Evaluating the impact of IMO 2020 on the container shipping industry.

by

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DECLARATION

I, the undersigned, **Kavitha Lutchman**, hereby declare that: the research reported in this dissertation, except where otherwise indicated, is my original work. This dissertation has not been submitted for any degree or examination at any other university. This dissertation does not contain other persons' writing, unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then: their words have been re-written, but the general information attributed to them has been referenced, where their exact words have been relied on, their writing has been clearly indicated as a quotation and referenced.

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SIGNED — DATE

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2. LIST OF ABBREVIATIONS

ACRONYM	DESCRIPTION
IMO	International Maritime Organisation
MAERSK	A.P. Møller – Mærsk A/S
SOx	Sulphur Oxide
NOx	Nitrogen Oxide
PM	Particulate Matter
NHTSA	National Highway Safety Administration
UNFCCC	United Nations Framework Conference on Climate Change
MARPOL	International Convention for the Prevention of Pollution from Ships
ECA	Emission Control Areas
CAC	Command and Control
EI	Economic Incentives
MAC	Marginal Abatement Cost Curves
ETS	Emission Trading Systems
LNG	Liquified Natural Gas
PPR	Pollution Prevention and Response
EEXI	Energy Efficiency Existing Ships Index
CII	Carbon Intensity Indicators
SEEMP	Ship Energy Efficiency Management Plan
VLSFO	Very low-sulphur fuel oil
HSFO	High-sulphur fuel oil
MAC	Maritime and Coastguard Agency
TEU	Twenty-foot equivalent units
BAF	Bunker Adjustment Fee

EGCS	Exhaust Gas Cleaning System
MDO	Marine Diesel Oil
EPA	Environmental Protection Agency
CBDR	Common but Differentiated Responsibilities
NMFT	No More Favourable Treatment
MEPC	Marine Environment Protection Committee

3. ABSTRACT

MARPOL Annex VI agreement (IMO 2020) entered into force in January 2020, seeking to reduce sulphur emissions in the global shipping industry arising from ships burning high sulphur bunker fuel. The regulation is estimated to cost the industry up to US$ 30 billion and offers no apparent direct benefit or advantage to the industry, as well as being ill-designed for effective enforcement. Shipowners who plan to comply have called for modifications to the regulation to address opportunities for non-compliance so that their good faith will not become a competitive disadvantage. These concerns around compliance are just one of the areas in which the efficacy of this regulation is being questioned. This paper takes a structured approach to assess the efficacy of this regulation in terms of four explicit goals: realising the necessary reduction in global sulphur emissions, achieving high compliance, encouraging continuous improvement in technology and business practices, and not unduly damaging the global shipping industry.

These goals are assessed across five chapters, the first of which interrogates the legal framework of the regulation, exploring the complicated question of regulatory authority, with a special focus on the enforcement mechanisms and the catastrophic effect of the COVID-19 pandemic on basic enforcement processes. The next chapter investigates the likely impact on the industry, contrasting the impact of market-based regulations and control and command type regulations, and different tools such as permits and taxes. This chapter also discusses the emerging disagreement between developing and developed countries over who should be responsible for the costs of environmental reform. Next, a case study of A.P. Møller – Mærsk A/S (Maersk) explores the compliance experience of the largest shipping company in the world, including their internal structuring to deliver compliance, and their pricing adjustments to offset some of the costs. The following chapter evaluates the practical and economic costs of this regulation across all major elements of the global shipping industry. The penultimate chapter makes an effort to predict what the long-term impact of this regulation is likely to be, using two different models for evaluating the interactions between profit-seeking industries and new environmental regulations in general: the Porter Hypothesis and the Polluter Haven Hypothesis. The final chapter concludes the paper with an evaluation of the regulation, and some suggested next steps which could improve the likelihood that the long-term goals of IMO 2020 will be realised.

CHAPTER 1 INTRODUCTION

I Aim

To evaluate IMO 2020 and determine whether it is likely to be effective, which for the purposes of this dissertation is defined as realising the necessary reduction in global sulphur emissions, achieving high compliance, encouraging continuous improvement in technology and business practices, and not unduly damaging the global shipping industry.

II Thesis

IMO 2020 is an imperfectly drafted regulation as it raises significant questions around the incentives to encourage compliance within the shipping industry, and the limitations of its enforcement mechanism and these must be addressed. The regulation came into force in the context of a major pandemic that has upended global trade and shipping operations. The context of global climate emergency means that the stakes are high, and it is essential to evaluate this regulation in legal and practical terms, now that it has come into effect.

III Background

The shipping industry contributes 13% of all greenhouse gas emissions via the sulphur emissions from burning bunker fuel. The International Convention for the Prevention of Pollution from Ships MARPOL Annex VI agreement was signed in 2008 between member countries of the International Maritime Organization (IMO).[1] The agreement stipulated that sulphur oxide (SOx) levels in maritime transport had to be reduced globally by 2025.[2] The regulation, commonly referred to as 'IMO 2020', entered into force in January 2020.

IMO 2020 addresses air pollution arising from sulphur emissions through maritime ships' utilisation of fuel oil (bunker fuel) by decreasing the allowed sulphur content by 80 per cent.[3] IMO 2020 identifies three particularly viable and effective technological changes that can be made to a ship to dramatically reduce emissions: using low sulphur fuel, installing scrubbers at the point of emission which removes the sulphur from the emissions and switching fuel to LNG. Compliance by the shipping industry is estimated to cost up to approximately USD30 billion in fuel costs between 2020 and 2023.[4]

[1]Annex VI of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78).
[2]Ibid.
[3]Annex VI of MARPOL 73/78 contains the regulations for the prevention of air pollution from ships of which regulation 14 deals with sulphur oxides (SO_X). Regulation 14(1) contains the sulphur content limitation of any fuel oil used onboard ships.
[4]C Egloff, R G Escudero, et al *Sharing the Costs of IMO 2020 Across the Ecosystem* available at *https://www.bcg.com/publications* accessed on 15 March 2020.

The design of the regulation influences the compliance from the industry - it must be designed in such a way as to be advantageous to the industry, especially as the cost of implementing the regulation falls to the industry. This cost may have an impact on the future competitiveness of the industry, with concerns of non-compliance being raised by industry stakeholders including Maersk and Hapag Lloyd.[5] These large shipping lines which intend to comply fully have expressed concern that they will lose competitive advantage if no enforcement mechanism is in place to prevent cheating. The shipowners who planned to adopt the lower sulphur emissions target called for measures to be put into place by the IMO to address non-compliance risks so that compliant organisations would not be placed at a competitive disadvantage by complying with IMO 2020.[6] Environmental regulations have succeeded or failed in the past based on their design, the existence of good and uniform structures to enforce compliance, and also the buy-in of the industry that is being regulated. In addition, the shipping industry has also been affected by the global pandemic, wreaking havoc with oil prices and global trade flows, shutting down whole ports and interrupting regulatory processes

Addressing greenhouse gas emissions in general, there is also an ongoing discussion between developing and developed nations on international measures being put into place to reduce greenhouse gas emissions. There are theories in the area of business studies, including the Porter Hypothesis discussed in this dissertation that suggest that, after the initial period of adjustment, companies adapting to new regulations ultimately become more competitive, and the industry can thrive as a result. The dissertation also reviews competing theories like the Pollution Haven Hypothesis which argue that regulation is likely to encourage polluters to seek out safe havens around the world, where regulations are barely enforced - in this case, ports with more lenient regulatory or enforcement mechanisms.

IV Outline

Chapter 1 introduces the topic and outlines the complexity of the business incentives, global enforcement environments and technological options under consideration. It also emphasises the seriousness of the situation and the urgent need for effective regulation to play a major role in reducing sulphur emissions from the shipping industry. The chapter also includes a literature

See also, Press Release 'IMO 2020 regulation could cost shippers extra US$60 billion a year', Wood Mackenzie, available at *https://www.woodmac.com* accessed on 15 March 2020.

[5]Maersk News Article 'Air Emissions' available at *https://www.maersk.com/news/articles/2019/04/03/air-emissions* accessed on 1 June 2020. See also Hapag Lloyd Press Presentation available at *https://www.hapag-lloyd.com/content/dam/website/downloads/press_and_media/publications/HapagLloyd_Presentation_IMO2020_For_greener_shipping.pdf* accessed on 5 June 2020.

[6]Ibid.

review of the scholarly articles that address the impact of this regulation on the global shipping industry.

Chapter 2 discusses the legal framework and will analyse what kind of regulation IMO 2020 is, and assess whether it is designed to be effective. The scope and authority of the regulation will be addressed as well as the enforcement mechanisms of IMO 2020. This chapter will discuss the unique challenges of enforcing this regulation across so many nations and ports, and finally the impact of the COVID-19 pandemic on the current status and practical enforcement of the regulation.

In Chapter 3, the regulation is assessed for likely impact on the shipping industry by contrasting command and control type regulations with market-based regulations, which offer different visions of how good regulations are built. This chapter will also address the choice of regulatory tools in the form of permits and taxes and their relative efficacy. In this chapter, there is also the first indication of substantial disagreement between developed and developing nations as to who should pay the price for environmental reform in the industry.

Chapter 4 brings the practical experience of IMO 2020 compliance through a case study of Maersk. It discusses the sheer scale of operations at Maersk and the breadth of regulatory compliance experiences that such a large shipping line will encounter around the globe. Then, the chapter moves on to the corporate reshuffle undertaken by Maersk to organise and enact the necessary work to be done. This includes a description of some of the technological and operational implementation challenges experienced by Maersk, and the pricing adjustments that had to be made to offset substantial compliance costs.

Chapter 5 will assess the cost of compliance with IMO 2020 to both shipping lines and ports, and the impact those costs are likely to have on the global shipping industry. This will cover questions about how compliance is to be measured and the practical tasks that ports will have to perform. Furthermore, the chapter will address the technological options available to shipping lines to achieve compliance, namely low sulphur fuels, scrubbers and alternative fuels such as LNG, judging the likely popularity of these different options for different business cases.

Chapter 6 attempts to predict the long-term outcomes of IMO 2020, using two contrasting business frameworks: the Porter Hypothesis, and the Polluter Haven Hypothesis. These two approaches will be used to review the likely business industry response to this regulation, in the long run, comparing the prediction of innovation and competitiveness suggested by the Porter Hypothesis, with the prediction of avoidance and lawlessness as suggested by the Pollution Haven Hypothesis.

The conclusion summarises the insights in these chapters, aiming to produce a clear evaluation of the IMO 2020 regulation in terms of effectiveness.

V Significance of the dissertation

This dissertation examines how IMO 2020 is designed and identifies the gaps that could be addressed to incentivise the shipping industry to comply with the regulation. The IMO 2020 regulation addresses air pollution arising from sulphur emissions through bunker fuel by decreasing the allowed SOx content.[7] Sulphur emissions through air pollution contribute to the acidification of the oceans and increased acid rain and have a negative impact on human health through respiratory symptoms and lung disease.[8] While the regulation is acknowledged as necessary to address the harmful effects of sulphur emissions it affords no direct benefit or advantage to the shipping industry. In addition, it simultaneously imposes an estimated cost of up to US$ 30 billion between 2020 and 2023, with bunker fuel costs being the highest costs faced by the shipping industry.[9] The high cost combined with the lack of direct advantage to the industry raises the risk of non-compliance. This dissertation is important to address the potential compliance and operating challenges which the shipping industry could encounter. The value of this dissertation lies in its contribution to the limited literature on the future of the container shipping industry's business processes from the tightening environmental regulation perspective.

VI Scope and Limitations

This dissertation focuses only on the container shipping industry, not the entire maritime industry. It also excludes other industries that are impacted by IMO 2020 like refineries, bunker fuel suppliers. The dissertation excludes individual Port and Flag States adoption into national law. As IMO 2020 entered into force in January 2020[10], there is limited literature available at the time of writing, leading to a reliance on historical international law literature and internet sources for current research and status updates.

[7] Annex VI of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978.

[8] Ibid.

[9] United Nations Conference on Trade and Development 'Review of Maritime Transport 2019' available at *https://unctad.org/webflyer/review-maritime-transport-2019, a*ccessed on 13 March 2020. International Maritime Organization. Press Briefing available at *https://www.imo.org/en/MediaCentre/PressBriefings/Pages/27-sulphur-2020-roundtable-.aspx a*ccessed on 15 March 2020.

[10] International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978, Annex VI

VII Literature Review

Since IMO 2020 came into force on 1 January 2020, several studies and scholarly views have emerged on the impact of the regulation on the shipping industry. Important lessons can be drawn on how IMO 2020 can be enhanced to be more industry-focused. This section discusses the various scholarly views on IMO 2020 and its relationship with the shipping industry.

A preliminary review of the current literature on the topic included reports, journals and cases as well as press releases and internet publications. Michael E. Porter and Claas van der Linde in their study entitled *Toward a New Conception of the Environment-Competitiveness Relationship*, writing in 1995[11] advocated the concept that environmental regulation can trigger innovation and lead to increased competitiveness and some extent improved performance to the industry.[12]

Stefan Ambec, Mark A. Cohen, Stewart Elgie, and Paul Lanoie in the study *The Porter Hypothesis at 20. Can Environmental Regulation Enhance Innovation and Competitiveness*[13] provides an overview of the key theoretical and empirical insights on Porter Hypothesis in the twenty years since it was originally published.[14]

Daniel J. Fiorino writing for the journal Environmental Law in 1996, in the work entitled *Toward a new system of Environmental Regulation: The case for an industry sector approach* promotes a discussion on whether regulatory systems should be more industry-focused.[15]

The research obtained from the Yale Journal on Regulation, entitled *From Command and Control to Collaboration and Deference: The Transformation of Auto Safety Regulation* describes the evolution of motor vehicle safety regulation adopted by the National Highway Safety Administration (NHTSA), including the utilisation of existing technologies from an initial focus on recalls, moving on to a model of 'cooperative regulation'.[16]

Yale Journal on Regulation also produced research on *The Law of the Test: Performance-Based Regulation and Diesel Emissions Control*.[17] This study conducts an analysis of United

[11]Michael E. Porter and Claas van der Linde 'Toward a New Conception of the Environment-Competitiveness Relationship' (1995) 9(4) *Journal of Economic Perspectives* 97-118

[12]Ibid.

[13]Stefan Ambec, Mark A. Cohen, Stewart Elgie, and Paul Lanoie 'The Porter Hypothesis at 20. Can Environmental Regulation Enhance Innovation and Competitiveness?' (2011) *RFF DP* 11-01.

[14]Ibid.

[15]Daniel J. Fiorino 'Toward a new system of Environmental Regulation: The case for an industry sector approach' (1996) 26 Environmental Law 457-488.

[16]Jerry L. Mashaw and David L. Harfst 'From Command and Control to Collaboration and Deference: The Transformation of Auto Safety Regulation' (2017) 34 *Yale*.

[17]Cary Coglianese & Jennifer Nash 'The Law of the Test: Performance-Based Regulation and Diesel Emissions Control' (2017) 34 *Yale.*

States of America's diesel emissions control to learn how performance-based regulation works in action and its relation to regulators broader policy objectives.[18]

Jody Freeman and Charles D. Kolstad entitled *Moving to Markets in Environmental Regulation: Lessons from Twenty Years of Experience*[19] which is a collection of essays proposing that market-based incentives have become the regulatory instrument used to resolve environmental challenges and discusses whether regulatory instruments are purely market-based or purely prescriptive, as well as the challenges posed by their design and failures of monitoring and enforcement.[20]

Bettina Lange's book titled *Implementing EU Pollution Control. Law and Integration.*[21] examines the role of law in European Union integration processes through the implementation of the EU Directive on Integrated Pollution Prevention and Control at European Level and in the UK and Germany. The relevant chapters within the book review how the key legal obligation of the Directive, to employ 'the best available techniques', is implemented.[22]

The United States Environmental Protection Agency issued *Guidelines for Preparing Economic Analyses: Regulatory and Non-Regulatory Approaches to Pollution Control*[23] a report which provides the guidelines issued by US EPA, an evaluation of the effectiveness of regulatory and non-regulatory approaches; and outlines the general approaches to environmental policy making including command-and-control and market-based incentives[24]

Apollonia Miola, Biagio Ciuffo, Emiliano Giovine, Marleen Marra, writing in 2010 for the Joint Research Centre of the European Commission on *Regulating Air Emissions from Ships. The State of the Art on Methodologies, Technologies and Policy Options*,[25] created a report designed to provide analytical tools to help define a policy strategy for regulating air emissions from ships, including insights into how to design a sector-based policy strategy, the technologies that might be used to reduce fuel consumption and pollutant emissions and the

[18]Ibid.
[19]Jody Freeman and Charles D. Kolstad *Moving to Markets in Environmental Regulation: Lessons from Twenty Years of Experience*, 2006.
[20]Ibid.
[21]Lange, B. *Implementing EU Pollution Control: Law and Integration*, 2008.
[22]Ibid.
[23]United States Environmental Protection Agency Guidelines for Preparing Economic Analyses: *Regulatory and Non-Regulatory Approaches to Pollution Control* (Chapter 4) 1/22.
[24]Ibid.
[25]Joint Research Centre of the European Commission) *Regulating Air Emissions from Ships. The State of the Art on Methodologies, Technologies and Policy Options (EUR 24602 EN).*

cost of these technologies and the main elements of the European Union's position on regulating air emissions.[26]

McKinsey and Company produced the 2019 report called *Global Downstream Outlook* to 2035,[27] which provides an overview on prices and margins impact through the implementation of IMO 2020 on the light, heavy and diesel gasoline market.[28]

Robert N. Stavins, in 2004 wrote a discussion paper *Can an Effective Global Climate Treaty Be Based on Sound Science, Rational Economics, and Pragmatic Politics*[29] in which Stavins proposes a three-part policy architecture: one of which is a market-based policy instrument covering emissions trading, carbon taxes, or hybrids of the two, including a much-cited quote:

> when properly designed and implemented, market-based instruments allow any desired level of pollution clean-up to be realized at the lowest overall cost to society, by providing incentives for the greatest reductions in pollution by those firms that can achieve these reductions most cheaply.[30]

In 2020, Patrizia Serra and Gianfranco Fancello conducted research and produced a publication entitled *Towards the IMO's GHG Goals: A Critical Overview of the Perspectives and Challenges of the Main Options for Decarbonizing International Shipping*,[31] particularly focusing on the pros and cons of the most popular emission reduction options. The study also highlighted the main challenges and barriers to implementation and the potential facilitators that could promote a wider application.[32] While the article focuses on carbon dioxide, the literature relevant to sulphur dioxide will be extracted for this study. The study is also relevant because it focuses on the perspectives of both the policymakers and the shipowners.[33]

Ryan Peng, wrote an article entitled *Does Environmental Management Improve Financial Performance? A Meta-Analytical Review*[34] which discusses the relationship between corporate

[26]Ibid.
[27]McKinsey and Company (2019) *Global Downstream Outlook to 2035*.
[28]Ibid.
[29]HKS Faculty Research Working Paper Series HKS Working Paper No. RWP04-020 *Can an Effective Global Climate Treaty Be Based on Sound Science, Rational Economics, and Pragmatic Politics'* (2004).
[30]Ibid.
[31]Patrizia Serra and Gianfranco Fancello 'Towards the IMO's GHG Goals: A Critical Overview of the Perspectives and Challenges of the Main Options for Decarbonizing International Shipping' (2020) 12 *Sustainability*
[32]Ibid.
[33]Ibid.
[34]Ryan Peng 'Does Environmental Management Improve Financial Performance? A Meta-Analytical Review' 2014 *Social and Environmental Accountability Journal*.

environmental performance and financial performance.[35] The article assimilates prior research reviewing this relationship and addresses the apparently inconsistent results found previously through a meta-analysis of 52 studies over a 35-year period.[36]

Mohseni, S., van Hassel, E., Sys, C. et al. writing on an *Economic evaluation of alternative technologies to mitigate Sulphur emissions in maritime container transport from both the vessel owner and shipper perspective*[37] conducted a study that considers the three alternative fuels or technologies as the best transition solutions afforded to the shipping industry.[38]

Articles published online in 2020 since IMO 2020 came into force and referred to for the purposes of the study include Reuters Mike Blake's *Factbox: IMO 2020 - a major shake-up for oil and shipping*' March 2020;[39] CNBCs Sam Meridith '*A global shipping revolution is weeks away — Here are the likely winners and losers*' March 2020;[40] the Boston Consulting Group's Camille Egloff, Rodrigo Garcia Escudero, et al '*Sharing the Costs of IMO 2020 Across the Ecosystem*'[41] February 2020;[42] and Wood Mackenzie Press Release *IMO 2020 regulation could cost shippers extra US$60 billion a year*, March 2020.[43]

In conclusion, based on the scholarly articles, there is a consensus that IMO 2020 will significantly impact the container shipping industry but that this impact could be mitigated by the regulation being designed to be performance or market-based.

[35]Ibid.

[36]Ibid.

[37]Mohseni, S., van Hassel, E., Sys, C. *et al.* 'Economic evaluation of alternative technologies to mitigate Sulphur emissions in maritime container transport from both the vessel owner and shipper perspective' (2019) 4 Journal *of Shipping and Trade*

[38]Ibid.

[39]Mike Blake 'Factbox: IMO 2020 - a major shake-up for oil and shipping' *Reuters* March 2020 available at *https://uk.reuters.com/article/us-imo-shipping-factbox*.

[40]Sam Meridith 'A global shipping revolution is weeks away — Here are the likely winners and losers' available at *https://www.cnbc.com/2019/10/30/imo-2020-the-winners-and-losers-of-a-global-shipping-revolution.html*, accessed on 12 March 2020.

[41]Camille Egloff, Rodrigo Garcia Escudero, et al 'Sharing the Costs of IMO 2020 Across the Ecosystem' Boston Consulting Group available at *https://www.bcg.com/publications/2019/sharing-costs-imo-2020-across-ecosystem*, accessed on 15 March 2020.

[42]Ibid.

[43]Wood Mackenzie Press Release 'IMO 2020 regulation could cost shippers extra US$60 billion a year' available at *https://www.woodmac.com/press-releases/imo-2020-regulation-shippers-us$60-billion-year*, accessed on 13 March 2020.

CHAPTER 2 LEGAL FRAMEWORK

I Introduction

This chapter examines MARPOL Annex VI section 14, specifically IMO 2020[44] in relation to its impact on the container shipping industry and an assessment as to whether the regulation is well designed to be effective. As laid out in Chapter 1, for the purposes of this dissertation, the design of IMO 2020 would be judged as effective if it is likely to achieve a) high levels of compliance, b) the necessary reductions in emissions globally, c) continuous improvements in both technology and business practices in the shipping industry, and d) minimal destructive impacts on the shipping industry as a whole.

The assessment in this chapter will focus on the applicable regulatory aspects of IMO 2020 to achieve high levels of compliance and minimal destructive impact on the shipping industry. Towards this aim, the chapter further reviews the challenges posed by the lack of meaningful enforcement of IMO 2020, a common concern in international law, where countries must first adopt the regulation and then undertake the effort of enforcing compliance themselves when it enters into force. In addition, the chapter describes the steps in progress by IMO 2020 to address the enforcement challenge. With IMO 2020 having come into force on 1 January 2020, this chapter also reviews the current status and findings during that year insofar as they indicate how effective the regulation is in practice.

II IMO 2020

(a) Entry into Force

IMO 2020 came into effect on 1 January 2020 to regulate the reduction of sulphur oxides (SOx) emissions from ships.[45] It sets out the parameters for compliance by ship operators and owners and provides guidelines for the enforcement by governments and national authorities of Member States that are parties to IMO 2020.[46]

Since the 1970s, global shipping volumes have grown by as much as 300 per cent, with world seaborne trade volumes at a new all-time high of 11 billion tonnes in 2018.[47] This growth has resulted in emissions increasing and the shipping industry is amongst the largest emitters of sulphur oxides globally.[48] Regulators first discussed the issue of ships' noxious exhaust gases

[44]Annex VI of the MARPOL 73/78
[45]Ibid
[46]Ibid
[47]United Nations Conference on Trade and Development *Review of Maritime Transport* (2019) 15, available at *https://unctad.org/webflyer/review-maritime-transport-2019,* accessed on 13 March 2020.
[48]United Nations Conference on Trade and Development *Review of Maritime Transport* (2019) 17 available at *https://unctad.org/webflyer/review-maritime-transport-2019,* accessed on 13 March 2020.

at the first MARPOL Convention in 1973 but it was twenty-four years later in 1997 that the IMO adopted Annex VI. A further eight years later, the established limits on sulphur and nitrogen oxide emissions from ships entered into force. The standard was initially set at a 3.5 per cent sulphur cap in 2012, later revised to the 0.5 per cent cap set in 2020. Strong and effective regulation is urgently needed.

(b) Regulatory scope and authority

The regulatory preserve of international shipping resides mainly with the International Maritime Organisation (IMO), the specialized United Nations agency responsible for the prevention of marine pollution by ships and the safety and security of shipping activities.[49] The IMO has traditionally addressed the environmental impact of maritime activities by introducing international conventions and laws to regulate them.[50] In 1997, it was designated by the United Nations Framework Conference on Climate Change (UNFCCC) as the body responsible for regulating maritime emissions.[51]

The main measure implemented by the IMO is the International Convention for the Prevention of Pollution from Ships (MARPOL), which came into force in 1983 intending to prevent and minimize pollution caused by ships in both operational and accidental situations.[52] The MARPOL convention includes six technical Annexes, of which Annex VI regulates air pollution generated by ships.[53] Specifically, Annex VI establishes the limits of SOx, NOx and PM global emissions and introduces Emission Control Areas (ECAs) in which more stringent emission policies apply.[54] Annex VI, through IMO 2020[55] establishes a reduction of sulphur content in marine fuel oils to a value of 0.5 per cent by weight.[56] Regulation 14 of IMO 2020 also established certain SOx Emission Control Areas (ECAs) in which the sulphur limit is 0.01 since 2015 (Baltic Sea, North Sea, North American, United States the Caribbean Sea).[57]

[49] International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978, Annex VI
[50] Ibid.
[51] Ibid.
[52] Annex VI of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978.
[53] Ibid.
[54] Ibid.
[55] Ibid.
[56] Ibid.
[57] Ibid.

III IMO 2020 Enforcement Mechanisms

The enforcement of IMO 2020 must be actioned by all Member States to be effective. The shipping industry has raised concerns of risk-free non-compliance as a result of insufficient detection mechanisms, few penalties and a lack of robust regulatory structure.[58] Currently, no single global entity is responsible for enforcement or sanctions, as these fall under the responsibility of Flag and Port States.[59]

In each Member State, the regulation must be ratified into domestic law and currently, only 30 of the 91 Member States have sulphur regulations in place, so enforcement could differ significantly from one location to another, making consistent and effective enforcement a challenge.[60]

Strong enforcement mechanisms are essential if the global shipping industry is to comply. Without serious enforcement, the costs avoided through non-compliance amount to 'free money', testing the resolve of even the most ethical business. For the most part, these cost savings come in the form of cheap fuel: there is a significant price difference between IMO 2020-compliant 0.5 per cent sulphur marine fuel and HSFO.[61] The Pollution Prevention and Response (PPR) sub-committee of the IMO are the lead entity working on enforcement to create a global standard through the consistent implementation of the rule for marine fuels consumed on the open oceans.[62] Any plan the PPR puts forward will still hinge on Member State participation.

Even with Member State participation, creating an effective enforcement mechanism can be a challenge due to the overlapping authority of various stakeholders including the IMO, Flag States and Port States. As a specialized agency of the United Nations, the IMO itself has no direct authority to enforce the regulation.[63] Initially, only Flag States had the authority to enforce IMO 2020[64] and then PPR held its 5th meeting in London to continue work on IMO

[58]Thang Do 'IMO 2020 and effects on the shipping industry' available at *https://www.seahawk-investments.com/2019/08/28/imo-2020-and-effects-on-the-shipping-industry-2/?lang=en* accessed on 12 December 2020.

[59]International Maritime Organisation 'Sulphur 2020 – cutting sulphur oxide emissions' available at *https://www.imo.org/en/MediaCentre/HotTopics/Pages/Sulphur-2020.aspx* accessed 12 December 2020.

[60]United Nations Convention on the Law of the Sea - Part XII, 1982.

[61]McKinsey and Company (2019) *Global Downstream Outlook to 2035.*

[62]Annex VI of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978.

[63]Ibid.

[64]Guidelines for port State control under MARPOL Annex VI Chapter 3 available at *https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/MEPC.321(74).pdf* accessed 30 November 2020.

2020 enforcement options.[65] As an outcome of PPR 5, the sub-committee agreed to develop a single set of guidelines for consistent implementation of IMO 2020.[66]

(a) Progress on addressing the enforcement challenge

The PPR agreed on the elements that would be part of the draft Guidelines[67] and the outcome is four potential mechanisms for tightening enforcement of IMO 2020, which include 1) providing Port States with the authority to enforce IMO 2020 compliance;[68] 2) potential loss of insurance coverage for ships without onboard scrubbers found to have utilized HSFO;[69] 3) enlisting support from large receivers of shipped goods to utilize only compliant ships[70] and 4) prohibiting ships without onboard scrubbers from transporting fuel oil with a sulphur content greater than 0.5 per cent.[71]

It is still unclear how exactly these draft amendments will be enforced; however, they do redefine the audience that must be persuaded to enforce compliance. By bringing insurers and large receivers of shipped goods into the system as enforcers-by-proxy, there is a chance that non-compliance could carry substantial financial risk. Nominating Port States as a clear enforcement authority effectively puts the duty of reporting non-compliance on ports themselves, which have the benefit of seeing the ships refuel and assisting them with equipment and parts. Port States have far more opportunity to witness non-compliance, whereas Flag States may not see a ship for years, if at all. In addition, Flag States are often strategically selected for their lax enforcement of regulations and low taxes, and thus may make for poor partners in any enforcement system. A ship governed by a lax Flag State will probably have to call at many enforcement-minded ports during its lifetime, thereby encountering meaningful compliance

[65]International Maritime Organization, Sub-Committee on Pollution Prevention and Response (PPR), 5th session, 5-9 February 2018 available at *https://www.imo.org/en/MediaCentre/MeetingSummaries/PPR/Pages/PPR-5th-Session.aspx* accessed 13 December 2020.

[66]Ibid.

[67]Ibid.

[68]IMO has adopted 2019 Guidelines for port State control under MARPOL Annex VI Chapter 3.

[69]Loss of insurance coverage: It is believed that failure to comply with the global sulfur cap could potentially allow for a vessel to be deemed "unseaworthy" and so relieve the insurer of liability for any claim. This is a contentious issue, but the IMO 2020 rule falls under MARPOL regulations, and a breach of MARPOL requirements could allow for a vessel's MARPOL certificate to be withdrawn or suspended by a flag state. This could then result in insurance underwriters denying coverage on the basis that the breach alters the "risk as a whole" of the vessel, regardless of any link with the actual loss that happened.

[70]Enlist support from large receivers of shipped goods: Large companies such as IKEA and Walmart that have significant volumes with the shipping industry may bring pressure on shipping firms to use only IMO-compliant fuel. This is under discussion as a measure outside IMO regulation that could help deter non-compliance.

[71]Prohibit transportation of HSFO: PPR proposed draft amendments to the MARPOL Convention on the prevention of pollution from ships (MARPOL Annex VI). These amendments to "prohibit the carriage of non-compliant fuel oil, such that the sulfur content of any fuel oil used or carried for use onboard ships shall not exceed 0.50%." was approved at MEPC 72 and entered into force March 1, 2020.

structures. If approved by MEPC, this PPR sub-committee action could be instrumental in minimizing future deliberate non-compliance with the IMO 2020.

It would be beneficial if the next meeting of the MEPC addressed the concerns raised by the shipping industry. The shipping industry has raised several points in relation to enforcement, which includes 1) the adoption of and further development of the Energy Efficiency Existing Ships Index (EEXI)[72], an extension of the new-building related Energy Efficiency Design Index (EEDI), a set of design requirements that were introduced for new ships built from 2013 onwards. EEXI is a new index that categorises existing ships' energy efficiency; 2) the Carbon Intensity Indicators (CII)[73] which is the new scale for the individual ship's carbon emissions which similarly rates the emissions efficiency of a ship on a scale from A to E, with E being the lowest level. Ships that only record 'E' for one year or 'D' for three consecutive years must present a plan for how their score can be improved and the plan must be documented in the ship's SEEMP. The Ship Energy Efficiency Management Plan (SEEMP) is the operational log that all ships must carry onboard and use to plan, implement and monitor energy efficiency improvements.

IV IMO 2020 Current Status in the Covid-19 Pandemic

During the first quarter of 2020, the COVID-19 pandemic spread globally, with a widespread impact on all industries including shipping.[74] When assessing IMO 2020's effectiveness as environmental regulation, it is important to account for the impact that this has had on the practical implementation of IMO 2020 given that the pandemic has caused substantial changes in the volume of global trade, the price of both high- and low-sulphur fuel, the ongoing and planned installation of scrubbers on ships, and the suspension of fuel inspections in some jurisdictions. To an enormous degree, the broad industry ecosystem, the machinery of compliance, and the priorities of individual companies have been disrupted, changed or suspended.

Prior to the implementation of IMO 2020, market forecasts had indicated that there would be a rise in the fuel price spread between very low-sulphur fuel oil (VLSFO) and high-sulphur

[72]International Maritime Organization, Energy Efficiency Measures available at *https://www.imo.org/en/OurWork/Environment/Pages/Technical-and-Operational-Measures.aspx* accessed on 5 December 2020.

[73]International Maritime Organisation 'IMO Environment Committee approves amendments to cut ship emissions'' available at *https://www.imo.org/en/MediaCentre/PressBriefings/pages/42-MEPC-short-term-measure.aspx* accessed on 10 December 2020.

[74] Ibid.

fuel oil (HSFO) as a direct result of implementation.[75] These forecasts were borne out between December 2019 and January 2020, when bunker prices did increase by approximately 35 to 45 per cent.[76] However, in the first quarter of 2020, owing in part to the chaos of the early stages of the pandemic, the fuel price spread fell from US$ 170 to US$ 75.[77] Furthermore, OPEC agreements at this time led to millions of barrels of extra oil in the market, resulting in a price low of US$ 20 per barrel during one period.[78] An assessment of the situation made by industry experts Drewry indicated:

> 'The good news is that the fuel part of ocean freight rates paid by shippers will fall and that the underlying bunker costs of shipping lines will also be much lower than previously expected. The extra cost of the IMO 2020 rule will be deferred until the global economy normalises.'[79]

(a) Impact of the Covid-19 Pandemic on IMO 2020

During the last quarter of 2019 and the early weeks of 2020, the spread between VLFSO and HSFO was higher, leading to probable economic gains for the carriers which chose a 'scrubbers and HSFO' compliance strategy. The unexpected sulphur fuel price decrease means that the returns for shipowners who have installed scrubber systems will be longer for the ships that have not retrofitted the technology.[80] For smaller ships, this will be even longer as a result of the lower economies of scale.[81]

A second impact of the Covid-19 pandemic relates to the installations of scrubbers. The pandemic had a significant impact on labour in Chinese yards and major installations were reported to be 60 days behind schedule.[82] Companies that were still in the process of implementing a 'scrubbers and HSFO' compliance strategy found their plans stalled amid global pandemic disruption, leading to cancelled maintenance and installation bookings.

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[75]KPMG International Cooperative 'Getting Ready for IMO 2020, available at *https://assets.kpmg/content/dam/kpmg/tr/pdf/2019/04/imo-2020.pdf*, accessed on 30 December 2020.

[76]Ibid.

[77]Maritime News 'Low-sulfur fuel prices plummet as IMO 2020 transition fades' available at *https://www.joc.com/maritime-news/low-sulfur-fuel-prices-plummet-imo-2020-transition-fades_20200131.html,* accessed 20 December 2020.

[78] Ibid.

[79]Drewry, 'Logistics Executive Briefing: IMO 2020 + Covid-19 = 0', available at *https://www.drewry.co.uk/logistics-executive-briefing/logistics-executive-briefing-articles/imo-2020--covid-19--0*, accessed on 13 December 2020.

[80]Ibid.

[81]Ibid.

[82]Max Tingyao Lin 'In China, six-week delays for newbuilding's and 60 days for scrubber installations' *Trade Winds, The Global Shipping News Source* 31 March 2020, available at *https://www.tradewindsnews.com/shipyards/in-china-six-week-delays-for-newbuildings-and-60-days-for-scrubber-installations/2-1-785163,* accessed 30 March 2020.

A third challenge in the implementation of the IMO regulations arose from inspections being cut back, where for instance the United Kingdom admitted that checks for compliant fuel had stopped entirely.[83] Speaking with Reuters about the enforcement of IMO 2020 in March 2020, the Maritime and Coastguard Agency (MCA), the spokesperson said they have suspended port state control inspections, which also meant that checking of compliant fuel had been suspended[84] revealing that their understandable priority was to get ships moving with the least possible virus exposure for both crews and port officials.

While the IMO praised the implementation of the regulation in January 2020, claiming that the transition had at that point been 'relatively smooth',[85] the real impact for both shippers and carriers will only be clear once markets have recovered from the current disruption caused by the pandemic.

V Conclusion

This chapter examined the applicable regulatory aspects of IMO 2020, discussing its likely efficacy in achieving the end goal of meeting the necessary emissions reduction without unreasonable cost or undesirable side effects. In specific, the regulation was assessed for the likelihood that it would achieve a) high levels of compliance, b) the necessary reductions in emissions globally, c) continuous improvements in both technology and business practices in the shipping industry, and d) minimal destructive impacts on the shipping industry as a whole.

The chapter further reviewed the complex, global enforcement challenge of IMO 2020, as well as the steps in progress at the IMO to address these issues through non-governmental partners such as insurance providers and large receivers of shipped goods, and the empowerment of Port States. Finally, the chapter reviewed the current state of the regulation, now that IMO 2020 is newly in effect, given the context of the Covid-19 pandemic and its disruption of both the global shipping industry and the compliance structures within IMO Member States.

[83]Reuters 'Britain Suspends IMO 2020 Fuel Checks Due to Coronavirus' 27 March 2020 available at *https://gcaptain.com/britain-suspends-imo-2020-fuel-checks-due-to-coronavirus/* accessed on 29 March 2020.
[84]Ibid.
[85]Sophie Barnes 'Insights: Covid-19 shakes up Sulphur 2020' available at *https://www.heavyliftpfi.com/insights/covid-19-shakes-up-sulphur-2020/17040.article,* accessed 13 April 2020.

CHAPTER 3 INDUSTRY IMPACT FRAMEWORK

I Introduction

The objective of this chapter is to determine if IMO 2020 is effective in that it is likely to achieve continuous improvements in both technology and business practices in the shipping industry and minimal destructive impacts on the shipping industry. An assessment will be conducted via two contrasting frameworks, namely control and command type regulation and market-oriented regulation. These frameworks will be used to analyse which elements of the regulation are most likely to impact the container shipping industry.

II A framework for assessment

The dissertation reviews whether IMO 2020 can be considered a market-based or command and control type of regulation to identify the elements of dis-incentivising non-compliance and incentivising compliance and whether the balance struck by IMO 2020 is appropriate. Market-based types of regulation incentivise the industry to comply with the regulation as it is economically advantageous to do so while command and control types of regulation depend on penalties and strong enforcement mechanisms to force compliance. Understanding what type of regulation IMO 2020 is furthering the achievement of the overall objective of the dissertation by highlighting shortcomings of IMO 2020. It relates to competitiveness in that companies which are incentivised to comply with the regulation are assured of competitive advantage. The aim of this examination is to determine if the regulation is designed to be effective as defined.

(i) Control and command regulations

Command-and-control regulations set specific limitations for pollution emissions and/or require the use of specific pollution-control technologies.[86] In the United States of America, there is evidence that such regulations have been successful through the enactment of the Clean Air Act of 1970,[87] and to a lesser extent, the Clean Water Act of 1972.[88] These two Acts have resulted in the improvement of air quality across metropolitan areas in the United States of

[86]Britannica 'Levels of Environmental Law' [incomplete], available at *https://www.britannica.com/topic/environmental-law/Levels-of-environmental-law#ref750177* accessed 5 November 2020.

[87]US Federal Law *Clean Air Act (CAA)* 1970. Incorrect citation of US legislation.

[88] US Federal Law *Federal Water Pollution Control Act Amendments of 1972*.

America.[89] Most air pollutants such as the airborne concentrations of lead were 93 per cent lower in 2000 than in 1980.[90]

There have been several studies conducted; first, Winston Harrington and Richard D. Morgenstern conducted a study published in 2004[91] on the best approach for solving environmental problems, comparing Command and Control (CAC) to Economic Incentives (EI) policies, in view of the US and Europe environmental regulations.[92] Next, Jonathan Gruber of the Massachusetts Institute of Technology outlined specific benefits that a command-and-control type of regulation could offer as follows:

> They are preferred in cases where the pollutant is so highly toxic that concern over their impact outweighs any economic efficiency concerns. Preferred when the Marginal Abatement Cost Curves (MAC) are uniform across all the firms in the regulated industry and the government can easily know the MAC curve. Preferred when the initial reduction in the amount of pollutant significantly benefits society, while continued reduction doesn't offer as much benefit. The Marginal Benefit of reduction is highly inelastic.[93]

However, there is also significant debate and discussion of the shortcomings of command-and-control regulations. This type of regulation can be inflexible in not allowing for different levels of access to resources and capabilities amongst industry stakeholders.[94] This limits companies' ability to establish the most cost-effective way to continue operating while addressing pollution.[95] In addition, this type of regulation does not provide any incentive or reward for companies that innovate to exceed expectations, which could potentially restrict financial investments in new technology.[96] Under such regulations, there is no meaningful reward for innovation that might reduce emissions by full orders of magnitude, because a fixed percentage of reduction is 'good enough' for compliance, and companies pursue it no further.

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[89]Paul R. Portney 'Market-Based Approaches to Environmental Policy: A "Refresher" Course' Resources 15 June 2020, available at *https://www.resourcesmag.org/archives/market-based-approaches-to-environmental-policy-a-refresher-course/*, accessed on 13 August 2020.

[90]Ibid.

[91]Harrington, Winston, Morgenstern, Richard, D. and Sterner, Thomas. (Eds.) *Choosing Environmental Policy Comparing Instruments and Outcomes in the United States and Europe* (2004).

[92]Ibid.

[93]Jonathan Gruber *Public Finance and Public Policy*, 2005.

[94]Khan Academy *Command-and-Control Regulation* available at *https://www.khanacademy.org/economics-finance-domain/microeconomics/market-failure-and-the-role-of-government/environmental-regulation/a/command-and-control-regulation-cnx* accessed on 15 November 2020.

[95] Ibid.

[96] Ibid.

Another shortcoming is that regulatory agencies are not always informed of the latest technology as it evolves[97], and an explicit technology-based command-and-control system can ultimately be more costly, with studies indicating that it was possible to meet the environmental goals with a lower cost.[98] A regulation that explicitly names specific technologies will quickly become dated, and those technologies may be kept in circulation long after their most useful life, purely for compliance with outdated regulation.

A further limitation relates to enforcement. There could be an incentive for companies to find loopholes or conceal their true emissions if the regulatory agency's enforcement mechanism is not strong or the regulation itself does not impose strict consequences for non-compliance.

IMO 2020 embodies several of these shortcomings in that it offers no incentive or reward for the shipping industry to innovate by investing in new technology and has no way to keep up to date with the latest technology. Finally, IMO 2020 is limited in that it has no defined enforcement mechanism.[99] In effect, there is no carrot, but there is also no stick.

(ii) Market-based regulations

Market-based regulations are more flexible measures that use economic incentives for companies to reduce emissions by any means they choose.[100] The underlying code is that of the 'polluter pays' principle, which requires that the polluter carry the cost of any measures to mitigate the impact of the pollution it causes.[101] This type of regulation places the decision making in the hands of the industry stakeholders by providing market-based incentives to offset the costs of their emission controls.[102] Examples include environmental taxes, provision of subsidies and various offsetting mechanisms, as well as Emission Trading Systems (ETS) in some regions.[103] The premise of market-based approaches to environmental regulation is that companies will economise and minimise their pollution to benefit economically from available

[97]Ibid.

[98]Ibid.

[99]Norton Rose Fulbright 'Enforcing IMO', available at *https://www.nortonrosefulbright.com/en/knowledge/publications/5c72cf58/enforcing-imo-2020-are-we-ready, https://stillwaterassociates.com/imo-2020-part-5-enforcement/?cn-reloaded=1* accessed on 12 December 2020.

[100]United States Environmental Protection Agency 'Economic Incentives' available at *https://www.epa.gov/environmental-economics/economic-incentives,* accessed on 10 April 2020

[101]Organisation for Economic Co-operation and Development 'Glossary of Statistical Terms: Polluter-Pays-Principle' 25 September 2001, available at *https://stats.oecd.org/glossary/detail.asp?ID=2074,* accessed on 15 March 2020.

[102]United States Environmental Protection Agency 'Economic Incentives' available at *https://www.epa.gov/environmental-economics/economic-incentives,* accessed 12 December 2020.

[103]European Commission 'Environmental Economics' available at *https://ec.europa.eu/environment/enveco/mbi.htm,* accessed 10 December 2020.

incentives.[104] In effect, this harnesses the inherent motivations of the company - profit maximisation and cost reduction - to work continuously towards emissions reduction for the benefit of all.

(iii) Permits and taxes

There are two main market-based approaches to environmental regulation: permits, and taxes.[105] The first is where air or water pollution control is based on a system that requires emissions permits[106] whereby a specific emission limit is assigned to the polluters.[107] Should a company exceed this limit, they will be required to take certain measures such as installing pollution reduction technology.[108] The incentive is that those who maintain their pollution below the limit do not have to make expensive investments in pollution-reducing technologies.[109]

The alternative approach is one that does not place limits on the amount of pollution emitted but rather focuses on taxing whatever total amount of pollution is emitted.[110] Polluters are free to pollute however they wish, provided that they pay the corresponding taxes that apply to the emissions. It thus creates an incentive to the shipowners to reduce emissions as much as possible to minimise their tax bill.[111]

IMO 2020 adopts permit-oriented measures in that shipping companies must not exceed the SOx emissions limit and may resort to specific types of control technology like installing scrubbers, utilising lower sulphur fuels or utilising alternative fuel technology such as Liquified Nitrogen Gas (LNG) to reduce SOx emissions. [112]

(iv) Motions towards market-based regulation

Member States submitted proposals for the introduction of market-based elements in the shipping industry at the 57th session of the Marine Environment Protection Committee (MEPC) in 2010. Various proposals were submitted, including 'an international fund for GHG emissions from ships, a leveraged incentive scheme to improve the energy-efficiency of ships based on

[104]Ibid.
[105]Paul R. Portney 'Market-Based Approaches to Environmental Policy: A "Refresher" Course' *Resources* 15 June 2020, available at *https://www.resourcesmag.org/archives/market-based-approaches-to-environmental-policy-a-refresher-course/*, accessed on 13 August 2020.
[106]Ibid.
[107]*Ibid*.
[108]Ibid.
[109]Ibid.
[110]Ibid.
[111]Ibid.
[112]Annex VI of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978.

an international GHG fund, a port state levy, ship efficiency and credit trading'[113], and a ship efficiency system. The Expert Group on Feasibility Study and Impact Assessment of Possible Market Based Measures are also considering several proposals for emission trading systems (which sets a global cap and a price on emissions from shipping), including those from Norway, the United Kingdom, France and Germany.[114]

(v) Key disagreements between developed and developing nations

The IMO Member States have not yet adopted any of the proposed market-based proposals, as there is a disconnect between developing and developed countries. While the developed countries have proposed some measures, these do not fully meet both the Common but Differentiated Responsibilities (CBDR) and No More Favourable Treatment (NMFT) principles[115].Developing countries such as Brazil, China, India, Peru, South Africa and Saudi Arabia opposed market-based discussions until such time as a consensus is reached on the financial commitments, and technological and capacity-building support from developed countries, in order to implement regulations on energy-efficiency for ships by developing countries.[116] Their position is rooted in perceived fairness - developed nations had the benefit of no emissions restriction for many decades, and have amassed the capital to afford countermeasures that may be out of reach for developing nations. They argue that applying wholesale restrictions now would damage their economic prospects unfairly.

In line with these principles, the joint proposal submission by China and India in March 2017, 'Comprehensive IMO Strategy on the Reduction of GHG Emissions from Ships', projects a future resolution that would integrate both the 'Common but Differentiated Responsibilities' (CBDR) and 'No More Favourable Treatment' (NMFT) principles.[117] Within the proposal, the NMFT principle is embodied in the requirement that developed and developing states should submit and implement 'national action plans' and take steps to address climate change. The CBDR principle has been incorporated in the proposal by providing that developed states

[113]SeaTrade Maritime News 'Are Market Based Measures the most feasible way to limit GHG emissions now?' available at *https://www.seatrade-maritime.com/opinions-analysis/are-market-based-measures-most-feasible-way-limit-ghg-emissions-now,* accessed on 13 March 2020.

[114]Sotiria Lagouvardou, Harilaos N. Psaraftis and Thalis Zis 'A Literature Survey on Market-Based Measures for the Decarbonization of Shipping' (2020) 12 *Sustainability.*

[115]Meeting Summary of the Marine Environment Protection Committee (MEPC), 71st session 3-7 July 2017 pg 17-18, available at *https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/MEPC-71.aspx,* accessed on 8 November 2020.

[116]Resolution MEPC.227(64) Adopted on 5 October 2012.

[117]Meeting Summary of the Marine Environment Protection Committee (MEPC), 71st session 3-7 July 2017 pg 17-18, available at *https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/MEPC-71.aspx,* accessed on 8 November 2020.

should 'take the lead by setting forth more ambitious targets, identify best practice on technical and operational measures for enhancing energy efficiency and alternative energy [research and development] while sharing experiences in developing national policies and legislations.'[118] Together, these principles aim to spread responsibility and costs for climate change mitigation measures more towards developed countries.

III Evaluation

IMO 2020 contains elements of both control and command and a market-based regulation. It is market-based in that it allows for the shipping industry to adopt several types of control technology like installing scrubbers, utilising lower sulphur fuels or utilising alternative fuel technology to comply with the broad objective of SOx emission reduction. IMO 2020 also contains elements of a control and command regulation in that it offers no incentive for the shipping industry to innovate by investing in new technology. Instead, companies are offered only the threat of being deemed non-compliant if they do not take on the costs of standard adaptations to meet the minimum degree of emissions reduction. In addition, it does not offer a way for the IMO to keep abreast of the latest technology and most significantly, the challenge that has been raised by the shipping industry: that the lack of an effective enforcement mechanism could lead to widespread non-compliance.[119]

IV Conclusion

This chapter examined the applicable regulatory aspects of IMO 2020, discussing its likely efficacy in achieving the end goal of meeting the necessary emissions reduction while achieving continuous improvements in both technology and business practices in the shipping industry, and minimal destructive impacts on the shipping industry as a whole.

The regulatory elements were examined through the prism of two contrasting frameworks, namely the control and command type of regulation and a market-oriented type regulation. It was concluded that IMO 2020 contains elements of both a command and control and market-based type of regulation but included more elements of command and control.

It was found that the market-based regulation is more favourable for effective environmental regulation because it incentivises innovation, encourages continuous

[118] Ibid.

[119] Ship and Bunker News Team 'Are authorities ready to enforce IMO 2020?' 22 January 2019 available at *https://shipandbunker.com/news/world/913755-feature-are-authorities-ready-to-enforce-imo2020,* accessed 10 December 2020.

improvement, rewards companies that exceed emissions reduction targets, and does not become outdated by specifying technologies that quickly become obsolete. In total, these positive elements improve the likelihood of higher compliance, reducing the reliance on expensive and complex enforcement controls.

CHAPTER 4 CASE STUDY

I Introduction

Regulations can be written without enough consideration for the practical limitations and financial incentives on the ground and on the water. Any regulation which demands behaviours that are at odds with the limitations and incentives in the real operating environment is unlikely to succeed, and a policymaker in London may not have experience in the fine art of negotiating port dues and dockside schedules in Port Matadi. For these reasons, once a regulation is passed, it is essential to review the actual compliance choices and behaviour of the real businesses that must now operate under these regulations.

Now that IMO 2020 is in effect, the discussion of whether it is a well-designed regulation shifts from the theoretical to the practical: the regulation has entered into force and must be complied with. This chapter discusses a case study of A.P. Møller – Mærsk A/S (Maersk), and their journey to compliance, their practical challenges, and their real-world experiences.

II Maersk as a case study candidate

(a) Scale of operations

Maersk has been the world's largest container shipping company since 1996[120] which makes it a particularly interesting case subject; it currently manages around 17 per cent of the global container fleet across 130 countries.[121] Maersk ships call at almost every port, they encounter all compliance environments, and any costs or technical installations they must face will be applied at an enormous scale. The top three container shipping companies amount to 50 per cent of global tonnage, and it is likely that Maersk's behaviour and choices will be closely followed by the other major lines.

Maersk also has a strong reputation and an internal culture of following rules. They are therefore the most interesting large company to observe in the wake of IMO 2020 because they will make an urgent effort to comply immediately. That said, conclusions cannot be drawn about the entire shipping industry from Maersk's actions, as they have substantial funds to draw on and can negotiate highly preferential contracts with parts suppliers and shipyards.

[120]Sidoman Investment Limited 'The biggest international container shipping companies in the world' available at *http://www.sidoman.com/2018/06/26/the-biggest-international-container-shipping-companies-in-the-world/,* accessed on 10 December 2020.

[121]Forest L. Reinhardt, Ramon Casadesus-Masanell, Frederik Nellemann *Maersk Line and the Future of Container Shipping* (2012) 5

(b) A wide range of experiences in regulation enforcement

Maersk ships call at ports all over the world, covering more than 120 countries and while their ships are uniformly equipped and held to identical standards, the same cannot be said of the ports. Some ports are well resourced and have a strong infrastructure in place, for example, in Denmark an incoming ship's emissions are measured by an automatic gas sniffer system, as it passes beneath the Great Belt Bridge[122] fitted with finely tuned SOx detection sensors, while this is not the case in many other ports globally.

Both the willingness and the capability to inspect and measure IMO 2020 compliance at a port depends on the port state. Even among the signatory states, only 30 per cent have enfolded the regulations of IMO 2020 into their national legal system. In Denmark, the IMO 2020 regulations have already been incorporated into national law, but this was achievable because emissions regulations are strictly enforced in all areas of life, from E-class mega-ships like the Ellie Maersk, to small family cars and lawnmowers.

Denmark's technical equipment, inspection bodies and law enforcement are well adapted for the work of emissions policing in a way that most developing nations simply are not. These disparities do create an uneven experience across different ports in terms of IMO 2020 inspections and enforcement. In high-compliance ports such as Copenhagen, ships can expect direct emissions measurement, on-board inspections for carriage of HSFO, and fuel tank sampling. In ports such as Lagos, those technologies and activities are noticeably absent. Still, to maintain their ability to call at so many different ports, Maersk must ensure that their ships are compliant.

II Maersk's compliance strategy

(a) Corporate organisational efforts

Maersk has a robust sustainability strategy that the Executive Board is responsible for executing.[123] Decarbonising logistics in support of the United Nations Sustainable Development Goal 13 is one of the four pillars of its sustainability strategy.[124] Maersk's target is to reach net-zero emissions from its shipping activities by 2050.[125] Given its proactiveness, there has never been any question of whether Maersk will comply with the global cap laid in

[122]Report to the Danish Environmental Protection Agency by Johan Mellqvist, Jörg Beecken, Vladimir Conde et al 'Surveillance of Sulfur Emissions from Ships in Danish Waters' (2017).

[123]A P Moller Maersk '2019 Sustainability Report' A4, available at *https://www.maersk.com/about/sustainability/reports*, accessed 30 November 2020.

[124]Ibid.

[125]Ibid.

IMO 2020.[126] Rather, the concern is about how it could prepare in such a way to enable compliance with the IMO 2020 legislation, to significantly reduce its negative environmental impacts and minimise financial risk due to the significant extra fuel costs.[127]

In preparing for IMO 2020 compliance,[128] Maersk established six workstreams, each of which addressed key areas in the change process.[129] The first, fuel sourcing involved employees in the Oil Trading department monitoring the fuel market for price developments to secure a sufficient supply of compliant low-sulphur fuels.[130] Next was cost recovery where the Ocean Products department engaged with customers to adjust existing pricing models to recover the additional fuel costs.[131] Third, for operational implementation, the Fleet Technology department collaborated with the trading department on bunkering of compliant fuel and switchover procedures and created schedules for scrubber installations.[132] Additionally, the Network strategy department determined where its ships would be deployed by 1 January 2020,[133] and which ships would be eligible for installation of scrubbers. Finally, the Chartering department worked to ensure alignment between the owners of chartered ships and Maersk's compliance approach.[134]

(b) Engagement with the IMO

The topic of how to enforce the SOx limits and track compliance had been the focus of high-level discussions in the IMO in the past years since the declaration of its plans to adopt the regulation.[135] Maersk's regulatory affairs team worked closely with the IMO to track regulatory developments and participated in a dialogue with regulators to ensure successful compliance and clarify regulatory concerns.[136] This stands to reason as Maersk has the most touchpoints in ports around the world; they have ships on every major route and in every major port. This means that Maersk must be concerned about what every major port state enforces and enacts,

[126]Ibid.
[127]Ibid.
[128]Ibid.
[129]Ibid.
[130]Ibid.
[131]Ibid.
[132]Ibid.
[133]Ibid.
[134]Ibid.
[135]United Nations Conference on Trade and Development 'Review of Maritime Transport 2019' available at *https://unctad.org/webflyer/review-maritime-transport-2019,* accessed on 13 March 2020.
[136]A P Moller Maersk '2019 Sustainability Report' A4, available at *https://www.maersk.com/about/sustainability/reports,* accessed 30 November 2020.

be it the testing of fuel ratios, issuing penalties for excessive emissions, or even going so far as to arrest the captain of the ship.

The IMO can recommend what inspections and actions must be taken, but it remains the ports' decision as to whether they want to enforce the regulations or not, and this raises the risk of individual ports not conducting the inspection due to congestion for example. The competitive dilemma that Maersk faces is that they will bear the cost of full compliance with IMO 2020, but unless IMO 2020 is properly enforced around the globe, less compliant shipping lines will have the comparative economic advantage of failing to comply.

It is therefore not entirely without self-interest that Maersk did collaborate with the IMO in the early discussion stages to offer an industry perspective. Maersk and other members of the shipping industry insisted on and prevailed in adding, a 'carriage ban' which ruled that ships should not even be transporting high-sulphur fuels. Maersk has made substantial strides in pressing for substantial enforcement mechanisms with the IMO, states and ports to ensure that Maersk and other complying shipping lines will be competing on a level playing field post-implementation.[137]

In 2019, after negotiations among stakeholders in which Maersk provided its expertise, changes were made to alter the way enforcement is implemented.[138] Previously, a state could only apply penalties on any failure to comply with maritime law within 200 nautical miles of a country's exclusive economic zone.[139] It will also now be possible to calculate the penalty amount based on the savings achieved by the shipowner over the entire voyage.[140] The combination of an increased enforcement region per state, and the ability to calculate penalties to account for much more of a ship's total route, changes the stakes for polluting shipowners. It represents both an increase in the penalty amounts and greater reach for the more enforcement-inclined ports to enforce the global limit on SOx. The resources, technology and skills for assessment in Copenhagen can now be used to punish polluting activities off the East Coast of Africa. This is likely to improve compliance greatly by making recurring non-compliant conduct much riskier, much more expensive, and much less attractive.[141]

[137]Ibid.

[138]International Maritime Organisation 'Guidelines for port State control under MARPOL Annex VI' Chapter 3 available at *https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/MEPC.321(74).pdf* accessed 30 November 2020.

[139]Ibid.

[140]Ibid.

[141]A P Moller Maersk 'Sustainability Report 2019' A4 available at *https://www.maersk.com/about/sustainability/reports*, accessed 30 November 2020.

(c) The technological adjustments for SOx emissions reduction

Maersk is in a fortunate position as most of their ships already comply with the global sulphur cap because they are able to use low-sulphur fuels.[142] Several of Maersk ships that cannot use low-sulphur fuels have open-loop scrubbers installed, that uses seawater to reduce the sulphur content of the exhaust gasses to 0.1% before the process water is discharged overboard.[143]

Scrubbers do not simply make the SOx disappear: the captured sulphur must still be disposed of safely and in an environmentally friendly manner. The IMO is currently investigating the health and environmental effects of both closed and open-loop scrubbers.[144] Open-loop scrubbers use seawater with no added chemicals to wash the exhaust gases to remove SOx.[145] Closed-loop systems use freshwater with an additive.[146] Maersk has noted their preference for addressing sulphur at land-based refineries rather than on ships at sea.[147] However, taking into consideration the uncertainty over the price and supply of compliant fuel, Maersk has chosen to use scrubbers as a secondary part of its approach to compliance.[148] As a result of IMO 2020 allowing both the option of using low sulphur fuels and the option of installing scrubbers, Maersk is in a position to comfortably achieve the sulphur emissions goals.

(d) Implementation challenges

In the 2019 Sustainability Reports, Maersk clearly states that one of the main challenges it faced in preparing for the global cap was uncertainty.[149] Given the short timelines between the announcement and the regulation coming into force, all shipowners and operators had to switch fuel types or install scrubbers at the same time, causing some understandable strain on the available shipyards and suppliers.[150] For Maersk, as well as other carriers, the plans for adopting either of these measures were highly strategically sensitive, since any large firm signalling their technology choice would affect the prices and availability of that choice, and the availability of

[142]Ibid.

[143]Ibid.

[144]Sub-Committee on Pollution Prevention and Response, which at its sixth session, reviewed the 2015 Guidelines for Exhaust Gas Cleaning Systems (resolution MEPC.259(68)) (PPR 6/WP.1). The final report of PPR 6 is also relevant.

[145]European Parliament 'Parliamentary Questions', available at *https://www.europarl.europa.eu/doceo/document/E-8-2016-006861_EN.html*, accessed 3 December 2020.

[146] Ibid.

[147]A P Moller Maersk 'Sustainability Report 2019' A4 available at *https://www.maersk.com/about/sustainability/reports*, accessed 30 November 2020.

[148]Ibid.

[149]A P Moller Maersk 'Sustainability Report 2019' A4 available at *https://www.maersk.com/about/sustainability/reports*, accessed 30 November 2020.

[150]Ibid.

shipyard bookings in the short time frame for compliance. This led to great uncertainty in these markets as to the exact demand for compliant fuel and scrubbers.[151]

Likewise, even on the producer side, the price and supply of compliant fuel were also uncertain.[152] All carriers, including Maersk, thus had to factor into their consideration that the cost of compliant fuels is higher than the high sulphur fuel being used and that those price spreads would be very volatile.[153] Consequently, the supply and demand were unpredictable and fuel prices were volatile throughout 2019.[154] Maersk, like many other industry players, had to increase the buffer amounts of fuel purchased and stored, to be able to spread and aggregate the impact of price changes in fuel across their financial year.[155] This in turn led to shippers being uncertain of their likely fuel cost and resulted in some instability in the Bunker Adjustment Fee (BAF) as shippers had to ensure they were not underpaying or overpaying for fuel.[156] The implementation of IMO 2020 caused a great deal of uncertainty and defensive purchasing behaviour in both the industry and the global economy.

(e) Pricing adjustments

Broadly viewed, the global sulphur cap is the first example of establishing a mechanism for pricing negative effects on the environment. Through dialogue and collaboration with customers, Maersk has developed new pricing mechanisms that pass on higher fuel costs to customers in a way it considers fair, predictable and understandable.[157] Customers are charged a fuel surcharge, which accounts for the fuel price fluctuations, being based on average prices in key bunkering ports around the world. A second component, an explicit environmental surcharge, covers the costs of other adjustments.[158]

III Evaluation

(a) Likelihood of achieving the necessary reduction of emissions globally

The technologies on offer - scrubbers and low-sulphur fuel - allow any shipowner to comply in whichever way they see fit. There is no uniform obligation that would force owners of older ships to refit engines at enormous cost to accept low-sulphur fuel, and by the same token, owners of the newer, clean fuel ships are not obliged to book their ships into the shipyard for

[151] Ibid
[152] Ibid.
[153] Ibid.
[154] Ibid
[155] Ibid.
[156] Ibid.
[157] A P Moller Maersk 'Sustainability Report 2019' A4 available at *https://www.maersk.com/about/sustainability/reports*, accessed 30 November 2020.
[158] Ibid.

the retrofitting of scrubbers. Scrubber technology is instrumental in the effort to meaningfully curb these emissions since it gives shipowners a relatively economical means to 'redeem' older ships that might otherwise be forced into scrap. This means that compliance is feasible and that even older ships can be made relatively environmentally friendly. By giving viable options to both wealthy companies with new ships, and smaller companies with less cash to spend on new engines, the odds of reducing the total emissions of the global fleet of container ships are good.

(b) Likelihood of high compliance

It was never a consideration that Maersk would not comply with the regulation, however, Maersk themselves have raised that there is a great deal to be concerned about in the realm of enforcement of IMO 2020. The general absence of consistent enforcement practices across global ports means that there is a variation in inspections for every aspect of compliance, and it is possible that the port in question has never performed a compliance check of any kind, and has neither the equipment nor the impetus to begin doing so. Additionally, there are also busy ports in developed countries that may have the process and infrastructure to do so but choose a faster berthing and turn-around time rather than take the time to perform compliance checks.

All of this leads to a regulatory environment where high compliance is likely for some and not for others. Large shipping lines, with reputations to defend, which call at the most rigorous ports will be subjected to scrutiny and penalties and are likely to keep their emissions low. Together, the largest lines account for roughly 50 per cent of the global fleet. However, some shipowners could evade penalties by avoiding the most stringent ports.

(c) Likelihood of lasting damage to the shipping industry

Despite the ongoing discussions, the actual launch of the regulation gave the industry a very small window of time to adopt the necessary measures to achieve compliance which led to uncertainty, particularly in terms of the availability and cost of the low sulphur fuel. This created a challenging situation for smaller shipping lines, and even Maersk had to mobilise rapidly to reach full compliance in time.

Disruptions and fuel price fluctuations aside, the options given to all shipping lines - low sulphur fuel, alternative fuels and two types of scrubbers - make it unlikely that any shipping line will be forced out of business because of these regulatory requirements. Ships old and new can be brought up to the necessary standard with widely available technology that is not punitively expensive. In this respect, the loose enforcement environment is a positive factor - the congestion at the shipyards caused by major shipping lines placing orders to apply changes likely forced smaller shipping lines to wait.

In the first months of 2021, following the pandemic shock to global trade and port operations, it is not clear that any shipping lines have suffered unduly under the IMO 2020 regulation, nor have many shipping routes shut down or been reduced to minimal service because of compliance costs or avoidance of ports with high enforcement. To the extent to which we can assess the impact of IMO 2020 separate from the impact of the pandemic, any damage to the global shipping industry appears to have been minimal.

IV Summation

This chapter explored the real-world impact of the arrival of IMO 2020 through a case study based on the experiences of Maersk, the world's largest container shipping company. Maersk's corporate strategy for compliance were described, including the six workstreams that were set up to address fuel sourcing, cost recovery, operational implementation, ship deployment and chartered ships compliance. This case study described the efforts by Maersk to work with the IMO to provide practical advice to ensure that the stipulations of the regulation would be realistically attainable, and suitable to conditions in the ports and on the ships. The choice of technological adjustments for compliance were described, as well as the strategic considerations of that choice for large and small shipping lines, with older or newer ships. This case study also explored the challenges created by the relatively short window of time which all shipping lines had to organise their compliance before the regulation came into effect, including the impact on shipyards fitting scrubbers as well as the global low sulphur fuel price. In addition, the new pricing measures introduced by Maersk to cover both the fuel price variation and the additional environmental compliance costs were explored.

The chapter closed with an evaluation of the IMO 2020 regulation with respect to three of the key effectiveness themes - the likelihood of achieving the necessary reduction in emissions, the likelihood of high compliance, and the likelihood of lasting damage to the shipping industry. Based on the experiences of Maersk, IMO 2020 does appear to be effective in reducing emissions but may not be very effective in terms of achieving high compliance outside of the larger shipping lines which call at the most enforcement-inclined ports. The likelihood that the regulation has caused any lasting damage to the shipping industry is assessed to be low but is difficult to confirm given that the global pandemic has distorted the normal global trade flows, and fuel prices, to an enormous degree.

CHAPTER 5 IMO 2020 COST OF COMPLIANCE

I Introduction

This chapter discusses the economic implications of IMO 2020 for the container shipping industry by assessing the cost of compliance with IMO 2020 to both shipping lines and ports, and the impact those costs are likely to have on the global shipping industry. The chapter reviews how compliance is to be measured and the practical tasks that ports will have to perform. Furthermore, the chapter addresses the technological options available to shipping lines to achieve compliance, namely low sulphur fuels, scrubbers and alternative fuels such as LNG, judging the likely popularity of these different options for different business cases.

II Compliance implications of IMO 2020 for the container shipping industry

The following section reviews the compliance costs of IMO 2020 on the shipping industry. Several compliance-related questions have been raised by the introduction of IMO 2020 including how compliance is to be determined, what are the procedures that will apply and what measures will be used to determine whether bunker fuel onboard and ship operations are compliant. There is bound to be a deviation due to different jurisdictions and the limited amount of time the regulation has been in force, thus this section attempts to examine these questions in relation to ships without scrubbers or other equivalent means of compliance by reference to the IMO Guidelines available.

(a) How compliance is to be determined

(i) Guidelines

At the 74th session of MEPC, the IMO approved the two guidelines which will be used to establish how compliance by various stakeholders is to be determined. The first of these is the 2019 Guidelines for Consistent Implementation of the 0.5 per cent Sulphur Limit under MARPOL Annex VI.[159] The purpose of the Guidelines is for Administrations, Port States, shipowners, builders and fuel suppliers to use them to ensure consistent implementation of the 0.50 per cent sulphur limit. In addition, the 74th session of the MEPC also approved the 2019 Guidelines for Port State Control which outlines the procedures that will apply and what measures will be undertaken at ports to determine whether the bunker fuel is onboard and vessel operations are compliant.[160] These guidelines are intended to provide guidance towards Port

[159]International Maritime Organization 'Sulphur 2020 implementation – IMO issues additional guidance', available at *https://www.imo.org/en/MediaCentre/PressBriefings/Pages/10-MEPC-74-sulphur-2020.aspx*, accessed on 20 November 2020.

[160]International Maritime Organisation 'Guidelines for port State control under MARPOL Annex VI' Chapter 3 (2019) available at *https://www.imo.org/en/MediaCentre/HotTopics/Pages/Sulphur-2020.aspx accessed on 19 November 2020.*

State inspections for compliance with MARPOL Annex VI and should, in theory, ensure consistency across ports when conducting these inspections. It should also serve as a method of recognising deviances and non-compliance in the application of control procedures.

(ii) The port inspection procedure

The procedure to verify compliance, summarised in an article by Vijay Rao, is that the Port State will carry out an initial inspection which will include, amongst other things, 'evidence of fuel delivered to and used onboard the vessel, vessel certification and its validity, maintenance and other records required under MARPOL, the existence of required procedures, such as fuel change over procedures'.[161] Where the observations give 'clear grounds' for believing that the condition of the ship or equipment does not correspond with the particulars of the certification or documentation a more detailed inspection will be carried out.

Although not exhaustive, the 'clear grounds' for a detailed inspection would include observations such as missing or expired/invalid certificates, missing documents or records such as the aforementioned fuel change over procedures, MARPOL Annex VI record books, inconsistencies on the bunker delivery note and other documentation/certification.[162] Similarly, a detailed inspection may be triggered by inconsistencies between the voyage plan and compliant fuel reserves onboard, any data from a remote or portable emission measuring device, or receipt of any information which would indicate that the ship may not be compliant, which opens the door for whistle-blowers to step forward safely. The full list of 'clear grounds' is set out in the guidance.[163]

In accordance with the Guidelines, a detailed inspection by the Port State will conduct a more in-depth review of on-board documentation and examine the operational procedures and familiarity of the crew with regard to, amongst other things, bunkering and change over procedures in connection with MARPOL Annex VI. The most important part of this detailed investigation will be to check and verify whether fuel oil used by the ship complies with Regulation 14 of MARPOL Annex VI. Sampling and testing of the fuel are to be in accordance with Regulation 18.8.2 of MARPOL Annex VI, following the procedures set out in the amended Appendix VI (Verification Procedures for a MARPOL Annex VI fuel oil sample).[164] Until the

[161]Vijay Rao 'How will compliance with MARPOL Annex VI be determined?' *Steamship Mutual* available at *https://www.steamshipmutual.com/publications/Articles/How-will-MARPOL-Annex-VI-be-determined012020* accessed on 02 February 2020.
[162]Ibid.
[163]Ibid.
[164]International Maritime Organisation 'Index of MEPC Resolutions and Guidelines related to MARPOL Annex VI', available at *https://www.imo.org/en/OurWork/Environment/Pages/Index-of-MEPC-Resolutions-and-Guidelines-related-to-MARPOL-Annex-VI.aspx*, accessed 1 December 2020.

amended verification procedures in Appendix VI come into force in 2021, the IMO has issued a circular to Member States recommending their early implementation and directs Port States to the amended procedures in its guidance.[165]

The amended Appendix VI provides an agreed method for determining whether the fuel oil delivered to, in-use and carried onboard the ship is in accordance with MARPOL Annex VI. In addition to the procedure for the 'MARPOL sample', procedures for the collection and analysis of 'in-use' samples from the ship's service system and 'onboard' samples from the storage tanks have been included. The 'MARPOL sample' details must be recorded in the ship's sample logbook together with the bunker delivery note and enough details for traceability. Samples shall be tested in accordance with MARPOL Annex VI Appendix VI.

III Economic Implications of IMO 2020 on the container shipping industry

(a) Fuel Cost implications

The implementation of IMO 2020 has the most economic impact in the form of fuel costs for the container shipping industry. Fuel costs account for 50 to 60 per cent of the operating costs of a ship.[166] Shipping is thus an industry that is particularly sensitive to the fluctuation of fuel prices.[167] This has prompted the industry to consider alternative energy sources or alternative operational execution such as slow steaming.[168]

While the exact numbers on total bunker fuel consumption are not easily obtainable, the Lloyd's List Daily Briefing in November 2019 estimated around 250 to 350 million tonnes of bunker fuel is consumed annually.[169] Other researchers have estimated this number could be up to approximately 400 million tonnes.[170] According to an IHS Markit Whitepaper released in March 2019, the projected 2020 demand for fuel is estimated to exceed 500 million tonnes, with larger container ships (+4000 TEU) accounting for 20 per cent of the demand for marine

[165]The details of the approved amendments to Appendix VI are set out in the MEPC.1/ Circ. 882 'Early Application of the verification procedures for a MARPOL Annex VI fuel oil sample'

[166]Elizabeth Stratiotis 'Fuel Costs in Ocean Shipping' *More Than Shipping*, available at *https://www.morethanshipping.com/fuel-costs-ocean-shipping/*, accessed on 13 August 2020.

[167]Emily Billing and Tim Fitzgibbon 'What shipowners, refiners, and traders should know about IMO 2020', available at *https://www.mckinsey.com/industries/oil-and-gas/our-insights/what-shipowners-refiners-and-traders-should-know-about-imo-2020#,* accessed on 19 December 2020.

[168]Patrizia Serra and Gianfranco Fancello 'Towards the IMO's GHG Goals: A Critical Overview of the Perspectives and Challenges of the Main Options for Decarbonizing International Shipping' (2020) 12 *Sustainability*

[169]Lloyd's List 'Shipping edges towards mandatory R&D fund' *Daily Briefing* 13 November 2019 available at *https://lloydslist.maritimeintelligence.informa.com/-/media/lloyds-list/daily-pdf/2019/11-november/dailypdf131119.pdf,* accessed on 13 August 2020.

[170]Meeting Minutes 'International Maritime Organization Marine Environment Protection Committee' 59th session Agenda item 4 MEPC 59/INF, 2009.

fuels.[171] Due to the anticipated increase in fuel costs arising from the utilisation of low sulphur fuel, the percentage of fuel costs as operating cost is expected to increase.[172] The volatility of fuel prices can be considered one of the main drivers of profitability in shipping, and companies frequently implement operational optimisation to reduce fuel costs.

(b) Options to address compliance measures

As IMO 2020 directly addresses the fuel component of the sulphur emissions from ships, there is a need to review the cost of implementing each of the three options provided to the shipowners by the regulation. These options are a) using lower sulphur fuels, b) installing scrubbers, c) using non-fuel oil alternatives – liquified natural gas (LNG).[173]

(i) Option 1. Utilising lower sulphur fuels

First, this dissertation will discuss the economic implications of the shipping industry utilising lower sulphur fuels to comply with IMO 2020. Van Rynbach *et al* view that the easiest option to comply with the sulphur limits is to utilise marine diesel oil with a sulphur content at or below 0.1 per cent in the Emission Control Areas (ECA zones) or 0.5 per cent globally.[174] However, there are two major concerns about switching directly from crude oil to lower sulphur fuel. The first concerns the availability of lower sulphur fuel. Crude oil is a by-product of the refining industry and therefore easily available but low sulphur fuel is not as accessible.[175] Should the shift be made, it is doubtful that the processing plants could respond in the short term to the increased demand, particularly when considering that the shipping industry consumes approximately half of the global fuel oil produced.[176]

The second concern is that low sulphur fuel costs more per tonne than crude oil does. For an industry that consumes millions of tonnes of fuel annually, this represents a significant

[171]IHS Markit Whitepaper 'IMO 2020: What every shipper needs to know' (2019), available at *https://www.joc.com/sites/default/files/u45421/Whitepapers/GeminiSeaburyWP_24pages.pdf* accessed on 13 August 2020.

[172]Camille Egloff, Rodrigo Garcia Escudero, et al 'Sharing the Costs of IMO 2020 Across the Ecosystem' available at *https://www.bcg.com/publications,* accessed 15 September 2020.

[173]International Maritime Organization 'Comprehensive set of guidance and guidelines to support the consistent implementation of 2020 sulphur limit agreed' available at *https://www.imo.org/en/MediaCentre/PressBriefings/Pages/10-MEPC-74-sulphur-2020.asp*x accessed 15 August 2020.

[174]E A Rynbach, K E. Briers and N J DelGatto Analysis *of fuel alternatives for commercial ships in the ECA era* (2018) Revision 6 at 3, available at *https://pdfs.semanticscholar.org/03ca/549244677e1a0351651c479a137e6070c532.pdf,* accessed on 13 August 2020.

[175]McKinsey & Company 'What shipowners, refiners, and traders should know about IMO 2020' available at *https://www.mckinsey.com/industries/oil-and-gas/our-insights/what-shipowners-refiners-and-traders-should-know-about-imo-2020* accessed 15 August 2020.

[176]Wood Mackenzie 'IMO 2020: Mayhem or opportunity?' available at *https://www.woodmac.com/nslp/imo-2020-guide/* accessed 19 December 2020.

operating cost increase.[177] Nevertheless, the majority of ships will need to switch to low-sulphur bunker fuel to comply with the IMO 2020 limits.

(ii) Option 2. Use of Exhaust Gas Cleaning System (EGCS) or Scrubbers

The second option available is for the container shipping industry to lower emissions by installing scrubber technology on ships. Scrubbers are designed to remove particulate matter and polluting components like SOx from the exhaust gasses generated by the combustion process in the ship's engines.[178] By using scrubbers, shipowners can continue to utilise high sulphur bunker fuels and benefit from the lower cost of the fuel whilst reducing their emissions.

Scrubbers would therefore appear to be a miracle solution; however, they do raise two major challenges. The first is that installing scrubbers also brings up concerns about costs, which range from the actual installation of the equipment, the business losses due to ship downtime while the scrubbers are being installed and any potential increased fuel or power consumption as a result of running the scrubbers.[179] Secondly, the use of open-loop scrubbers has been banned in several port locations like Singapore, one of the world's busiest shipping hubs.[180]

In 2018, the trade publication Alphaliner reported that scrubbers are more popular than LNG fuel as an alternative to complying with the SOx limits, with only 13 LNG powered units (new builds and conversions) expected to be ready, while the number of scrubber-fitted container ships (new builds and retrofits) was expected to come close to 200 units by January 2020.[181] Despite increased interest from shipowners for both scrubbers and LNG, the total number of ships retrofitted with scrubbers will only be a fraction of the global containership fleet.

(iii) Option 3: Use of non-fuel oil alternatives - liquefied natural gas (LNG)

The third alternative that the container shipping industry can consider is utilising LNG, which is the cleanest fossil fuel. It emits almost zero sulphur and particulate matter and reduces up to

[177]Press Release 'IMO 2020 regulation could cost shippers extra US$60 billion a year', *Wood Mackenzie*, available at *https://www.woodmac.com* accessed on 15 March 2020.

[178]Hulda Winnes, Erik Fridell and Jana Moldanová 'Effects of Marine Exhaust Gas Scrubbers on Gas and Particle Emissions' (2020) *Journal of Marine Science and Engineering* 8

[179]Ibid.

[180]Jacob Damgaard 'List of Jurisdictions Restricting Or Banning Scrubber Wash Water Discharges', available at *https://britanniapandi.com/2020/01/list-of-jurisdictions-restricting-or-banning-scrubber-wash-water-discharges/*, accessed 14 November 2020.

[181]Seyed Abolfazl Mohseni, Edwin van Hassel, Crista Sys et al, 'Economic evaluation of alternative technologies to mitigate sulphur emissions in maritime container transport from both the vessel owner and shipper perspective' (2019) 4 *Journal of Shipping and Trade* 9, available at *https://link.springer.com/content/pdf/10.1186/s41072-019-0051-8.pdf*, accessed on 13 August 2020.

90 per cent of nitrogen oxide.[182] ships utilising LNG can therefore operate in ECAs and globally without having to switch fuel sources from high sulphur to low sulphur to comply with IMO 2020. LNG is considered a long-term solution for the shipping industry, to address the IMOs aim to achieve a 50 per cent reduction in greenhouse gas emissions by 2050.

As excellent as these numbers are, the transition to LNG is neither simple nor cheap. ships would have to be refitted or new ones built to accommodate the use of natural gas as fuel.[183] As of February 2019, there were 143 LNG-powered ships in operation and a further 135 on order.[184] With a ship lifetime averaging between 20 to 30 years, recently ordered ships that operate on high sulphur fuel would not be able to support LNG fuel. The shipping industry is reluctant to order LNG-fuelled ships without an increase in LNG bunkering infrastructure and without sufficient growth in ship orders, the LNG bunkering industry has less incentive to develop greater infrastructure.[185]

The advantages of LNG include excellent reduction of pollutants such as SOx, NOx, and PM, followed by cost competitiveness when compared to distillate and residual fuels and finally LNG has greater energy density offering up to 24 per cent more energy output than heavy fuel oil.[186] The core challenge of LNG is compatibility with existing engines which increases the operational and retrofit costs and requirements of more space and weight. There are also challenges such as methane slip from engines burning gas, and the ongoing challenge of limited bunkering infrastructure. Most ports do not have LNG terminals due to the expense of set-up and maintenance, as well as safety concerns and resistance from citizens who live near the port.[187] Port authorities can only invest meaningfully in LNG bunker facilities if they have a rough idea of potential demand for LNG bunker from deep sea, shortsea and inland navigation.[188] Without that information in advance, most port authorities will struggle to lobby for the capital investment needed. An important aspect of the choice for the use of LNG or low

[182]Elizabeth Lindstad, Gunner S. Eskeland, Agathe Rialland, et al, 'Decarbonizing Maritime Transport: The Importance of Engine Technology and Regulations for LNG to Serve as a Transition Fuel' (2020) *Sustainability* 21.
[183]Ibid.
[184]Peter Keller '2019 will be the year of acceleration for LNG as marine fuel' available at *https://www.maritime-executive.com/editorials/2019-will-be-the-year-of-acceleration-for-lng-as-marine-fuel*, accessed on 5 December 2020.
[185]Reed Smith and Noah Jaffe 'LNG for 2020: IMO Sulphur Limits and the LNG Alternative' available at *https://www.hellenicshippingnews.com/lng-for-2020-imo-sulfur-limits-and-the-lng-alternative/*, accessed 30 November 2020.
[186]Jiaojung Deng, Xiaochen Wang, Zhilong Wei et al 'A review of NOx and SOx emission reduction technologies for marine diesel engines and the potential evaluation of liquefied natural gas fuelled vessels' (2020) 766 *Science of the Total Environment.*
[187]Ibid.
[188]Ibid.

Sulphur fuel is the bunker strategies of the shipping companies, to determine the reasons for them bunkering in certain ports and if it could be linked to factors like cost per ton of fuel, fuel quality or optimal routing.[189]

IV Conclusion

The compliance procedures to be followed by the Port State are well documented and range in intensity from initial, brief inspections to deep and detailed inspection of every element of compliance from fuel samples to documentation consistency. These inspections are time consuming and place a heavy documentation burden on ships entering port, so it is likely that many ships will be 'waved through' inspection when schedules are tight, or ports are chaotic. The compliance procedures have been designed to be friendly towards whistle-blowers with tips regarding non-compliance, which should contribute to a healthy compliance environment.

In economic terms, the clearest consequence is felt in the cost of fuel, which could feasibly double. This is a challenge for shipping lines, especially in an uncertain regulatory environment where it is not clear what the real penalties for non-compliance will be in practice, or if there are any penalties for non-compliance. From the perspective of the industry, it is difficult for the somewhat vague promise of being regarded as a 'good industry player' to weigh favourably against a huge increase in the price of the most important input to the business. Nevertheless, though LNG is unlikely to become a widespread solution, scrubber technology is a good option where the fuel price variance is too steep.

[189]Raimonds Aronietis & Christa Sys & Edwin van Hassel & Thierry Vanelslander 'Investigating the bunkering choice determinants: the case of the port of Antwerp' (2017) 2(1) *Journal of Shipping and Trade* 1 at 00

CHAPTER 6 TWO MODELS TO PREDICT THE END RESULT OF IMO 2020

I Introduction

Much of the discussion so far has focussed on the design and deliberations before IMO 2020 came into effect, and the rush for compliance immediately after it came into force, but a discussion of efficacy cannot be complete without some effort to predict the 'end game' - the likely state of the industry in the long term, as a result of this regulation.

Fortunately, the subject of long-term effects of environmental regulation has been covered in detail in many areas of academia, especially in commercial and economic disciplines. The study of how profit-motivated entities such as shipping lines will navigate the incentives and risks of a newly regulated industry. We will discuss two of the most relevant theory frameworks here, in an attempt to predict the future post IMO 2021.

II The Porter Hypothesis

It has been established that the burden of cost of implementing IMO 2020 lies with the shipping industry. This section discusses if there are potential benefits that could arise from the industry's' compliance. In 1995, Michael Porter and Claas van der Linde postulated that well-designed environmental regulations can induce and encourage innovations, such as cleaner technologies and environmental improvements, thus offsetting compliance costs and helping enhance business competitiveness.[190] This assertion is what is referred to as the Porter Hypothesis. These policies promote cost-cutting efficiency improvements, which reduce or offset regulatory costs, and foster innovation in new technologies that may help companies achieve international technological leadership and expand market share.

Porter & Van der Linde explain that there are at least five reasons that properly crafted regulations result in these outcomes. First, such regulations inform companies about probable resource inefficiencies and potential technological improvements. Second, good regulations focused on information gathering can achieve major benefits through increasing corporate awareness. Third, well-crafted regulations reduce the uncertainty as to whether investments to address environmental concerns will be valuable. Additionally, good regulations create pressure on companies which motivates them to resort to innovation to progress. Further, good regulations effectively level the transitional playing field. It must be noted, however, that Porter & Van der Linde also add a caveat that 'innovation cannot always completely offset the cost of

[190]Michael E. Porter and Claas van der Linde 'Toward a New Conception of the Environment-Competitiveness Relationship' (1995) vol 9 no 4 *Journal of Economic Perspectives* 97–118.

compliance, especially in the short term before learning can reduce the cost of innovation-based solutions.[191]

Applying the fundamentals of Porter's Hypothesis to IMO 2020, it is clear from the investment in scrubber technology that the regulation did inform the shipping industry of potential technological improvements. Next, in the planning stages of IMO 2020 being implemented, information gathering on the availability of low sulphur fuel and the status of alternative fuels benefited the shipping industry through increasing corporate awareness. IMO 2020 cannot be said to have reduced the uncertainty as to whether the considerable investments made by shipowners to address environmental concerns will be valuable, because the enforcement environment is so inconsistent, and with the regulation only being adopted in January 202 it is too soon to accrue substantial case law to give shipping lines a body of information on how likely they are to be penalised for non-compliance and how much those penalties would cost.

The regulation did create pressure on the industry which motivated shipowners to resort to innovation through further investments in technology to ensure compliance, for example 212 container ships had been fitted with scrubbers by December 2019.[192]

Finally, Porter's element of good regulations effectively levelling the transitional playing field cannot be said of IMO 2020. With the onus of enforcement being placed on Port States, and the varying degrees of capacity to enforce amongst Member States, the playing field is not level. There is an ongoing discussion at the Marine Environment Protection Committee (MEPC) amongst the Member States, in relation to the introduction of market-based elements in the shipping industry.

Since publication, the Porter Hypothesis has been widely cited within academic literature. It has raised many debates, with some research opposing the theory – mainly the impact of regulatory instruments on innovation when dealing with environmental issues.[193] Some empirical studies have been conducted to confirm its accuracy, albeit mostly with unclear

[191]Michael E. Porter and Claas van der Linde 'Toward a New Conception of the Environment-Competitiveness Relationship' (1995) vol 9 no 4 *Journal of Economic Perspectives* 97–118.

[192]Alphaliner Weekly Newsletter 'Scrubber fitted ships to reach over 10% of containership capacity by January' Volume 2019 Issue 50, available at *https://www.alphaliner.com/#publications,* accessed on 2 February 2020.

[193]For example, Palmer *et al* who proposes that complying with regulations is likely to increase costs or restrict firms' freedom of action (see Karen Palmer, Wallace E. Oates and Paul R. Portney 'Tightening Environmental Standards: The Benefit-Cost or the No-Cost Paradigm?' (1995) vol 9 no 4 *Journal of Economic Perspectives* 119-132). Others like Popp & Newell argue that money that businesses spend on regulatory compliance cannot be invested in satisfying their customers' needs for better and cheaper goods and services. There is therefore an offset on consumer welfare (see D Popp, RG Newell and AB Jaffe 'Energy, the Environment, and Technological Change' Chapter 21 in Bronwyn H Hall and Nathan Rosenberg (eds) *Handbooks of the Economics of Innovation* (2010) Vol. 2 873-937).

results.[194] A recent study that reviewed an extensive body of literature testing the hypothesis concluded that there is 'considerable heterogeneity' in the findings of most of the work.[195]

III The Pollution Haven Hypothesis

The influence of environmental regulations on a company's competitiveness has also been debated through theories like the Pollution Haven Hypothesis, which envisages that stringent environmental regulation will lead to increased compliance costs and transfer pollution-intensive production toward low abatement cost regions.[196] However, companies and policymakers are concerned that asymmetries in the stringency of environmental regulation could shift businesses to countries with less stringent regulation placing their companies at a disadvantage in a global economy. If the emissions are not measured in less regulated nations, it undermines the ability of the regulation to lower industry emissions globally, making the regulation ineffective.

Applying the Pollution Haven Hypothesis to IMO 2020, input from Member States has varied significantly, particularly in relation to the introduction of market-based elements in the shipping industry at the 57th session of Marine Environment Protection Committee (MEPC) in 2010. The proposals included recommendations for an international fund for GHG emissions from ships, a leveraged incentive scheme to improve the energy-efficiency of ships based on an international GHG fund, port state levy, ship efficiency and credit trading and ship efficiency system. However, the IMO member states are yet to adopt any of these market-based proposals, as there is disagreement between developing and developed countries. Developing countries opposed market-based discussions until a resolution on financial, technological and capacity building support from developed countries was adopted, in order to implement regulations on energy-efficiency for ships by developing countries.[197] These principles are yet to be enacted in any way, and until some regulatory unity can be achieved across all member states, the threat of polluter havens remains very real.

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[194]Blind contends that he manages to bring some semblance of coherence to results of studies done (see Knut Blind 'The influence of regulations on innovation: A quantitative assessment for OECD countries' (2012) vol 41 *Research Policy* 391-400.

[195]Mark Cohen and Adeline Tubb 'The Impact of Environmental Regulation on Firm and Country Competitiveness: A Meta-analysis of the Porter Hypothesis' (2018) 5(2) *Journal of the Association of Environmental and Resource Economists* 1-25. This paper reports on a meta-analysis of 103 publications that estimate the relationship between environmental regulation and firm or country-level productivity or competitiveness.

[196]Arik Levinson, M. Scott Taylor 'Unmasking the Pollution Haven Effect' (2008) 49 (1) *International Economic Review* 223-54.

[197] Resolution MEPC.227(64) Adopted on 5 October 2012.

IV Conclusion

The Porter Hypothesis is a venerable and much-cited model which nevertheless appears to be idealistic in the context of IMO 2020. It predicts that companies will make painful changes that result in better industry processes and technology, effectively culling the weak and making the industry fitter and more competitive. Theoretically, an environmental regulation places demands on an industry, the companies that will survive rise to the challenge, and emerge stronger and cleaner than before. However, the positive outcomes predicted by the Porter Hypothesis are fragile, both tacitly and explicitly assuming that there will be uniform enforcement of regulations, no widespread corruption and no viable ways to cheat. The Porter Hypothesis likely holds when there is a homogenous industry with a fair playing field, but the global shipping industry bears little resemblance to that.

By contrast, the Pollution Haven Hypothesis acknowledges that inconsistently enforced regulations around the globe will create safe havens where profit-motivated businesses will hide to evade the costs of compliance. The shipping industry is no stranger to this behaviour - many flag states are sought out by shipowners hunting for the most permissive jurisdictions - so it is logical to assume that similar behaviours may emerge here.

The long term risk is that this results in the creation of a two-tier shipping industry, where whole shipping lines operate on the margins, calling only at ports and shipyards in states that will not enforce the regulations in a meaningful way, undermining the efficacy of the IMO 2020 regulation in terms of reducing emissions. It may also cause damage to the global shipping industry, as shipping traffic is diverted away from well-regulated ports, and other standards begin to be eroded.

CHAPTER 7 CONCLUSION

I Evaluation

The dissertation set out with the objective of evaluating IMO 2020 to determine whether it is likely to be effective, which for the purposes of this dissertation is defined as realising the necessary reduction in global sulphur emissions, achieving high compliance, encouraging continuous improvement in technology and business practices, and not unduly damaging the global shipping industry. To meet its objectives, the dissertation reviewed the complexity of the business incentives, global enforcement environments and technological options under consideration in chapter one; discussed the legal framework and whether it is designed to be effective in chapter two, followed by an assessment on the likely impact on the shipping industry by contrasting command and control type regulations with market-based regulations in chapter three. Chapter four included the practical experience of compliance through a case study of Maersk and chapter five followed with an assessment on the cost of compliance. Chapter six attempted to predict the long-term outcomes of IMO 2020 by using two contrasting business frameworks. Taking all the input from these chapters together, a conclusion on the findings of each of these elements of IMO 2020 being effective follows.

(a) Likelihood of realising the necessary reduction in global sulphur emissions

The IMO 2020 regulation benefits from several technical advances in recent years. The low sulphur fuel option, and especially the existence of effective scrubbers for retrofitting, means that sulphur emissions can be hugely reduced with commonly available resources for a cost, which will be borne primarily by the shipowners and potentially passed on to consumers to some extent. Consistent and ubiquitous use of the tools available will lead to this objective being met. The effectiveness of this regulation is unlikely to be sabotaged by the technology in use but faces a risk through the conflicting business incentives at play. From the case study provided and the general overview of the industry adoption, we can safely assume that the likelihood of realising the necessary reduction in global sulphur emissions via the shipping lines is very high should IMO 2020 be successfully implemented globally.

(b) Likelihood of achieving high compliance

With the IMO 2020 regulation entering into force by January 2020, its advantage is that it does become binding on Member States, which in theory are obliged to enforce the regulation and carry out its decisions. In practise, what is clear is that obligations and responsibility of ensuring the terms of IMO 2020 are met lie with the shipping industry primarily. The dissertation has identified that the lack of an enforcement mechanism within IMO 2020 presents a challenge to

the shipping industry, but simultaneously via the Case Study in Chapter 4 identified that some (at least the large shipping lines) have prioritised implementing the terms and conditions of IMO 2020 to ensure that they are sufficiently compliant. It is clear thought, that implementing IMO 2020 is not in the best interests of the industry when the distinct lack of market-based incentives is taken into consideration. However, from a compliance perspective, the larger shipping lines, representing over half of the container shipping industry have indicated that they will undertake the necessary measures to comply with the IMO 2020 regulation.

(c) **Likelihood of continuous improvement in technology and business practices**

Having concluded that the larger shipping lines, representing over half of the container shipping industry will undertake the necessary measures to comply with the IMO 2020 regulation, the focus from the industry will be on ensuring that the optimal business practices and technological improvements are put into place to reduce or offset the cost of implementing IMO 2020. Having the options of either investing in scrubbers, using low sulphur fuels or using alternative fuel sources like LNG. The larger stakeholders within the container shipping industry have focused on different aspects of the options available but each have indicated a willingness to invest and to undertake the necessary changes in business practices and technology adoption to be compliant.

(d) **Likelihood of damage to the global shipping industry.**

It is very clear that the largest impact to the container shipping industry is the cost element that is included in them having to bear the responsibility of the IMO 2020 regulation being implemented. However, throughout the process, there has been no indication from any shipping line that this regulation will impact ongoing operations or that any significant decision relating to re-routing shipping corridors will take place. As described in the case study, Maersk has already been able to offset some of the costs of more expensive fuel using the pricing tools they have available. Any assessment of damage or disruption is nevertheless rendered almost impossible as this regulation launched into the context of a global pandemic virtually shutting down key corridors during 2020, an occurrence that has been widely accepted as the most significant macro factor impacting shipping markets in 2021. It can thus be concluded that at the time of writing IMO 2020 has caused very little to no damage to the global shipping industry.

II Next Steps

Drawing upon the preceding chapters, this dissertation concludes that the two following agenda items should be the next steps undertaken by the IMO, that is to address the enforcement

mechanism and introducing market-based elements to strengthen the regulation in line with proposals from various countries.

(a) Addressing IMO 2020 Enforcement Mechanism

The next step in addressing IMO 2020 enforcement mechanism should be to place on the agenda of the next meeting of the MEPC the concerns raised by the shipping industry. The meeting should undertake the discussion on the following items raised by the industry in relation to enforcement, which includes 1) the adoption of and further development of the Energy Efficiency Existing Ships Index (EEXI); 2) the Carbon Intensity Indicators (CII) and 3) that individual ship's carbon emissions plan must be documented in the Ship Energy Efficiency Management Plan (SEEMP). This is in addition to the draft amendment already being undertaken, as it is currently unclear how these draft amendments will be enforced. The draft amendments to cut the carbon intensity of ships have been approved by the IMO (since writing) in November 2020 and will be forward for formal adoption at MEPC 76 which will be held during 2021. The value of undertaking these steps will be to ensure that shipowners combine a technical (how ships are retrofitted and equipped) and operational (how ships operate) approach to reduce their emissions.

(b) Introducing IMO 2020 Market-Based Elements

The IMO Member States are yet to adopt any of the proposals under consideration within the Expert Group on Feasibility Study and Impact Assessment of Possible Market Based Measures due to the disagreement between developing and developed countries. Drawing on the dissertation, there will be value to adopting the joint proposal submission by China and India in March 2017 'Comprehensive IMO Strategy on the Reduction of GHG Emissions from Ships' which projects a future resolution which integrates both the Common but Differentiated Responsibilities (CBDR) and No More Favourable Treatment (NMFT) principles.[198] While input from Member States have varied in relation to the introduction of market-based elements, the EU has raised the option of unilaterally including shipping in its own carbon trading system, while Greece, Japan and South Korea have objected. The joint proposal includes recommendations for an international fund for GHG emissions from ships, a leveraged incentive scheme to improve the energy-efficiency of ships based on an international GHG fund, port state levy, ship efficiency and credit trading and ship efficiency system. The IMO

[198]Meeting Summary of the Marine Environment Protection Committee (MEPC), 71st session 3-7 July 2017 pg 17-18, available at *https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/MEPC-71.aspx*, accessed on 8 November 2020.

must soon make a decision that is acceptable to all parties, but the common factor has been that the decision must include market-based incentives.

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