

The Economic role of the Maritime Industry

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ABSTRACT: In the current climate, it is very important for us to reflect and highlight how important the maritime industry is for our country and the rest of the world. It is how we make trading of essential day-to-day goods and services possible to keep powering our industries and support employment. Maritime is everything existing with regards to the sea or worldwide waterways, especially with regards to the navigation, shipping and marine designing. Indeed, this role this industry plays in our daily lives is crucial. Think about The oil that powers the cars we have, many of our other vehicles, electronics, coffee we drink, the food we eat and the clothes we wear, most comes from overseas, and goes over seas if it is produced in our home country. Shipping has historically been the primary mode of transportation and a vital communication link, connecting coastal cities, nations, and continents.

After rail transport, water transport is the most cost-effective and environmentally friendly way to travel or move goods. Today, approximately 90% of global trade relies on the international shipping industry. In parallel to the extraordinary increase of traditional sea-related activities, the maritime sector has experienced a significant qualitative and quantitative expansion with the appearance and development of two new industrial growth poles: the offshore oil exploration and production industry, and the cruise sector. In this paper I have discussed about the economy growth through all the maritime sectors and one major problem related to maritime sector which is shipping finance and investment. The objective of this journal is to provide a comprehensive analysis of the maritime industry's economic importance, its role in global trade, and the challenges it faces. It aims to highlight the industry's contribution to economic growth, technological innovation, and industrial advancement, while also addressing the risks associated with shipping finance and investment. The journal explores various risk management tools and strategies, such as hedging, interest-rate swaps, and collars, to mitigate financial risks and ensure the stability of shipping companies. Additionally, it examines the future growth prospects of the maritime sector, driven by global economic trends, technological advancements, and regulatory frameworks. By addressing these challenges and leveraging emerging opportunities, the maritime industry can continue to thrive and play a pivotal role in shaping the future of global trade and economic growth.

I. INTRODUCTION:

The maritime industry is an indispensable cornerstone of global economic development, serving as the lifeblood of international trade, commerce, and connectivity. Its significance extends far beyond the movement of goods across oceans; it is a dynamic and multifaceted sector that underpins the global economy, linking nations, industries, and markets through an intricate network of shipping routes, ports, and logistics systems. The industry encompasses a vast array of activities, including sea transportation, port operations, shipbuilding, maritime services, and marine tourism, all of which collectively contribute to the economic prosperity of nations and the global economy at large. As the world becomes increasingly interconnected, the role of the maritime sector in facilitating trade, supporting industries, and driving innovation has never been more critical. The maritime industry's economic importance is underscored by its substantial contribution to global GDP, employment, and trade volumes. Seaports, for instance, are not merely transit points for goods but are dynamic hubs of economic activity that generate significant value-added benefits for their host countries. They facilitate the movement of goods, raw materials, and energy resources, enabling industries to thrive and economies to grow. The shipping industry, which forms the core of maritime operations, is indispensable for global trade, transporting over 80% of the world's goods by volume. From bulk carriers and container ships to specialized vessels for offshore operations, the shipping industry supports a wide range of economic activities, including mining, fishing, energy production, and tourism. Moreover, the maritime sector is a catalyst for technological innovation and industrial advancement. The shipbuilding industry, for example, has evolved to meet the demands of modern trade, with a focus on constructing sophisticated, high-value vessels that cater to specific market needs. European shipyards, despite facing challenges such as higher labor costs, have carved out a niche by specializing in advanced maritime technologies and high-quality shipbuilding. Similarly, the rise of marine tourism has opened new avenues for economic growth, creating jobs, boosting local economies, and fostering cultural exchange. However, the maritime industry is not without its challenges. It operates in a highly volatile

and cyclical environment, influenced by fluctuating trade volumes, geopolitical events, and market dynamics. The industry is also exposed to a myriad of risks, including operational hazards, natural disasters, cybersecurity threats, and the impacts of climate change. These risks necessitate robust risk management strategies to ensure the sustainability and resilience of maritime operations. Financial risks, in particular, pose significant challenges, given the capital-intensive nature of the industry and its reliance on external financing. Effective risk management tools, such as hedging, interest-rate swaps, and collars, are essential for mitigating these risks and ensuring the financial stability of shipping companies. The maritime sector's future growth is closely tied to global economic trends, technological advancements, and regulatory frameworks. As developing economies continue to drive demand for goods and resources, the industry must adapt to new challenges, such as infrastructure limitations, environmental regulations, and the need for sustainable practices. The transition towards decarbonization, for instance, presents both challenges and opportunities for the maritime industry, requiring innovative solutions to reduce emissions and adopt alternative fuels.

In addition to economic and operational considerations, the maritime industry plays a crucial role in shaping national identities and cultural heritage. For countries like Britain, with a rich maritime history, the industry is not only a source of economic strength but also a symbol of national pride. However, maintaining this legacy requires continuous investment in infrastructure, education, and workforce development. The industry must also address issues such as gender disparity and the aging labor force to ensure a sustainable and inclusive future. Despite its critical importance, the maritime sector often remains underappreciated by the general public, who may not fully grasp its influence and role as an essential element in social and economic development. The industry is a potential source of excellent employment and career opportunities, with several million people currently working in activities and companies directly and indirectly related to oceans and seas worldwide. Historically, the shipping and fishing industries have experienced a continuing trend of increase both in their fleets and in total trade volume and fishing capacity, respectively. Shipping has long been the major form of transportation, as well as an essential communication link connecting coastal cities, countries, and continents. Next to rail transportation, water transportation is economically and environmentally the most efficient way to travel or transport merchandise; and, nowadays, around 90% of world trade is carried by the international shipping industry.

Maritime activities continue to expand, bringing benefits for people across the world thanks to the growing efficiency of technical and human resources. The merchant navy, offshore oil sector, commercial fishery, and cruise companies are part of the industry of the future, and the maritime sector is already a key catalyst for socio-economic development and international competitiveness in a changing world. This global sector, supported in the twentieth century by the economies of North America and Western Europe, has shown strong growth over the last four decades, despite the worldwide economic recession of the early 1980s and the financial crises of the late 1990s and 2007. From just over eight thousand billion ton-miles in 1968 to over 40 thousand billion ton-miles in 2010, the industry is expected to witness further growth in the coming decades, driven by the demands of China's and India's emerging economies, with the subsequent rise in the level of maritime activities and the economic value and impact they represent. Globalization and the development of low-cost manufacturing centers in East Europe, China, and India, the aging and decreasing workforce in developed countries, the rising cost of environmental legislation, the rise of global terrorism, piracy, transnational crimes (human/drug-trafficking and smuggling), and illegal use of the sea (poaching and connected crimes) along with the cost of security measures to combat such phenomena, and the increasing global energy and food demand are key factors in a period of considerable change, development, and new challenges.

Quantifying the total value of the global maritime industry is challenging due to its broad impact on various aspects of modern societies and their development. The maritime sector plays a crucial role in natural resources and energy, trade and industry, science, and recreational activities. Leaving aside its historical evolution and current structure in geographical clusters with homogeneity and linkages amongst its constituents, the maritime sector is composed of organizations and activities such as The maritime sector encompasses a wide range of industries, including maritime transportation, the naval industry (such as naval engineering, shipbuilding companies, and component suppliers), commercial fishing and aquaculture, the cruise and recreational sector, sport and commercial ports and marinas, marine energy sources, naval forces, marine and ocean research and sciences, maritime training academies and centers, as well as various professional services related to maritime activities. Additionally, there are numerous professional associations, trade unions, and organizations that support the rights and interests of seafarers and maritime professionals. In conclusion, the maritime industry is a cornerstone of global economic development, driving trade, innovation, and connectivity across the world. Its multifaceted contributions to the economy, coupled with its ability to adapt to changing market dynamics,

underscore its enduring importance. However, the industry must navigate a complex landscape of risks and challenges, requiring strategic planning, innovation, and collaboration among stakeholders. By addressing these challenges and leveraging emerging opportunities, the maritime industry can continue to thrive and play a pivotal role in shaping the future of global trade and economic growth. Why is Maritime an important industry?

Global economic development heavily depends on the maritime industry. Seaports together with their port activities add large economic value to countries where they operate. The maritime transport sector contains operations of maritime transport agencies in addition to sea transportation and coastal operations and maintaining storage facilities in ports and offering multiple maritime transport support services. Transit shipping routes have the potential to produce revenue streams by charging fees to users of ports. The growing global shipping need corresponds with rising economic production statistics. The expansion of shipping operations leads to higher international trade which ultimately boosts multiple business sectors including financial organizations and insurance firms and real estate agents and lawyers. Through maritime industry connectivity companies from various sectors can maximize their operations which drives economic development and expansion.

II. ECONOMY IMPORTANCE OF MARITIME INDUSTRY:

The maritime industry significantly contributes to global economies, serving as a cornerstone for growth and development in many nations. The sector is experiencing substantial expansion, with the United Nations Conference on Trade and Development projecting a 3.4% increase in international maritime trade value by 2024. This growth is primarily driven by rapid expansion in containerized and dry bulk cargoes, with projected compound annual growth rates of 4.5% and 3.9%, respectively. As global economic dynamics shift, the relationship between industry and government must evolve. Maritime sector stakeholders will need to amplify their voices in media and demonstrate their contributions to national economies to gain recognition. Historically, sea trade and naval power sustained continental empires, but technological advancements and resource limitations have transformed the global economy. In the modern era, investors seek comparative advantages for profitability, accelerating globalization and increasing trade interactions. Shipping, ports, and related services must adapt to these trends. While trade flows dynamically based on demand, countries and populations remain geographically fixed, creating a complex relationship that requires political management. Prioritizing free trade policies necessitates government encouragement of innovation and competitive advantage in industries and services to prevent foreign dominance. This approach demands continuous investment in research, technology development, and skilled workforce cultivation within a neutral fiscal environment that avoids competitive disadvantages. To secure a foundation for innovation and competitiveness, the role of shipping and related services must be reinforced. This strengthening will support the development of more innovative and competitive industries in the global marketplace.

The maritime sector has undergone significant changes in the last three decades, necessitating a more integrated approach to career development programs. A comprehensive study is needed to assess the future demand for skilled maritime personnel across the entire sector. This study should explore the potential expansion of the Merchant Navy Training Board's responsibilities to include apprenticeships in related fields, graduate programs, and coordination of maritime training for disadvantaged groups. Promoting maritime awareness among families and schools is crucial, and Seavision's role in providing maritime educational and career information requires long-term support from both industry and government. Similarly, the newly formed Marine Industries Leadership Council needs backing, with government involvement encouraged to foster an innovative and competitive maritime sector. While nostalgia can influence perceptions of Britain's maritime heritage, there are concrete opportunities for the future. The country requires efficient ports and effective transport infrastructure, along with knowledgeable shippers and well-coordinated logistics. The global increase in shipping demand presents opportunities for designers and engineers to develop innovative transportation methods for cargo and passengers. Maritime-related services such as law, finance, broking, and insurance can benefit from the growing trade volume. The fishing industry faces complex challenges in balancing optimal yields, fair compensation for fishermen, and the need to conserve finite living resources, which will be a key focus for the Marine Management Organization. As a modern trading nation, Britain's dependence on the sea has increased. The global nature of manufacturing and trade is evident in the import of consumer goods and components, as well as the export of British-assembled products. While relying entirely on foreign companies for sea transport and logistics might seem cost-effective, this approach could have long-term implications for the nation's maritime capabilities and economic independence. Companies must balance profitability in global markets with domestic responsibilities. Governments are tasked with providing reliable services and support to their constituents locally.

The maritime sector has faced neglect from governmental promotion for years, leading to a decline. Maintaining critical levels across the maritime industry is crucial for Britain to capitalize on future maritime opportunities. The current challenge lies in reversing this trend and transforming the vision into reality. From 1996 to 2016, the maritime industry experienced significant growth. Seaborne trade worldwide increased by 112% during this period, outpacing the global GDP growth of 73%. This indicates that the maritime industry's growth rate is approximately 1.5 times that of the global economy. According to International Maritime Organization (IMO) statistics, approximately

III. IMPORTANCE OF SHIPPING INDUSTRY IN ECONOMY

The shipping industry directly contributes billions to global GDP . Ships and maritime transportation are necessary for most of the activities related to BE/BG, e.g: Sea mining and fishing activities; construction and maintenance of offshore infrastructure maintenance to oil and gas platform operations and aquaculture facility construction and tourist transportation as well as research-based activities carried out at sea. Therefore, a healthy and productive shipping industry will facilitate the successful development of BE objectives. The performance of the shipping industry is highly dependent on markets, as it is impacted due to the constant changes of world trade volume. This is clearly explained with a simple example “If the active merchant fleet is 1000 m. dwt, and seaborne trade grows by 5%, this will generate demand for an additional 50 m. dwt of new ships. If, incase, 20 m. dwt of ships are scrapped than the total requirement for new vessels will be 70 m. dwt. If, however, instead of growing by 5% seaborne trade remains at the same level, then there will be no need to expand the fleet and demand will be only 20 m. dwt. Taking the argument a step further, if seaborne trade falls by 5% there will not be any demand for new ships”. Therefore, the shipping industry experiences significant cycles, making it unpredictable and inconsistent. To understand how the shipping industry works, a good knowledge of these cycles is needed. Due to the shipping cycles the supply and demand for ships is balanced. If the supply is low than the market investors are willing-to-pay high freight rates and if the supply is high than the market squeezes the cashflow until the owners waive the offer and ships are scrapped. The cyclic nature of the market affects both ship production activities and transportation business operations through the maritime sector.

As shown in Table 1 below shipping cycles consist of 4 stages

STAGE	CHARACTERISTICS	CONSEQUENCES
TROUGH	<ul style="list-style-type: none"> Evidence of shipping overcapacity. Freight rates fall to the operating cost of the least efficient 	<ul style="list-style-type: none"> Ships queue up at loading points and vessels at sea slow steam to save fuel and delay arrival. Shipping companies short of cash are forced to sell ships at distress prices, since there are few buyers.
Recovery	<ul style="list-style-type: none"> Supply and demands move towards balance. Markets remain uncertain and unpredictable. Liquidity improves 	<ul style="list-style-type: none"> The first positive sign of a recovery is positive increase in freight rates above operating costs, followed by a fall in laid up tonnage. Liquidity improves second hand prices and sentiment firms.
PEAK	<ul style="list-style-type: none"> All the surplus has been absorbed. Freight rates are high, 2 to 3 times operating cost. Owners become very liquid. 	<ul style="list-style-type: none"> Markets enter a phase where supply and demand are in tight balance: the peak may last a few weeks or several years, depending on the balance of supply/demand pressures. The fleet operate at full speed

STAGE	CHARACTERISTICS	CONSEQUENCES
Collapse	<ul style="list-style-type: none"> • Supply overtakes demand. • Freight rates fall • Liquidity remain high 	<ul style="list-style-type: none"> • Markets move into collapse phase. • Ships reduce operating speed

Importance of ship building in economy: The market for ships consists of three different submarkets, namely: the new building market; the secondhand market; and the scrap market. Within each submarket, the interaction between supply and demand for the asset determines the vessel price. Almost all ship sales and purchases (S&P) are carried out through specialist S&P brokers, with the exception of new buildings, which may be ordered by investors to shipyards directly. The sale and purchase of ships is a lengthy process, which can take anything between a few weeks and several months to complete. This process involves different stages of placing the ship in the market, the negotiation of price and conditions of contract, preparing the memorandum of agreement,

Shipbuilding	Sectors	
	Ship construction (incl. Newbuilding and Repair & Conversion)	Builds the hull and basic structures of a ship. In order to increase efficiencies in shipbuilding, there is an increasing trend of splitting new building and repair activities in different shipyards. As a result, a geographical displacement of ship repair activities is occurring towards areas close to the major transportation routes.
	Marine equipment	Defined as "the supply industry to the shipyards". Increasing outsourcing and subcontracting of shipbuilding activities gave rise to the marine equipment industry. Accounts for a large part of the value-added of a ship (could be as high as 70-80%). Given the wide variety of products and services provided by the marine equipment industry it is considered a very heterogeneous sector (see Annex 7.2).
	Ship scrapping	In charge of dismantling ships. It is a very basic industry in which either companies or their markets are normally located in developing countries (lower labour costs). Obtained steel panels use to be rolled and reused in the local markets as raw materials (e.g., construction industry). Due to these characteristics this sub-sector is not of special relevance for European shipyards.
	Naval vessels	As it is dominated by political and strategic factors, it differs from the competitiveness point of view. In contrast with the previous sectors it is characterised by its relatively stable market.
Segments	Tankers	Designed to transport liquids and gases in bulk (e.g., oil, gas, juice, wine, etc.). There exist different types of tankers depending on their size: Panamax (up to 70,000 DWT); Aframax (70,000-120,000 DWT); Suezmax (120,000-200,000 DWT); Very Large Crude Carriers (200,000-325,000 DWT); and, Ultra Large Crude Carriers (325,000-550,000 DWT).
	Dry bulk carriers	Less sophisticated, but highly efficient. Intended for the transport of dry unpacked cargo (e.g., coal, cement, mineral ores or grain). Classified depending on their size characteristics: Handies (10-49,999 DWT); Panamax (50, 000-79,900 DWT); and, Capesize (> 80,000DWT).
	Container ships	A revolution for the shipping industry. Containerisation of goods facilitated the mechanised handling of the cargo and reduced burglary. Despite of some exceptions (e.g., cars), containers are the cargo standard unit for almost every manufactured item. Standard containers are 20 feet and 40 feet in length.
	Passenger ships	Two main categories: cruise ships and ferries (i.e., "fun" or "function"). Cruise ships are designed for leisure purposes and ferries to move people (and, vehicles) on regular itineraries quickly and cheaply. A wide variety of ferry types exist: ranging from small passenger ships to big Ro-Ro ferries (Roll-on Roll-off), that have the capacity to carry thousands of passengers and hundreds of vehicles.
	Specialised vessels	Vessels with some onboard machinery/equipment to perform specific tasks related to different marine industries (e.g., offshore vessels, dredgers, chemical tankers or LPG-LNG carriers).
	Mega-Yachts	Luxury yachts of 24 meter or more in length. Professionally crewed, very expensive and privately owned sailing or motor ships.

inspections and final closing of the deal, after which the ship is delivered to the buyer.

Table: 2 Shipbuilding sectors and segments
 (Source: Sectors and segments of the shipping industry (Author's compilation based on Stopford, 1997; Christiansen et al., 2007; ECORYS)

There are two main factors responsible for the dominance of Asian shipyards over the Europeans yards.

- Labour costs: Europe, Japan and S. Korea have similar labour costs, which are significantly higher than those from China.
- Steel price: The price of steel determines shipbuilding costs to the highest degree because it serves as the principal manufacturing material in ship construction. Asian nations in particular China control most global steel manufacturing and consumption. European shipyards encounter a market disadvantage due to having to obtain their raw materials at elevated prices.

European shipyards accept an adverse raw material environment and chose specialization for constructing sophisticated maritime vessels of high value addition. The European shipbuilding industry uses this approach to minimize negative effects generated by its higher labor expenses. All shipbuilding activities of Finland, France, Italy and UK focus on passenger boats and ferries as their specialty sectors while Denmark excels at building container ships. The remainder of the countries segment their assets among multiple types of maritime products yet shipments represent a concentrated focus throughout Europe.

Importance of ports in economy: Ports and terminals earn money by charging ships for the use of their facilities. Leaving aside competitive factors, port charges must cover unit costs, and these have a fixed and variable element. The shipowner may be charged in two ways, an 'all-in' rate where, apart from some minor ancillary services, everything is included; or an 'add-on' rate where the shipowner pays a basic charge to which extras are added for the various services used by the ship during its visit to the port. The method of charging depends upon the type of cargo operation, but both will vary according to volume, with trigger points activating tariff changes. The core value of ports is economic since they support trade flows and the ecosystem of related activities. Since ports require a significant financial investment, they are expected to generate sufficient value to make these investments worthwhile. From an economic and public policy perspective, ports are viewed as economic catalysts for the regions they serve. There are two distinct approaches which can be followed when evaluating the strategic and economic significance of ports. The first is to measure the economic importance of ports via different parameters. There exists a wide variety of potential indicators; some are presented in absolute figures, while others are shown in relative terms. A non-exhaustive list includes:

Gross value-added: Gross value added provides an insight into the contribution of port activity to the GDP (Gross Domestic Product) or GRP (Gross Regional Product) in a given time period (often annually). This added-value can be challenging to evaluate since ports directly influence activities directly connected to them and without which the port could not properly function. There is also a range of indirect impacts on the whole ecosystem of economic activities that may interact with the activities directly related to the port. With the expansion of international trade, the indirect effects of ports on national and regional economies became even more important.

Employment : Employment is mainly expressed in full-time equivalents (FTEs) and provides an insight into how port activities contribute to employment creation. Typically, a snapshot is taken annually to measure total employment or port activities. Like added value, there is a broad spectrum of jobs that are indirectly linked to port operations.

Trade volumes and values : Trade volumes and values shows a perspective into the importance of ports for international trade. Traffic direction can also be considered since several ports are dominantly export platforms while others are focused on imports. In such cases, identical trade volumes and compositions can support distinct economic structures.

Fiscal revenue : Fiscal revenue reflects how port activities contribute to tax income at various government levels, from national to municipal. This is especially important in justifying public spending on port-related infrastructure and support.

Investments : Investment by the public and private sector in port activities over a given period. Port superstructure and infrastructure are capital intensive and require constant maintenance.

The second approach is more qualitative and aims to evaluate the importance and value of seaports in driving the economic development and performance of their markets.

Maritime transport and logistics : Marine transportation and logistics is an integral, part of the global economy. The marine transportation system consists of a network of specialized vessels, the ports they serve, and the transportation infrastructure connecting factories, terminals, distribution centers, and markets. Maritime transport plays a crucial role as both a complement to and, in some cases, an alternative for other freight transportation methods. For many goods and trade routes, waterborne commerce has no direct substitute. However, on certain routes—such as coastal, short-sea shipping, or inland river systems—marine transport can serve as an alternative to road and rail, depending on factors like cost, transit time, and infrastructure availability. Other important marine transportation activities include passenger transportation (ferries and cruise ships), national defence (Naval vessels), fishing and resource extraction, and navigational service (vessel-assist tugs, harbour maintenance vessels, etc.).

Maritime Transportation	Sections	
	Deep sea	Inter-continental transportation that employs the larger size vessels. Deep-sea vessels spend long periods of time at sea.
	Short sea	Intra-continental transportation that employs the smaller size vessels. It redistributes cargo delivered to continental centres (e.g., Hong Kong or Rotterdam) by deep sea vessels, competing with land based transport. Subject to many political restrictions (e.g., cabotage).
	Domestic ferries	Transport of people, vehicles and cargo. Often used as shuttle service between ports. Short routes are served by small vessels, while large liners are used in longer routes.
Segments	Cruises	Passenger transport with leisure purposes. Transportation on itself may not be the principal purpose, as ship's amenities are part of the experience.
	Liner	Operate according to a published itinerary and schedule. Usually control container and general cargo vessels.
	Tramp	Operate with no fixed itinerary and schedule. Transport the available cargo under contracts of affreightment. Usually control tankers and bulk carriers.
	Industrial	Operators that own the cargoes shipped and control the vessels used in transportation. Strive to minimise the cost of shipping the cargo of vertically integrated companies (e.g., oil, chemicals, ores...).

Table:3 Sectors and segments of the shipping industry
 (Source: Author's compilation based on Stopford, 1997; Christiansen et al., 2007; ECORYS)

The modern international transport and logistics system consists of roads, railways, inland waterways, shipping lines and air freight services, each using different vehicles. In practice, the system is divided into three zones: inter-regional transport, which includes deep-sea shipping and air freight; short-sea shipping, which handles cargo over shorter distances and often distributes goods received from deep-sea services; and inland transport, which encompasses road, rail, river, and canal transportation.

The role of marine tourism in economic development :

- Marine tourism boosts the revenue of the economy, creates thousands of jobs, develops the infrastructures of a country, and a sense of cultural exchange between foreigners and citizens.
- In the 21st-century economy, tourism is a vital component of the economic system, playing a key role in driving development and modernization. A tourist destination can generate significant revenue for the state budget through taxes and fees paid by businesses operating in the area. Tourists act as consumers of goods and recipients of various services.
- The tourist purchases goods and takes advantage of various services. Thus, tourism can support economic development of both the local community and the economy of a country, through earnings from domestic and foreign visitors.
- Tourism also boosts the export of local products. It is estimated that 15-20% of the tourist expenditure is spent for gifts, clothing and souvenirs. In numerous tourist destinations, markets offer local crafts, providing income for local artisans while also creating a unique shopping experience for visitors.

All the marine sectors plays major role in the economic development of both nation and global but there are lots of problems related to maritime industry and one of the major problem is RISK IN SHIPPING FINANCE AND INVESTMENT. Now we will see what are the risks and how to reduce and manage the risks.

INVESTORS: The main investment and financing facilities in the shipping industry.

- **Equity:** shipping company seeks investors to take a stake in the company, sharing the risks and receiving the rewards.

Example : owner equity, limited partnership, ship fund, public offering.

- **Mezzanine finance :** A half way between debt and equity.

Example: private placement.

- **Senior debt :**
 the favoured way of financing shipping, Attractive to borrowers as a flexible way of financing a shipping company, while retaining the ownership of the business.

Example: bond issue, commercial bank loan, shipyard credit, private placement.

- **Lease:** the shipowner hands it over to the lessee in return for a rent. At the end of the lease the property reverts to the lessor.

Example: financial lease, operating lease.

Risk in shipping finance and investment :

- **RISK ASSOCIATED WITH OPERATIONS OF VESSELS AND OFFSHORE PLANTS:** Some of the major risks that a company faces are damage to the ships and cargoes or injury to any crew members caused by vessel collision, ships running aground, fires and other accidents as well as environmental pollution from leakage of cargo oil and bunker oil.

To prevent accidents from occurring the owned vessels or chartered vessels, companies safety operation headquarters, sales divisions, shipowners and ship management companies work together they train and supervise crew members for safety standard specifications which maintain the safety of the vessels. Companies also do variety of preparations to counter the dangers due to pirate attack and terrorism by providing sufficient training to the crew members, providing support from the head office and installing necessary facilities. In case of accidents the company is prepared with insurance policies that have the necessary amount of coverage for hull insurance, general liability insurance, war risk insurance and loss of earning insurance in order to secure adequate funds for any compensation and to avoid a major impact to profit.

- ✚ **RISK DUE TO NATURAL DISASTER AND EPIDEMIC RISKS:** Sometimes the company had to suffer a lot of financial damage due to natural disasters and epidemics. For example the ongoing COVID - 19 pandemic that started in 2020 cause a lot of damages to many companies. To keep the vessels operating even in case of natural disaster and for maintaining continuous supply chain companies have formulated BCP manual and introduced satellite offices and backup systems and also provide trainings.
- ✚ **RISKS RELATED TO HUMAN RIGHTS AND SUPPLY CHAIN:** Companies respect the human rights of group employees and all the people involved in supply chain. It is essential to ensure their safety and health and create environments where every one can work properly without any discrimination and harassment of any kind.
- ✚ **RISK DUE TO CYBERSECURITY:** In recent years there is a lot of increased cases of cybersecurity because of that many companies have to suffer losses. To prevent from cybersecurity risks companies has implemented many measures.
- ✚ **SHIPPING MARKET FLUCTUATION RISKS:** It is the another fundamental risk in the shipping finance and investment. To prevent excessive market risk companies manage risks by limiting the total amount of risks, dispersing risks and reducing the amount of risks during every year. To limit total risk exposure companies takes steps to obtain medium to long term contracts with domestic and overseas customers. To disperse risk companies use portfolio strategy of different types of vessels subject to different patterns of market fluctuations. This helps the company to balance market risk across business units compensating for peaks and troughs. Companies reduce the amount of risk every year by using freight forwarding agreements. Companies use total risk control method to reduce total amount of shipping market risks.
- ✚ **CLIMATE CHANGE RISKS:** By causing more severe weather and sea events, climate change such as global warming can present a danger to safe ship operations. The movement toward decarbonization to combat climate change has the potential to drastically change the business environment for companies, which requires large volumes of bunker oil and transports various kinds of fossil energy as a main cargo, in the context of higher costs to comply with public regulations and a structural reduction in transport demand. By developing and providing solutions for alternative fuel transportation and low-carbon or decarbonization technology, companies views this change as a business opportunity as decarbonization stimulates new demand. The companies uses a TCFD frame-work to visualize its climate change risks and formulate related policies.

Risk management in shipping:

Risk management is a three-step process:

- ✚ risk modelling which implies identifying the underlying risk factors and modelling their dynamics.
- ✚ risk measurement which implies quantifying the impact of risk factors on financial results .
- ✚ risk management which implies controlling risk with risk- informed decision making.

Risk management does not necessarily imply risk reduction. the objective of risk management is not to reduce risk, but more importantly to quantify and control risk. Most of the times, the intention is not to eliminate risk, but rather to alter our risk profile according to the prevailing market conditions, our risk preferences, and potential regulatory or contractual requirements. Most industries can differentiate between business risks and market risks. Other industries cannot distinguish between business risks and market risks. Shipping can be said to belong to the industries that cannot distinguish between business risks and market risks. Financial results in shipping are directly influenced by movements in the world's freight rate markets. Freight rates have historically been very volatile. The impact of unforeseen geo-political events and the slow speed of adjusting supply to demand have often resulted in dramatic fluctuations in the level of freight rates. Fluctuations in freight rates have direct impact on fleet cash flow and cash flow performance is the primary concern in shipping, both from an owner and a lender perspective. So, what really matters when measuring freight market risk is the impact of freight rate variability on cash flow performance.

Risk management in shipping is necessary due to various industry inefficiencies. Given its high capital requirements, shipping demands substantial funding for fleet expansion and replacement. Yet, it has very limited opportunities to diversify its sources of funding, as most of its financing comes in the form of bank debt. Secondly, regarding the bond between asset and liability, asset economic life is usually much longer than the term of debt financing, variable revenues meet fixed debt obligations and there is a high positive correlation between freight rates and vessel values, leading to a situation of low collateral support when default is most likely. Finally, many banks tend to be influenced by the general sentiment of shipping markets: they appear more willing to lend when the market (and vessel prices) is high, despite the fact that the market will eventually revert back to lower levels; in contrast, they appear rather hesitant to extend credit at a period of low freight rates, although these are likely to rise to more sustainable levels.

Methods of reducing the financial risk: In finance, hedging is the strategy of mitigating risk exposure by establishing an offsetting position in the derivatives market. Derivative markets allow market agents to minimize their exposure to risk by reducing the variance of their portfolio. The hedging techniques and instruments used to hedge interest rate risk include interest-rate forwards, called "forward rate agreements", interest-rate futures, interest-rate swaps and interest-rate options. Forward rate agreements (FRA) are over-the-counter contracts between parties that determine the rate of interest to be paid on an agreed-upon date in the future. In other words, an FRA is a contract to exchange an interest rate commitment on a notional amount. It specifies the applicable rates, termination date, and notional value. The main advantage of the FRA market is that because the contracts are exchange-traded, credit risk is reduced. An interest-rate swap is a bilateral OTC contractual agreement to exchange streams of interest payments for a specific maturity, called the tenor, based on a notional principal. The notional principal is only used for the purposes of calculating interest payments and is not exchanged between the two parties. Swap transactions involve intermediaries, usually banks that get commission and brokerage fees for their services. It should be noted that usually for a shipping company, the swap will be arranged directly through the lending bank and in most cases, the shipowner will simply be paying the fixed rate instead of paying or receiving the offsetting cash flows. Swaps are very useful hedging tools and provide an effective hedge against fluctuations in interest rates.

Caplets and floorlets are risk-management tools, designed to provide insurance by setting a maximum (cap) and a minimum (floor) floating rate respectively for a certain interest-rate period. A caplet is defined as a long position on a single call option on an underlying interest rate. An interest rate caplet gives its holder the opportunity to limit any possible future losses due to an increase in interest rates. The purchase of the call option compensates the floating-rate borrower in the case of an interest-rate rise and provides an upper bound on the spot interest-rate payment which the borrower has to pay at expiry. A floorlet, on the other hand, is defined as a long position on a single put option on an underlying asset. An interest-rate floorlet gives its holder the opportunity to limit any possible future losses due to a drop in interest rates. The purchase of the put option compensates the floating-rate lender/investor in the case of an interest-rate fall and provides a lower bound on the spot interest-rate payment that the investor receives at expiry.

Caps and floors are structured on the basis of a specific reference rate, for example, three-month LIBOR, which is reset at regular intervals. A caplet (long call) pays at expiry an amount equal to the difference between the spot interest rate and the strike rate, if this amount is positive, and zero otherwise. In the same way, a floorlet (long put) pays at expiry an amount equal to the difference between the strike rate and spot interest rate, if this amount is positive, and zero. Collars are highly effective risk management tools that limit both the potential gains and losses of the holder within a predefined range. Collars are a combination of caps and floors, which allow the profit/loss of the investor to be limited to a maximum (cap) and minimum (floor). For example, a shipowner who plans to borrow a certain amount of capital in the future can buy an interest-rate call option (cap) and sell an interest-rate put option (floor) with a notional principal equal to the amount of the loan and expiration dates that match the tenor of the loan. If the shipowner is borrowing money at a floating LIBOR rate, the cap will limit any possible future losses due to an increase in interest rates by compensating the borrower at each reset. For this insurance, the shipowner will pay a cap premium. A way to offset the higher premium is to sell a put option for the same maturity but lower strike and receive the floor premium. However, by doing so, potential profits are limited if interest rates fall. The purpose of collars is to limit the effective borrowing cost by setting upper and lower bounds.

INNOVATION: Table below shows the main drivers, market opportunities, barriers and technological responses for innovation in the shipping sector.

	TREND	DRIVERS	MARKET POTENTIAL	TECHNOLOGICAL BARRIERS			TECHNOLOGICAL RESPONSE
				Development	Scaling up	Expression of demand	
MARKET TRENDS	1. Fuel efficiency & cost reduction	Increased competition: pressure to reduce operating costs Increasing oil prices	Fuel-efficient systems Alternative fuel types ¹	Financial: High perceived risk Difficulties to fulfill technical standards Lack of skilled labour	Reluctance of shipping companies: hamper innovation (lack of learning by doing)	Conservatism of shipping companies Lack of rebuilding: no incorporation of new technologies	Improved designs (hull, reduced resistance) Propellers Propulsion Improving Devices Wind assistance devices Optimised operation Improved engine efficiency Waste heat recovery systems
	2. Environmental awareness and CSR	Increased environmental awareness of consumers	Limited. Almost always linked to a direct business case; more likely to take place in segments operating close to consumers	Technologically do not differ significantly from those described for Trends 1, 3, 4, 5, 6. Due to the lack of direct regulatory pressure, the main barrier relies on the willingness of shipping companies (which can see the increasing environmental awareness of consumers as a potential investment/business opportunity).			Similar to those described for Trends 1, 3, 4, 5, 6. Positive factor: Environmental awareness and CSR development more progressed in Europe (potential "home market")
REGULATORY TRENDS*	3. NO _x abatement	Global regulation: e.g. IMO, MARPOL EU regulation: e.g. Air Quality Directive National/local regulation: e.g., tax levies in Norway	Selective Catalytic Reduction ¹ Dual fuel engines LNG engines ¹ Exhaust Gas Recirculation ¹	Relatively few. Active European industries in the development of green innovations	Reluctance of shipping companies: hamper innovation (lack of learning by doing)	Regulatory/market uncertainty Lack of supporting infrastructure	Development of new LNG engines Installation of SCR systems Retrofits of existing engines
	4. SO _x abatement	Global regulation: e.g. IMO, MARPOL EU regulation: e.g. Directive (2005/33/EC)	Low sulphur content fuels (MDO, LNG) Scrubbers ⁶	Relatively few. Active European industries in the development of green innovations		Regulatory uncertainty	Development of new LNG engines Use of on board scrubbers
	5. CO ₂	Global regulation ⁷ : e.g. Energy Efficiency Design Index (EEDI), Ship Energy Efficiency Management Plans (SEEMP) EU regulation: Transport White Paper	Electrical energy efficient technologies	Similar to those described for Trend 1.		Regulatory uncertainty	Improved fuel efficiency of engines Low carbon content fuels Reduced engine power
	6. Ballast water and sediment treatment	Global regulation: Convention for the Control and Management of Ships' Ballast Water and Sediments	Ballast water management systems ⁸	Relatively few. Active European industries in the development of green innovations		Regulatory uncertainty	Integration of ballast treatment systems on board which kill organisms and bacteria
	7. Offshore renewable energy	European Renewable Energy Directive (2009/28/EC)	Specialised support vessels Platforms and foundations for turbines	Lack of yard infrastructure and skills	Limited. Barriers presumably related to the state-of-the-art of the renewable sector rather than to the shipping sectors	Regulatory and budgetary uncertainty	Adaptation of technologies and vessels to make them suitable for even deeper and further offshore areas
OTHERS	CLIMATE CHANGE						
		DRIVERS	MARKET POTENTIAL	BARRIERS	TECHNOLOGICAL RESPONSE		
8. The Arctic climate divide	Opening up of cross-Arctic routes	Icebreakers	Access to the arctic route Uncertainty in route accessibility	Financing	Exploration of Oil & Gas Environmental concerns		

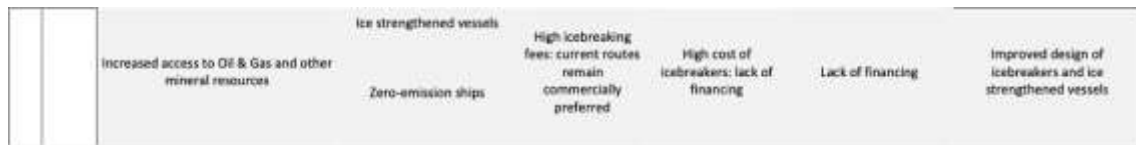


Table 4: the main drivers, market opportunities, barriers and technological responses for innovation in the shipping sector. (Source DNV 2012)

IV. CONCLUSION:

- Shipping is a highly volatile and market dependent sector. While good economic times favour its fast growth, crisis times hit it strongly.
- The development of the sector is strongly influenced by differences in labour costs, both at global and European levels.
- the wage differences between Eastern and Western countries the global specialisation strategies are replicated at the intra-European level. Eastern countries (intra- and extra-EU) act as "low cost" countries, building ships of lower value-added and technological level. On the other hand the western countries, overcome the fact of having higher wage costs by specialising in high value-added and technological segments.
- The growth in shipping demand is driven by developing economies, which are growing at the expense of the slowdown in developed economies.
- The growing demand of developing countries requires new epicentres for the distribution of goods. The need to transport more goods, can lead to problems of lack of infrastructure and logistics, either inside or outside the transportation mainlines.
- Despite the poor global economic situation, new market trends and the international regulatory framework can act as a boost to the sector.
- The ageing of the labour force together with the poor image of the sector can put at risk the renewal of the qualified labour force.
- With only 2% of the labour force, the presence of women in shipping is practically limited currently to the cruise and ferries segments.
- The promotion of maritime clusters can improve the image of the sector, and: (i) make it more attractive for future workers; (ii) increase the transfer of knowledge between maritime economic sectors; and (iii) encourage the involvement of women.
- In shipping finance and investment there are lots of risks but the risk can be reduced and managed by some methods discussed above .

Looking ahead, the future of the maritime industry is closely tied to global economic trends, technological advancements, and regulatory frameworks. As emerging economies continue to drive demand for goods and resources, the industry must adapt to new opportunities and challenges, such as infrastructure development, workforce training, and the adoption of green technologies. By embracing innovation, sustainability, and strategic planning, the maritime sector can continue to thrive and maintain its pivotal role in shaping the future of global trade and economic development. In conclusion, the maritime industry is not just a facilitator of trade but a dynamic and multifaceted sector that underpins the global economy. Its contributions to economic growth, technological progress, and international connectivity are unparalleled. To sustain its growth and resilience, the industry must navigate its challenges with foresight and collaboration, leveraging emerging opportunities to ensure its continued success. By doing so, the maritime sector will remain a vital force in driving global prosperity and shaping a sustainable future for generations to come.

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