Special issue: ends of eras and new beginnings: twenty-first century challenges for shipping

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Accepted: 7 December 2021 / Published online: 8 February 2022

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1 Ends of eras and new beginnings: the origins of this special issue

This editorial follows—more than two decades later—two shorter ones written by two of the three co-editors for two of the first volumes of MEL see Thanopoulou and Kavussanos (2000). The idea of this present special issue was initiated at the International Association of Maritime Economists (IAME) 2019 conference, organised by the Athens University of Economics and Business (AUEB) in Athens, Greece and kindly agreed to be hosted by MEL.

The two early editorials were written at the time when the old century was drawing to a close with the general anticipation for the 21st being a mixture of hyped-up fears about IT disruption from the ‘millennium bug’ and of heightened hopes for unhindered growth; neither was to materialise. Instead, the first twenty years of the new century were marked by a multitude of events which were not necessarily positive. Such events included the best freight markets ever, coupled with substantially higher volatility in freight rates and ship prices—in a

Dedicated to the loving memory of Professor Ilias Visvikis.

COMMENT BY THE EiC. As their name suggests, Special Issues are ‘special’ projects. In their development, processes, including development time and reviewing periods, may be at variance with standard MEL procedure. The objectives of a S.I. may also vary and these include thematic concentrations; hot issues; or reporting on the outcomes of an important conference (in this occasion IAME2019-Athens). This special issue, in addition, together with sincere thanks to our three guest editors for their painstaking work, is dedicated to the loving memory of our late colleague, Ilias Visvikis, who left us so unfairly and so early, but who will always be remembered through his work on ‘shipping finance’ he left behind to our small fraternity of maritime economists. HH.

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superlative of a shipping cycle ending abruptly after the Lehman Brothers collapse in late 2008—and the worst markets ever that followed. That negative record during the early 2016 trough was less than eight years from the cyclical peak that had preceded it and well forecasted some time earlier (Haralambides and Thanopoulou 2014). Despite abysmal market performances at various other times along the lean post-Lehman Brothers period—and the absence until late 2020 of a firmer durable recovery—yearly records in terms of world trade and world tonnage were also being continuously broken all along. Volatility seemed for years almost irrelevant: long-term investor decisions, such as vessel ordering, and traditional solutions (see Kavussanos 2002) which had been followed by owners during recessions, such as scrapping and lay-up, seemed to be all but disappearing, despite dramatic conditions prevailing often in most markets, albeit not necessarily concurrently across them.

There were eventually good reasons for the apparent lack of—and departure from—classic responses to market crises; such reasons have been established through research (Alizadeh et al. 2017) to be related to changes in the perception of what charterers expected from shipping companies and to the speed of mean reversion which seemed to accelerate over recent years (Alizadeh et al. 2019). These were not the first changes to be noted across a fast-changing world economy. Apart from a number of known-unknowns—if we follow the Rumsfeld spontaneous 2002 taxonomy of events—and from newly formed geopolitical balances (and imbalances), emerging technological and management trends have been in the meantime transforming shipping thoroughly. In the case of some of these trends, this effect was rather belated compared to other industries which had entered the digital era much earlier than shipping and with a stronger, or more sweeping, momentum over the last twenty years.

The introduction and independent formation of freight rate indices from the Baltic Exchange through the Baltic Freight Index (BFI)—representing initially 13 routes of the dry bulk shipping sector, which has become today the Baltic Dry Index (BDI) (see Katris and Kavussanos 2021)—in 1985 have been a significant milestone in providing information and transparency of freight markets and have enabled further research in shipping markets when taking into account the ship price indices also developed. In our days, and following academic research (see Kavussanos 1996a, 1996b, 1997, 2002), and the realisation by market agents that markets in shipping have to be treated discretely, further freight indices have been developed by the Baltic Exchange and other exchanges to measure and publish separate independent freight rate indices for individual routes and, overall, for the various subsectors of shipping (see Kavussanos and Moysiadou 2021). These include the Baltic Capesize Index (BCI), the Baltic Panamax Index (BPI), the Baltic Supramax Index (BSI), the Baltic Handymax Index (BHMI), the Baltic Handysize Index (BHI), the Baltic Dirty Tanker Index (BDTI), the Baltic Clean Tanker Index (BCTI) and the Shanghai Containerised Freight Index (SCFI). The indices measure freight rates in the corresponding sub-segments of shipping, respectively (see Kavussanos et al. (2021) for details). Moreover, the independent establishment and daily publication of these freight rate indices through the Baltic Exchange have enabled the introduction of freight derivative contracts, based on them, as a ‘modern’ tool in the management

of volatility prevalent in such markets. The first ever derivative contract on freight rates was the BIFFEX futures contract, listed at LIFFE in London since 1985 [see Kavussanos and Nomikos (1999, 2000), Kavussanos and Visvikis (2011, 2016) and Kavussanos et al (2021) for a description of available derivative instruments, as separate tools to deal with freight rate volatility and risks in the cargo carrying sector of the shipping industry].

The presidency of Donald Trump in the USA over the period 2016–2020 brought anxiety to maritime industry market participants, as his declared policy of ‘America First’, led to protectionism rather than free trade. The enactment of US tariffs towards certain foreign imports, triggered retaliatory tariffs from China, Canada, Mexico and the EU (European Union). The USA withdrew from the Trans-Pacific Partnership negotiations and signed the United States–Mexico–Canada Agreement (USMCA) in 2018, a successor agreement to North American Free Trade Agreement (NAFTA). These developments had a negative impact on international trade and as a consequence on maritime trade. Increasing anxiety as to what the next day might bring should President Trump won another term of 4 years in office. The Biden administration, since it took office in 2021, declared its aim to return to the earlier state of affairs, which are positive news for international and maritime trade as a consequence; such stable climate is conducive to business planning in long-term projects, such as those involved in international and maritime trade.

One of the most significant issues that relate to the maritime industry has to do with politicians and the electorate in many countries around the world turning their eye on urgent actions for the protection of the environment—be it air, water, or earth see Kavussanos and Tsouknidis (2021). Vessels pollute the environment in a number of ways, including the air through both greenhouse gas (GHG) and non-GHG emissions. These include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and Sulphur Oxides (SO_x), and are harmful to human health and the environment. The global shipping industry emits around 940 million tonnes of CO₂ annually [see United Nations Conference on Trade and Development (UNCTAD 2019)], representing about 2.5% of global GHG emissions (see International Maritime Organization (IMO), 2014 study). Unlike the sectors of energy, industrial processes, agriculture and waste, the shipping industry has not been under specific obligations imposed by the 1997 Kyoto Protocol. Also, the 2015 Paris agreement made no reference to the sector of international shipping. In 2011, the IMO, being the main regulatory body responsible for the shipping industry, amended Annex VI of the international convention for the prevention of pollution from ships (MARPOL) and introduced new mandatory standards through two technical measures: the Energy Efficiency Design Index (EEDI) and the Ship Energy Efficiency Management Plan (SEEMP). Combined these measures are expected eventually to lead to less emissions. Specifically, the EEDI introduces minimum efficiency design requirements for all new ships, while SEEMP defines a technological threshold for all ships, aimed to meet energy efficiency requirements, such as, for example, less fuel consumption (Resolution MEPC.203.62).¹

¹ On 20th of November 2020, new mandatory regulations to cut the carbon intensity of existing ships were approved by IMO’s Marine Environment Protection Committee (MEPC), which are in line with the

In 2018, the IMO announced the first emissions reduction target, aiming to reduce emissions by at least 50% by 2050 compared to the 2008 level. Measures proposed by IMO to achieve this target include technical and operational energy efficiency measures, focusing on improving EEDI and SEEMP frameworks, as well as technical cooperation and capacity building. The measures and time plans include a) National Action Plans (deemed short-term) to cover the period 2018–2023, aiming to create supportive domestic policies; b) Market-based mechanisms, deemed medium term, covering the period 2023–2030, aiming to work through the introduction of market (tax) incentives for cleaner fuels; and c) The use of alternative fuels to replace polluting ones in the long run, i.e. beyond 2030. The aim is to shift resources and capital towards low or zero-carbon fuels by 2030. A significant part for the implementation of the above is played through shipping finance and capital markets (see Kavussanos and Tsouknidis (2021) for details in relation to the developing regulatory framework on green shipping finance and the role of capital providers in reducing the environmental footprint of the industry). Several initiatives by regulatory bodies and private companies have been introduced, aiming to reduce shipping-related emissions through green financing schemes. All the aforementioned environmental concerns have brought and continue to bring about revolutionary changes in the maritime industry, including capital markets, and set the ground for significant research to be carried in this area.

Work on this special issue started at the completion of the first two decades of this millennium. The months to come would change fundamental elements of everyday life, challenge and overturn economic policies, all while rewriting the hierarchy of social priorities from East to West and North to South. Since early 2020, the planet has been struggling with a scale of loss of life and daily disruption of all hitherto ‘normality’ that seemed—and continues to be—unthinkable outside periods of generalised military conflict.

Since the guest editorial team meeting and exchanges at the 2019 IAME Athens Conference, developments were to snowball just within a couple of quarters ahead. The declaration of the pandemic by the World Health Organization came on March 11 about three months after the first cases had been reported in the world press in the final days of 2019. To all key actors across the global maritime value chain, the possibility that the emerging extraordinary circumstances would persist and even amplify had already become a clear prospect. Due to the area of the pandemic’s first known outbreak, measures taken and production stoppages affected quickly all maritime trades to and from China, which by the end of the old century had become

Footnote 1 (continued)

IMO’s (2018) strategy on GHG emissions and are expected to be enforced by 2023. Specifically, a new Energy Efficiency Existing Ship Index (EEXI) is introduced whose standards will be largely equivalent to the current Energy Efficiency Design Index (EEDI) for newbuild ships in 2020. Furthermore, a new operational Carbon Intensity Indicator (CII) will be used to rank vessels in terms of fuel efficiency (ranging from A to E, with ships rated D and below falling under the minimum standard). These measures aim to address both the technical and operational aspects of vessels’ environmental performance.

established as the undisputed world manufacturing facility, trade hub and shipping's most important origin and destination.

However, nothing since the declaration of the pandemic, including very early plans for this special issue and its editorial, was to remain the same and nothing seemed to vindicate any linear type of forecast: In an unexpected twist, early predictions for a generalised recession of world trade and shipping freight markets—especially of a duration that could jeopardise the financial future of related industries such as shipping—did not materialise. Neither did forecasts for a meltdown of vulnerable national economies prove accurate.

The real impact of the pandemic and of related measures to contain it resulted in two different—and finally divergent—trends across the maritime system: the first was related to freight movements; the second to passenger transport by sea. In the first case, this of goods transport, the turn to e-commerce made local production and distribution channels succumb to world-scale competition, with rising imports of the old economies as soon as the Chinese trades started rolling again. This shift led to a boom in container exports from Asia which fed in turn a large part of the dry bulk trades carrying materials necessary for production. The second trend, affecting passenger mobility (for any reason, professional or recreational), was to also create an unthinkable situation whereas normal crew replacement was limited to emergency crew relief only.

While the negative impact of social-distancing rules and COVID-19 still affects passenger transport markets—including cruises—and may continue to hinder regular crew replacements longer than initially hoped for, the pandemic would seem to preclude any good markets such as the ones enjoyed since the summer of 2020 across most of the dry bulk trades and in container shipping. However, even the early COVID-19 period included record rates in the tanker market, together with other 'firsts' which were at the root of the spring 2020 tanker bonanza. Amongst these, they were the very first negative price of oil ever recorded, resulting in an oil storage frenzy, never seen in any previous oil market volatility period (of which there were many). With the oil price entering the minus territory, the direction of bottlenecks of oil logistics started reversing in early spring 2020, as production continued but consumption sunk. The exhaustion of any other storage capacity made tankers the only solution. As the procurement of emergency supplies took centre stage amidst a well by now manifested excessive dependence on Asia—established in the first two decades of the century as the planet's manufacturing hub—paradoxes such as this of the early 2020 tanker market pushed the need to understand volatility aspects further.

Container shipping developments also contributed to the maritime supply chain and freight logistics taking centre stage amidst the pandemic. So did briefly a vessel misadventure amidst the Suez Canal. Within hours, artificial waterways became global news whereby a six-day battle between sand and size was being watched by millions in awe daily.

The EVER GIVEN grounding brought to light all that the pandemic had brought—almost violently—to the fore but had been in the works in the background for years. The incident underlined strongly the increased interdependence that more than two decades of full globalisation had created; as the onset

of the pandemic before it, this accident also signalled the limits of the globalised economic system established already by the millennium (Thanopoulou 2000) in which shipping and logistics operate and are by definition bound to serve.

The papers included in the present issue, ranging from analyses of key decisions like investment and flag choice in a volatility context and from leadership paradigms to container management and software foundations through Operation Research techniques, wrap-up in their own way each the status of state-of-the-art research in their field; at least, as this was transpiring before what might be known in the future as the Great Disruption of 2020.

However, COVID-19—having marked its presence across all shipping markets for two full calendar years by the time of publication of this editorial—could hardly qualify as a disruptive ‘unknown-unknown’ in the spontaneous taxonomy provided in 2002 by the late US Secretary of Defense Donald Rumsfeld (Rumsfeld 2002); neither could it qualify as a Black Swan in Taleb (2007) parlance: pandemics were transported via the sea—together with wealth and people—for thousands of years. However, COVID-19 will stay in shipping memory as one exogenous shock amidst a period of great transformation of the system of shipping including remotely managed operations and the exploitation through Artificial Intelligence of Big Data; in this, the pandemic served indeed as the Great Accelerator.

2 Constants within disruption: volatility as key feature of investments and operations’ decision making

As it must have already transpired, the end of the two decades of the twenty-first century was to signal abruptly—and across the globe—the end of the era of unhindered mass movement and the acceleration—by this newly emerged *force majeure*—of shipping trends such as automation and digitalisation; trends that were noted to be well in the works already by around the middle of the previous decades (Lambrou et al. 2019) but were expected to impact on the shipping value chain rather gradually over the longer term. There were constants, however, which were inherited from the previous two decades. In a perfect paradox, one of these was related to aspects of volatility which permeated the turbulent post-2008 years and was further aggravated through the onset of the pandemic. There are early research assessments (Alizadeh et al. 2019) showing that the speed of mean reversion had a separate and not always concurrent effect with volatility of shipping investments and operational decisions; yet, freight market fluctuations continued to be the trademark of the turbulent post-Lehman Brothers shipping scene.

The first paper included in this volume by Melas, Panayides and Tsouknidis with the title ‘*Dynamic Volatility Spillovers and investor sentiment components across shipping freight markets*’, investigates whether dynamic volatility spillovers across shipping freight markets can be explained by a set of indicators capturing shipping investors’ sentiment.

The issue of volatility in freight markets and ship prices and, thus in the returns of shipping investments, was introduced through the work of Kavussanos (1996a, 1996b, 1997 and 2003) and, as suggested, captures the risk component in the

investment decisions of agents involved in the maritime industry. It was demonstrated that these risks, just like the mean freight rates and ship prices, vary over time, as market conditions in the international shipping industry change. It was revealed that there is volatility clustering in freight rates, with volatilities being high during and after periods of shocks and unexpected events occurring in the industry and low in calmer periods. The importance of investigating volatilities lies in the heart of finance theory, where as Markowitz (1952) in his Nobel prize winning work demonstrated, investors' utility from investments is determined by expected returns and risks, where risks are measured through volatilities—that is, variances. The seminal work of Engle (1982) on Autoregressive Conditional Heteroskedasticity (ARCH) models allowed the latter to be modelled as time varying, recognising the fact that the state of markets evolves and investment portfolio managers must take this into account in their management decisions. Applying this set of models to shipping markets revealed the existence of different risk-return tradeoffs amongst the various sub-segments of freight rates as well as their time-varying nature. These results point to constructing dynamic portfolios of shipping investments, based on the time-varying risk-return tradeoffs of freight rates and ship prices.

The investigation of spillover effects amongst foreign exchange markets, particularly in variances—on a time-varying basis, began with the work of Engle et al (1988). Kavussanos and Visvikis (2004) utilised their techniques and introduced the investigation of volatility spillover effects amongst various markets in shipping; they extended the exercise by considering spillovers between shipping markets and other markets outside the shipping industry that might affect the maritime ones. For the former case, Kavussanos and Visvikis investigated volatility spillover effects between the freight and the Forward Freight Agreements (FFAs) markets. Later, Kavussanos et al. (2010, 2014) considered information linkages between freight derivatives and commodity derivative markets.

Along these lines, the Melas et al. paper in the current volume investigates the volatility spillover effects and investor sentiment across shipping freight markets. The link of market volatility in the shipping markets with behavioural sentiment-related characteristics is discussed in Greenwood and Hanson (2015); they suggest that shipowners in their decision-making process are overoptimistic and ignore competitors' ability to undertake similar investments themselves, an essential characteristic of competitive markets.

Capturing the investor sentiment in the maritime industry is an interesting and important issue, investigated in Papapostolou et al (2014, 2016) who utilise variables that take into account three aspects of shipping markets, assumed to reflect expectations of shipping investors; that is: (i) Market expectations, captured by the variables: Money Committed (MC)—defined as the value of newbuilding vessels on order—and net contracting (NC)—defined as the difference between orderbook plus newbuilding deliveries minus demolitions, taking into account the net additions to the fleet; (ii) Valuation, measured by the Price to Earnings ratio (P/E) and the ratio of Second-hand to NewBuildings price (S/NB); and finally (iii) market liquidity, captured by the turnover ratio (TURN), defined as the number of vessels being sold in a year as a proportion of the fleet. In their own paper, Melas et al. consider the above factors as determinants of volatility spillovers across shipping freight rates

segments and sub-segments, using the methodology of the volatility spillover index introduced by Diebold and Yilmaz (2012). Their main results are the following: an increase of the S/NB ratio triggers an increase of the economic information transmission within both the dry bulk and tanker segments; an increase in the P/E ratio and in the turnover ratio trigger an increase of the economic information transmission within each of the dry bulk and tanker vessels, respectively.

The results of Melas et al. (on this issue) have important implications for shipping market players as they reveal novel mechanisms of economic information transmission within the segments and across the sub-segments of shipping freight markets and contributes to the quest for understanding the information transmission both amongst means (returns) and risks (variances) of investors participating in shipping markets—freight, ships, etc. This quest will continue to feature high in the research agenda as it is at the core of market function, and so will be the case with research on information transmission between shipping and other markets outside the industry; important sources of information which investors may use for better decision can hardly lose market or research interest.

Volatility is also a core market feature in the next paper in this volume entitled '*Freight rate volatility and the flag-switching decision*' by Chondrokouki and Tsekrekos. The paper deals with a very important decision variable: the one regarding the choice of registering a ship under a flag different to that of the nationality or place of residence of its owner. The authors remind us that, in essence, the main objective for registering ships under open registers is to maximise profit and flexibility in comparison to the conditions offered by domestic registries. The maximisation of profits essentially implies minimising the difference between revenues and direct or indirect costs from operating ships, with the focus being more on the minimisation of the 'costs' part of the equation. The latter may come about from the typically zero or nominal tonnage-based taxes, rather than corporate taxation; the flexibility to employ cheaper, foreign, crews; the more relaxed national regulations regarding certain standards of vessel operations; the probability of being inspected and possibly delayed or detained by some port authority; and other related elements. In the quest for competitiveness, at the intensely competitive international environment that shipping companies operate in, the choice of flag can play a critical role.

The authors have chosen to empirically test the predictions of Kavussanos and Tsekrekos (2011) who formulated the decision to change a vessel's flag as an optimal switching problem, along the lines of real options models in finance as in Myers (1977). Their selection of bulk carrier data is a very astute one: apart from the odd tanker bonanza—due mainly to extraordinary exogenous factors—remove extra space, the bulk carrier market is the area *par excellence* where in recent years freight rate records have been consecutively broken, until the eve of the Lehman collapse. However, chains of speculative vessel subcontracting, created as successive charterers bet on the trend to gain from freight differentials, were also broken following that fateful fall of 2008. Chains of sub-chartering of vessels were an element which characterised the early part of the twenty-first century, out of the desire of shipping players to turn market volatility to market opportunity for speculative profit. It remains that the traditional aim behind the decision to flag-out has been the quest for profit maximisation, whether used 'aggressively' by ownership cohorts not having lost

competitiveness, or used ‘defensively’ by shipping companies of fleets of traditional countries faced with cheaper competitors emerging (Thanopoulou 1994). Overall, at times of low markets flagging out intensifies, with loss minimisation rather than profit maximisation being the common denominator for most operators. Due to the competitive character of most shipping markets and the absence of market power of individual owners/operators, during such times, the focus shifts more to the minimisation of the ‘cost’ part of the equation. In any case, as Chondrokouki and Tsekrekos underline—with empirical proof—in the quest of remaining competitive in the intensely competitive international shipping environment, the choice of flag to be flown by the vessel is perceived still by shipping companies as playing a critical role in remaining competitive. Shipping data suggest the same. With volatility and lower-cost competitors emerging since the crisis of the 1970s and the 1980s (Thanopoulou 1998), the first two decades of the twenty-first century established the course towards flagging out as a fact with the vast majority of the world fleet not flying the national colours nowadays (UNCTAD 2020). This includes countries of various sizes, of current or past presence in world shipping, with the tax element not necessarily being the main one in the process of decision making; it should be reminded at this point that apart from tonnage-tax systems, times of crises yield negligible profits or pure losses.

Past studies on the important topic of flag choice include Egiyan (1990) investigating flag characteristics of open registries; Thanopoulou (1998), pointing to the entrance of less-developed countries in shipping and the flagging-out trend that took place in the traditional maritime countries following the maritime crisis of the 1970s and the 1980s, particularly in periods of low freight rates with companies focusing on the minimisation of expenses. Cullinane and Robertshaw (1996) examined the qualitative factors that affect vessel registration decisions while Tolofari et al. (1986), Asteris (1993) and Bergantino and Marlow (1998) suggest that manning costs, the availability of skilled crew, compliance costs and the search for less bureaucracy affect the decisions of shipping companies in their choice of flag.

Other empirical studies include Hoffmann et al. (2004), Cariou and Wolff (2011) and Luo et al. (2013), the latter pointing to the flag selection behaviour being affected by factors such as vessel quality, registration fees, crew nationality requirements and port state and flag state controls. Fan et al. (2014) link the flagging-out decision to port state control inspection rates, the operator’s nationality, the country’s income tax rate, the per capita GDP, the vessel age and type and the classification society utilised by the ship. Marlow and Mitroussi (2011, 2012) verify that taxation, manning regulations, the attitude of trade unions towards certain flags and inspection procedures are significant factors influencing the choice of flag, while Mitroussi and Arghyrou (2016) find that the net flag-out ratio they introduce is influenced by the ease of starting a new business, the characteristics of a country’s tax system and the level of transparency.

Following the Kavussanos and Tsekrekos (2011) model, shipping companies opt to register vessels in open registries in periods of high uncertainty in benefits, as captured by the high volatility of freight rates and return to national registers in periods of low uncertainty i.e. in periods with low freight rate volatility, with this finding not changing even after accounting for differences in register and vessel characteristics. Here,

Chondrokouki and Tsekrekos investigate the predictions of that model empirically using ‘duration analysis’ and a ‘Cox proportional hazards model’. In their model, the hazard rate of the time until a flag change depends on the vessel type, taxation, inspection rates, certification by a classification society and the volatility in freight rates.

Along the lines of a priori expectations, the authors verify empirically that in the presence of high volatility in freight rates, shipowners tend to flag-out to open registries in their effort to minimise costs and to achieve a greater degree of flexibility. Conversely, it is shown that in the presence of low freight rate volatility, shipowners opt to keep vessels under the same flag for prolonged periods of time. These constitute important findings, helping market agents to better understand the functioning of the shipping markets and have implications not only for ship-owning and ship-management companies but also for flag administrators. At the same time, this research constitutes a pioneering empirical study, confirming the effect of freight rate volatility on flag-switching. In parallel, the study also contributes to the empirical literature on real options models in the field of shipping.

However, the focus on sustainability may be increasing in the future the weight of parameters beyond the rate of taxation or crew costs. Such factors have been on the rise—especially when the markets succumb to oversupply in which case charterers focus on the quality characteristics of the vessel; today there are clear indications of what was suspected more than twenty years ago (Strandenes 1999), i.e. prospective ‘two-tier’ markets ahead. At the same time, the classification of flags by quality in white, grey and black by the various Memoranda of Understanding (MoUs) makes the decision to flag-out a more complex one. As Chondrokouki and Tsekrekos mention, shipping companies have also to consider the probability of specific flags been inspected and possible delays or ensuing detentions.

In this line, and in the quest for surviving in the intensely competitive environment of international shipping, the choice of flag may progressively be made with more emphasis on quality parameters. While open registries will continue to allow shipowners to reduce their operating costs through lower crew costs, the rise of sustainability as an overriding ‘clause’ for most activities might put the emphasis more on operational flexibility for registry selection than on cost savings including reduced taxation.

Sustainability may, of course be a game changer in the future for much more than just issues of shipping competitiveness, requiring that future researchers think outside ‘the box’. It is precisely another—and in shipping terms equally famous since the time of Malcolm McLean, the modern liner industry innovator of the 1950s—box that has revolutionised trade. The container box revolution McLean introduced created new needs for effective management of expensive maritime assets, such as containerships and box terminals. It was also containers that many decades later would save the day since early 2020, providing necessary equipment and goods along with a glimpse of normality as the liner industry had to adjust to the sudden pressures of the pandemic.

3 Inside and outside the box: container market capacity management

The next two papers presented in this editorial focus on the container market and on two key aspects of the liner shipping industry. Container sea transport was the sector of shipping which grew massively in this century; it has continued to grow through the COVID-19 pandemic despite some early disruption and container relocation problems (Notteboom et al. 2021b).

The third paper of this special issue entitled ‘A Constraint Programming Approach to Cargo Load Capacity Planning in Container Vessels’, by Lee and Low, is focusing on the area of container management, dealing with planning of route specific containership capacity.

The concept of operations research was coined for decision-support methods in military decision making; in the pre-Big Data and Artificial Intelligence times, OR had been the main tool for supporting operational decisions. Early approaches and applications focused on military problems during World War II: Initially, in the UK to make effective use of military technologies such as underwater mines and radar and, later, in the US at the tactical level to support frontline military operations and logistical decisions (Takai 2009). Often, however, Charles Babbage’s (1791–1871) methods of sorting and distribution of mail in England are given as an earlier example of operations research. After the war, operations research gained ground as a general method, technically supporting decision making (Thomas 2021). The experience from using operations research for military decision making after the war soon led to several civilian and commercial applications. Thereafter, operational research seemed indispensable in rational planning of highly complex distribution networks including the optimisation of transportation routes (Takai 2009). Optimal inventory theory is another early application of operations research in transport and logistics.

Businesses have been applying operational research either to search for an optimal solution to maximise profits or minimise costs. They do this by formulating an optimisation model of the problem at hand. The model is designed to reflect the structure of the problem and the relationship between relevant variables and parameters taking into account all restrictions—constraints—that should be fulfilled. In this way operations, research is a decision-support tool for management, thus, facilitating the best use of a most critical scarce resource: time.

Operational research analysis may be used for decision support on either the strategic, tactical or operational level and decisions at different levels might very well be linked. The paper of Low and Lee falls in this wide vein, with the authors suggesting and designing a model for strategic capacity planning of container vessels, for a specific trade, using a model to present different scenarios on the share of different container sizes, that is 20-, 40-, and 45-foot containers and container weights used in the trade. They point out that such strategic analyses must be supported by specific cargo-mix modelling at the operational level when loading cargo to a specific vessel.

Competition in the container industry has led to a continuous pressure to reduce costs. This competition between container shipping companies reflects the pressure

in international trade for lower transport costs both for raw materials, intermediaries and finalised goods. Furthermore, the increased geographical fragmentation of production is a function of more cost-efficient movements of materials and merchandise in global trade (Venables 1999). In addition, geographical fragmentation of production is fuelling this transport cost reduction by adding new volumes and thereby allowing for exploiting economies of scale in shipping.

The container introduction in the 1960s allowed for increasing vessel sizes by reducing larger vessels diseconomy of scale in cargo handling in port (Cullinane and Khanna 2000). Thus, global trade has seen a sharp increase in the size of container vessels with the current largest vessel being able to carry close to 24,000 twenty-foot equivalent unit containers (TEU) (Scott 2021). The potential for further increase in vessel size may be limited compared to the explosive growth in size seen since 2000 when the largest vessel had a capacity of approximately 8000 TEU (Notteboom et al. 2021a, b). This may further strengthen the need for better capacity planning, as the gains from further economies of scale may be limited. The challenge, thus, is to increase the number of containers carried by each vessel or—in other words—to minimise the unexploited container slots in the ship. In the literature, there are different approaches to solving this planning and operations problem. This is in addition to any increased efficiency through the terminal or the port. Such approaches also apply operations research as was explored in a special issue on operational research in optimising the terminal link in container supply chains in this journal.

Low and Lee are building on a solid foundation when using operational analysis in their modelling of planning for exploiting the cargo load capacity of vessels operating in fixed routes in a container line operation. They point out that combinatorial optimisation has been used to first divide the designed cargo capacity in a new vessel into blocks in each bay and thereafter assign slots to these blocks. The last step is the operational problem of allocating containers to the slots. Other researchers have also applied mathematical programming to solve the loading problem of the container vessel. Low and Lee in their mention two of them: Kos and Zenzerovic (2007) and Ting and Tzeng (2004). Criteria or objectives differ in these two studies. The first is maximising the number of TEUs loaded to the vessels, whereas the second maximises revenue by ranking the containers based on the income derived by carrying each specific container.

Following the long tradition of employing operational research analysis to raise the efficiency in logistics, Low and Lee extend earlier analyses of how to exploit the carrying capacity of container vessels operating in a route network allowing for containers of different sizes.

Constrained programming (CP) differs from combinatorial optimisation and mathematical programming by being fit for problems with multiple constraints of a complex type. Low and Lee use this methodology in their paper, to consider both cargo weights and container size. Their model handles both hard and soft constraints; examples of hard constraints being stacking restrictions, slots for reefer containers and lashing regulations, while ship stability is mentioned under the soft constraints category. Constrained programming is in many ways similar to cargo-mix

problems in that both handle multiple constraints, but as the container vessel needs to load a given cargo list in a port, the CP approach is better suited.

The aim of Lee and Low is to develop through modelling the foundation of a specialised decision-support software for the container liner industry, to increase the efficiency in capacity planning on specific trades served by a container line. By using the constrained programming approach to capacity planning, the authors add to the existing optimisation methods by introducing several cargo type constraints. They find a base solution: the capacity planning is modelled to maximise vessel space utilisation under complex constraints.

To show that this is not only an academic exercise but may be applicable in a real industry context, Low and Lee supplement the model development by solving cases. The idea is that the shipping lines should have a useful tool to speed up the process of capacity planning. The authors present an empirical case of capacity planning based on real-world ship data from a specific shipping line, defining the route, the vessels, and the array of containers (dimensions and weights) that may be in the port waiting for transport. The performance criteria follow from two of the three dimensions of the objective function: the TEU capacity utilised and the number of TEUs that have to be re-stowed; an element that, if neglected, can translate into a multitude of operational and by extension commercial problems.

In the first scenario analysis Lee and Low vary the share of 40 feet containers and find, as should be expected, that the number of unused slots (characteristic of the objective function) is less, the lower the share of 40 feet (FEU) containers amongst the containers in the trade. The second scenario they present is to vary the distribution of container weights again focusing on minimising the unused slots; and rightfully so. If one neglected an element, which emerged over the past two decades, this usually was the lack of solutions for the problem of the uneven distribution of weight. This has come into scrutiny following a number of incidents involving suspected structural damage due to weight distribution (Solum 2020). Lee and Low find that when the share of heavier containers increases, the number of re-stows may rise signifying the requirement that heavy containers may not be stacked upon lighter ones. They also perform similar model simulations with different assumptions on the share of reefer containers.

There was never perhaps a better time for honing such tools as during trade imbalances and the problem with empty containers. The latter have contributed to container freight rates increasing, as much as blank sailings did to achieve a balance between a suddenly hindered demand—due to port and manufacturing closures—and the more than ample under the circumstances container transport capacity in the first months of the pandemic. This balancing act was not achieved outside the established since the early 1990s—novel then—contemporary system of organisation of liner shipping operators in global alliances (Thanopoulou et al. 1999; Ryoo and Thanopoulou 1999); this supply response had followed the globalisation of the networks of container shippers themselves (Thanopoulou 2000).

The next paper, entitled *Strategic alliances in container shipping: A review of the literature and future research agenda*, by Ghorbani, Acciaro, Transchel and Cariou, reviews the extensive literature on strategic alliances since the first publications on

the subject, around the start of the second part of the 1990s. The authors' aim was to highlight emerging themes and propose new avenues in this area of research.

As route-based consortia could not serve anymore the globalised networks required by modern shippers (Thanopoulou 2000; Thanopoulou et al. 1999; Ryoo and Thanopoulou 1999), the 'conference-consortium'-based system exploded to give way to a system of strategic alliances. This system may have become dominant but definitely—as underlined by the authors who characteristically depict changes in alliance participation in their paper—not as stable as the conference system which, however, had its focus on price and revenue stability and not on operational cooperation. That nineteenth century created route-based system of liner company cooperation, aiming to limit market volatility, only partially survives today following the abolition of conferences at EU level in 2008. Since then, and in the turbulent years that followed the post-Lehman Brothers shipping market collapse, liner shipping has survived and currently thrives based on the success of this new form of cooperation and on the basis of increasing concentration in this sector of shipping.

Formation, management and optimisation of strategic global alliances are the three research theme groupings of the tens of papers collected and reviewed by content by Ghorbani, Acciaro, Transchel and Cariou as a first step to be followed by a deeper analysis of future areas of research into this particular form of operational cooperation which seems to have served the industry so well as to compete soon in longevity with consortia; the latter had numbered about three decades of more stable existence but this was in a different context, geographically constrained and conference-protected.

There are fewer main players currently in liner shipping than ever before, with concentration—when calculated using publicly available TEU capacity distribution data (Alphaliner 2021)—having exceeded any possible expectation of 20 years ago (Thanopoulou et al. 1999); there are even fewer alliances today than they were during their starting phase in the mid-1990s, as shown characteristically by the authors.

Following a detailed discussion of the main features of the development of strategic global alliances, the authors identify areas for future research pointing to only few papers published on the reasons for joining strategic alliances instead of opting for further Mergers & Acquisitions (M&A). The authors note, however, the shift of major liner companies towards Strategic Alliances (S.A.s) as a clear indication of their increased attractiveness. This is one main area to which the authors point as a likely one for further research: this is especially so in terms of suitable candidates for M&As, capital availability, uncertainty in the market and of market share restrictions due to antitrust legislation.

Another future research subject—and not unrelated—the authors point to is this of partner selection, especially in relation to measurement mechanisms as in the case of partner selection criteria. The authors also note that more research insights on the negotiation process amongst companies can be added especially on failures which may hide—as is usually the case with failures—more lessons than successes.

A further research topic authors identify through their systematic analysis is the role of newly emerging technologies applicable in shipping on the partnership structure of alliances. In terms of management-related aspects, the authors point to limited knowledge on how to monitor shared risks amongst members and on the

need to extend research into the value added of Strategic Alliances. More specific areas identified by the authors as meriting more research are those of sharing vessel expenses, suggesting that quantitative studies on the optimal mechanism to distribute vessel expenses amongst SA members could indeed add valuable insights. Another management aspect they put forward as a further research area relates to information-sharing amongst members of SAs through suitable mechanisms. In terms of optimisation problems associated with SAs, the authors point to the need to fit optimisation research in the future to realistic assumptions and to include in the process physical restrictions. Their point is a valid one as the closer to real conditions assumptions are, the more applicable and popular such solutions can become. Eventually a most tempting research suggestion by Ghorbani et al. is on the need to focus on such areas as the impact of SAs on fuel consumption and the related effect on emissions and speed optimisation which they note are relatively under-explored ones.

The underlying ‘material’, allowing the growth of the container market was, of course, beyond just forms of operational cooperation, although these played their role in sustaining liner operators through the turbulent first twenty years of the twenty-first century. Behind the new global networks were the growth of international trade and the extensive relocation of globalised production chains. The latter were supported by increasingly faster and practically instantaneous communications bringing about the complete globalisation of world economic transactions; these became most practically paperless, if not instantaneous as well.

However, this transition of almost the entire economy of the planet into the new era has not decreased uncertainty. On the contrary, all these parameters have added to it (see Thanopoulou and Strandenes 2021). This period of transition has been accompanied and has to be accommodated by a fast-increasing world population seeking guidance in any plausible rational—and sometimes irrational—interpretation of trends and contemporary phenomena and especially of the impact that such transitional conditions may have for welfare and well-being.

A theme related to both uncertainty-enhancing factors and the response of key maritime stakeholders to the changing shipping environment is touched upon next in this special issue in the paper by Progoulaki, Tsioumas and Voutsina under the title ‘*Turning followers into leaders: commercial shipping versus Navy*’.

Leadership has acquired an increased importance, following the emergence of Covid-19 for steering commercial shipping during periods of extraordinary circumstances, highlighting leadership related aspects: human resource management and motivation, empathy, adapting and innovating when confronted with challenges and, above all, have a broad risk management education but also perspective.

The time for discussing more the role of leadership in the shipping industry (Thamrin 2012) is today more relevant than ever in view of emerging trends such as sustainability and automation/digitalisation: Strong leadership is required for fostering innovation and adaptation in a changing setting, thus assuming the role of transformation leadership, as defined by Burns (1978) and playing a prime role in the process.

Progoulaki, Tsioumas and Voutsina search and research in their paper at a time when leadership is sought at all levels in the current shipping industry environment:

the future seems to hold different roles for the human resource onboard and ashore, for management techniques but also for the entire business model of shipping.

Hitherto, the one type of leadership mostly discussed has been cost leadership; this was eventually at the expense of the discussion of leadership as a human quality of captains of industry, of captains and of crew, or of managerial executives and teams.

By turning to the Navy as a paradigm which may lead and above all inspire, Progoulaki et al. put forward the proposition that the working environment on board commercial vessels closely resembles that of Navy ships and they search in the naval arm of the military for compatibility with commercial shipping needs and for inspiration in terms of leadership practices. They also note that the comparative analysis of leadership behaviour in merchant shipping does reveal a degree of divergence from the one in the Navy.

The essential in the authors putting forward the paradigm of the military and more specifically of the system of naval forces is that a lot of emphasis is placed on the importance of inspiring followers and of creating an emotional attachment. The authors note that 'leading by example', combined with the strong and respectable personality of the leader is top priority in military environments. In parallel, there is a considerable effort towards achieving effective interaction and fostering a sense of community. The effectiveness of the Navy leadership model is attributed by the authors to monetary benefits not being an option in a military context; therefore, they note, naval leaders have to search for other sources of motivation.

The authors also note that the value of inspiring crews to overcome hurdles and attain superior levels of performance has not yet attracted equally high attention in the maritime industry, emphasising that the tanker industry, where the stakes are high if leadership is not shown in critical circumstances, seems to be acknowledging more the positive effects of leadership both on board as well as on ship-shore cooperation through the introduction of industry standards of best practices.

Following their systematic literature review, Progoulaki, Tsioumas and Voutsina suggest producing a comprehensive model of leadership applicable to the specific idiosyncratic conditions of commercial shipping through a multi-level analysis of leadership across different levels of authority. They also suggest that the reliability and validity in the measurement of leadership effectiveness should become more accurate and that further leadership skills and approaches relevant to the context of commercial shipping should be provided and elaborated beyond the standard provisions of the International Maritime Organization (IMO) skills' requirements.

Towards this aim, Progoulaki, Tsioumas and Voutsina propose that some of the Navy leadership practices are transposed to commercial shipping, constituting a source of competitive advantage for ship-management companies as well through modernisation and restructuring of leadership-building training in order to address not just the operations level, but also the managerial level, both in ship and office working environment; they also assess the need for further research and academic interest in leadership aspects in the context of commercial shipping.

The paper by Progoulaki, Tsioumas and Voutsina needs itself followers in terms of the need for a rising interest in aspects of leadership in shipping which must materialise especially into more research into the transformational leadership traits; the

latter are necessary amidst the transformation of the industry itself to an equivalent degree as in general management research where the theme has acquired increasing significance in recent decades (Goethels et al. 2004).

The focus on leadership as a human quality is even more necessary as the extreme uncertainty reigns about the future of every aspect of the system of shipping, which includes all of what has been defined as maritime ‘hardware’ and ‘software’, the latter denoting also all management aspects, including leadership and innovation (Thanopoulou et al. 2010). In this context, leadership for change is an essential ingredient for the adaptation through transformation of any business organisation (Gowan—Sahadath 2010) and the quest for what—with foresight—has been termed decades ago as twenty-first century leadership (Rost 1991) includes it.

4 ‘All change’: acceleration, interruption or disruption in the way ahead?

In terms of demand opportunities and challenges for maritime transport, *distance*, rather than *volume* may be the critical parameter for the networks of tomorrow. Volume is not forecasted to decline anytime soon as record upon record in international trade was broken during the first two decades of the twenty-first century despite the reduction of the GDP/trade elasticity in recent years (Strandenes and Thanopoulou 2020a) and the brief disruption of the immediate post-Lehman Brothers period boosted by growing demographic parameters.

Regardless of whether neo-Malthusians or non-Malthusians win the theoretical battle on the sustainable effect of population growth, an issue that failed to be resolved for centuries in any case, this world will keep on growing. Both the Chinese and Indian demographic policy experiences showed that even when society abides by strict reproduction rules or is discouraged to grow—through strong incentives—population growth continues. With demographics still rising in a world increasingly focused on labour-saving technologies, frictions and imbalances will persist generating mass movement at national, intraregional and interregional level; and so will the need of the more privileged to know the world around them, the entire history of our species being after all one of continuous movement and exploration.

However, what can prove more of a challenge, even more serious than this of the geographical restructuring of world production, is the emergence of a society of *use* rather than ownership, with all its potential impact on the pattern of consumption of impoverished middle classes around the planet (Strandenes and Thanopoulou 2020b); the latter have discovered in resource sharing—from bicycles to revamped applications of traditional home-based hospitality—first a ‘fad’ and then a rational way to overcome financial impasses. With it, challenges related to automation and remote management of resources have multiplied. The momentum of these trends finally made inroads into freight carrying shipping with the autonomy of vessels—relative or absolute—being now officially included, with its varied degrees, as a serious prospect at the highest level of the international maritime authorities (IMO 2018).

MASS was indeed a genial appellation for this new prospect emanating from the initials of Maritime Autonomous Surface Ships, fast turning into reality through a variety of prototype applications and being the subject of a significant number of projects, many of which funded by the European Commission as well as by individual countries. Mass consumption, massive transport vehicles—across all modes including ships and shipping—and massive movement all around the planet have been the special features of an era of technologically propelled globalisation and of multiplied energy needs to fuel transport services.

Maritime transport automation is primarily put forward with management optimisation in mind and will definitely open up new challenges and friction between the human and the purely hardware and software technical systems. This has been the case historically across most industries and there is little ground to believe that shipping will be different. Indeed, the social and legal issues arising through any degree of vessel autonomy—bar the baseline ‘degree I’ as put forward by IMO essentially describing current best practices in contemporary shipping—are in essence unexplored. But the timing is opportune. A social consensus on the distribution of the benefits of automation will facilitate the process while efforts to create such a workforce-transport automation agenda at European level involving stakeholders in the process are under way, funded by the European Commission in the context of its HORIZON program (WE-TRANSFORM 2021).

If carefully introduced and thoroughly addressed, in terms of transition complications, digitalisation-based automation may at the end increase profits and reduce excessive workloads of tedious repetitive tasks—mental or manual—concurrently. A consensus on how benefits and costs of automation are to be distributed across society would remove friction or any nineteenth century Luddite phenomena (Nuvolari 2002) with algorithms and not machines being ‘the enemy’ of the revolted workforce this time. Knowledge and research-based consensus, accelerating automation or allowing it to take hold at the pace technically possible, would also increase the social gains in terms of less pollution through increased efficiencies and exploitation of data from the natural environment for decreasing energy consumption. The challenges created through automation in transport—a trend further propelled through COVID-19—are many and another entire journal special issue or edited volume would not suffice to sketch the potential repercussions of the pandemic on acceleration of emerging trends in shipping.

In so far as established trends are concerned, for what seems to be still a substantial period ahead, the world will eventually continue to be run by the 2Ms: Mass and Mobility and both these for a third M as motive: Money. However, if the future is to be sustainable for the massive numbers of population who need to have access to sustainable transport for themselves and for the goods they produce, exchange and need, the hierarchy of the values high up in our *modus operandi* may have to change across all types of economic transactions. If anything, the climate and health crises succeeding—and coinciding with—each other in recent years are urging us to prioritise the truly scarce resources: clean air, clean seas, safe routing and suitable living and conditions. Especially in the case of Human Resources, i.e. the people who staff these critical transport services, it is time they are put forward as a priority: for

relief, for access to twenty-first century skills and for guidance in the new paths so many will have to take in the new automated digital world.

It was precious people along all of the maritime value chain who allowed the world system of exchanges to continue to be the lifeline for our everyday lives even under the strenuous circumstances of late. In either normality conditions, more turbulent ones and in extreme uncertainty—this state of flux on which there is no consensus on the direction of forming trends—such lifelines are the prerequisite for life itself to emerge as the winner in the perennial battle of humanity with scarcity, sickness and need. And it is with the help of its people, of their resilience and sacrifices, their knowledge and their power of innovation, that the system of maritime transport and logistics has never surrendered whatever the threat.

Manolis in Athens, Siri in Bergen, Helen in Chios.

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