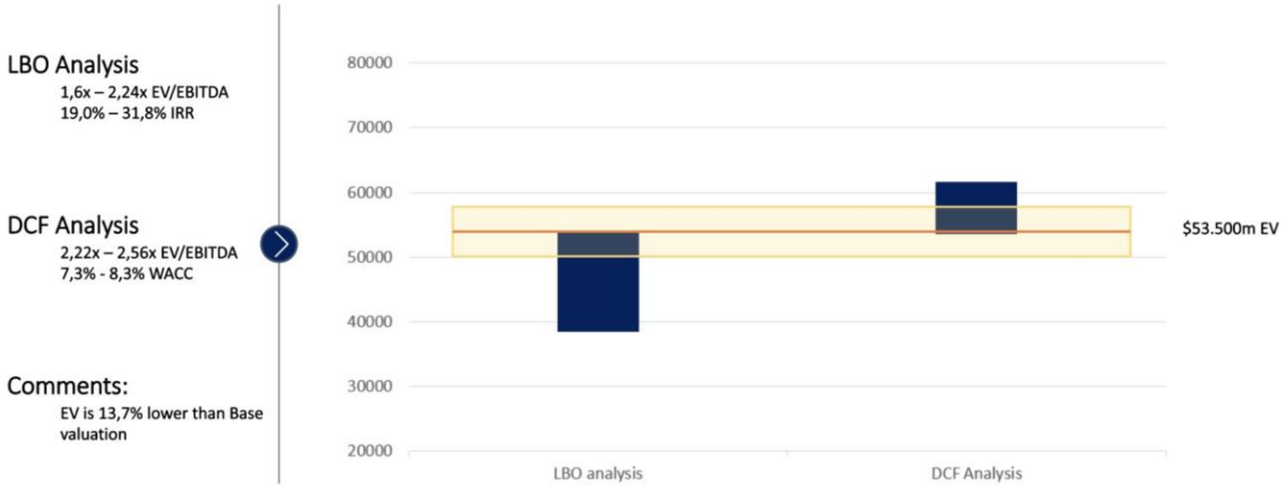
Finally, the reduced exposure to taxes is accounted for by reducing the taxable energy consumption, which causes a decrease in COGS% of sales relative to the Status Quo strategy (see figure below). In sum, this strategy has a negative and positive effect on COGS % of sales in the valuation model. On one hand, it limits the exposure to the legislation which decreases COGS% of sales. On the other hand, it increases COGS% of sales because of operations being moved to a less profitable sector. The net effect, however, is an increase in COGS % of sales relative to the SQ strategy (see the figure below). This is reflected in the assumption of operating scenario 3 in our assumption sheet (see appendix 9.7)

A. P. Møller-Mærsk A/S
Energy Consumption
($ in millions, fiscal year ending December 31) — Regulation Scenario EU Tax

Regulation Scenario	1	2019	2020	2021	2022	2023	2024	2025	2026
Total additional expense from fuel tax and ETS (m$)						**165.03**	**264.16**	**374.01**	**506.96**
Sales (m$)						60,957	57,300	58,503	63,300
Extra expense to COGS % of sales						0.27%	0.46%	0.64%	0.80%

5.4.2.3 Results

Pursuing the L&S strategy yields an EV of $53.5 Billion which corresponds to a 13.7% reduction compared to the base valuation. The sensitivity analysis of the DCF analysis reported that the EV of Maersk under this strategy was between $52.68 Billion and $60.68 Billion. In the LBO analysis, the entry multiples would fulfill the benchmark IRRs was 1.6x and 2.24x which corresponds to EVs of $38.46 Billion and $53.84 Billion. The ranges of each valuation model are plotted below with a 5% margin of error illustrated. If Maersk pursues this strategy, they will not pollute any less. The same amount of traditional fuel is used but just with less exposure to tax. Thus, fuel composition and total GHG emission are unchanged.



5.4.3 Operating Scenario 4: Scale E-Methanol consumption (RLF)

5.4.3.1 Operationalization

The strategy of RLF consists of gradually upscaling the use of E-methanol as a green alternative to traditional fuel oil. This strategy is in line with Maersk's signed letters of intent to scale global green emethanol production starting in 2025 (Maersk, 2022). E-Methanol is a renewable fuel type produced by carbon capture and subsequent chemical reactions through power-to-x technology. Maersk intends to enter strategic partnerships with six e-Methanol producers worldwide, most notably the Danish Energy firm Oersted, to gradually increase global production. However, the signed letters of intent do not entail any obligations. The strategy of RLF entails that Maersk, in fact, executes on this intent and gradually substitute oil fuel with green e-Methanol to achieve the ambition of carbon neutrality by 2040.
Consequently, unlike other discussed strategies, the RLF strategy actively pursues decarbonization.

The RLF strategy resembles the Emission Avoider strategy in (Sprengel & Busch, 2011)'s typology as it entails an active approach to make operations carbon neutral. Scaling global production of e-Methanol will enable Maersk to increase the rate of substitution from fuel oil consumption to renewable fuels. The RLF strategy will make Maersk's entire operation independent of GHG emissions, which is the motivation of the Emission Avoider strategy as well.

5.4.3.2. Implementation in our analysis

Implementing the strategy in the financial analysis consisted of three things. First, we forecasted the price of oil and e-Methanol. Second, we forecasted the e-Methanol consumption and adjusted oil consumption accordingly. Third, we accounted for the increased costs of fuel due to the increased use of e-Methanol.

To forecast the price of oil and e-Methanol, the most recent scientific studies were used. The current market price of oil is about $700/ton and is expected to normalize in 2026 around $425 before decreasing with a long-term rate of 1% (McKinsey, 2018). In terms of e-Methanol, the current market price is about $1,300/ton and is expected to decline to levels between $250 - $630 by 2050 (IRENA AND METHANOL INSTITUTE , 2021). The financial model will assume that the price will hit $400 in 2050, implying a gradual decrease in price of 4%. To forecast e-Methanol consumption, Maersk is assumed to execute on the signed letters of intent of increasing annual e-Methanol consumption by 1,330,000 tons in the period of 2024-2026. These amounts are added to the annual consumption of 450,000 tons already accounted for in the model. Maersk's long term annual increase of consumption is calculated to achieve the net zero target in 2040 i.e., a fuel composition of 100% renewable fuels. Since e-Methanol is 90% as efficient as oil, an additional annual consumption of 736.000 tons is required to completely substitute oil by 2040. To calculate the cost of increasing e-Methanol consumption, the forecasted consumption of eMethanol is multiplied with the forecasted price. Then to calculate the savings of substituting oil, the forecasted consumption of oil is multiplied with the forecasted price. As a final step, the net effect of substituting oil with e-Methanol is calculated and expressed relative to forecasted sales to arrive at the additional effect on COGS% of sales (see figures below)

Assumptions Page 1 - Income Statement and Cash Flow Statement		Year 1 2022	Year 2 2023	Year 3 2024	Year 4 2025	Year 5 2026
Fuel cost forecast ($/ton)						
Oil Price	Current $700	700	580	500	425	421
Growth %			-17%	-14%	-15%	(1.0%)
E-Methanol Price	Current: $1300	1300	1246	1195	1146	1099
Growth %			(4.1%)	-4%	-4%	-4%
Net effect of oil to e-Methanol conversion						
Additional e-Methanol consumption (ton)				130,000	830,000	1,330,000
Cost (m$)				155	951	1,461
Decrease in Oil consumption (ton)				118,950	759,450	1,216,950
Saving ($m)				59	323	512
Net effect on cost (m$)				**96**	**628**	**949**
Fuel Cost of RLF (m$)						
Net effect on cost (m$)				96	628	949
Sales (m$)		75,442	60,957	57,300	58,503	63,300
Additional effect on COGS % of Sales from substituting oil with e-Methanol				**0.2%**	**1.1%**	**1.5%**

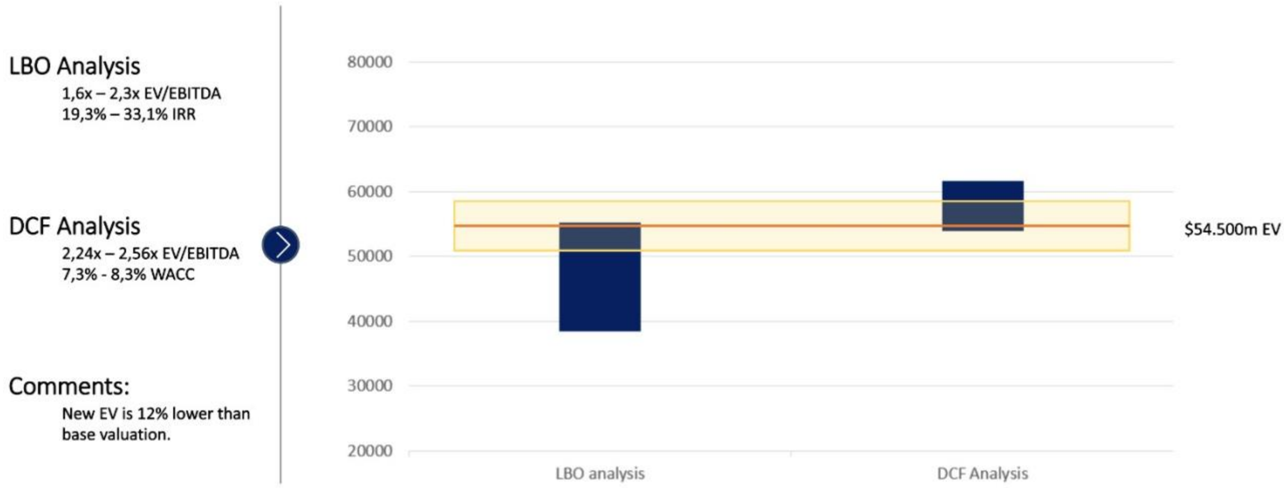
Finally, we accounted for the decreased exposure to taxation from the decreased use of traditional oil (see figure below). In total, the change in composition of fuel consumption has a positive and a negative effect on COGS % of sales. Since the tax rate of renewable fuels are lower than oil and they do not cause any GHG emission, the RLF strategy leads to less exposure to the legislation. This causes the COGS % of sales to decrease. On the contrary, as e-Methanol is more expensive than oil, the RLF strategy leads to higher total fuel cost. This causes the COGS % of sales to increase. The net effect is an increase in COGS % of sales relative to the SQ strategy. This is reflected in the assumptions of operating scenario 4 (see appendix 9.8)

A. P. Møller-Mærsk A/S
Energy Consumption
($ in millions, fiscal year ending December 31)
Regulation Scenario EU Tax

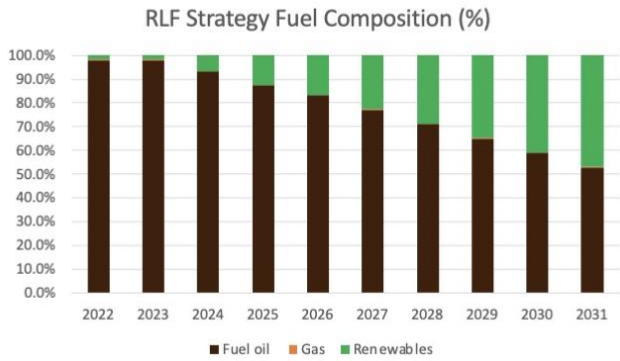
Regulation Scenario	1	2019	2020	2021	2022	2023	2024	2025	2026
Total additional expense from fuel tax and ETS (m$)						**165.03**	**279.23**	**387.84**	**524.00**
Sales (m$)						60,957	57,300	58,503	63,300
Extra expense to COGS % of sales						0.27%	0.49%	0.66%	0.83%

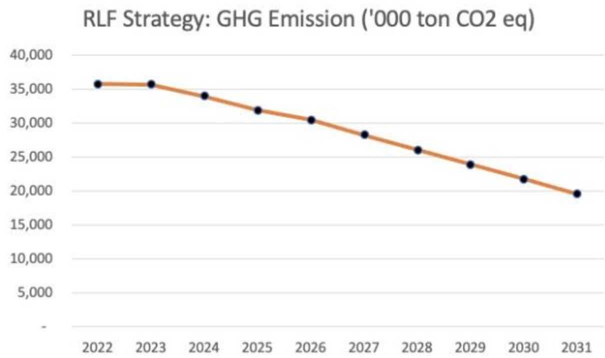
5.4.3.3 Results

Pursuing the RLF strategy yields an EV of $54.5 Billion which corresponds to a 12% reduction in the EV of Maersk compared to the base valuation. The sensitivity analysis of the DCF model reported an EV a range of $54.6 Billion and $62.8 Billion. Similarly, from the LBO model the entry multiples to arrive at the benchmark IRR range was 1.6x and 2.3x. This implied that the true EV is likely within a range of $38.46 Billion and $53.6 Billion. The ranges of each valuation model are plotted below with the calculated EV and a 5% margin of error illustrated.



Furthermore, the fuel composition and the GHG emission of pursuing the RLF strategy is plotted as well. This strategy entails that Maersk gradually will make their entire operation reliant on e-Methanol and thus drastically reduce their GHG emission.

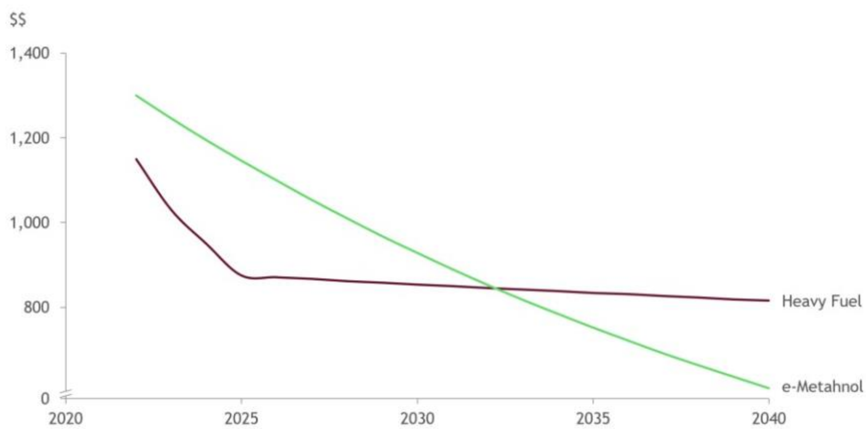




5.4.4 Operating Scenario 5: Fulfill the IMO tax (IMOT)

5.4.3.1 Operationalization

The strategy of IMOT is two-folded. First, it ensures the implementation of a tax of $450/ton oil by the International Maritime Organization (IMO). Second, it operates under this tax while gradually scaling up e-Methanol consumption. This strategy is in line with Maersk's request to the IMO of imposing a $450/ton oil tax to ease the commercialization of renewable fuels (Wittels, 2021). This tax would effectively make the transition from oil to e-Methanol much more attractive from a financial perspective. It would drive the current de facto cost of oil up to $1,150/ton and thus, according to the current projections of cost in E-methanol and Oil, make it more expensive than e-Methanol by 2033 (see graph below). Furthermore, unlike the EGD tax, an IMO tax would be universal and apply to all global shipping routes. This would level the playing field for shipping firms in terms of decarbonization regardless of exposure to the European Market. To reiterate, the IMOT strategy requires Maersk to use political influence to assert pressure on the IMO to impose a universal $450/ton fuel tax. Once Implemented, Maersk will operate under the same decarbonization strategy as dictated by the RLF strategy.



This strategy resembles a combination of Regulation Shaper and Emission Avoider from (Sprengel & Busch, 2011)'s typology since the IMOT strategy involves pushing legislators for a higher oil tax while gradually scaling up e-Methanol energy consumption. The parallel to the Emission Avoider strategy has already been elaborated. The parallel to the Regulation Shaper strategy is based on the IMOT strategy's engagement in political processes making sure that the high tax of $450/ton oil is implemented.

5.4.3.2 Implementation in our analysis

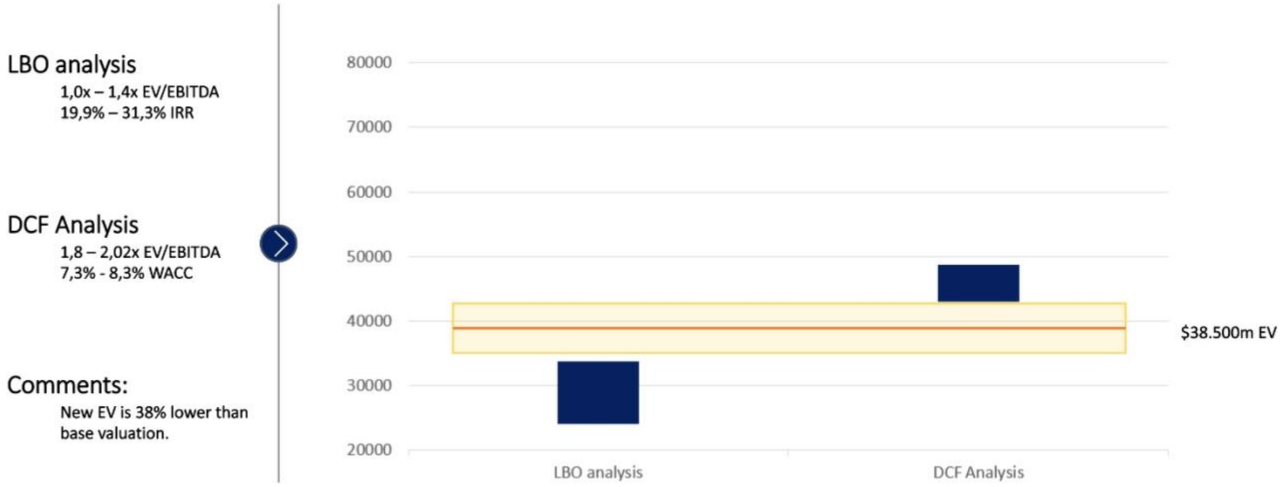
Implementing this strategy in the financial analysis follows the same approach as implementing the RLF adjustment. However, this strategy also accounts for the increased tax expense from the IMO tax of $450/ton oil. To account for this, the energy consumption sheet considers two regulation scenarios. Regulation Scenario 1 contains the legislation implemented by EGD of $45/ton oil, $35/ton gas and $7.5/ ton RLF and EUAs of $84. Regulation scenario 2 only contains the $450/ton fuel tax. The projection of energy consumption is the same as under the RLF strategy. The net effect on COGS% of sales is a considerable increase compared to the SQ strategy. These numbers are reflected in assumptions of operating scenario 5 (see appendix 9.9) and in the figure below.

A. P. Møller-Mærsk A/S
Energy Consumption
($ in millions, fiscal year ending December 31)
Regulation Scenario IMO Tax

Regulation Scenario	2	2019	2020	2021	2022	2023	2024	2025	2026
Total additional expense from fuel tax and ETS (m$)						**4101.32**	**3902.81**	**3664.48**	**3494.25**
Sales (m$)						60,957	57,300	58,503	63,300
Extra expense to COGS % of sales						6.73%	6.81%	6.26%	5.52%

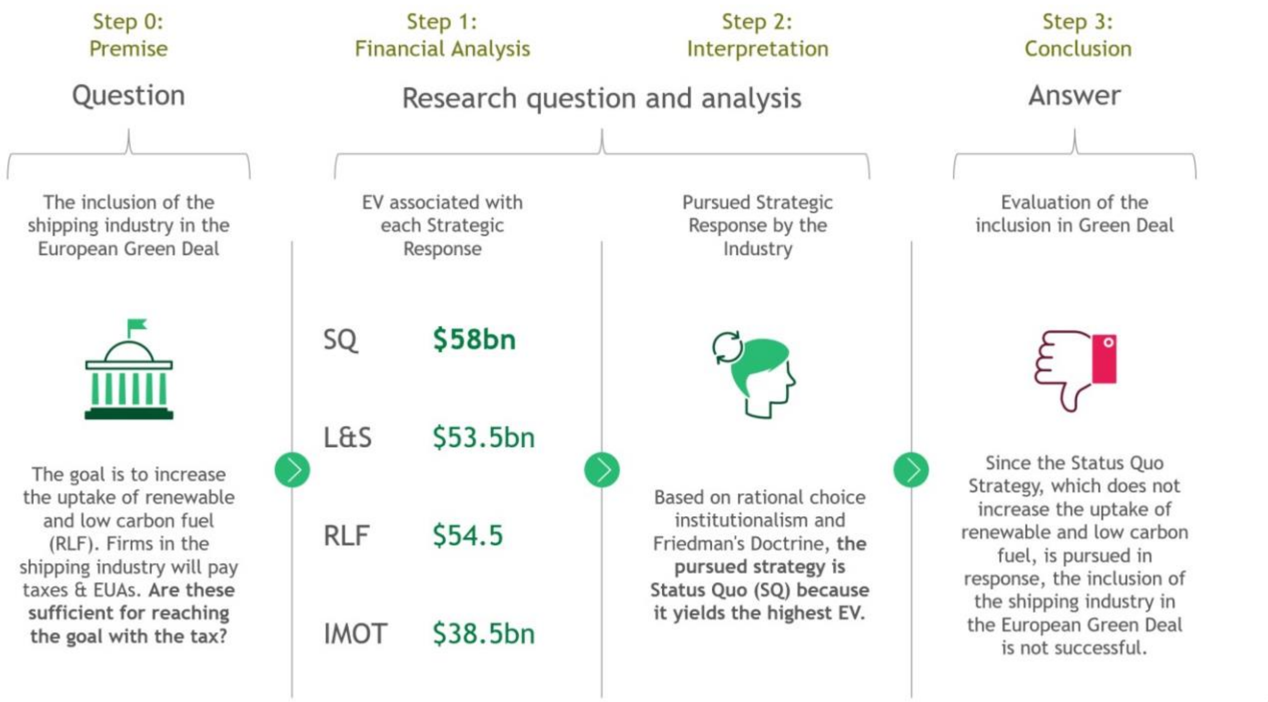
5.4.3.3 Results

Pursuing the IMOT strategy yields an EV of $38.5 Billion, which corresponds to a 38% reduction in the EV of Maersk. The sensitivity analysis of the DCF model reported that the EV is within a range of $42.64 Billion and $48.38 Billion. The LBO model yielded entry multiples 1x - 1.4x to obtain proper IRRs. This implied that the EV is likely within a range of range of $24 Billion and $33.65 Billion. The ranges provided by each valuation model are plotted below with the calculated EV and a 5% margin of error illustrated. Furthermore, in terms of decarbonization, the results are identical to the outcome of the RLF strategy.



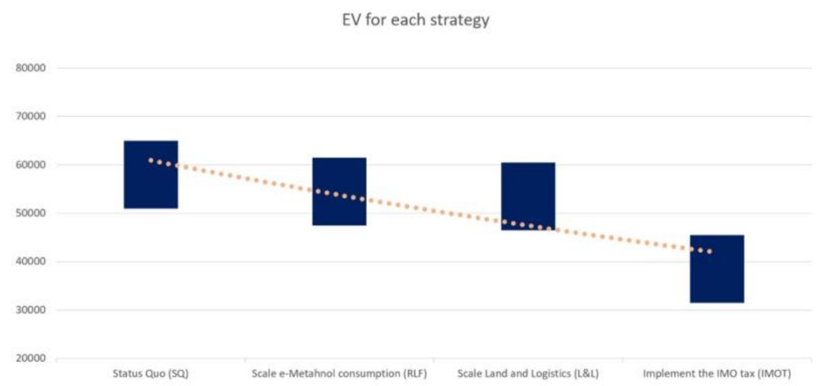
5.5 Results and Interpretation

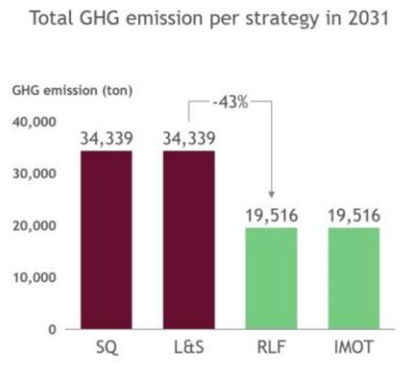
Finally, as EV has been calculated for each strategic response, it can be identified which strategy yields the highest EV. Subsequently, this finding is used to determine which strategy is the most likely to be pursued in response to the EGD. This is explicated by the figure below.



5.5.1 Step 1) Results from Financial Analysis

When comparing the calculated EVs of each strategic response, it is apparent that Status Quo (SQ) yields the highest EV. This conclusion is drawn by plotting the 5% margins of error on the results of each identified strategic response. It appears that the Status Quo strategy yields the highest EV, while not reducing carbon emissions nor increasing the uptake of RLF. Meanwhile, the strategy that yields the lowest EV is the IMOT strategy, which is the strategy that reduces carbon emissions most together with RLF.





5.5.2 Step 2) Interpretation and Answer to Research Question

Based on the theoretical assumptions of Friedman's Doctrine and Rational Choice Institutionalism, the actual strategic response that Maersk is likely to pursue in response to the inclusion in the European Green Deal is Status Quo because it leads to the highest possible EV. Friedman's doctrine states that the purpose of corporate actors is to maximize shareholder value. Since the cost structure is held constant in the analysis, the EV also reflects the level of shareholder value. The notion that corporations should seek to maximize shareholder value is backed up by Rational Choice Institutionalism which assumes that the individual is self-interested and will maximize utility. The theoretical assumptions and their impact on the answer will be discussed later. Since of the comparability of Maersk with the rest of the industry as discussed in 4.2 Research Design, each strategic response is likely to have similar relative impact on enterprise value across the industry. Therefore, Maersk's choice of Status Quo is expected to resemble the strategic response of the industry in general.

5.5.3 Step 3) Evaluation of the inclusion of the shipping industry in the Green Deal

Since Status Quo is the strategy most likely to be pursued and by no means increases the uptake of renewable and low carbon fuel, our analysis deems the inclusion of the shipping industry in the European Green Deal unsuccessful. To reiterate, the objective of the inclusion of the shipping industry was "*'increasing the uptake of renewable and low carbon fuel (RLF) in EU maritime transport with a view to reducing emissions from the sector, both in navigation and at berth and thereby contribute to achieving EU and international climate objectives'*" (Tuominen, 2022). As illustrated in the analysis, the Status Quo strategy entails stalling decarbonization efforts. Instead, only financially motivated investments are pursued, and free cash flows are used for dividend payouts, share buybacks and other related activities to increase shareholder wealth. Since this strategy entails no active efforts to increase the uptake of RLF, the inclusion is considered ineffective and unable to achieve the outlined ambitions. The proposed fuel tax rates and ETS schemes are thus in themselves inadequate.

6.0 Discussion of Results

In the following sections, we will discuss our finding and put it in into the context of the current literature. We will also discuss other explanations for why the shipping industry is not expected to increase the uptake of RLF from a critical realist philosophical point of view.

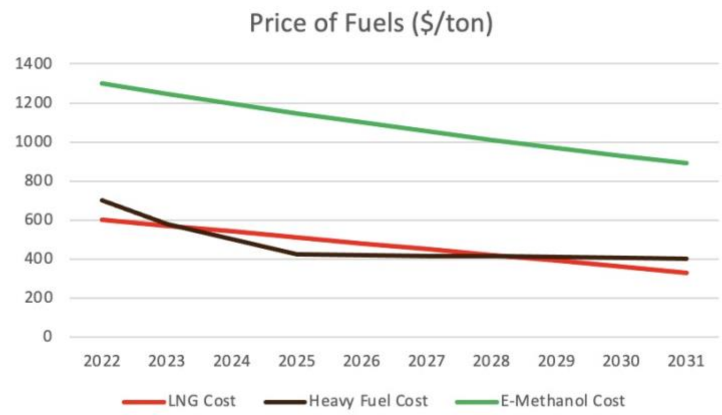
6.1 Relation to Literary Review

6.1.1 Political Implication

A major political implication from our analysis is that the inclusion of the shipping industry in the EGD is insufficient to cause an increase in the uptake of renewable and low carbon fuels from a Rational Choice Institutionalist perspective. As described in the literary review, both the EU and the International Maritime Organization (IMO) have established ambitious targets for reduction in carbon emissions. IMO mandates a 50% reduction in GHG emission compared to 2008 levels by 2050. The Goal of the EU's European Green Deal was to achieve more than 55% cuts in GHG emissions, at least 32% share of renewable energy and above 32,5% improvement in energy efficiency by 2030 (European-Council, 2021). Based on our analysis, we can however conclude that the initiative of including the shipping industry in the European Green Deal is not sufficient to drive an impact towards these goals. In other words, posing taxes of $45/ton oil and demanding ETSs for operations in the EU seems to be too unambitious if we wish to make a difference.

6.1.2 Scope of the RLF Strategy

Among the four specific analyzed strategies, the Status Quo strategy was determined to be the most beneficial to enterprise value, and thus predicted as the most likely strategic response by the shipping industry. However, this result might have been different if the RLF strategy had been operationalized differently. In this thesis, the RLF strategy was operationalized as scaling the use of e-Methanol to achieve carbon neutrality. Yet, E-methanol is not the only fuel considered RLF. Many alternative fuels like hydrogen, biofuels, and liquid natural gas (LNG) are also considered RLF as they are low in carbon emission (McKenna, 2020). LNG is of particular interest as it has gained traction in the shipping industry in recent years. Most notably, the French shipping conglomerate CGM-CGA has been a frontrunner in converting their fleet to be power by LNG (CMA-CGM, 2021). The current price per ton of LNG in Europe is $600 and it is expected to decline to $330 (World Bank, 2021). This effectively makes it cheaper than the current and projected price of oil (see graph below). Therefore, if the RLF strategy had been operationalized as scaling the use of LNG as well, it could have yielded a higher EV than Status Quo in our analysis, making it the most likely strategy to be pursued. Therefore, not considering LNG as an RLF strategy can be considered as a limitation of our thesis.



However, it might be argued that the objective of *'increasing the uptake of Renewable and Low carbon Fuels (RLF)'* is too broadly defined for actual sustainable goals to be pursued because it encompasses fuel types that causes much other pollution than carbon emission. In fact, burning LNG emits methane into the atmosphere which breaks down the ozone layer (McKenna, 2020). This could substantiate an argument that the objective of 'increasing the uptake of Renewable and low carbon Fuels' is poorly defined because it encompasses fuel types that cause much pollution by means other than carbon emission. As highlighted in the industry overview, the shipping industry is at a critical juncture in terms of decarbonizing their operations (Hua, Hwang, & Cheng, 2019). Making the wrong decision could have adverse long-term consequences, since modern vessels have an expected lifetime of +20 years. Thus, it is important to build legislation that incentivizes long term solutions with renewable fuels like E-methanol instead of low carbon fuels like LNG that still pollutes.

6.1.2 Impact Assessments

In contrast to our results, previous studies on the European Green Deal have predicted it to be highly efficient. As mentioned in the literary review, the impact assessment of 'fit-for-55' for shipping industry expects fossil fuel savings of about 13 % by 2030 and 89-91 % by 2050. Further, GHG emission reductions are expected to be around -11 % by 2030 and around -77-78 % by 2050 (Tuominen, 2022).

Previous research discussed in the literary review by Wang & Li (2022) also finds evidence that an ad valorem energy tax will reduce the production and consumption of oil in enterprises. These conclusions contrast with our results that predict the inclusion of the shipping industry in the EGD's fit-for-55 to be inefficient to drive actual change in carbon emissions and increased uptake of RLF. One could argue that the diverging conclusions are due to the method used to conduct the research: Previous research bases its findings on Computable General Equilibrium models which account for macroeconomic and technological capacities to drive the green transition. These modelling tools are from the European Commission's modelling inventory and knowledge management system (MIDAS), including the main models used in the fit-for-55 impact assessment: PRIMES, PRIMES-TREMOVE, TRUST. Our research, on the other hand, is based on financial valuations and a prediction of actual pursued strategy rather than what strategies the industry is capable of pursuing.

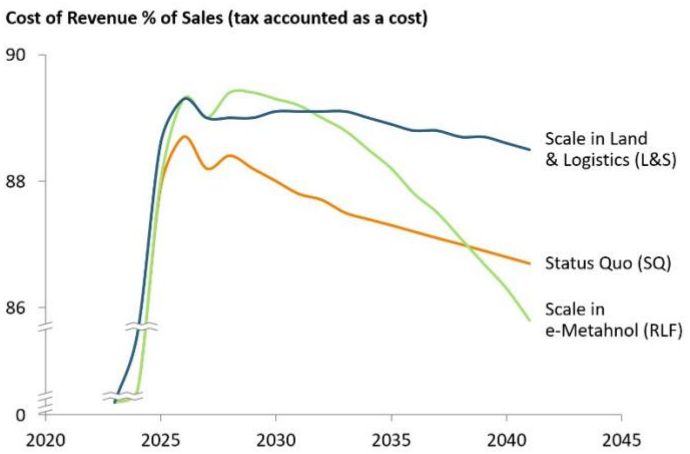
6.1.3 Fit with Predictions by Sprengel & Busch (2011)

Our claim that the shipping industry will pursue the minimalist Status Quo strategic response is in line with what would be predicted using Sprengel and Busch's framework (2011). Sprengel & Busch derive a relationship between GHG intensity, and the strategic response to green institutional pressure pursued by firms. As mentioned in the literary review, they find that high GHG intensity, ceteris paribus, leads to a response strategy with high ambitions to reduce carbon emission and vice versa. Within the framework of their study, you could therefore make a prediction of what strategic response Maersk would pursue by measuring Maersk's GHG intensity. The GHG intensity of Maersk is 473 ton CO^2/m$ revenue and is below the average GHG intensity of 496 ton CO^2/m$ in the Minimalist group. According to the Sprengel and Busch's framework, Maersk is therefore most likely to pursue the Minimalist strategy which implies little or no actions to curb carbon emissions. Maersk's low number of GHG intensity reflects that Maersk has already made an array of initiatives to reduce carbon emission that only leaves solutions that are too expensive for the firm to pursue (Wan, el Makhloufi, Chen, & Tang, 2018). Sprengel and Busch's prediction of Maersk's response strategy based the firm's GHG intensity is thus in line with the result of our analysis, namely, that Maersk will choose the strategic response that resembles the Minimalist strategy because investing in RLF is too expensive.

6.2 Alternative Explanations with Critical Realism

To increase the external validity of the analysis, further research could seek to go beyond rational choice institutionalism and account for a holistic view on individual behavior and their preferences. As discussed, positivism provides a limited framework to make valid predictive arguments because many unobservable events such as socials structures, discourses and other informal institutional pressures are ignored. As opposed to a positivist philosophy of science, a critical realist perspective would have allowed us to explore such deeper layers of causality. In the following sections, two other explanations than EV for the predicted minimalistic strategic response are given. Finally, from a critical realist perspective, we discuss why the shipping industry could, in fact, pursue the RLF strategy despite its low associated EV.

6.2.1 Short-Termism and Financialization



With a $450 oil tax, Emission Avoider will be the least costly strategy by 2038

From a critical realist perspective, one could suggest that the EU tax is insufficient to meet its goal, not merely because of the high EV associated with status quo, but because of underlying structural conditions of financialization that causes short-term behavior of corporate actors (Davis & Kim, 2015). As outlined in the literary review, financialization causes a short-term orientation toward shareholder value that leads to substantial changes in corporate strategies. Therefore, one could argue that the choice of the Status Quo strategy based on the high EV is a symptom of deeper societal structures like financialization. Similarly, this short-term perspective as an explanation for the lack of political action can also be derived from our analysis. In fact, in the conditions of Maersk's proposed tax of $450/ton oil we see that the cheapest strategy is to scale up e-Methanol on a long-term basis. Even from an RCI perspective, one could argue that imposing a tax of $450/ton oil would cause the shipping industry to increase the uptake of RLF on a long-term basis. From a critical realist perspective, however Davis & Kim (2015) provide the argument that short-term ambitions of achieving financial goals prevent this from happening. Firms and governments are unwilling to push for it since the enterprise value is not maximized in the short term, which is required in a world of financialization. While this deeper and more holistic explanation is not accounted for in our analysis, it is in line with our findings.

6.2.2 Lobbyism

Similarly, from a critical realist perspective, one could use extensive lobbyism to explain the lack of political action towards adequate carbon taxes. The puzzle from a critical realist perspective is that legislators, who can pose efficient taxes in their Real and Actual domain, are not observed to do so in the Empirical Domain. In other words, while their inherent 'structure' and 'mechanisms' facilitate action towards reducing carbon emissions, the 'conditions' surrounding them cause stagnant outcomes instead. This claim is backed up by a long array of literature on lobbyism. A report by London-based think tank InfluenceMap tracked 20 trade bodies' efforts to lobby against the "Fit for 55" net-zero policy package (Brooks, 2021). Thus, causal explanation for the lack renewable initiatives by the shipping industry can also be ascribed to deeper structural conditions such as corporate lobbying. While low EVs associated with green strategic responses constitutes a positivist, methodologically individualist explanation for lack of green investments, research on lobbyism is likely to provide a deeper, more comprehensive analysis of why the political initiative of EGD is expected to come up short.

6.2.3 Stakeholder Theory

In our analysis, we have used Positivism as philosophy of science and Friedman's Doctrine and RCI as theoretical framework. Replacing the philosophical perspective with critical realism and the theoretical framework with Freeman's stakeholder theory and the logic of appropriateness could result in findings contrary to those from our analysis. From a stakeholder theory perspective, it could be predicted that a strategy that increases the uptake of RLF would be pursued despite not maximizing enterprise value. This is because stakeholder theory argues that the effects on EV of each strategy are and should be insufficient predictors of firm's strategy since a firm is responsible to a broad range of stakeholders besides shareholders (Freeman, 1984). As the logic of appropriateness states, the power of perceptions among stakeholders in society is much more dictating than utility maximization. This thesis argues that the shipping industry will *not* respond with a strategy that increases the uptake of RLF. Deviating from the premise that legislative and corporate actors are selfish, short-term, and utility maximizing, you may find reason to believe that the shipping industry, in fact, *will* pursue a strategic response that increases the uptake of RLF. This is evident in the increased efforts in CSR and ESG compliance that highlights how firms are increasingly letting social concerns control their operations rather than maximization of shareholder value. Neglecting these characteristics in our analysis may lead to inaccurate and misleading conclusions about the outcome of the EGD. For example, as mentioned in a letter from the chief officer of decarbonization at Maersk, Jacob Sterling, they *"… see it as the right thing to do – it is [their] responsibility"* (Sterling, 2022).

7.0 Conclusion

7.1 Findings

To evaluate whether the inclusion of the shipping industry in the European Green Deal (EGD) could be deemed successful, we posed the research question: "*What strategic response to the inclusion in the European Green Deal will the shipping industry pursue?"*. Our analysis found that the shipping industry is likely to pursue a minimalist, Status Quo strategy which does not increase the uptake of RLF nor reduce carbon emissions. In conclusion, the inclusion of the shipping industry in the EGD is not expected to be successful. This is concluded with a positivist philosophy of science and a theoretical basis of Friedman's doctrine and Rational Choice Institutionalism. Therefore, the predictive argument made in this thesis rests on the assumption that firms in the shipping industry will pursue a strategy to maximize the value for shareholders. A limitation of this philosophy of science is that it uses methodological individualism and assumes individuals to have a fixed personality. Therefore, no deeper structural explanations for the failure of the legislation are given. Neither does the analysis consider the possibility that firms would pursue a green strategic response *despite* low projected enterprise values. Nonetheless, to the extent that actors are rational and self-interested, the findings can be used as a valid prediction. Furthermore, the theoretical basis of a carbon tax is the Rational Choice Institutionalist assumption that modifying prices and costs will influence consumer behavior (Perloff, 2018). It is therefore appropriate and relevant to evaluate such tax with the same theoretical scope.

7.2 Political Recommendations

Based on the analysis, the tax imposed on the shipping industry by the EGD is inadequate to incentivize the intended strategic response. Furthermore, as shown in discussion point 6.2.1, imposing a tax of $450 per ton oil globally would make a gradual conversion to e-Methanol the most profitable strategy by 2038. Due to DCF valuations being based on time value of money, such a strategy would not necessarily yield the highest EV, but it does provide a long-term economic basis to pursue it. For this reason, a political recommendation to the European Union, IMO, and other supranational organizations is to double down on carbon taxes. To advance the time until e-Methanol would be profitable under such a tax, governments and global institutions could subsidize research and contracts on orders of fuel to drive down the cost faster than the assumed 4% a year in the analysis. By accelerating the process of making e-Methanol profitable, chances are that it will also be the strategy that yields the highest enterprise value because time value of money in financial valuations favors profit today over those in the future.

7.3 Further Research

Further research could be conducted in two fields. First, it is relevant to see if comparable results are found in other hard-to-abate industries like aviation which accounts for an equal share of global GHG emission to shipping (Ritchie, 2020). Such results could provide the basis for a broader evaluation of whether the European Green Deal was successful or whether it must be amplified or changed completely to have an impact. Second, to make a better prediction of each strategy's associated enterprise value, further research could investigate consumer's willingness to pay for green shipping, that is, shipping that is based on RLF. This is interesting because such consumer preference enables the shipping industry to increase freight rates and thus avoid losing enterprise value when pursuing a green strategy. Instead of financial valuations, such research could be conducted with questionnaires and interviews and would follow a more holistic philosophical approach than the positivist perspective used in this thesis.

8.0 Bibliography

IRENA AND METHANOL INSTITUTE . (2021). *Innovation Outlook: Renewable Methanol.* Abu Dhabi: International Renewable Energy Agency.

Amundi. (2020). *ESG Thema - EU Fit for 55 package.* Paris: Amundi Asset Management.

Azhgaliyeva, D., Kapsaplyamova, Z., & Low, L. (2018). Implications of fiscal and financial policies for unlocking green finance and green investment. *ADBI Working Paper No. 861*.

Balsiger, J. (2016, November 2016). *logic of appropriateness*. Retrieved from Encyclopedia Britannica.: https://www.britannica.com/topic/logic-of-appropriateness

Bloomberg. (2022). *Bloomberg Professionel Services.* Retrieved from Global Bloomberg Estimates Data Content and Data: https://www.bloomberg.com/professional/dataset/global-bloombergestimates-data/

Boqiang Lin, X. L. (2011). The effect of carbon tax on per capita CO2 emissions. *Energy Policy,*, 51375146.

Brooks, C. (2021, August 06). *Fit for 55: Shipping industry lobby fights EU net-zero policy.* Retrieved from https://cleanenergynews.ihsmarkit.com/: https://cleanenergynews.ihsmarkit.com/researchanalysis/fit-for-55-shipping-industry-lobby-attacks-eu-netzero-emission.html

Bryman, A. (2016). Chapter 14) Using Existing Data. In A. Bryman, *Social Research Methods* (pp. 308327). Oxford: Oxford University Press.

Bryman, A. (2016). Chapter 2) Social Research strategies: quantitative research and qualitative research. In A. Bryman, *Social Research Methods* (pp. 16-37). Oxford: Oxford University Press.

Bryman, A. (2016). Chapter 3) Research Design. In A. Bryman, *Social Research Methods* (pp. 39-71). Oxford: Oxford University Press.

Bryman, A. (2016). Chapter 7 - The nature of Quantitative Research. In A. Bryman, *Social Research Methods* (pp. 148-169). Oxford: Oxford University Press.

Buch-Hansen, H. (2021). Chapter 2 Understanding and Using Philosophy of Social Science. In H. Buch-Hansen, *Philosophy of Social Science: A typology* (pp. 49-61).

Carballo Piñeiro, L., Mejia Jr, M. Q., & Ballini, F. (2021). Beyond COVID-19: the future of maritime transport. *WMU Journal of Maritime Affairs volume 20*, 127–133.

CMA-CGM. (2021). *The CMA CGM JACQUES SAADE, the world's first 23,000 TEU powered by LNG.* Marseille : CMA-CGM.

CMA-CGM Group. (2021). *Annual Report 2021*. Marseille: CMA-CGM Group.

Colijn, B., & Abettan, S. (2022). *Just how fit is the EU's Fit for 55 climate strategy for Europe's economy?* London: ING Bank NV. .

Computable General Equilibrium modelling: introduction. (2016, 1 06). Retrieved from Scottish Government : https://www.gov.scot/publications/cge-modelling-introduction/

Danish Ship Finance, & Rainmaking. (2022). *Maritime Trend Report.* Copenhagen: Danish Ship Finance and Rainmaking.

Davis, G. F., & Kim, S. (2015). Financialization of the Economy. *Annual Review of Sociology.*

Dornoff et. al, J. (2021). *Fit for 55: A review and evaluation of the European Commission proposal for amending the CO2 targets for new cars and vans.* INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION.

Dwivedi et al. (2022). Climate change and COP26: Are digital technologies and information management part of the problem or the solution? An editorial reflection and call to action. *International Journal of Information Management, Volume 63*.

EEX. (2022, May 20). *EEX* . Retrieved from Spot Market: https://www.eex.com/en/marketdata/environmental-markets/spot-market

Epstein, G. A. (2006). *Financialization and the World Economy.* New York: Edward Elgar Publishing Ltd.

EU-Commission. (2019, December 11). *EC.* Retrieved from Press Corner > President von der Leyen on the European Green Deal: https://ec.europa.eu/commission/presscorner/detail/en/SPEECH_19_6749

European Court of Auditors. (2021). *Special Report - The Polluter Pays Principle: Inconsistent application across EU environmental policies and actions.* Brussels : European Court of Auditors.

European-Council. (2021, July 14). *European Council.* Retrieved from Policies > European Green Deal: https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-greentransition/

Evergreen Marine Corp. (2021). *Annual Report.* Taoyuan City: Evergreen Marine Corp.

Faunhofer ISI, & Stefan Scheuer Consulting. (2021). *Will the Fit for 55 package deliver on energy efficiency targets? A high-level assessment* . Faunhofer ISI; Stefan Scheuer Consulting;.

Freeman, R. E. (1984). *Strategic management: A stakeholder approach.* Boston: Pitman.

Freeman, R. E. (2010). *Strategic Management: A Stakeholder Approach.* Cambridge University Press: Cambridge University Press.

Friedman, M. (1970, September 13). A Friedman doctrine-- The Social Responsibility Of Business Is to Increase Its Profits. *NY Times.*

Friis, L. (2022). Mærsk opjusterer og styrer mod nyt rekordoverskud på over 200 milliarder. *Berlingske* .

Graf, A., & Görlach, B. (2021). *A "Fit for 55" Package Based on Environmental Integrity and Solidarity.* Berlin: Agora Energiewende.

Green, J., Hadden, J., Hale, T., & Mahdavi, P. (2021). *Transition, Hedge, or Resist? Understanding Political and Economic Behavior toward Decarbonization in the Oil and Gas Industry.* Toronto: University of Toronto.

Halim, R. A., Kirstein, L., Merk, O., & Martinez, L. M. (2018). Decarbonization Pathways for International Maritime Transport: A Model-Based Policy Impact Assessment. *Sustainability 2018, 10(7).*

Hapag-Lloyd. (2021). *Annual Report 2021.* Hamburg: Hapag-Lloyd.

Hempel, C. G. (1978). *The empiricist criterion of meaning.* 1950.

Herrnstein, R. J. (1990). Rational choice theory: Necessary but not sufficient. *American Psychologist*, 356–367.

Hua, J., Hwang, D.-S., & Cheng, C.-W. (2019). Total life cycle emissions of post-Panamax containerships powered by conventional fuel or natural gas. *Journal of the Air & Waste Management Association Volume 69, Issue 2*, 131-144.

IMO. (2018, April 9-13). *MPEC Summary* . Retrieved from Marine Environment Protection Committee (MEPC), 72nd session, 9-13 April 2018: https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/MEPC-72nd-session.aspx

Irfan, U. (2022, April 21). How to save the planet from the largest vehicles on Earth. *Vox.*

Keating, D. (2021, December 15). Opinion: 'Fit for 55 part II' doesn't reflect a climate emergency. *Energy Monitor.*

Lagouvardou, S., Psaraftis, H. N., & Zis, T. (2020). A Literature Survey on Market-Based Measures for the Decarbonization of Shipping. *Sustainability, 12(10).*

Lieberman, M. B., & Montgomery, D. B. (1988). First-mover advantages. *Special Issue: Strategy Content Research, Volume 9, Issue S1*, 41-58.

Maersk. (2021). *A.P. Moller - Maersk ESG data overview 2021.* Copenhagen: Maersk.

Maersk. (2021). *Annual Report 2021.* Copenhagen: A. P. Moller-Maersk A/S.

Maersk. (2021). *Annual Sustainability Report.* Copenhagen: Maersk.

Maersk. (2022, May 2). *A.P. Moller - Maersk completes acquisition of Pilot Freight Services.* Retrieved from Maersk Press Releases: https://www.maersk.com/news/articles/2022/05/02/maerskcompletes-acquisition-of-pilot-freight-services

Maersk. (2022, March 10). *A.P. Moller - Maersk engages in strategic partnerships across the globe to scale green methanol production by 2025*. Retrieved from Maersk Press Releases: https://www.maersk.com/news/articles/2022/03/10/maersk-engages-in-strategicpartnerships-to-scale-green-methanol-production

Mallouppas, G., & Yfantis, E. A. (2021). Decarbonization in Shipping Industry: A Review of Research, Technology Development, and Innovation Proposals. *Journal of Maritime Scientific Engineering, 9(4).*

Manzanero, L. D., & Krupp, K. J. (2008). *Forecasting Container Freight Rates – An Econometric Analysis.* Copenhagen: Department of Economics, CBS.

March, J., & Olsen, J. (2011). *The Logic of Appropriateness.* Oxford: Oxford Handbooks Online.

McAleer, S. (2003). Friedman's Stockholder Theory of Corporate Moral Responsibility. *Teaching Business Ethics volume 7*, 437–451.

McKenna, P. (2020, February 1). Shipping Lines Turn to LNG-Powered Vessels, But They're Worse for the Climate. *Inside Climate News.*

McKinsey. (2018). *IMO 2020 and the outlook for marine fuels.* New York: McKinsey.

McKinsey&Company. (2021, August 23). *What's going on with shipping rates?* Retrieved from YouTube: https://www.youtube.com/watch?v=JVclnMdxpAI

Meltzer, J. P. (2014). A Carbon Tax as a Driver of Green Technology Innovation and the Implications for International Trade. *Energy Law Journal, Vol 35 No. 1.*

MSC. (2021). *Annual Report 2021.* Geneve: Medditeranian Shipping Company, S.A.

Notteboom, T., & Carriou, P. (2009). Fuel surcharge practices of container shipping lines: Is it about cost recovery or revenue making? *International Association of Maritime Economists (IAME)* .

Palley, T. I. (2007). Financialization: What It Is and Why It Matters. *The Levy Economics Institute and Economics for Democratic and Open Societies Working Paper No. 525.*

Perloff, J. M. (2018). Chapter 4: Consumer Choice. In J. M. Perloff, *Microeconomics Eigth Edition* (pp. 97143). Pearson.

Phillips, R., Freeman, E. R., & Wicks, A. C. (2015). *What Stakeholder Theory is Not.* Campbridge: Cambridge University Press.

Pigou, A. C. (1920). *The Economics of Welfare.* Cambridge: Cambridge University Press.

Pollack, M. (2007). Chapter 2: Rational Choice and EU Politics. In M. Pollack, K. Jorgensen, & R. Ben J, *The SAGE Handbook of European Union Politics* (pp. 31-57). London: SAGE Publications.

Qadir, S. A., Al-Motairib, H., Tahirc, F., & Al-Fagihcd, L. (2021). Incentives and strategies for financing the renewable energy transition: A review. *Energy Reports Volume 7*, 3590-3606.

Richardson, S., Teoh, S. H., & Wysosci, P. D. (2010). The Walk-down to Beatable Analyst Forecasts: The Role of Equity Issuance and Insider Trading Incentives. *Contemporary Accounting Research, Vol 21, issue 4*, 885-924.

Ritchie, H. (2020, October 22). Climate change and flying: what share of global CO2 emissions come from aviation? *Our World In Data.*

Rosenbaum, J., & Pearl, J. (2014). *Valuation, Leveraged Buyouts, and Mergers & Acquisitions.* New Jersey: Wiley.

Sayer, A. (2000). *Realism and social science.* London : SAGE Publications.

Serafeim, G., Horton, J., & Wu, S. (2015, June 05). How Banking Analysts' Biases Benefit Everyone Except Investors. *Harvard Business Review.*

Shell, & Deloitte. (2020). *Decarbonising Shipping: All Hands on Deck.* Hague: Shell.

Shepsle, K. A. (2006). Chapter 2; Rational Choice Institutionalism. In R. E. Goodin, & S. A. Binder, *The Oxford Handbook of Political Institutions* (pp. 23-38). Oxford: Oxford Univesity Press.

Smith, T., Jalkanen, J., Anderson, B., Corbett, J., Faber, J., Hanayama, S., & Pandey, A. (2014). Third Imo Greenhouse Gas Study 2014. *IMO*, 327.

Sprengel, D. C., & Busch, T. (2011). Stakeholder engagement and environmental strategy - the case of climate change. *Business strategy and the environment, Vol.20 (6)*, 351-364.

Statbank. (2022, May 2). *Effektiv Rente af Statsobligationer efter Land - Danmark*. Retrieved from Statbank: https://www.statbank.dk/statbank5a/SelectVarVal/saveselections.asp

Statista. (2021, June). *Average market risk premium (MRP) in Denmark from 2011 to 2021*. Retrieved from Statista: https://www.statista.com/statistics/664822/average-market-risk-premium-denmarkeurope/

Statista. (2022). *Leading ship operator's share of the world liner fleet as of April 30, 2022.* London: Statista.

Steiger, F. (2008). *The Validity of Company Valuation.* European Business School.

Sterling, J. (2022, May 15). Attempted Interview: Maersk Head of Decarbonization. (M. Thostrup, & M. M. Nielsen, Interviewers)

Stratiotis, E. (2018, January 22). Fuel Costs in Ocean Shipping. *MoreThanShipping*.

Sørås, G. (2021). *Carbon cost enters the maritime everyday business.* Stavanger: Siglar Carbon.

Sørås, G., & Asprou, N. (2021, July 28). *Siglar Carbon*. Retrieved from Three ways in which the EU's "Fit for 55" package affects ship and cargo owners: https://www.siglarcarbon.com/post/threeways-in-which-the-eus-fit-for-55-package-affects-ship-and-cargo-owners

Tuominen, M. (2022). *'Fit for 55' package: Fuel EU Maritime.* Brussels: European Parliamentary Research Service.

Tuominen, M. (2022). *'Fit for 55' package: Fuel EU Maritime.* Brussels: European Parliament.

United Nations. (2022). *The Climate Crisis – A Race We Can Win.* New York: United Nations.

United-Nations. (2015). *Adoption of the Paris Agreement FCCC/CP/2015/L.9/Rev1.* Paris: United Nations Framework Convention on Climate Change.

Wan, Z., el Makhloufi, A., Chen, Y., & Tang, J. (2018). Decarbonizing the international shipping industry: Solutions and policy recommendations. *Marine Pollution Bulletin, Volume 126*, 428-435.

Wang, J., Wang, S., & Li, H. (2022). *The Impact of Energy Tax on Carbon Emission Mitigation: An Integrated Analysis Using CGE and SDA.* Beijing: School of Economics, Peking University.

Williamson, P. (2016). Emissions reduction: Scrutinize CO2 removal methods. *Nature, vol. 530*, 153– 155.

Wittels, J. (2021, June 2). Maersk Seeks $150-a-Ton Carbon Tax on Shipping Fuel. *Bloomberg, Europe Edition.*

World Bank. (2021). *World Bank: Natural Gas Price Forecast.* Washington DC: World Bank.

Yang Ming Marine. (2021). *Annual Report 2021.* Keelung City: Yang Ming Marine Transport Corporation.

9.0 Appendix

9.1:

Z. Wan et al. Marine Pollution Bulletin 126 (2018) 428–435

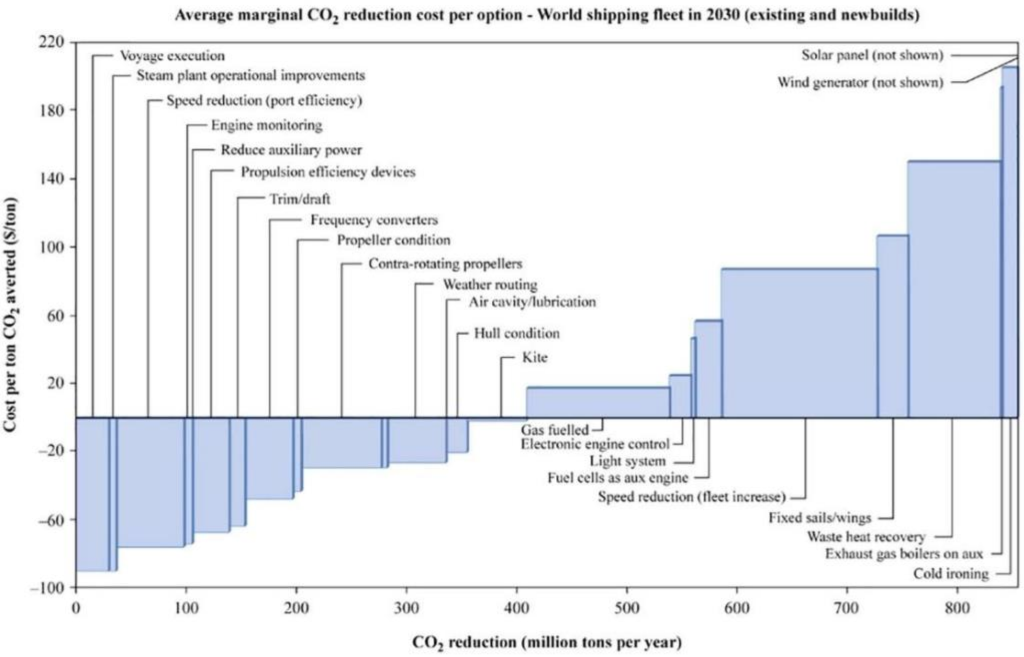


Fig. 3. Average marginal CO_2 reduction cost per option
Figure adapted from the study by Eide et al. (2011). Cost-effective solutions are mainly operational ones, such as slow steaming and weather routing. In contrast, many technical solutions carry a hefty price tag that offers no incentive to the industry to invest—the average CO_2 reduction cost is 50–200 USD/ton, which is far more expensive than the emission-trading price of $5–15/ton in the United States. Carbon trading is favored by many economists and industry because it will lower the compliance cost while meeting the emission reduction target.

9.2:

AP Moller-Maersk A/S

Benchmarking Analysis – Financial Statistics and Ratios, Page 1

($ in millions, except per share data)

Company	Ticker	Market Valuation: Equity Value	Market Valuation: Enterprise Value	LTM Financial Statistics: Sales	Gross Profit	EBITDA	EBIT	Net Income	LTM Profitability Margins: Gross Profit (%)	EBITDA (%)	EBIT (%)	Net Income (%)	Growth Rates: Sales Hist. 1-year	Sales Est. 1-year	EBITDA Hist. 1-year	EBITDA Est. 1-year	EPS Hist. 1-year	EPS Est. 1-year	EPS Est. LT
AP Moller-Maersk A/S	MAERSKB DC	$51,141	$55,355	$61,787	$19,279	$23,780	$19,188	$18,027	31%	38%	31%	29%	55%	22%	188%	33%	515%	41%	1%
Tier I: Most Comparable Marine Shipping Firms																			
HMM CO LTD	011200 KS	$23,852	$23,268	$12,053	$6,779	$7,118	$6,546	$4,538	56%	59%	54%	38%	121%	8%	387%	10%	9802%	229%	1%
Yang Ming Marine Transpc	2609 TT	15,188	9,672	11,947	7,631	7,898	7,271	5,918	64%	66%	61%	50%	133%	13%	551%	9%	1302%	9%	1%
COSCO Shipping Holdings	1919 HK	25,338	23,100	58,347	25,310	25,151	23,126	15,676	43%	43%	40%	27%	108%	6%	463%	4%	984%	4%	1%
Hapag-Lloyd AG	HLAG GR	74,777	72,009	26,344	11,025	12,807	11,073	10,734	42%	49%	42%	41%	0%	0%	0%	0%	0%	0%	-36%
Evergreen Marine Corp	2603 TT	26,827	21,411	20,431	20,431	20,677	19,802	17,953	100%	101%	97%	88%	149%	19%	481%	23%	863%	23%	1%
Mean									61%	64%	59%	49%	102%	9%	377%	9%	2590%	53%	-7%
Median									56%	59%	54%	41%	121%	8%	463%	9%	984%	9%	1%
Tier II: Comparable Marine Shipping Firms																			
Wan Hai Lines LTD	FFF	$12,420	$12,420	$8,163	$4,821	$4,571	$4,571	$3,703	59%	56%	56%	45%	194%	18%	951%	11%	950%	-1%	0%
Danos Corp	DAC US	1,651	1,651	690	402	475	358	401	58%	69%	52%	58%	50%	26%	58%	47%	209%	24%	0%
Orient Overseas INTL LTD	316 HK	17,706	13,145	16,832	8,176	7,929	7,359	7,129	49%	47%	44%	42%	105%	19%	471%	15%	669%	18%	0%
Kawasaki Kisen Kaisha LT	9107 JP	6,141	8,357	6,741	671	613	232	5,652	10%	9%	3%	84%	14%	-15%	35%	-20%	494%	-28%	0%
Mitsui OSK LINES LTD	9104 JP	9,146	17,026	11,304	1,353	1,340	570	6,287	12%	12%	5%	56%	21%	-14%	170%	-11%	573%	-30%	1%
Mean									38%	39%	32%	57%	77%	7%	337%	8%	579%	-3%	0%
Median									49%	47%	44%	56%	50%	18%	170%	11%	573%	-1%	0%

9.3:

($ in millions, fiscal year ending December 31)

Returns Analysis

			Projection Period									
		Pro forma 2021	Year 1 2022	Year 2 2023	Year 3 2024	Year 4 2025	Year 5 2026	Year 6 2027	Year 7 2028	Year 8 2029	Year 9 2030	Year 10 2031
Entry EBITDA Multiple	2.3											
Initial Equity Investment		$20,384.2										
EBITDA			$31,534.7	$15,848.8	$10,886.9	$10,530.5	$11,394.0	$11,621.9	$11,854.4	$12,091.4	$12,333.3	$12,579.9
Exit EBITDA Multiple	5											
Enterprise Value at Exit			$157,673.6	$79,244.2	$54,434.7	$52,652.7	$56,970.2	$58,109.6	$59,271.8	$60,457.2	$61,666.3	$62,899.7
Less: Net Debt												
Revolving Credit Facility			-	$878.1	$5,251.2	$717.7	-	-	-	-	-	-
Term Loan A			-	-	-	-	-	-	-	-	-	-
Term Loan B			26,630.0	17,117.4	7,604.8	7,604.8	1,021.8	-	-	-	-	-
Term Loan C			-	-	-	-	-	-	-	-	-	-
Existing Term Loan			-	-	-	-	-	-	-	-	-	-
2nd Lien			-	-	-	-	-	-	-	-	-	-
Senior Notes			-	-	-	-	-	-	-	-	-	-
Senior Subordinated Notes			-	-	-	-	-	-	-	-	-	-
Other Debt			-	-	-	-	-	-	-	-	-	-
Total Debt			$26,630.0	$17,995.5	$12,855.9	$8,322.4	$1,021.8	-	-	-	-	-
Less: Cash and Cash Equivalents			11,832.0	11,832.0	11,832.0	11,832.0	11,832.0	16,899.0	23,241.9	29,837.2	36,692.3	43,815.3
Net Debt			$14,798.0	$6,163.5	$1,023.9	($3,509.6)	($10,810.2)	($16,899.0)	($23,241.9)	($29,837.2)	($36,692.3)	($43,815.3)
Equity Value at Exit			$142,875.6	$73,080.7	$53,410.8	$56,162.2	$67,780.3	$75,008.6	$82,513.7	$90,294.3	$98,358.6	$106,714.9
Cash Return			7.0x	3.6x	2.6x	2.8x	3.3x	3.7x	4.0x	4.4x	4.8x	5.2x

	Year 1 2022	Year 2 2023	Year 3 2024	Year 4 2025	Year 5 2026	Year 6 2027	Year 7 2028	Year 8 2029	Year 9 2030	Year 10 2031
Initial Equity Investment	($20,384.2)	($20,384.2)	($20,384.2)	($20,384.2)	($20,384.2)	($20,384.2)	($20,384.2)	($20,384.2)	($20,384.2)	($20,384.2)
Equity Proceeds	$142,875.6	-	-	-	-	-	-	-	-	-
		$73,080.7	-	-	-	-	-	-	-	-
			$53,410.8	-	-	-	-	-	-	-
				$56,162.2	-	-	-	-	-	-
					$67,780.3	-	-	-	-	-
						$75,008.6	-	-	-	-
							$82,513.7	-	-	-
								$90,294.3	-	-
									$98,358.6	-
										$106,714.9
IRR	600.9%	89.3%	37.9%	28.8%	27.2%	24.3%	22.1%	20.4%	19.1%	18.0%

9.4:

ValueCo Corporation
Discounted Cash Flow Analysis
($ in millions, fiscal year ending December 31) Operating Scenario Base

		Historical Period			CAGR		Projection Period					CAGR
Operating Scenario	1											
Mid-Year Convention	Y	2018	2019	2020	('18- '20)	2021	2022	2023	2024	2025	2026	('22 - '26)
Sales		$39,280.0	$38,890.0	$39,740.0	0.6%	$61,787.0	$75,441.9	$60,957.1	$57,299.7	$58,502.9	$63,300.2	0.5%
% growth		NA	(1.0%)	2.2%		55.5%	22.1%	(19.2%)	(6.0%)	2.1%	8.2%	
Cost of Goods Sold		23,018.0	20,319.0	18,856.0		21,911.0	26,781.9	27,430.7	28,306.0	29,251.5	31,650.1	
Gross Profit		$16,262.0	$18,571.0	$20,884.0	13.3%	$39,876.0	$48,660.0	$33,526.4	$28,993.6	$29,251.5	$31,650.1	-4.5%
% margin		41.4%	47.8%	52.6%		64.5%	64.5%	55.0%	50.6%	50.0%	50.0%	
Selling, Administrative, other income/costs		12,453.0	12,859.0	12,658.0		15,840.0	17,125.3	17,677.6	18,106.7	18,720.9	20,256.1	
EBITDA		$3,809.0	$5,712.0	$8,226.0	47.0%	$24,036.0	$31,534.7	$15,848.8	$10,886.9	$10,530.5	$11,394.0	-13.9%
% margin		9.7%	14.7%	20.7%		38.9%	41.8%	26.0%	19.0%	18.0%	18.0%	
D&A, net gain from asset sale and joint ventures		3,588.0	3,987.0	4,040.0		4,362.0	5,353.5	5,010.6	5,428.3	5,475.5	6,656.0	
EBIT		$221.0	$1,725.0	$4,186.0	335.2%	$19,674.0	$26,181.2	$10,838.2	$5,458.6	$5,055.0	$4,738.0	-24.8%
% margin		0.6%	4.4%	10.5%		31.8%	34.7%	17.8%	9.5%	8.6%	7.5%	
Taxes		397.8	458.0	406.9		678.9	5,759.9	2,384.4	1,200.9	1,112.1	1,042.4	
EBIAT		($176.8)	$1,267.0	$3,779.1	-	$18,995.1	$20,421.3	$8,453.8	$4,257.7	$3,942.9	$3,695.6	-27.9%
Plus: Depreciation & Amortization		3,196.0	4,265.0	4,378.0		4,592.0	5,353.5	5,010.6	5,428.3	5,475.5	6,656.0	
Less: Capital Expenditures		(3,219.0)	(2,035.0)	(1,322.0)		(2,976.0)	(4,451.1)	(5,608.1)	(4,813.2)	(4,914.2)	(3,291.6)	
Less: Inc./(Dec.) in Net Working Capital		(2,275.0)	(1,594.0)	202.0		(5,595.0)	733.2	1,996.2	664.2	59.1	(72.9)	
Unlevered Free Cash Flow		($2,474.8)	$1,903.0	$7,037.1		$15,016.1	$22,057.0	$9,852.5	$5,537.0	$4,563.3	$6,987.1	
WACC		7.76%										
Discount Period							0.5	1.5	2.5	3.5	4.5	
Discount Factor							0.96	0.89	0.83	0.77	0.71	
Present Value of Free Cash Flow							$21,248.0	$8,807.7	$4,593.4	$3,513.0	$4,991.6	

Enterprise Value	
Cumulative Present Value of FCF	$43,153.6
Terminal Value	
Terminal Year EBITDA (2026E)	$11,394.0
Exit Multiple	2.5x
Terminal Value	$28,485.1
Discount Factor	0.69
Present Value of Terminal Value	$19,603.3
% of Enterprise Value	31.2%
Enterprise Value	$62,757.0

Implied Equity Value and Share Price	
Enterprise Value	$62,757.0
Less: Total Debt	-
Less: Preferred Stock	-
Less: Noncontrolling Interest	(1,080.0)
Plus: Cash and Cash Equivalents	12,153.0
Implied Equity Value	$73,830.0
Fully Diluted Shares Outstanding	19.00
Implied Share Price	$3,885.42

Implied Perpetuity Growth Rate	
Terminal Year Free Cash Flow (2026E)	$6,987.1
WACC	7.8%
Terminal Value	$28,485.1
Implied Perpetuity Growth Rate	(14.1%)

Implied EV/EBITDA	
Enterprise Value	$62,757.0
LTM 31/12/2021 EBITDA	24,036.0
Implied EV/EBITDA	2.61x

9.5:

9.6:

Assumptions Page 1 - Income Statement and Cash Flow Statement		Year 1 2022	Year 2 2023	Year 3 2024	Year 4 2025	Year 5 2026
Cost of Goods Sold (% sales)		35.5%	45.3%	49.9%	50.7%	50.9%
Base	1	35.5%	45.0%	49.4%	50.0%	50.0%
Status Quo	2	35.5%	45.3%	49.9%	50.7%	50.9%

9.7:

Assumptions Page 1 - Income Statement and Cash Flow Statement		Year 1 2022	Year 2 2023	Year 3 2024	Year 4 2025	Year 5 2026
Cost of Goods Sold (% sales)		36.4%	46.5%	51.1%	52.2%	52.7%
Base	1	35.5%	45.0%	49.4%	50.0%	50.0%
Status Quo	2	35.5%	45.3%	49.9%	50.7%	50.9%
Scale Logistics & Services (L&S)	3	36.4%	46.5%	51.1%	52.2%	52.7%

9.8:

Assumptions Page 1 - Income Statement and Cash Flow Statement		Year 1 2022	Year 2 2023	Year 3 2024	Year 4 2025	Year 5 2026
Cost of Goods Sold (% sales)		35.5%	45.3%	50.1%	51.7%	52.3%
Base	1	35.5%	45.0%	49.4%	50.0%	50.0%
Status Quo	2	35.5%	45.3%	49.9%	50.7%	50.9%
Scale Logistics & Services (L&S)	3	36.4%	46.5%	51.1%	52.2%	52.7%
Scale E-methanol (RLF)	4	35.5%	45.3%	50.1%	51.7%	52.3%

9.9:

Assumptions Page 1 - Income Statement and Cash Flow Statement		Year 1 2022	Year 2 2023	Year 3 2024	Year 4 2025	Year 5 2026
Cost of Goods Sold (% sales)		35.5%	51.7%	56.4%	57.3%	57.0%
Base	1	35.5%	45.0%	49.4%	50.0%	50.0%
Status Quo	2	35.5%	45.3%	49.9%	50.7%	50.9%
Scale Logistics & Services (L&S)	3	36.4%	46.5%	51.1%	52.2%	52.7%
Scale E-methanol (RLF)	4	35.5%	45.3%	50.1%	51.7%	52.3%
Higher Tax & E-methanol	5	35.5%	51.7%	56.4%	57.3%	57.0%