Corporate governance in the shipping industry: board interlocks and agency conflicts

Andreas Andrikopoulos, Andreas Georgakopoulos, Anna Merika and Andreas Merikas

Abstract

Purpose – *This paper aims to explore the effect of interlocking directorates on agency conflicts and corporate performance in the shipping industry.*

Design/methodology/approach – *The authors use social network analysis to discover central nodes in the network of personal and corporate connections in an international sample of 110 listed shipping companies.*

Findings – *Assessing network structure, the authors find that the network of corporate leaders is denser than the network of shipping companies. The network of shipping companies is populated with many isolated nodes; the network of shipping executives and directors is populated with many cohesive groups in which the longest distance between two corporate leaders is two companies. The authors find that interlocking corporate leadership can help resolve agency conflicts in the shipping industry, bearing a negative effect on the magnitude of agency costs. The extent of leadership overlaps is associated with board size, financial leverage and profitability. The relationship between profits and interlocks is bidirectional, implying that interlocking directorates bear a positive effect on asset returns.*

Originality/value – *The authors map the relational structures in the social networks of companies and company leaders in the shipping industry and discover the cross-sectional determinants of interlocks in the shipping industry. The finding about the effect of interlocks on profitability and agency costs bears policy implications for the design of corporate governance in the shipping industry.*

Keywords *Social networks, Corporate governance, Interlocking directorates, Shipping industry*

Paper type *Research paper*

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1. Introduction

Boards of directors are interlocked when one director is sitting in the board of two companies; such configurations are also called interlocking directorates. Board interlocks constitute interconnections not only of personal career paths but also of organizational objectives and choices. Interlocking directorates characterize strategic interdependence between companies in all major capitalist economies (Jonnergrad and Stafsudd, 2011; Bellenzier and Grassi, 2014; Cannella *et al.*, 2015). Moreover, they affect corporate strategic choices such as alliances, the design of executive compensation, mergers and acquisitions and initial public offerings (Gulati and Westphal, 1999; Wong *et al.*, 2015; Kramarz and Thesmar, 2013; Rousseau and Stroup, 2015; Moore *et al.*, 2012); there has also been a documented effect of interlocking directorates on auditor choice and accounting practices like expensing or backdating Employee Stock Options (Riise Johansen and Petersson, 2013; Kang and Tan, 2008; Bizjak *et al.*, 2009).

On the individual level, interlocks may be driven by concerns of career advancement, prestige and economic incentives such as the increase in one's financial (as well as nonfinancial) remuneration. The pursuit of such benefits needs to be weighed against the

costs of maintaining and developing a personal network. In this context, professional success may be both a prerequisite and a consequence of occupying network positions of increased centrality and brokerage power (Horton *et al.*, 2012; Engelberg *et al.*, 2012; Zhu and Chen, 2015). However, interlocks may also be due to the desire of major players to be part of the capital asset allocation process. This motive can be associated with processes which reinforce cohesion in an upper social class which is populated by, among other individuals, members of corporate elite who act as directors of major corporations. In this respect, interlocks may assist the hegemony of the corporate world (over the rest of social groups) as opposed to assisting the hegemony of one company. This argument is supported by the fact that broken ties (in longitudinal studies) are not replaced with new appointments from the same organization (such as a bank) which means that the ties were personal rather than organizational (Mizruchi, 1996). Class cohesion may be associated with the fact that members of the elite pursue common goals, are behaviorally similar, engage in social interaction and may play similar roles in structurally equivalent networks such as interlocking directorates. Such class cohesion may also have political ends, leading to the concentration of political power (Galaskiewicz *et al.*, 1985; Heemskerk, 2013; Allen, 1974). Evidence of concentrated political power in interlocking directorates has been found in corporate networks in post-communist Hungary, corporate and social networks in political campaigns in Nebraska, corporate alliances in US trade policies and congressional testimonies (Stark and Vedres, 2012; Hayden *et al.*, 2013; Dreiling and Darves, 2011).

Apart from political gains and professional advancement, centrality in cohesive networks fosters an individual's relational embeddedness and, therefore, the choices that individuals make about their connections (interpersonal networks) may change or reproduce interorganizational networks. Corporate organizations connect, in the form of interlocking directorates, for a plethora of reasons. First, the scarcity of resources such as information and capital fosters corporate alliances which are articulated in interlocking boards of directors. Access to scarce resources can help a company reduce organizational uncertainty, improve its performance and increase its chances for survival in a changing economic environment. This is the argument of the resource-dependence theory, which suggests that organizations can be interdependent an operated in the context of power relations to the extent that they need to interact to get access to resources that are available in their environment (Pfeffer and Salancik, 1978). With respect to the flow of trustworthy information, outside directors may support knowledge spillovers across organizations, and they are often chosen for their professional expertise as well as their professional and social status (Mizruchi, 1996; Brass *et al.*, 2004). With respect to interlocks as evidence of access to scarce financial capital, corporate loans can help us explain the extensive presence of financial companies in the boards of directors of nonfinancial companies. Creditors may provide scarce financial resources, but they also need to ensure that these resources will be used to their best interest (Jensen and Meckling, 1976). In this context, interlocking directorates with banks may be viewed as either evidence of collaboration between providers and users of capital or a costly mechanism of monitoring and corporate control which is employed to reduce agency costs of debt (Dooley, 1969; Mizruchi and Stearns, 1988; Galaskiewicz and Wasserman, 1981; Ong *et al.*, 2003). Therefore, such interlocks reflect corporate control which is exerted by the banks over the organizations that they finance and, therefore, they may increase the influence which is exerted by financial organizations upon society (Richardson, 1987). However, such control is far from complete as – among other reasons – directors are functionally distinct from managers who run major corporations in the interest of (or at the expense of) capital providers. Moreover, interlocking directorates may foster collaboration between competitors and imitation of business practices, thereby leading to concentration of market power and limiting the disciplining potential of interlocks in the market for corporate control (Devos *et al.*, 2009). Nevertheless, the ability of interlocks to foster value creation, grant access to scarce resources and contribute to the diffusion of organizational practices is neither omnipresent nor

homogeneous across organizations. It depends on the similarity of the connected organizations' institutional logics, the connected director's power in the board, the status of her professional experience and the diversity of her network in terms of demographic, intellectual, professional and geographic characteristics (Shropshire, 2010; Shipilov *et al.*, 2010; Fang *et al.*, 2018).

Drawing on the social, personal and organizational importance of interlocking directorates, we explore social networks of executives and board members in the shipping industry. Maritime shipping covers 90 per cent of global trade, is expected to grow 3.8 per cent per year between 2018 and 2023 and has a fleet of more than 94,000 vessels (UNCTAD, 2018). We focus on interlocking leadership in shipping companies because these companies have particular corporate-governance characteristics. They are global and, consequently, can circumvent some local institutional and cultural constraints in corporate governance practices (taxes, flags and crews are cases in point); this is important because corporate governance practices are often shaped by national institutional frameworks (Aguilera and Jackson, 2010). Furthermore, the shipping industry exhibits a particular corporate-governance mix such as small board size, CEO duality and, characteristically, increased family ownership (Koufopoulos *et al.*, 2010; Giannakopoulou *et al.*, 2016); the structure of the boards of directors in shipping companies is affecting financial decision making as well as financial performance (Andreou *et al.*, 2014). Our analysis of shipping interlocks spans both interpersonal as well as interorganizational networks in the shipping industry. Our contribution is threefold. We map the relational structures in the social networks of companies and company leaders. We find the cross-sectional determinants of interlocks in the shipping industry and we assess the effect of interlocking corporate leadership in agency conflicts within shipping companies. Section 2 outlines prior research in corporate governance in the shipping industry. Section 3 presents an outline of our sample and methodology. In Section 4, we present evidence on social networks and discuss the structure of interlocking directorates in the shipping industry. Section 5 concludes the paper.

2. Corporate governance in the shipping industry: prior research

Prior research in shipping has explored corporate governance with respect to:

- ownership structure, board-of-directors membership and their effect on financial performance;
- the market for corporate control;
- the association between disclosure practices and financial performance; and
- national variations of governance in shipping.

2.1 Ownership structure, Board-of-Directors membership and financial performance

Lambertides and Louca (2008) investigated the effect of ownership structure on operating performance; their sample included 266 firm-year observations which span the 2002-2004 period. Focusing on shipping companies' cash-flow from operations and exploring the agency-related capabilities and effects of ownership structure, they found that operating performance is affected by the presence of foreign shareholders and investor corporations, whereas it is insensitive to employee and government ownership. Tsionas *et al.* (2012) expanded the debate on ownership structure in shipping, exploring the determinants of ownership concentration in the shipping industry. Using a generalized method of moments approach, they studied performance data in 107 listed shipping companies. They found that ownership concentration was negatively associated with financial leverage and positively associated with corporate size and profitability. They also discovered that

corporate profitability (return on assets and return on equity) is positively associated with ownership concentration; this bidirectional link between ownership concentration and profitability was attributed to the particular structure of the shipping industry.

Andreou *et al.* (2014) produced similar arguments on the importance of corporate governance for value creation in shipping. They investigated shipping companies which were listed in US capital markets, in the 1999-2010 period. The structure of corporate ownership and the structure of the board of directors were found to affect financial performance in terms of profitability (return-on-assets), sub-optimal investment and the quality of earnings management.

2.2 The market for corporate control in shipping: mergers and acquisitions

Syriopoulos and Theotocas (2007) were the first to explore mergers in shipping and their argument was structured on a case study. They explored corporate governance practices in association with the acquisition of Stelmar Shipping by Overseas Shipholding Group in 2004. Corroborating findings in previous studies, they discovered that shareholder gains accrue to a greater extent to takeover targets than to bidders and argued that corporate governance can be transfigured in the market for corporate control. Andreou *et al.* (2012) studied a bigger sample: their research question involved the consequences of mergers and acquisitions in the freight transportation industry, in a sample which ran from 1980 to 2009. They produced evidence that both bidders and targets reap synergistic gains from mergers and acquisitions and that bidders do not overpay in mergers, thereby refuting the argument on empire-building motives in mergers and acquisitions (bidders, however, reap more gains in friendly, rather than hostile mergers). Targets reap more gains in vertical mergers, implying that mergers create more value when they produce longer supply chains.

Alexandrou *et al.* (2014) produced evidence of capital-market inefficiency: investigating shipping mergers and acquisitions from 1984 to 2011, they discovered abnormal stock-market returns accruing to both acquirers and targets. They also reported that corporate gains were higher in cross-border deals and in diversifying rather than in focus-increasing deals.

2.3 Corporate disclosure practices and financial performance in shipping

Andrikopoulos *et al.* (2013) explored Web-disclosure practices in the shipping industry. Using a disclosure index to capture the quantity and depth of disclosed information, they investigated the relationship between profitability and disclosure in 171 listed shipping companies. They found that the profitability-disclosure relationship is bidirectional: More profitable firms have both adequate resources and the need for legitimacy which makes possible a well-organized platform of Web-based dissemination of financial information; moreover, firms with high levels of Web-based disclosure to all interested parties enjoy higher profitability (return-on-equity), reducing via transparency the perceived risk and hence the cost of capital of prospective shareholders and creditors.

Drobetz *et al.* (2014) analyzed disclosure practices in an international sample of 111 listed shipping companies, between 2002 and 2010. Expanding the debate on corporate communication in shipping, they explored disclosure about corporate social responsibility (CSR) practices. They investigated the determinants of CSR disclosure by shipping companies. Using a generalized smoothly mixing regression to capture heterogeneity and Markov Chain Monte Carlo for Bayesian inference and approximating CSR disclosure with a disclosure index, they documented an increasing tendency of shipping companies to communicate their CSR activities to interested stakeholders. They found that CSR disclosure is positively affected by corporate size and negatively affected by financial leverage; more importantly, they documented a bidirectional relationship between

corporate valuation (approximated with Tobin's Q) and CSR disclosure, which can help explain an increasing emphasis on CSR practices by shipping companies. However – contrary to the findings of Andrikopoulos et al. (2013) on financial disclosure – they came up with mixed evidence about the relationship between CSR disclosure and profitability (return on assets), with findings being sensitive to variations of flag state. The conflicting results of these two studies – Andrikopoulos et al. (2013) and Drobetz et al. (2014) – could be attributed to the fact that Drobetz et al. (2014) focused on voluntary disclosure, whereas Andrikopoulos et al. (2013) explored both mandatory and voluntary disclosure by listed shipping companies. This difference matters, as recent evidence has shown that the disclosure of governance practices in shipping is quite sensitive to the mandatory or voluntary nature of disclosed governance practices (Ko et al., 2016).

2.4 Corporate governance in shipping: cross-national variations

Randøy et al. (2003) investigated corporate governance mechanisms in the Norwegian shipping industry. Studying a sample of 32 listed companies in Norway and Sweden over a three-year period (1996-1998), they discovered that financial performance (return on assets) was positively associated with the number of independent Board-of-Directors members and founding-family membership for the CEO; financial performance was found to be irrelevant to stock ownership by Board-of-Directors members.

Koufopoulos et al. (2010) used a questionnaire survey to identify and assess corporate governance mechanisms in the Greek shipping industry. Using a sample of 27 Greek shipping companies they found extensive board-of-directors involvement in monitoring business operations and shaping corporate strategy. They also discovered extensive CEO duality, implying increased CEO influence over the board of directors and strategic decision processes, corroborating prior research evidence on CEO's involvement in corporate planning in the Greek shipping industry (Koufopoulos et al., 2005). Moreover, they produced evidence of small boards of directors which were also thinly populated by external-independent members. Syriopoulos and Tsatsaronis (2011) assessed 11 Greek shipping companies with respect to structural characteristics (and value-adding potential) of internal and external corporate governance mechanisms. They found that profitability is positively associated with ownership concentration and with appointing a CEO who is a member of the family that founded the shipping company. Contrary to previous arguments on the importance of interlocking directorates, they found that the independence of board members is irrelevant for the profitability of Greek shipping companies. They also highlighted the international varieties of corporate governance in shipping, by demonstrating value-relevant differences with the corporate governance of Scandinavian companies as demonstrated in Randøy et al. (2003).

3. Sample and methodology

Expanding prior research which focused solely on interlocking boards of directors, we collected data on two types of corporate leadership: board members and key executives for all listed shipping companies for which the Bloomberg website provided data (key executives were Chief Operating Officers, Chief Financial Officers, Corporate General Counsels, etc.). For each director and executive, we recorded her affiliations beyond the company whose board she was sitting in; data collection took place in May 2016. We ended up with 110 shipping companies, 1247 shipping executives and directors and 1507 companies which are affiliated with shipping companies (as affiliations of shipping executives and directors). Each of the 110 listed shipping companies owns and operates ships, primarily tankers, dry bulks and containers. The shipping companies of our sample include 9,072 ships, amounting to 38 per cent of the global fleet[1]. We managed to extract sectoral affiliations for 793 out of the 1,507 affiliated companies. We see in Table I that

| Table I	Most represented sectors in the boards of directors and the executive leadership of shipping companies	
Sector		Representation (%)
Industrials		35.30
Financials		15.77
Energy		11.97
Consumer discretionary		10.97
Utilities		2.14

industrials and financials are the most represented sectors in the network of shipping directors and executives.

We used social network analysis to examine the relational structures of connected companies and leaders[2]. While a complete account of social network analysis is not within the scope of this study, we will briefly sketch the essential elements of our methodology. A social network is a set of actors and the connections between these actors. Social networks are often demonstrated with graphs, in which actors are depicted as nodes and connections are depicted as edges between the nodes. Two nodes are considered connected if there is a path that connects them; a path is a sequence of edges. The length of a path is the sum of the edges that the path contains. There may be many paths which lead from one node to another; the length of the shortest path between two nodes is called the geodesic distance between them. A group of connected nodes is called a component. Connected networks are dense in the sense that there is a multitude of connections between the nodes: network density is the ratio of existing connections between the network's nodes over the maximum number of possible connections. Network structure is largely articulated around the central nodes of the network: these nodes keep the network "together", either because they are connected with many other nodes or because they act as "bridges" between otherwise disconnected nodes.

There are many ways to measure a node's importance in a network. Degree centrality measures the number of a node's connections. This is the number of nodes that are directly connected to a node (i.e. connected with a single edge so that the distance between a node and its adjacent nodes equals 1). Betweenness centrality measures the proportion of the network's shortest paths which go through the node. For all pairs of nodes, there is the shortest path that connects them and a node's betweenness centrality is the ratio of the shortest paths that pass through that node to total number of the network's shortest paths. Closeness centrality is based on a node's distance from all other nodes combined (closeness-central nodes are the closest to all others, cumulatively). A node's closeness centrality is measured with the reciprocal of the sum of the length of all shortest paths that connect that node and all the other nodes in the network. Eigenvector centrality measures a node's centrality with the centrality of its connections. The computation of eigenvector centrality is based on the eigenvector of the greatest eigenvalue of the network's adjacency matrix, a matrix whose element in the i-th row and j-th column is 1 if nodes i and j are connected and zero otherwise.

In our network of interlocking leadership in shipping, we consider two shipping companies connected if at least one board member or key executive in one shipping company is affiliated with the other shipping company. Likewise, we consider two board members or executives as connected if they both serve in the same company at least once. Network edges are weighted with the number of repeated connections between two companies or executives (this setup draws on Breiger (1974) and helps combine interpersonal and intergroup ties). As an example, Figure 1 presents the network of Golar LNG which is the

Figure 1 The ego-network of Golar LNG

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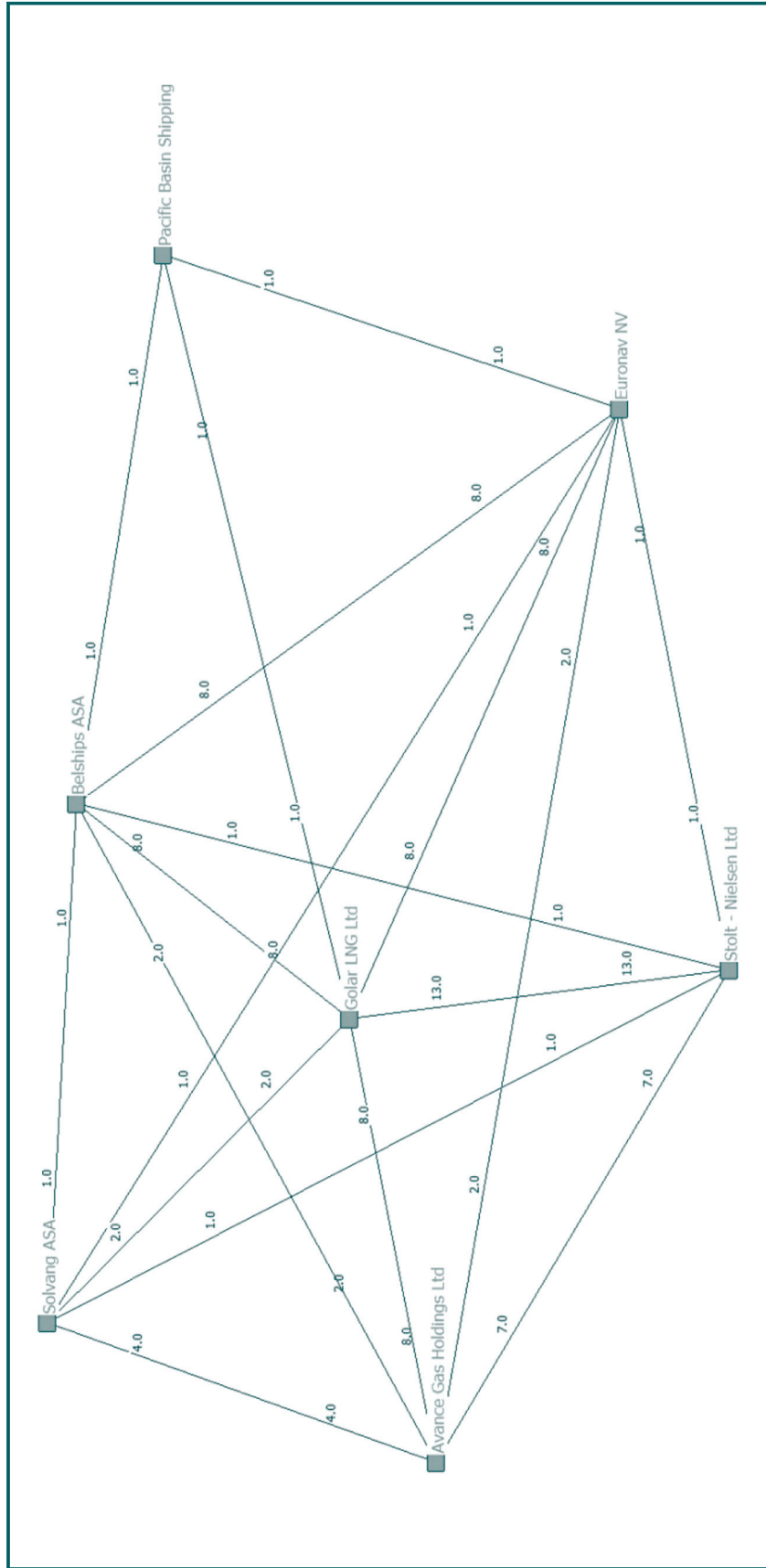
most degree-central shipping company in the network. The numbers on the network's edges are the weights: the number of times that two companies are connected.

4. Leadership interlocks in the shipping industry

Figures 2 and 3 present the layout of the network of shipping companies and the network of shipping executives and directors. We see that the network of companies has a large number of isolated nodes and is less cohesive than the network of executives and directors. Excluding isolates, there are only 6 components in the companies' network and 73 components in the executives' network. Neither network is dense, but the network of corporate leaders is more tightly knitted: network density is 1.11 per cent for the executives' and directors' network and 0.8 per cent for the companies' network. To assess relational structures in interlocking leadership, we also identified and measured cohesive groups within the networks. We explored groups of nodes in which the maximum distance between two nodes is two edges. There are 16 such groups in the companies' network (containing 3 to 9 nodes), and there are 115 such groups in the executives' and directors' network (containing 3 to 43 nodes). Normalizing these measures (dividing with the number of nodes in each network), we see that both the number and the size of these cohesive groups are higher for the companies' network.

Tables II and III present the most central nodes in the companies' and the directors' networks. Centrality matters because it is evidence of accumulated social capital, prominence and influence in the flow of information and resources across a social network (Horton *et al.*, 2012; Andrikopoulos and Economou, 2015; Wasserman and Faust, 1994). Different centrality measures yield different results: no individual appears in all four top-fifteen centrality rankings, whereas only one company is among the 15 most central across all rankings. In the directors' and executives' network, nine out of fifteen most degree-central corporate leaders are also between the most eigenvector-central (eight out of fifteen for the companies' network). This indicates that individuals and companies with the largest
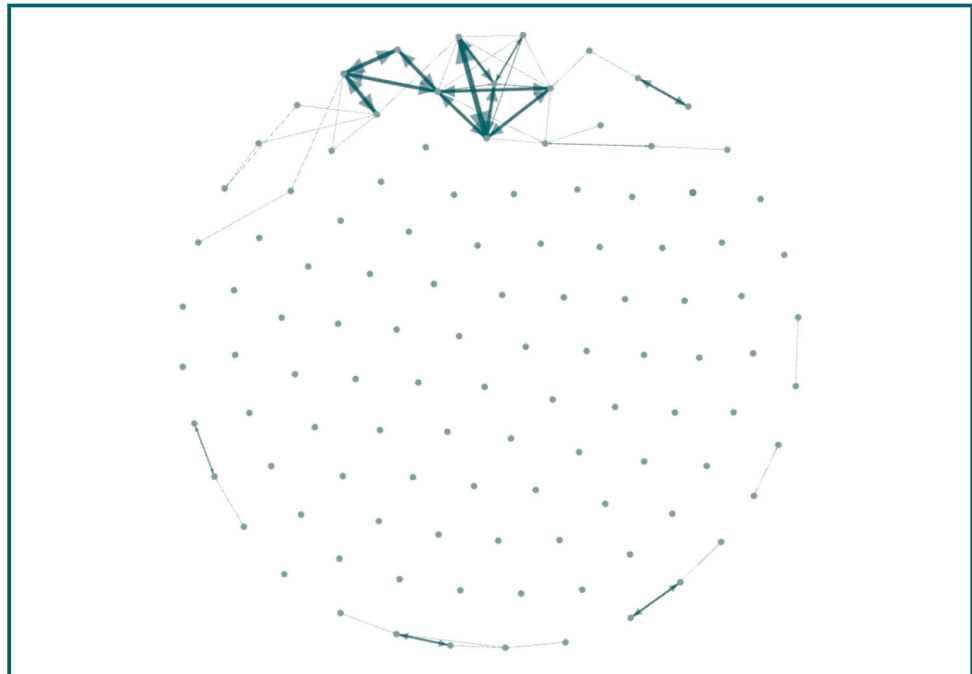
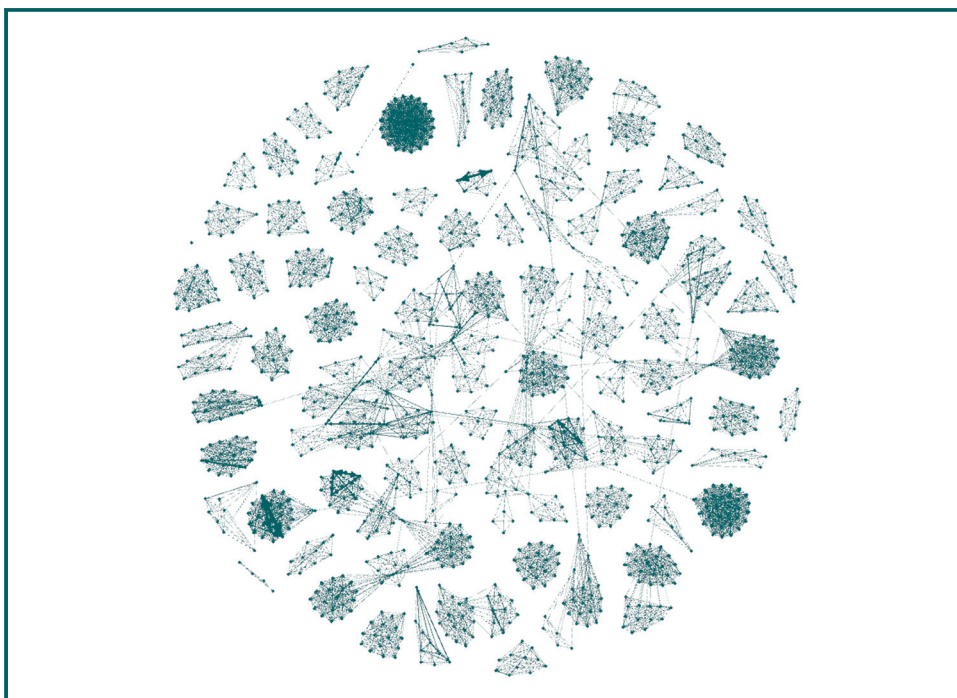| **Figure 2** | The network of shipping companies |

Figure 3 The network of key executives and board members

Table II Most central shipping companies

Rank	Degree	Betweenness	Closeness	Eigenvector
1	Golar LNG Ltd	Euronav NV	Odfjell SE	Golar LNG Ltd
2	Euronav NV	Belships ASA	DP World Ltd	Euronav NV
3	Exmar NV	Bulk Invest ASA	Yara Intl ASA	Stolt - Nielsen Ltd
4	Stolt - Nielsen Ltd	Exmar NV	Tipco Asphalt PCL	Belships ASA
5	Avance Gas Holdings Ltd	Pacific Basin Shipping Ltd	American Shipping Co ASA	Avance Gas Holdings Ltd
6	Belships ASA	Stolt - Nielsen Ltd	Orient Overseas International Ltd	Exmar NV
7	Cie Maritime Belge SA	Nordic American Tankers Ltd	2GO Group Inc	Cie Maritime Belge SA
8	Bulk Invest ASA	American Shipping Co ASA	DOF ASA	Solvang ASA
9	Solvang ASA	2GO Group Inc	IM Skaugen SE	Bulk Invest ASA
10	Aegean Marine Petroleum Network Inc	Shipping Corp of India Ltd	Shipping Corp of India Ltd	Pacific Basin Shipping Ltd
11	American Shipping Co ASA	IM Skaugen SE	Aker ASA	Aker ASA
12	Danaos Corp	DOF ASA	Nordic American Tankers Ltd	Nordic American Tankers Ltd
13	Gener8 Maritime Inc	Golar LNG Ltd	Cie Maritime Belge SA	Shipping Corp of India Ltd
14	Odfjell SE	Seaspan Corp	Avance Gas Holdings Ltd	DOF ASA
15	Pacific Basin Shipping Ltd	Aegean Marine Petroleum Network Inc	Bulk Invest ASA	IM Skaugen SE

number of direct connections have ended up connecting with central nodes in the networks.

Leadership interlocks vary considerably across the shipping industry and are essential elements of the industry's corporate governance. Exploring the cross section of interlocks,

Rank	Degree	Betweenness	Closeness	Eigenvector
	Table III Most central shipping directors and key executives			
1	Chaiwat Srivalwat	Carl Erik Steen	Chris Boehringer	An Hui-Cheol
2	Jacques Marechal	Ludwig Criel	Christian Lintner	An Jung-Ok
3	Jacques Marcel Pastor	Andreas Ove Ugland	Christian Mens	Baik Hyung-Duk
4	An Hui-Cheol	Christian Rytter Jr	Christian Soegaard-Christensen	Chang Yong-Ho
5	An Jung-Ok	Peter Ditlef Knudsen	David Neil Weinstein	Chey Tae-Won
6	Baik Hyung-Duk	Daniel Rochfort Bradshaw	Jacob Meldgaard	Cho Kyung-Mok
7	Chang Yong-Ho	Robert Charles Nicholson	Jesper S Jensen	Choe Jae-Won
8	Chey Tae-Won	Amado R Santiago	Paer Goeran Trapp	Choi Hyun-Seok
9	Cho Kyung-Mok	Annette Malm Justad	Torben Janholt	Chu Ha-Sik
10	Choe Jae-Won	Jens Ismar	Lars Christensen	Do Ji-Heon
11	Choi Hyun-Seok	Karel Stes	Alison J F Riegels	Ha Geum-Yeol
12	Chu Ha-Sik	Bipin Bihari Sinha	Arvid Grundekjoen	Han Young-Suk
13	Do Ji-Heon	Klaus Nyborg	Asger Lauritsen	Jang Eui-Dong
14	Ha Geum-Yeol	Monico V Jacob	Christian Danmark	Jeong Heung-Seob
15	Han Young-Suk	Rashed Ali Hassan Abdulla	Henrik Lykkegaard Madsen	Ju Sun-Sik

we used regression analysis to assess the effect of well-known determinants of interlocks: corporate size, board size, profitability and financial leverage (accounting data refer to 2015 year-end financial results and were collected from published financial statements). We expect a positive effect of financial leverage on the number of interlocks: creditors may get to sit in the boards of directors of the companies that they finance, as a mechanism for dealing with agency costs of debt and therefore for exerting corporate control (Galaskiewicz and Wasserman, 1981; Ong et al., 2003)[3]. We expect a positive effect of corporate size on the number of interlocks, since larger companies are exposed to a wider range of activities and partnerships and are expected to have a larger number of interlocks (Devos et al., 2009); likewise, we expect the number of interlocks to be positively associated with the size of the board of directors. Profitability also tends to affect positively the number of interlocks: successful, profitable firms are more attractive to prospective board members (Mizruchi and Stearns, 1988; Ong et al., 2003). Finally, larger boards of directors are more likely to include a larger number of board members who sit in other boards in the shipping industry.

Table IV presents variable definitions and descriptive statistics of our analysis. We use asset turnover as an inverse proxy of agency costs, drawing on the assumption that efficient asset utilization is indicative of lower agency costs (Florackis and Ozkan, 2009). Average profitability is negative, reflecting the downturn of the shipping industry; board size is small [in accordance with previous findings in Koufopoulos et al. (2010) and Hellenic Observatory of Corporate Governance (2016)] and interlocks account for more than one third of key executives and board members. Table V demonstrates the results of our regression analysis on the determinants of interlocking leadership. We used GMM estimation with the purpose to capture endogeneity between board interlocks and financial performance; a complete account of the cross section of profitability is beyond the scope of this paper. Nevertheless, the cross-sectional analysis of profitability includes some well-discussed factors in the literature on corporate governance and company performance, such as size, financial leverage, independent directors and gender diversity in the board of directors (Ntim, 2015; Galbreath, 2018).

The regression results corroborate our expectations on the positive effects of firm size, profitability, leverage and board size on extent of interlocking corporate leadership in shipping. Our findings also indicate that interlocking directorates bear a positive effect on shareholder profits: shared knowledge and business practices across interlocked shipping companies may help the diffusion of industry wisdom and thus help amplify shareholder profitability.

Table IV Data description

Panel A: Definition of variables
INT board members and key executives which are also board members or key executives in other companies
LMC natural logarithm of market capitalization in million dollars
ROE return on equity (%)
ROA return on assets (%)
ROI return on invested capital (%)
IND independent directors (%)
WD women directors (%)
DEBT debt/equity
BOARD number of board members – board size
LAGENCY natural logarithm of net sales/net total assets

Panel B: Descriptive statistics

	INT	LMC	ROE	LAGENCY	BOARD	DEBT	ROI	IND	ROA	WD
Mean	2.645	5.208	−0.028	−1.103	7.427	1.685	−4.786	0.484	−3.652	0.121
Median	2.000	5.303	4.320	−1.488	7.000	1.154	1.464	0.500	0.105	0.120
Maximum	10.00	12.197	35.950	10.271	18.00	10.700	30.089	1.000	21.034	0.440
Minimum	0.000	0.174	−118.100	−7.440	1.000	0.3240	−72.449	0.000	−62.844	0.000
SD	2.097	2.212	21.5432	2.738	2.744	2.442	16.458	0.187	12.200	0.116

Table V Assessing the determinants of the number of interlocks (estimation with GMM)

Dep. variable INT	Coefficient	Dep. variable ROE	Coefficient
Const	0.510 (0.191)***	Const	0.476 (0.091)
LMC	0.550 (0.039)***	LMC	−0.111 (0.011)***
ROE	0.363 (0.091)***	INT	0.036 (0.008)***
DEBT	0.003 (0.0001)***	DEBT	−0.002 (0.0002)***
BOARD	0.040	IND	0.260 (0.108)***
		DIV	0.261 (0.019)***
	(0.024)*		
Prob(J-Statistic) 0.239			

Notes: Standard errors in parentheses; ***0.01 level of significance or below; *above 0.10 level of significance

As interlocks are often associated with the presence of creditors in the companies that they finance, we have run a robustness check for our model, using Return on Assets (ROA) and Return on Invested Capital (ROI) instead of ROE (Tables VI and VII). It turns out the interlocks and asset returns maintain a bidirectional association: companies with high asset returns tend to attract the interest of board members who already sit in other boards and, on the other hand, interlocking directorates serve a vehicle for partnership across the industry and such partnership can boost asset returns.

Finally, we investigated the most policy-relevant aspect of interlocking leadership: its impact on the quality of corporate governance and its effect on agency costs in particular (Zona et al., 2018). Table VIII presents GMM results on the association between asset turnover and the number of interlocks. Again, we model performance with the sole purpose of capturing endogeneity between asset turnover and performance (not as a full-scale account of profitability in the shipping industry). There is a positive effect of interlocks on asset turnover which means that interlocks help resolve agency conflicts, thus acting as an efficient corporate governance instrument for the shipping industry. We also incorporated well-known control variables for agency costs like profitability, board size and financial leverage. With respect to board structure, which is essentially the topic

Table VI Assessing the determinants of the number of interlocks (estimation with GMM)

Dep. variable INT	Coefficient	Dep. variable ROA	Coefficient
Const	−1.129 (0.629)*	Const	−0.051 (0.284)
LMC	0.738 (0.097)***	LMC	−0.343 (0.054)***
ROA	1.185 (0.052)***	INT	0.246 (0.024)***
DEBT	0.002 (0.0005)***	DEBT	−0.003 (0.002)*
BOARD	0.169	IND	0.968 (0.288)***
		DIV	0.185 (0.081)***
	(0.041)**		
Prob(J-Statistic) 0.228			

Notes: Standard errors in parentheses; ***0.01 level of significance or below; **between 0.05 and 0.10 level of significance; *above 0.10 level of significance

Table VII Assessing the determinants of the number of interlocks (estimation with GMM)

Dep. variable INT	Coefficient	Dep. variable ROI	Coefficient
Const	−0.093 (0.303)	Const	0.572 (0.056)***
LMC	0.583 (0.065)***	LMC	−0.133 (0.011)***
ROI	0.349 (0.014)***	INT	0.070 (0.008)***
DEBT	0.035 (0.0045)***	DEBT	−0.014 (0.004)***
BOARD	0.065 (0.037)***	IND	0.260 (0.063)***
		DIV	0.716 (0.138)***
Prob(J-Statistic) 0.250			

Notes: Standard errors in parentheses; ***0.01 level of significance or below

Table VIII Assessing the effect of interlocks on agency costs (GMM-Estimation)

Dep. variable LAGENCY	Coefficient	Dep. variable ROE	Coefficient
Const	1.173 (0.063)***	Const	−21.260 (1.425)***
INT	0.015 (0.009)***	LMC	−3.219 (0.445)***
ROE	0.001 (0.0002)***	LAGENCY	4.381 (0.187)***
DEBT	−0.083 (0.012)***	DEBT	−0.091 (0.002)***
BOARD	−0.082	IND	2.606 (0.282)***
		DIV	6.289 (3.730)**
	(0.008)***		
Prob(J-Statistic) 0.270			

Notes: Standard errors in parentheses; ***0.01 level of significance or below; **between 0.05 and 0.10 level of significance

of this paper, our findings suggest that larger boards of directors are associated with smaller agency costs, implying that larger boards effectively employ larger amounts of resources in monitoring the activities of shipping companies. Our findings are robust to the measurement of company performance with alternative proxies such as ROA and ROI (Tables IX and X).

5. Summary and conclusion

Interlocking directorates are an important mechanism of corporate governance: they affect the flow of resources and information across companies, while shaping corporate executives' career paths, prestige and rewards. We explored interlocking leadership in the shipping industry and investigated networks of individuals and networks of corporations.

Table IX	Assessing the effect of interlocks on agency costs (GMM-Estimation)		
Dep. variable LAGENCY	*Coefficient*	*Dep. variable ROA*	*Coefficient*
Const	1.379 (0.111)***	Const	−21.403 (1.425)***
INT	0.015 (0.009)***	LMC	−2.728 (0.185)***
ROA	0.014 (0.008)**	LAGENCY	3.540 (0.215)***
DEBT	−0.204 (0.025)***	DEBT	−2.974 (0.330)***
BOARD	−0.091	IND	2.284 (1.668)***
	(0.012)***	DIV	6.395 (1.729)***
Prob(J-Statistic) 0.246			

Notes: Standard errors in parentheses; ***0.01 level of significance or below; **between 0.05 and 0.10 level of significance

Table X	Assessing the effect of interlocks on agency costs (GMM-Estimation)		
Dep. variable LAGENCY	*Coefficient*	*Dep. variable ROI*	*Coefficient*
Const	1.237 (0.049)***	Const	−5.228 (2.640)**
INT	0.010 (0.005)***	LMC	−2.096 (0.183)***
ROI	0.007 (0.0003)***	LAGENCY	6.066 (0.114)***
DEBT	−0.157 (0.019)***	DEBT	−48.278 (1.783)***
BOARD	−0.075	IND	20.892 (3.186)***
	(0.005)***	DIV	23.148 (5.097)**
Prob(J-Statistic) 0.254			

Notes: Standard errors in parentheses; ***0.01 level of significance or below; **between 0.05 and 0.10 level of significance

Even though quantitative research on interlocks does not fully capture the rich complexities of organizational behavior, we discovered the structure of the social networks of boards of directors and executive leadership and we documented the determinants of interlocks. More importantly, we found that interlocks bear a positive effect on profitability and a negative effect on agency costs in the shipping industry. These findings bear important policy implications for corporate governance in shipping. Interlocking directorates could be employed to resolve agency conflicts, mitigate agency costs of debt and contribute to value creation for all capital providers, debt and equity alike.

Future research could address the principal limitation of this study, which has to do with the fact that the data set spans only one year. The limited time span cannot help us reveal the full range of organizational dynamics that shape and shaped by board interlocks. A longitudinal analysis is needed to explore the dynamics of networks and see how the replacement of board members across time reproduces or transforms the actors of interorganizational cooptation and control. Furthermore, future research could explore intra-organizational networks in shipping companies, based on personal relationships, family ties and political or religious affiliations; such ties may help explain the allocation of resources and the emergence of organizational change in shipping companies. Moreover, interviews with members of interlocking boards can help illuminate how interlocks emerge out of personal agendas along with organizational objectives.

Notes

1. Our estimate on the size of the global fleet is based on ABS World Shipping & Shipbuilding Outlook 2017

2. Among the directors and executives in our sample, there are global company leaders included in the Lloyd's 2017 list of the most powerful shipping businessmen worldwide, such as Xu Lirong (Cosco Group), Robert Uggla (Maersk Group), Angeliki Frangou (Navios),George Economou (Dryships).

3. A more detailed account for the effect of financial leverage on interlocks would have to account for the structure of debt holdings. For example, if corporate debt is held by the CEO, then corporate financial decisions are more conservative (Beavers, 2018). In that case, there might be less need for creditors to participate in the Board of Directors to make sure that financial policy is adequately prudent.

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Appendix

Table AI	The companies in our sample	
Companies	*Country of domicile*	*Exchanges traded*
2GO Group Inc	Philippines	Philippine Stock Exchange
AP Moller - Maersk A/S	Denmark	NASDAQ Copenhagen
Aegean Marine Petroleum Networ	Greece	New York Stock Exchange
Algoma Central Corp	Canada	Toronto Stock Exchange
American Shipping Co ASA	Norway	Oslo Stock Exchange
Ardmore Shipping Corp	Ireland	New York Stock Exchange
Avance Gas Holding Ltd	Norway	OTC
National Shipping Co of Saudi	Saudi Arabia	Saudi Stock Exchange
Belships ASA	Norway	Oslo Stock Exchange
Bourbon Corp	France	Euronext Paris
Buana Lintas Lautan Tbk PT	Indonesia	Jakarta Stock Exchange
Costamare Inc	Monaco	New York Stock Exchange
Courage Investment Group Ltd	Hong Kong	Stock Exchange of Hong Kong
Chang Jiang Shipping Group Pho	China	Shenzhen Stock Exchange
Daiichi Chuo KK	Japan	New York Stock Exchange
Danaos Corp	Greece	New York Stock Exchange
DHT Holdings Inc	Bermuda	New York Stock Exchange
Diana Shipping Inc	Greece	New York Stock Exchange
DOF ASA	Norway	Oslo Stock Exchange
Dorian LPG Ltd	U.S.A.	New York Stock Exchange
DP World Ltd	U.A.E	London Stock Exchange
DryShips Inc	Greece	NASDAQ CM
Ea Technique M Bhd	Malaysia	Bursa Malaysia
Eagle Bulk Shipping Inc	U.S.A.	NASDAQ GS
Epic Gas Ltd	Singapore	Oslo Stock Exchange
Erria A/S	Denmark	NASDAQ Copenhagen
Euronav NV	Belgium	New York Stock Exchange
Evergreen Marine Corp Taiwan	Taiwan	Taiwan Stock Exchange
Exmar NV	Belgium	Brussels Stock Exchange
First Ship Lease Trust	Singapore	Stock Exchange of Singapore
First Steamship Co Ltd	Taiwan	Taiwan Stock Exchange
Franbo Lines Corp	Taiwan	Taiwan Stock Exchange
GasLog Ltd	Monaco	New York Stock Exchange
Gener8 Maritime Inc	U.S.A.	New York Stock Exchange, Frankfurt Stock Exchange
Global Ship Lease Inc	U.K.	New York Stock Exchange
Globus Maritime Ltd	Greece	NASDAQ CM
Golar LNG Ltd	Bermuda	NASDAQ GS
Grindrod Shipping Holdings Ltd	Singapore	NASDAQ GS
Gulf Marine Services PLC	U.A.E.	London Stock Exchange
Gulf Navigation Co	U.A.E.	United Arab Emirates Stock Exchange
Hainan Strait Shipping Co Ltd	China	Shenzhen Stock Exchange
Hellenic Carriers Ltd	Greece	London Stock Exchange,Euro Composite
Heung-A Shipping Co Ltd	Korea	Soth Korea Exchange
IM Skaugen Asa-Old	Norway	Oslo Stock Exchange
Iino Kaiun Kaisha Ltd	Japan	Tokyo Stock Exchange
International Shipholding Corp	U.S.A.	New York Stock Exchange,Tokyo Stock Exchange
Inui Global Logistics Co Ltd	Japan	Tokyo Stock Exchange
Jinhui Shipping & Transportat	Hong Kong	Oslo Stock Exchange
Jutha Maritime PCL	Thailand	Bangkok Stock Exchange
K-Line Co Ltd	Japan	Tokyo Stock Exchange
KSS LINE Ltd	South Korea	Korea Exchange
Kyoei Tanker Co Ltd	Japan	Tokyo Stock Exchange
Marenave Schiffahrts AG	Germany	Hamburg Stock Exchange

(*continued*)

Table AI

Companies	Country of domicile	Exchanges traded
Meiji Shipping Co Ltd	Japan	Tokyo Stock Exchange
Navigator Gas LLC	Malasia	Bursa Malaysia
Neptune Orient Lines Ltd/Singa	Singapore	Stock Exchange of Singapore
NewLead Holdings Ltd	Greece	OTC
Nippon Yusen Kaisha Line China	China	New York Stock Exchange, Tokyo Stock Exchange
D/S Norden A/S	Denmark	NASDAQ Copenhagen
Nordic American Tankers Ltd	Norway	New York Stock Exchange
NS United Kaiun Kaisha Ltd	Japan	Tokyo Stock Exchange
Odfjell SE	Norway	London Stock Exchange
Orient Overseas International	Hong Kong	Stock Exchange of Hong Kong
Otto Marine Ltd	Singapore	Stock Exchange of Singapore
Pacific Basin Shipping Ltd	Hong Kong	Stock Exchange of Hong Kong
Precious Shipping PCL	Thailand	Bangkok Stock Exchange
Arpeni Pratama Ocean Line Tbk	Indonesia	Frankfurt Stock Exchange
Capitol Nusantara Indonesia Tb	Indonesia	Jakarta Stock Exchange
Nakilat Inc	Qatar	United Arab Emirates Stock Exchange
Regional Container Lines PCL	Thailand	Bangkok Stock Exchange
Safe Bulkers Inc	Monaco	New York Stock Exchange
Samudera Indonesia Tbk PT	Indonesia	Jakarta Stock Exchange
Sealink International Bhd	Malaysia	Bursa Malaysia
Seanergy Maritime Holdings Cor	Greece	NASDAQ CM
Seaspan Corp	Hong Kong	New York Stock Exchange
Seroja Investments Ltd	Singapore	Stock Exchange of Singapore
Shih Wei Navigation Co Ltd	Taiwan	Taiwan Stock Exchange
Shipping Corp of India Ltd	Indonesia	National Stock Exchange of India
Sincere Navigation Corp	Taiwan	Taiwan Stock Exchange
Singapore Shipping Corp Ltd	Singapore	Stock Exchange of Singapore
SK Holdings Co Ltd	Korea	Korea Exchange
Sloman Neptun Schiffahrts AG	Germany	Berlin Stock Exchange
Soechi Lines Tbk PT	Indonesia	Jakarta Stock Exchange
Solvang ASA	Norway	London Stoch Exchange, Oslo Stock Exchange
Star Bulk Carriers Corp	Greece	NASDAQ, Oslo Stock Exchange
Stolt-Nielsen Ltd	U.K.	Oslo Stock Exchange, New York Stock Exchange
Tankerska Plovidba DD	Croatia	Zagreb Stock Exchange
Team Tankers International Ltd	Norway	London Stock Exchange, Oslo Stock Exchange
Teekay Corp	Bermuda	New York Stock Exchange
Pelayaran Tempuran Emas Tbk PT	Indonesia	Jakarta Stock Exchange
TOP Ships Inc	Greece	NASDAQ CM
Torm A/S	Denmark	NASDAQ Copenhagen
Trada Alam Minera Tbk PT	Indonesia	Jakarta Stock Exchange
Transocean Ltd	U.S.A.	New York Stock Exchange
Uljanik Plovidba DD	Croatia	Zagreb Stock Exchange
Wan Hai Lines Ltd	Taiwan	Taiwan Stock Exchange
Western Bulk Chartering AS	Norway	OTC
Wisdom Marine Lines Co Ltd	Taiwan	Taiwan Stock Exchange
Yang Ming Marine Transport Cor	Taiwan	Taiwan Stock Exchange
Yara International ASA	Norway	Oslo Stock Exchange
Zhongchang Big Data Corp Ltd	China	Shanghai Stock Exchange
Murmansk Shipping Co	Russia	Moscow Exchange
Chevron Corp	U.S.A.	New York Stock Exchange
Maritime Belge SA	Belgium	Brussels Stock Exchange
Tipco Asphalt PCL	Thailand	Bangkok Stock Exchange
Korea Line Corp	South Korea	Korea Exchange
Bulk Invest ASA	Norway	Oslo Stock Exchange
Hafnia Tankers Inc	Denmark	NASDAQ Copenhagen
Aurora LPG Holding ASA	Norway	Oslo Stock Exchange
Uni-Asia Holdings Ltd	Japan	Shanghai Stock Exchange,Tokyo Stock Exchange