Investment, Financing and Mergers & Acquisitions in the Shipping Industry

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for the degree of Doctor of Philosophy

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Declaration of Original Authorship

I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

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Abstract

This thesis provides the comprehensive understanding of investment, financing and mergers and acquisitions (M&As) in the shipping industry in three in-depth analyses.

The first section of the thesis aims to document the evolution and the development in the shipping finance and investment literature by providing a comprehensive review of all existing research in the areas of (a) sources of finance and capital structure in shipping, (b) shipping investment and valuation, (c) corporate governance of shipping companies, and (d) risk measurement and management in shipping. For this purpose, a structured investigation of 137 papers published in 43 scholarly journals during the past four decades (1979-2017) has been performed. Bibliometric analysis shows that shipping finance and investment literature has expanded its scope since 1990s covering a variety of emerging research topics (including M&As), largely triggered by profound changes in business practice in the shipping industry, through interdisciplinary and international collaborations. In addition, content analysis highlights that findings in the shipping finance and investment literature provide valuable insights into characteristics in financial management of shipping companies in terms of highly leveraged capital structure, diversification of financing sources, investment decision, risk-return profile, value creation from M&As and gradual shift in corporate governance. Furthermore, the literature survey critically discusses research gaps, puzzling anomalies and under-explored areas providing promising directions of future research in this area.

The second section of the thesis examines one of the most important angles of shipping investment documented in the review of the literature: inorganic investment. The aim is to draw the broad map of shipping M&A activity and to highlight the characteristics of this multi-faceted market using an extensive and global sample of 2,261 deals consummated by shipping companies during 1990-2014. Especially, considering drawbacks of classification in the extant shipping M&A research, all shipping M&A deals in the sample are partitioned into a new industrial segmentation reflecting actual business areas of acquiring and target firms. The results indicate that M&As play a key role in shaping the current shipping industry through both horizontal and vertical consolidation. The results also document the significance of cross-border deals as well as traditional European and emerging Asian initiatives in the shipping M&A market. In addition, the investigation of determinants of acquisition premium reveals that premium is negatively associated with the size and stock valuation of target firms. Furthermore, using the Tobit and the logit models, I analyse the choice of payment method in

shipping M&As. The results show that the use of cash in shipping M&As is negatively associated with the deals size, but positively with acquirer size.

Finally, as a follow-up to the second section, the third section of the thesis investigates the valuation effects of shipping M&As. The results suggest that both acquiring and target firms achieve positive shareholder returns, measured in 5-day Cumulative Abnormal Returns (CARs) around the announcement date, with statistical significance. The analysis also highlights several characteristics of value creation drivers in the shipping M&A market, such as, positive announcement returns in acquisitions of publicly listed targets and in stock-financed deals, outperformance of cross-border deals compared to domestic transactions, and the negative impact of the size of constituent firms.

Overall, this thesis offers an extensive insight on investment, financing and M&A activity in the shipping industry from various perspectives ranging from the evolution of research contributions to empirical evidence on deal- and firm- characteristics and the value creation effect. The comprehensive synthesis of shipping finance and investment research findings offers invaluable information for understanding financial management in the shipping industry and shapes the future research topics in this area. Further, findings on shipping M&As based on the actual business areas of involved firms provide a comprehensive overview of the multi-faceted consolidation market that is largely driven by industry-specific factors.

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1. INTRODUCTION TO THE THESIS

1.1. Research Motivation

The development of the financial system has long been instrumental to the healthy growth of the global economy, and various services provided by financial institutions play a key role in facilitating business proliferation and outlining major aspects of corporate financial management. This has especially been true for the shipping industry over the past few decades. As a growing number of shipping companies perceive financial management as a core part of their business strategies, the landscape of shipping finance and investment has changed remarkably in several respects. Notably, in a significant departure from their traditional preference for bank loans to secure funds for fleet expansion and replacement, ship-owners have gradually explored alternative financing sources since the 1990s, such as (both public and private) equity capitals and bond markets.[1] While attempting to attract external funding from a wider range of potential shareholders and stakeholders, a number of shipping companies have transformed themselves from family-oriented businesses to corporate entities for more transparent corporate governance and better compliance with regulations required by international capital markets. Furthermore, shipping company managers who are concerned about their exposure to adverse movements of freight rates, fuel prices and exchange rates have paid a great deal of attention to risk management, especially with shipping derivatives.

In an industry characterised by global competition, high-risk revenues and asset value, cyclicality and capital intensiveness, all of which cultivate a challenging business environment, corporate financial management is of crucial importance for shipping companies to navigate through the boom-bust cycles. Given the high degree of uncertainty in freight rates and the amount of capital required for vessel acquisition, the success or failure of even a single investment project has far-reaching effects on shipping companies' prosperity. Furthermore, a shipping firm's longevity generally depends on its access to financing sources with favourable terms (mostly, low interest rates). Especially amid the bleak financial situation of the decreased level of bank credit availability following the shipping market collapse in the second half of 2008, during which freight rate earnings fell precipitously, securing funds for acquiring fuel-

[1] It is estimated that bank lending takes approximately 75% of funding requirements of the shipping industry (ABN AMRO, 2011, Shipping Finance and Investment: Current Trends in Ship Finance, 3rd Mare Forum in Ship Finance, Istanbul, 22nd March).

efficient ships provides a competitive edge to shipping companies in preparation for future shipping market recovery.

Considering the significance of corporate financial management for business in the real world, it is not surprising that a voluminous body of research has been conducted addressing issues unfolding in the areas of shipping finance and investment. Academic research in this field has attempted to identify underlying factors that trigger changes in business practice, to analyse the effect of those changes in more quantitative ways, and to suggest a potential 'best practice'. Nonetheless, to the best of my knowledge, there is no comprehensive and structured survey of published research in this area with the exception of Kavussanos and Visvikis (2006b) who investigated papers in shipping derivatives. In stark contrast, there have been studies dealing with theoretical development, research evolution, academic taxonomy and future research directions in transportation-related areas, such as port operation, logistics and supply chain management, and maritime transport. Accordingly, the first objective of this thesis is to fill the research gap by providing a comprehensive analysis of existing shipping finance and investment literature. For this purpose, this thesis carries out bibliometric and content analysis of 137 shipping finance and investment papers published in scholarly journals during 1979–2017. Furthermore, after analysing the research evolution in the shipping finance and investment area, this survey attempts to shape the future research agenda by critically discussing the gaps in the existing literature.

Among the promising future research topics that this literature survey has identified, this thesis pays particular attention to inorganic investment (M&As) in the shipping industry, as significant unfilled gaps exist in this research area. Given the importance and far-reaching effects of M&A activity for the business practice of shipping companies, there are several reasons why the research topic of business consolidation deserves further attention from researchers in the shipping finance and investment area. First, the rise of mergers and acquisitions (M&As) constitutes one of the most remarkable phenomena in the shipping industry. Researchers have observed that the maritime industry, especially the liner sector, becomes concentrated at an ever-increasing pace, and this trend is to a large extent facilitated by consolidation activity during the past few decades. It is generally perceived that since the 1990s, major market players in the liner sector have pursued both horizontal and vertical consolidation under challenging economic circumstances. For instance, as the enactment of the US Ocean Shipping Reform Act (OSRA) in 1998 *de facto* phased out the shipping conference system, in which price collusion and anti-trust exemption were granted, liner shipping

companies were confronted with more intense competition, and consequently, increased uncertainty in freight rate earnings. As such, liner shipping companies had to strategically rationalise their operations through consolidating, pursuing economies of scale and improving asset utilisation. In addition, M&A activity is also prevalent in the tramp (dry bulk and tanker) industry, which is generally known to be fragmented compared to the liner sector. Gilje *et al.* (2002) reported that business consolidation in the tanker sector started to rise in the early 1990s and intensified in the second half of the same decade. Merikas *et al.* (2014) documented that the ownership structure of Very Large Crude Carriers (VLCCs) was increasingly concentrated during 1993–2009.

Second, M&As can provide a plethora of strategic and operational advantages. Shipping companies have taken advantage of M&As for complementing organic growth, gaining access to new markets and regional expertise, side-lining competitors from specific markets, expanding their client base and achieving cost reduction. In addition, the rapid transformation towards offshore production, largely seeking low-cost labour in developing countries, has motivated shipping companies to extend their geographical reach and to control a wider range of logistics service.

Third, business consolidation has been proposed as a solution for the shipping industry's current issues of overcapacity resulting from an ordering frenzy during the heyday of the mid-2000s and a low rate of demand recovery largely attributable to the Chinese economy heading towards a soft or hard landing. For instance, Maersk Line, the largest containership operator, has recently been reported to be refraining from ordering newbuilding, relying instead on takeovers for its expansion and survival over the post-2008 shipping market recession, which is widely expected to persist for next few years.[2] In such a difficult time, when the bulk of shipping companies are financially distressed due to vessel operation below the break-even point, consolidation can provide potential benefits such as freight rate recovery to a sustainable level, shipping market stability and cost reduction.

Accordingly, this thesis aims to extend the previous literature and provide a comprehensive understanding of M&As in the shipping industry. To this end, this thesis targets three additional objectives. The second objective of this thesis is to provide an analysis of the market for corporate control in the shipping industry. One of the most serious drawbacks of prior research on shipping M&As is sample classification. Specifically, this thesis focusses on various

[2] The Globe and Mail, 'Maersk welcomes consolidation in shipping industry', 1st November 2016.

business areas of acquirers and targets within the maritime spectrum (e.g. dry-bulk, tanker, container, passenger, port, freight forwarding) that are largely under-researched in the extant shipping M&A literature. Considering that previous shipping M&A literature has documented conflicting evidence on the value creation effect by sub-sectors within the shipping industry, it is particularly important to examine the business consolidation activity of shipping companies based on clear-cut categorisation. Specifically, the studies that utilise the SIC system in searching M&A deals of shipping companies may fail to identify actual business areas of constituent firms (e.g. ship-owning, port operation, freight forwarding). Moreover, the use of SIC is likely to either include non-shipping transactions or to exclude a substantial number of shipping transactions, as the classification system can be problematic in applying for service industries (Walker and Murphy, 2001), such as shipping. Although the sample in this thesis is also based on SIC, all transactions are double-checked with hand-collected information (e.g. press articles, annual reports, exchange filings) in order to identify the actual business areas of involved firms. This process ensures, to a considerable extent, that the findings in this thesis are based on the most bias-free sample of shipping M&A deals ever used.

The vast majority of previous studies dealing with shipping and transportation M&As have focussed on horizontal consolidation and have paid relatively less attention to vertical integration or diversification. However, M&A activity in the various transportation and related service industries becomes increasingly multifaceted in terms of the business areas of constituent firms. As international division of the production process is unfolding, and consequently, synchronising the global supply chain from the sources of commodities to end-users becomes a critical success factor, the importance of vertical integration between related transportation service companies has been elevated. Considering that shipping comprises a core part of the global supply chain by servicing approximately 80 to 90% of international trade, it is not surprising that leading shipping companies have sought to build up their logistical function by gaining access to port operation, hinterland activity and multi-modal transportation. Furthermore, the inclusion of vertical integration and diversification leads the scope of this thesis to cover shipping M&A market participants from other industries. For example, since shipping transportation plays a key role in the downstream in the oil and gas industry, major oil and gas companies pursue improving their downstream operations by acquiring tanker shipping companies. Merikas *et al.* (2014) reported that consolidation in the tanker sector coincided with the large-scale mergers in the oil industry in the late 1990s. In addition, the involvement of financial institutions (e.g. investment banks, private equity firms) driven by

desire for under-valued shipping assets in market deterioration and tight bank credit after 2008 facilitates M&A activity in the shipping industry, calling for in-depth analysis.

The third objective of this thesis is to investigate the characteristics of the shipping M&A market. Given that financial management of shipping companies is largely affected by idiosyncratic features of the maritime industry (e.g. shipping market uncertainty, international business, capital intensiveness), it is likely that shipping M&A activity illustrates industry-specific characteristics. For example, ship-owning companies generally known to be concerned about ownership dilution are more likely to choose cash for M&A payment. By contrast, assuming that cash-financed deals increase acquirers' financial leverage through additional debts, shipping companies generally known to be high leveraged are more likely to choose stock-for-stock exchange to relieve financial distress costs. Since the choice of payment method has far-reaching effects on post-merger capital structure and corporate governance of combined shipping companies, it is particularly important to address the conflicting theoretical explanations for financing decisions in shipping M&As. Thus, this thesis addresses several interesting observations regarding the characteristics of shipping M&A transactions.

Finally, the fourth objective of this thesis is to examine the value creation effect in shipping M&A activity. To justify the costly and time-consuming process of combining independent business entities, an M&A transaction should offer economic or strategic benefits to both acquiring and target firms. However, the detrimental value creation effect of either negative or negligible gain for shareholders of acquiring firms around the deal announcement is one of the most stylised facts in the corporate finance literature. In sharp contrast, the vast majority of shipping M&A literature provides evidence that both acquiring and target firms achieve positive abnormal returns for their stock prices. Although shipping M&A studies offer some valuable insights concerning the gains in shipping business consolidation, their results are based on either anecdotal observations that are hardly generalisable or else samples that are too extensive and might be subject to ambiguous classification across different segments within the shipping industry. Thus, it is important to address the sample issue and to investigate variations in acquisition gains by different sectors. Using a fine-tuned dataset, this thesis presents findings on gains from shipping M&A deals by actual business areas of acquiring and target firms. In addition, the associations between announcement returns and the drivers of value creation are also investigated.

1.2. Outline of the Thesis and Research Contributions

This thesis consists of five chapters focussing on financial management and business consolidation in the shipping industry. The current chapter presents a brief description of the research motivation, along with an outline and potential contributions of this thesis.

Chapter 2 provides a review of the evolution of the shipping finance and investment literature, including shipping M&A research. For this purpose, a bibliometric analysis is performed for a sample of 137 papers published in 43 academic journals during 1979–2017 in terms of research topic diversification, methodological issues and authorship collaboration. The results reveal that the academic domain of shipping finance and investment research has expanded with the emergence of new topics addressing contemporary business issues in the shipping industry. Moreover, the findings of those papers, grouped by four major academic areas in the corporate finance literature (capital structure, valuation methods, corporate governance and risk measurement/management), are analysed and directions for future research are proposed.

Chapter 3 offers an extensive overview of the shipping M&A market over approximately the last three decades. Using a sample of M&A transactions carried out by shipping and related transportation service companies during 1990–2014, the chapter presents the evolution and characteristics of shipping M&A activity over time. In particular, considering the drawbacks of the current industry classification system, as discussed earlier, all shipping M&A deals in the sample are partitioned into a new industrial segmentation. The results indicate that both horizontal consolidation and vertical integration consummated during three shipping M&A waves in the sample play a vital role in shaping the current structure of the international maritime industry. In addition, shipping M&A activity can be characterised with the traditional initiative of the European region, the recent rise of the Asian region and the predominant use of cash for M&A financing. Consistent with evidence presented in Alexandridis *et al.* (2013), it is found that acquisition premium is negatively associated with the target's size (measured by pre-announcement market capitalisation) and stock valuation (measured by pre-announcement market-to-book ratio). Moreover, for the first time in the maritime literature, this chapter examines the determinants of the payment method in shipping M&As. Supporting the information asymmetry hypothesis (Hansen, 1987), the results indicate that the use of cash is negatively associated with the deal size, as large-sized acquirers tend to pay with cash.

Chapter 4 investigates the value creation effect in shipping M&As. While the previous corporate finance literature has provided evidence that M&As tend to be value-destroying for

acquirers and targets, shipping M&A studies have largely documented that both involved firms demonstrate positive abnormal returns around the deal announcement. Consistent with the results of the shipping M&A literature, the results in this chapter indicate that cumulative abnormal returns (CARs) for both acquirers and targets are positive, though a much larger part of acquisition gains is channelled into target firms. The effect of deal characteristics on acquisition gains also differs from general conclusions in the extant M&A literature, though the results are not supported in the multivariate analysis. First, acquisitions of publicly listed targets generate positive CARs for acquirers. Second, cross-border deals outperform domestic transactions for both acquiring and target firms. Third, stock-financed deals offer positive gains for acquirers and numerically outperform cash offers. Finally, it is found that gains from shipping M&As are generally well explained by the size of the acquirers and targets, consistent with the findings of Moeller *et al.* (2004) and Alexandridis *et al.* (2013), respectively. Furthermore, the results also document variations in CARs for involved firms and the effect of deal characteristics on acquisition gains according to business segments. While CARs for acquirers are higher in diversification deals, those for targets are higher in horizontal deals. In addition, the outperformance of cross-border deals is especially remarkable for ship-owning acquirers. Furthermore, firm valuation of ship-owning acquirers demonstrates a positive effect on acquisition gains in horizontal deals. Finally, firm-valuation of ship-owning targets is negatively associated with abnormal returns for both shipping and non-shipping acquirers.

Finally, Chapter 5 provides the conclusions of this thesis, in addition to some suggestions for future research.

2. SHIPPING TRANSPORTATION FINANCE AND INVESTMENT: A CRITICAL SURVEY OF THE EMPIRICAL EVIDENCE SETTING THE FUTURE RESEARCH AGENDA

2.1. Introduction

The international maritime transportation industry facilitates between 80 and 90% of global commodity trade in terms of volume and contributes significantly to the welfare of nations.[3] The shipping transportation sector adds approximately $380 billion a year to the global economy, highlighting its importance to the world economy and international trade (see the "Global Shipping Market Report" in "Catalyst Corporate Finance", 2016). According to data from Clarksons Platou, during the 2005–2017 period, the aggregate capital invested in newbuilding vessels alone exceeded $1.5 trillion, with $263 billion spent during the cycle peak of 2007. Raising large amounts of capital to meet investment needs tends to be challenging in an industry characterised by cyclical and seasonal fluctuations, often experiencing prolonged periods of uncertainty and volatility (Kavussanos, 2010). The distinctive characteristics of the shipping industry, such as its capital intensiveness and market cyclicality, render corporate financial management decisions a top priority for shipping companies, affecting almost every aspect of shipping businesses from cash flow generation capacity (Drobetz et al., 2016a) to corporate ownership/governance structures (Andreou *et al.*, 2014) and, ultimately, their value creation potential (Kang *et al.*, 2016). Naturally, investment decisions and the associated financing choices entail significant challenges for shipping companies (see Kavussanos and Visvikis, 2016 for a comprehensive overview of financial management in the shipping industry). In fact, their longevity is historically contingent on their access to financing with favourable terms and especially low interest rates (Stopford, 2009). Along these lines, the global financial crisis of 2008, and the ensuing environment of low freight rates, further highlighted the importance of access to financing for shipping companies, enabling those with the capacity to finance new projects to weather the storm. At the trough of the cycle, a large number of companies faced financial distress, with Hanjin Shipping filing for bankruptcy in August 2016 providing a notable example. The crisis also highlighted the need for risk management strategies and tools to understand and manage the risks involved in running a

[3] The numbers on the shipping industry's share of global trade are from UNCTAD (2015), retrieved from: http://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=1374 and the International Chamber of Shipping, retrieved in January 2017 from http://www.ics-shipping.org/shipping-facts/shipping-and-world-trade.

shipping business (see, for instance, Kavussanos, 2010; Kavussanos and Visvikis, 2006a; 2011).

Early efforts to finance shipping projects largely involved own equity and, subsequently, relatively small amounts of capital provided by banks. Since the early 1990s, a growing number of shipping companies have relied on global capital markets—in a break from traditional sources of financing, such as bank loans—to diversify their funding sources and tap into a wider range of institutional and retail investors. To gain access to global capital markets, shipping companies had to evolve from typically family-oriented businesses to corporate entities, which in turn led to a structural transformation and expedited significant improvements in their corporate governance. Given the significance of shipping finance and investment as a specialised area of maritime transportation, the research conducted in this area has been voluminous since the first empirical study was published by Yolland (1979). In spite of the impact of shipping finance on both the academic community and business practice, to date, and to the best of my knowledge, there has been no comprehensive survey of published research in this area. Notwithstanding, a number of studies have attempted to address conceptualisation, methodological issues, theoretical developments, academic taxonomy and future research directions in areas relevant to transportation, such as in port management (Ng, 2013; Pallis *et al.*, 2010; Pallis *et al.*, 2011; Steenken *et al.*, 2004; Woo *et al.*, 2012; Woo *et al.*, 2011), in logistics and supply chain management (Burgess *et al.*, 2006; Ho *et al.*, 2002; Mentzer and Kahn, 1995; Panayides, 2006), in shipping freight derivatives (Kavussanos and Visvikis, 2006b), in container shipping (Lau *et al.*, 2013) and in maritime transport (Shi and Li, 2017).

To fill this research gap, the current study provides a critical survey and analysis of existing research by examining all academic studies published in scholarly journals in the area of shipping finance and investment during the 1979–2017 period, complemented with selected books and book chapters, and provides suggestions to set the future research agenda for scholars. In order to provide a complete review of the literature, I first reviewed transportation/logistics and maritime scholarly journals in searching for studies related to shipping finance and investment. Then, I investigated all other publications of authors who have at least one shipping finance and investment paper in those journals, as well as references of their journal articles, in order to identify other relevant research published in journals within various social science areas, such as finance, economics and management. This involves 137 papers published in 43 scholarly journals. The journal titles along with aggregate

Table 2.1 List of Scholarly Journals Featuring Shipping Finance and Investment Articles 1979–2017 (paper counts)

Journal Title	All	Pre-1990s	1990-1999	2000-2009	Post-2010s
African Journal of Business Management	1	0	0	0	1
American Economic Review	1	0	0	0	1
Applied Economics	3	0	1	1	1
Applied Economics Letters	1	0	0	0	1
Applied Financial Economics	1	0	0	0	1
Applied Mathematical Finance	1	0	0	0	1
Asian Journal of Shipping and Logistics	3	0	0	0	3
Corporate Governance: The international journal of business in society	1	0	0	0	1
Empirical Economics	1	0	0	0	1
Energy Economics	1	0	0	0	1
Eurasian Business Review	1	0	0	0	1
European Financial Management	1	0	0	0	1
International Journal of Financial Markets and Derivatives	1	0	0	0	1
International Journal of Financial Services Management	1	0	0	1	0
International Journal of Forecasting	2	0	0	1	1
International Journal of Logistics Research and Applications	1	0	0	1	0
International Journal of Production Economics	1	0	0	0	1
International Journal of Theoretical and Empirical Finance	1	0	0	1	0
International Journal of Transport Economics	3	0	0	3	0
International Review of Financial Analysis	1	0	0	0	1
Journal of Applied Business Research	1	0	0	0	1
Journal of Banking and Finance	1	0	0	1	0
Journal of Derivatives	1	0	0	1	0
Journal of Derivatives & Hedge Funds	1	0	0	1	0
Journal of Forecasting	1	0	0	1	0
Journal of Futures Markets	6	0	2	3	1
Journal of Islamic Thought and Civilisation	1	0	0	0	1
Journal of Mechanical Engineering	1	0	0	0	1
Journal of Multi-Criteria Decision Analysis	1	0	0	1	0
Journal of Transport Economics and Policy	1	0	1	0	0
Maritime Economics and Logistics	17	0	2	8	7
Maritime Policy and Management	34	4	8	12	10
Multinational Finance Journal	1	0	0	0	1
Quarterly Journal of Economics	1	0	0	0	1
Review of Derivatives Research	2	0	0	2	0
Review of Finance	1	0	0	0	1
Review of Financial Economics	1	0	0	1	0
The Journal of Alternative Investments	1	0	0	1	0
Transportation Journal	1	0	1	0	0
Transportation Research Part A: Policy and Practice	2	0	0	0	2
Transportation Research Part B: Methodological	2	0	1	1	0
Transportation Research Part E: Logistics and Transportation Review	31	0	1	7	23
WMU Journal of Maritime Affairs	1	0	0	1	0
Total	**137**	**4**	**17**	**49**	**67**

paper counts for four sub-periods are presented in Table 2.1. It turns out that the majority of shipping finance and investment studies have been published in transportation and maritime

academic journals. Notably, 82 out of 137 papers have been published in the following three academic journals alone: Maritime Policy and Management (34 paper counts), Transportation Research Part E: Logistics and Transportation Review (31 paper counts) and Maritime Economics and Logistics (17 paper counts). I further classify the papers examined in this study into four major research areas inspired by the classification structure typically adopted in the mainstream corporate finance literature. These include (a) sources of finance and capital structure in shipping, (b) shipping investment and valuation methods, (c) corporate governance of shipping companies, and (d) risk measurement and management in shipping.

This thesis also conducts a comprehensive bibliometric analysis of the related academic literature in shipping finance and investments. This aims to provide additional information concerning the frequency of publications in each research area, the methodological approaches utilised, co-authorship associations and research impact. The second part of the paper comprises a comprehensive review of the literature and critical discussion of the empirical evidence of the four aforementioned distinct research areas (a)–(d) of finance. Each section identifies pivotal gaps in the literature along with potential paths for further research. All sections include a summary of the research designs and findings, tabulated concisely for ease of reference.

This survey paper contributes to the extant literature in several important ways. First, to the best of my knowledge, it is the first to offer a comprehensive overview of the research findings in the area of shipping finance. Second, the bibliometric analysis more succinctly highlights the research developments in the area of shipping finance. Third, the paper provides a comprehensive synthesis of all published research in shipping finance and investment, and it offers an invaluable source of information for both the academic community and business practice. Finally, this paper shapes the future research agenda for shipping finance and investment by critically discussing the gaps in the extant literature and the potential avenues for further research.

The rest of this paper is organised as follows. Section 2.2 provides a bibliometric overview of all studies included in this survey. Sections 2.3–2.6 offer, respectively, a comprehensive review of the literature, key empirical findings and suggestions for future research on four major research areas in shipping finance and investments. Finally, Section 2.7 concludes the paper.

2.2. Bibliometric Review

As a first step, I provide an overview of the evolution of the literature in the area of shipping finance, investments and risk management, and I identify trends in key bibliometric statistics on the research topics covered, the methodologies employed, the papers' research impact and co-authorship collaborations. Table 2.2 provides a classification of existing shipping finance and investment literature by research topic, journal discipline and regional focus of the research topics. In terms of research topics (see Panel A), it appears that during 1979–2017, risk measurement and management in shipping (54 papers) and shipping investment/valuation methods (51 papers) have attracted significant attention, followed by sources of finance/capital structure in shipping (26 papers). Moreover, the focus of shipping finance research seems to have evolved over time. For instance, during the pre-1990s period, only three studies examined valuation methods. Thereafter, the literature has progressively expanded on alternative topics that fall broadly within the areas of capital structure, inorganic investments (M&As), and corporate governance and risk management. Furthermore, Panel B illustrates the distribution of studies published in shipping finance partitioned by journal discipline. Journals in the broad transportation and maritime disciplines account for the vast majority of academic publications (70%). Academic journals in the fields of finance, economics, and operations and management have also published papers focussing on shipping finance and investment. However, their share is significantly lower, although it has gradually increased post-2009.

Finally, Panel C classifies the studies by the regional focus of their empirical investigation. Evidently, the regional scope of the shipping finance literature is primarily US oriented, especially for studies examining samples of listed shipping companies. This can be attributed to the fact that the US money and capital markets have been developed much earlier and cater to a more suitable financial environment for shipping companies to seek capital. Thus, certain areas of shipping finance, such as initial public offerings (IPOs) and high-yield bonds, have taken place primarily in US markets since the mid-90s. Another contributing factor is that, depending on the research question examined, there is broader data availability for US-listed shipping companies. This can in turn be attributed to more stringent regulations in US capital markets, requiring full disclosure of corporate information when raising capital.

Further, I group the studies included in this survey paper according to the methodological approach they follow. To that end, I adopt a classification scheme in line with the one in the field of operations management research put forward by Wacker (1998). The classification

differentiates between two main research approaches. The analytical approach includes deductive methods ('*drawing logically certain conclusions through the process of reasoning*'), while the empirical approach includes inductive methods ('*deriving general principles from specific observations*'). Each approach comprises three sub-categories; the analytical approach consists of conceptual, mathematical and statistical methods while the empirical approach includes experimental, statistical and case studies.

Table 2.2 Research Topics, Journal Disciplines and Regional Focus (paper counts)

	All	Pre-1990s	1990-1999	2000-2009	Post-2000s
Panel A: Research Topics					
Sources of Finance in Shipping and Capital Structure	26	1	1	9	15
Shipping Investment and Valuation Methods	51	3	6	18	24
Corporate Governance of Shipping Companies	6	0	0	1	5
Risk Measurement and Management in Shipping	54	0	10	21	23
Panel B: Journal Discipline					
Maritime	52	4	10	21	17
Transportation and Logistics	44	0	4	12	28
Finance	22	0	2	12	8
Economics	8	0	1	1	6
Management	5	0	0	1	4
Operations	4	0	0	2	2
Engineering	1	0	0	0	1
Sociology	1	0	0	0	1
Panel C: Regional Focus of the Research Topic					
Country	31	0	3	10	18
US	18	0	3	6	9
Greece	4	0	0	1	3
China	2	0	0	1	1
Germany	2	0	0	0	2
Japan	2	0	0	0	2
Brazil	1	0	0	1	0
South Korea	1	0	0	0	1
UK	1	0	0	1	0
Region	7	0	1	6	0
Global	30	0	3	7	20
N/A	69	4	10	26	29

Note: In Panel B, the journals included in each discipline are as follows (in alphabetical order): **Maritime** (Maritime Economics and Logistics, Maritime Policy and Management, WMU Journal of Maritime Affairs); **Transportation and Logistics** (Asian Journal of Shipping and Logistics, International Journal of Logistics Research and Applications, International Journal of Transport Economics, Journal of Transport Economics and Policy, Transportation Journal, Transportation Research Part A: Policy and Practice, Transportation Research Part B: Methodological, Transportation Research Part E: Logistics and Transportation Review); **Finance** (Applied Financial Economics, Applied Mathematical Finance, European Financial Management, International Journal of Financial Markets and Derivatives, International Journal of Financial Services Management, International Journal of Theoretical and Empirical Finance, International Review of Financial Analysis, Journal of Banking and Finance, Journal of Derivatives, Journal of Derivatives and Hedge Funds, Journal of Futures Markets, Multinational Finance Journal, Review of Derivatives Research, Review of Finance, Review of Financial Economics, The Journal of Alternative Investments); **Economics** (American Economic Review, Applied Economics, Applied Economics Letters, Empirical Economics, Energy Economics, Quarterly Journal of Economics); **Management and Business** (African Journal of Business Management, Corporate Governance: The International Journal of Business in Society, Eurasian Business Review, Journal of Applied Business Research, Journal of Multi-Criteria Decision Analysis); **Operations** (International Journal of Forecasting, International Journal of Production Economics, Journal of Forecasting); **Engineering** (Journal of Mechanical Engineering); and **Sociology** (Journal of Islamic Thought and Civilisation).

Table 2.3, Panel A illustrates the distribution of shipping finance studies classified according to Wacker's (1998) framework. The vast majority of the studies (112 paper counts or 82% of all papers) employ employed empirical methodologies, mostly using statistical measures to provide empirical evidence. This pattern is rather different from that observed in survey studies in other shipping-related fields, such as for port studies (Woo *et al.*, 2011) and logistics/supply chain management (SCM) studies (Burgess *et al.*, 2006), where the analytical-conceptual research designs are the most popular among the methodological approaches adopted.

Table 2.3 Methodological Issues (paper counts)

		All	Pre-1990s	1990-1999	2000-2009	Post-2000s
Panel A: Theory-building Types						
Analytical - Total		**25**	1	3	8	13
	Conceptual	3	1	0	1	1
	Mathematical	16	0	3	6	7
	Statistical	6	0	0	1	5
Empirical - Total		**112**	3	14	41	54
	Experimental	1	0	0	0	1
	Statistical	105	1	14	39	51
	Case study	6	2	0	2	2
Panel B: Data Analysis Techniques						
Regression		43	1	6	11	25
Error Correction Model		21	0	1	14	6
Real Option Modelling		14	0	2	5	7
Descriptive		13	3	1	5	4
Autoregressive Conditional Heteroscedasticity		10	0	2	2	6
Event Study Analysis		8	0	0	6	2
Autoregressive Moving Average		3	0	2	0	1
Simultaneous Equations Modelling		3	0	0	0	3
Analytical Hierarchy Process		2	0	0	0	2
Efficient Frontier Analysis		2	0	0	1	1
Principal Component Analysis		2	0	0	1	1
Simulation		2	0	0	0	2
Utilites Additives Discriminantes		2	0	0	1	1
Value-at-Risk		2	0	0	1	1
Others		10	0	3	2	5

Notes: In Panel C, data analysis techniques of the same modelling family are grouped under the same category. For example, regression incudes univariate, multivariate and logit models, options pricing includes both closed-form solutions and dynamic programming, and autoregressive conditional heteroscedasticity (ARCH) also includes generalised ARCH models. The 'Others' group includes cost-benefit analysis, regime switching and other techniques that have only one paper count.

Table 2.3, Panel B takes a step further in classifying shipping finance literature by focussing specifically on the data analysis techniques utilised. The most frequently employed technique for data analysis is the classical regression model (43 papers or 31% of the total), followed by the error correction model (21 papers or 15% of the total), real options modelling (14 papers

or 10% of the total), descriptive analysis (13 papers or 9% of the total), autoregressive conditional heteroscedasticity modelling (10 paper or 7% of the total) and event study analysis (8 papers or 6% of the total). The recent surge in popularity of event study analysis and options pricing models can be attributed to the emergence of new research strands in the shipping finance literature, such as M&As, IPOs, and real options analysis (ROA).

Finally, Table 2.4, Panel A presents additional information for the studies examined, namely, the number of authors and the type of co-authorship, while Panel B illustrates their research impact in terms of citations. The number of authors per paper has gradually increased over the past four decades from an average of one author during pre-1990s to 2.7 during post-2000s. See Appendix A for the number of scholarly publications per author over the 137 papers in shipping finance and investment literature. Along with the increase in the number of authors per paper, the extent of international collaborations has also notably increased, possibly due to recent globalisation trends along with the authentically international nature of the shipping industry.

Table 2.4 Authorship and Citations

	All	Pre-1990s	1990–1999	2000–2009	Post-2000s
Panel A: Authorship					
Average number of authors	2.4	1	1.6	2.3	2.7
Collaboration	68	0	2	23	43
International collaboration	40	0	2	15	23
Academic-industrial collaboration	19	0	1	7	11
Panel B: Citation Statistics					
Shipping finance papers					
Average citations per article	24.6	5.0	38.0	36.2	10.0
Annual average citations per article	2.6	0.1	1.9	3.0	2.6
Other papers in the same volume or issue					
Average citations per article	37.6	9.5	39.4	59.6	17.3
Annual average citations per article	4.2	0.3	2.0	4.7	4.8

Notes: In Panel A, the three types of collaboration are determined in terms of institutions to which individual authors are affiliated in the year of publication. Specifically, 'collaboration' indicates co-authorship between researchers from different institutions; 'international collaboration' indicates co-authorship between researchers from institutions in different countries; and 'academic-industrial collaboration' indicates co-authorship between researchers from academic and industrial (or business) institutions.

In addition, a growing number of papers have more recently been co-authored by both academics and practitioners, pointing to an acceleration in interconnectedness between academia and the industry. In terms of research impact reported in Table 2.4, Panel B, the average paper is cited 24.6 times throughout the entire sample period. The average annual

number of citations has increased from 0.1 during pre-1990s to 2.6 during post-2000s, indicating an increasing interest in the shipping finance area from the academic community.

The bibliometric analysis presented in this section illustrates the ways in which the literature on shipping finance, investments and risk management has evolved over time in terms of topics, academic disciplines, methodologies, collaborations and research impact. It is evident that researchers in this area have gradually addressed more diverse topics and expanded their networks and extent of collaborations through more international co-authorships. The following sections provide a thorough critical review of the literature, structured along the four major research areas in shipping finance, investments and risk management discussed earlier.

2.3. Sources of Finance in Shipping and Capital Structure

The inherently capital-intensive nature of the shipping industry places issues directly associated with ship financing decisions, such as the potential sources of finance and the choice of capital structure, at the forefront of shipping finance research. The importance of these topics is highlighted by the significant size of the capital invested in newbuilding vessels (on average, more than $130 billion per annum), with one vessel needing more than $60 million, subject to the vessel's type and size. In addition, the fact that second-hand vessels are frequently traded in the sale and purchase (S&P) market further adds to the demand for capital in the shipping industry.[4]

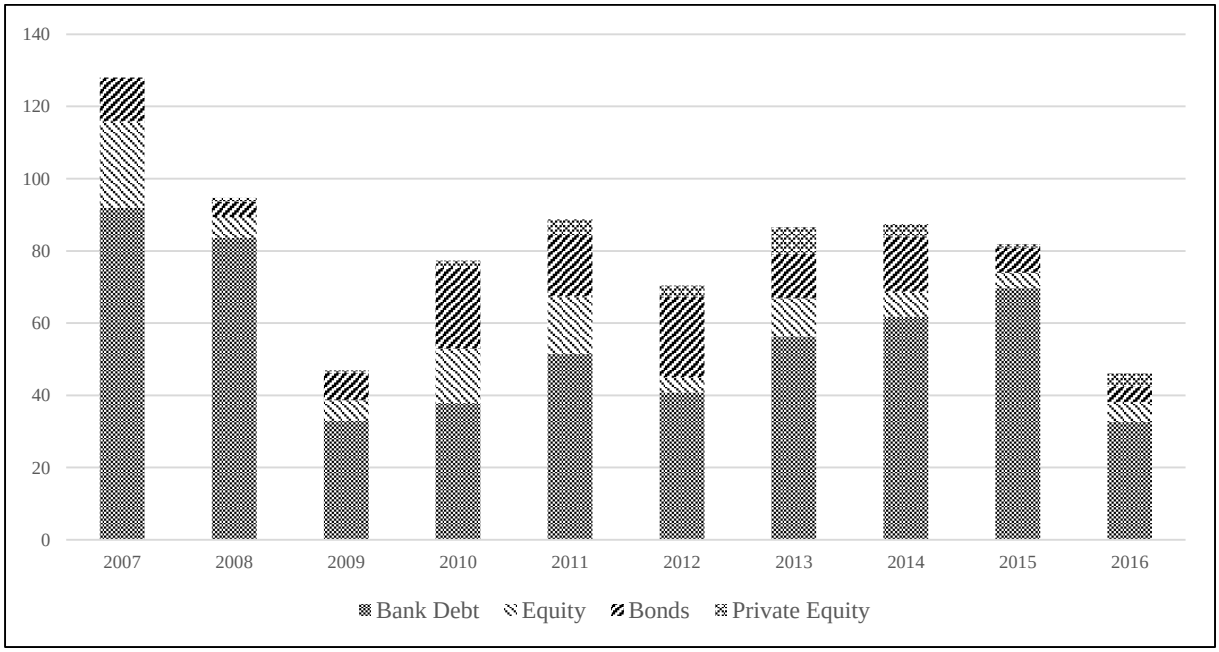
In addition to being capital intensive and highly liquid, the shipping industry is also affected by extreme fluctuations in vessel revenues, operating cash flows, and asset values, which altogether form a challenging business environment for shipping companies (Kavussanos and Visvikis, 2006a). Given the long-term economic life of the projects (vessels) in shipping, one might expect that the financing of shipping assets would primarily involve the use of debt. However, as in other industrial sectors, shipping companies also tend to adopt an optimal capital mix in order to best manage their cost of capital and tackle the severe troughs of shipping business cycles.

[4] According to Clarksons Platou, over 1,000 vessels per annum on average changed hands during the period 2005-2015.

In the 1980s, the shipping industry raised as much as 75% of its external funding from banks in the form of loans, while bonds and public equity accounted for only approximately 5%.[5] However, shipping finance has transformed significantly since the early 1990s, reflecting that a number of shipping companies began evolving from predominantly family businesses to more corporate-oriented structures in order to gain access to global capital markets. The need for shipping companies to diversify their sources of finance was further dictated by the tight credit markets in the aftermath of the 2008 financial crisis.

Figure 2.1 depicts the global evolution of shipping finance sources during the 2007–2016 period. The collapse of newbuilding vessel contracting and second-hand purchases, along with a steep surge in global economic risk levels, led to a sharp decline in the volume of bank debt (typically syndicated bank loans) raised by shipping companies in 2009. Following the onset of the global financial crisis, ship-lending banks reduced their exposures to the shipping industry and shifted their main operations from issuing new shipping bank loans to restructuring existing ones in order to minimise their losses. Even when they approved new bank loans, banks strived to minimise their risks. This was facilitated by requiring significantly

Figure 2.1 Sources of Capital in the Shipping Industry (2007–2016, in USD Billion)



Source: Marine Money International (as of January 2017); the 2016 figure is based on the first nine months only.

[5] ABN AMRO (2011), Shipping Finance and Investment: Current Trends in Ship Finance, 3rd Mare Forum in Ship Finance, Istanbul, 22nd March.

lower loan-to-value (LTV) ratios, shorter amortisation maturities (the maximum maturity of new bank loans may be five years), higher margin spreads and more substantial covenants and collateral to grant a credit facility (see Kavussanos and Tsouknidis, 2016). During this period, high-yield bond issues and private equity (PE) played a more important role as alternative sources of capital for shipping (see Kavussanos and Tsouknidis, 2014). These trends triggered the interest of academic research focussing on evaluating the effectiveness of alternative sources of capital in the shipping industry. This section aims to provide a critical review of the main findings with regards to different financing sources and capital structure in the shipping industry, shaping the future research agenda.

2.3.1. Shipping Bank Loans and Credit Risk Analysis

As can be observed in Figure 2.1, shipping bank loans have traditionally been the most popular source of financing in the shipping industry, accounting for approximately 70% of the total ship-funding requirements during the 2007–2016 period. This can be primarily attributed to the fact that a bank loan constitutes the cheapest and simplest external funding source for shipping projects. In addition, bank loans do not affect the ownership structure of a shipping company. This is a markedly desirable feature for shipping businesses, since they are typically reluctant to endure significant changes in their traditional family-oriented and highly concentrated ownership structures. Perhaps even more importantly, raising funds through bank loans does not require the public disclosure of (generally confidential) strategic, financial and operational information. By contrast, IPOs and bond issues require making such information public to investors to a much larger extent (Kavussanos and Tsouknidis, 2014; 2016).

Historically, shipping bank loans have been granted on the basis of relationship banking, through which a long-term rapport is established based on amicable trust and information sharing between the obligor and the bank (Gavalas and Syriopoulos, 2015; Kavussanos and Tsouknidis, 2016; Mitroussi *et al.*, 2016). Proper assessment of default risk in shipping bank loan agreements requires taking into account qualitative factors, such as the owners' reputation, background, business commitment, know-how and credit history; along with quantitative factors, such as their financial status, market share and fleet composition. To this end, the multi-criteria decision-making (MCDM) approach—a process of decision-making optimisation with multiple criteria—can provide a tool for developing a systematic default risk assessment model for shipping bank loan applications.

Dimitras *et al.* (2002) employ the Utilities Additives Discriminants (UTADIS) method to assess the default risk for a sample of 17 granted shipping bank loans drawn over the 1999–2001 period.[6] Initially, the authors investigate a wide set of credit criteria for loan evaluation, the weights of which are set based on the subjective opinion of financial professionals working on a specific consulting firm (the decision makers). Subsequently, the UTADIS method is used to specify a utility function for each group of bank loan applications according to their default risk and the cut-off utility level for granting a loan. The most important factors in assessing the default risk of shipping bank loans are found to be the ownership structure and the quality/experience of the management team (34%), followed by the credit history of the obligor (20%) and fleet characteristics (12%). However, as acknowledged by the authors, these weights and utility thresholds might change if a new sample with different characteristics is employed in the analysis or if there is a change in the perspective of the decision makers regarding which criteria are relevant for assessing the default risk of a new potential obligor.

In a related study, Gavalas and Syriopoulos (2015) draw inferences regarding the relevant factors for assessing default risk of shipping bank loans from primary data collected through a bank survey questionnaire. The authors survey a sample of 16 managers working in different ship-lending commercial banks in Greece. These bank managers were asked to identify the factors that they considered important when assessing shipping bank loan applications. Having specified an initial set of credit criteria, Gavalas and Syriopoulos (2015) also utilise the UTADIS method to determine a utility function and the cut-off utility thresholds for granting a loan in a manner similar to Dimitras *et al.* (2002). The results indicate that the credit rating migration probability, the debt-to-equity ratio and the asset coverage ratio are the most important factors for classifying shipping bank loan applications according to their default risk. However, it can be argued that specifying the relevant factors in assessing the default risk of shipping bank loans through a survey questionnaire entails significant subjectivism, as each manager may evaluate the weighting and composition of the relevant factors differently when assessing a loan agreement.

After the onset of the global financial crisis in 2008, the landscape of bank financing for the shipping industry changed drastically. As seen in Figure 2.1, the amount of shipping investments fell by more than 60% during the 2007–2016 period, with bank debt following suit.

[6] The UTADIS method belongs to the wider family of the UTA multicriteria methods – for details see Devaud *et al.* (1980). Given a pre-specified grouping of criteria, in this case credit loan criteria, the UTADIS method seeks to provide an additive utility function and the corresponding utility thresholds that leads to the minimum error when evaluating default risk.

According to a questionnaire-based survey by Gong *et al.* (2013), among 12 ship-lending banks in Hong Kong over the years 2008–2009, banks appear to assign larger weights to loan quality and loan security rather than expanding their market share in shipping finance. In the face of tightening financial regulations and credit requirements, ship-lending banks started reducing their exposures to the shipping industry and have been more reluctant to provide new debt capital for shipping investments.

In parallel to the retreat of bank lending in shipping, the rising uncertainty in the global economy, coupled with the absence of liquidity in the banking sector (Santos, 2011), has led to a significant increase of default risk in capital markets, which in turn led several banks and bank-dependent businesses to bankruptcy (Chava and Purnanandam, 2011). For this reason, identifying default risk drivers in shipping bank loans is of paramount importance for the survival of ship-lending financial institutions and other shipping market participants. Kavussanos and Tsouknidis (2016) address this point using a logit credit scoring model to identify the default risk drivers of shipping bank loans for the first time in the literature. The authors use data compiled from the credit portfolio of a Greek commercial ship-lending bank, which includes 128 loans issued to 63 shipping companies over a 14-year period spanning from 1997 to 2011. Their sample includes shipping bank loans for newbuildings and second-hand vessels in four main segments of the shipping industry, namely, dry bulk, tankers, containerships and gas carriers. The authors find that industry-specific variables, which capture current and expected (forward-looking) conditions in the extremely volatile global freight markets, the risk appetite of shipowners proxied by the chartering policy employed, as well as a pricing variable—the arrangement fee over the amount of loan— – are the most significant factors explaining defaults of bank loans.

In a similar vein, Mitroussi *et al.* (2016) document that market conditions and chartering policy are important factors in determining the performance risk of shipping bank loans. The authors utilise a logit credit scoring methodology to examine the performance risk drivers for a sample of 30 shipping bank loans for dry bulk vessels during the 2005–2009 period. In a more recent study, which examines the default risk drivers of 192 shipping companies during the 2001–2016 period, Lozinskaia *et al.* (2017) document that the probability of default increases with one-year lags of Tobin's *Q* (proxied by the ratio of market value / book value) and EBITDA (earnings before interest, tax, dividends and amortisation) and decreases with one-year lags of the total assets (size) of the company and the growth in GDP (gross domestic product).

Despite the contribution of existing literature focussing on the assessment of default risk in shipping bank loan agreements, a shortcoming of this work stems from the lack of sufficient publicly available data on such deals to build representative samples of the global portfolio of shipping bank loans. Kavussanos and Tsouknidis (2016) examine the largest such portfolio of shipping bank loans in the extant literature. Despite the fact that Greek banks are regulated by the European Central Bank and must comply with the Basel regulatory framework, even this extensive portfolio may not be representative of the global shipping bank loans' industry. Future studies can address this gap by focussing on larger shipping bank loan portfolios, ideally across different regions of the world. This is especially important from a regulatory point of view, since banks operating in different countries or regions are subject to different regulatory frameworks and authorities. For example, in the US, lending banks are primarily supervised by one of the following institutions: the Federal Deposit Insurance Corporation, the Federal Reserve Board, or the Office of the Comptroller of the Currency. In the EU, by contrast, the framework on the supervision of credit institutions comprises the following: (i) the Directive 2013/36/EU of the European Parliament concerning access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, and (ii) Regulation (EU) 575/2013 of the European Parliament concerning prudential requirements for credit institutions and investment firms, which amends Regulation (EU) 648/2012.[7] Such divergence in regulatory frameworks may exert varying degrees of pressure on financial institutions to reduce their exposures, especially to risky industries, such as the shipping sector. This can be primarily implemented by imposing stricter—and less favourable for shipowners—terms on shipping bank loans agreements.

Furthermore, given the deadlock in bank credit and the tightened financial regulations in the post-crisis period, another important question that naturally arises concerns whether bank lending is likely to remain the primary source of ship financing. Along these lines, banking industry practice that evolves as seen in the survey results of Gong *et al.* (2013) reflects that banks have implemented measures to limit their exposure to the shipping industry. Their lending capacity is hampered by the weak shipping market conditions and the implementation of new banking regulations, such as the stricter capital requirements under BASEL III by the Basel Committee on Banking Supervision, which aims at tightening regulation, monitoring and

[7] In the U.S., bank lending is regulated primarily through the following Acts: The Home Mortgage Disclosure Act (HMDA) of 1975, The Equal Credit Opportunity Act (ECOA) of 1974, The Truth in Lending Act (TILA) of 1968, and The Fair Credit Reporting Act (FCRA) of 1970.

risk management across the banking industry. Thus, future research can offer insights on this issue by exploring whether alternative sources of shipping finance can effectively fill the bank-lending gap when the market recovers and under what conditions bank lending to the shipping industry might recover.

2.3.2. Public Debt and Shipping Bond Pricing

Financing shipping projects by tapping the public debt market has gradually gained popularity in recent decades (see Kavussanos and Tsouknidis, 2014 for details). Sea Containers Ltd. was the first shipping company to issue a public debt of $125 mil. in 1992. As reflected in Figure 2.1, on average, bond issues account for approximately 15.4% of the total capital provided for shipping investments over the 2007–2016 period.

Issuing public debt has gained pace as a source of funding for the shipping industry for several reasons. First, many shipping companies evolved from traditional family businesses to corporate entities—in several cases publicly listed—and, as a result, adopted a modern corporate structure that can support the issuance of public debt. Second, shipping bonds often provide borrowers with more flexible terms compared to shipping bank loans, since ship-lending banks generally insist on floating interest rates and high collateral value—typically, the vessel being financed. Third, issuing public debt involves a less cumbersome and time-consuming process than issuing equity capital. This is mainly because bonds typically involve fixed coupon rates and often lower borrowing cost due to risk sharing, less documentation and debt covenants, among other things. Fourth, bond issues do not change the ownership structure of the shipping company, whereas issuing equity capital dilutes its ownership. Fifth, raising funds through bond issues offer borrowers the opportunity to realise tax benefits. Accordingly, from an accounting perspective, interest coupon payments are treated as costs and reduce the tax-bill and the cost of capital for the shipping companies. Sixth, bond issues can provide an alternative to traditional bank finance during periods of credit crunches, such as during the recent global financial crisis. Seventh, the bulk of repayment for a bond issue comes at its maturity, thus easing the cash flows of shipping companies during its life; this is not the case for bank loans, where the repayment schedule is typically more evenly distributed, as it also involves capital repayment. Despite their benefits, however, shipping bonds tend to expose shipping investors to higher financial distress costs. This is mainly because renegotiating their terms with the bondholders is more complex and costly relative to shipping bank loans. This

limitation became more pronounced during the late 1990s and again during the global financial crisis when a number of shipping companies failed to restructure or renegotiate their repayment schedules with bondholders and defaulted on their bond payments (Stopford, 2009).

A primary concern for shipping companies issuing public debt is its relatively higher cost of capital relative to shipping bank loans. This is reflected in the so-called 'bond spread', defined as the additional yield over the risk-free rate, that bond investors require as compensation for the risk premium they incur. Kavussanos and Tsouknidis (2014) document that, on average, the spreads of shipping bonds globally are between two and three times larger than the typical spread of corporate bonds in other sectors, placing them well into the high-yield segment of bond issues. One of the main reasons for carrying such large spreads relative to the rest of the corporate bond issues is to compensate the bondholder for the risks incurred when exposed to the shipping industry. These risks are primarily linked with the unique characteristics of the shipping industry outlined earlier in this paper.

The extant literature investigating the factors explaining shipping bond spreads is relatively thin. Leggate (2000) focusses on 33 newly issued European shipping bonds over the 1997–2000 period and reports a negative relation between credit ratings and bond coupons, and a positive relation between credit ratings and shipping market conditions. Grammenos and Arkoulis (2003) explore bond spread determinants of 30 new high-yield offerings issued by US-listed shipping companies during the 1993–2008 period. They document that shipping bond spreads are positively related to the issuer's financial leverage and negatively related to credit ratings and shipping market conditions. However, these studies only examine the cross-sectional variation in bond spreads, thus missing the time dimension that might be prevalent in the data. Grammenos *et al.* (2007) examine shipping bond spread determinants by estimating panel data regressions that capture this time dimension. The authors analyse a sample of 40 seasoned high-yield bond offerings issued by US-listed shipping companies during the 1998–2002 period. They find the main drivers of shipping bond spreads to be credit ratings, changes in shipping market earnings—which matched the findings of their 2003 study—as well as the term to maturity, the yield of 10-year treasury bonds and the yield of the Merrill Lynch single-B index.

In a related study, Grammenos *et al.* (2008) examine the default risk drivers of shipping bonds instead of bond spread determinants. The key financial variables associated with the probability of default are found to be the gearing ratio, the amount (value) raised through the bond issue

over the total assets ratio, the working capital over total assets ratio, the retained earnings over the total assets ratio and an industry-specific variable that captures the shipping market conditions at the time of issuance. They find that higher values of the gearing ratio, defined as the amount (value) of the bond issue raised over total assets, to be associated with higher probabilities of default. By contrast, variables capturing the shipping market conditions, the working capital over the total assets ratio and the retained earnings over the total assets ratio are all negatively related to the default probability of a company issuing high-yield bonds. Identifying the relevant factors for explaining the observed defaults in shipping bond issues is important if it leads to a model that is able to predict a-priori the probability of default of such bond issues. The authors assess the predictive ability of their model in a Type I and Type II errors framework (see Zavgren, 1983). A Type I error occurs when the model predicts that a bond will not default when it actually does. A Type II error occurs when the model predicts that a bond will default when it does not. Naturally, a Type I error is costlier than a Type II error. Overall, when forecasting in-sample, the specified model correctly predicts 96% of the observations, and the Type II error is 2.70%, whereas the Type I error is 7.69%.

Finally, Kavussanos and Tsouknidis (2014) provide new empirical evidence concerning the determinants of global shipping bond spreads. They utilise a sample of 54 shipping bonds issued by listed shipping companies around the world during the 2003–2010 period. Panel data regressions are estimated and show significantly different results when two-way adjusted clustered standard errors (Petersen, 2009) are utilised. This casts doubt on previously reported findings in published studies, as evidently, results may be biased due to a lack of this correction. The main determinants of shipping bond spreads in the aforementioned study are found to be the liquidity and credit rating of the bond issue, the volatility of the stock market, the bond markets' cyclicality and freight earnings. These findings are different from previous published research on this issue, as they reveal that shipping bond spreads reflect also the cyclicality observed in freight rates under different shipping market conditions. Specifically, no previous study has assessed the explanatory power of the cyclical bond issuers' index—the Global Services Cyclical Index, GISC—on shipping bond spreads. Cyclicality is well known to be a major issue in the shipping industry (see Kavussanos and Alizadeh, 2001; Stopford, 2009), and such cyclicality is also revealed to be reflected in shipping bond spreads' determinants. However, the GISC bond index is significant during the pre-crisis period, but becomes insignificant during the crisis period; it may be argued that under '*normal*' market conditions,

market participants paid more attention to the cyclical variables prevailing in shipping when compared to the global financial crisis period.

Overall, the literature on shipping bond spreads can be enriched by examining several significant aspects of the general corporate bond pricing literature. For example, existing studies have focussed primarily on assessing the liquidity risk involved in bond trading and reflected in bond spreads. The utilised measures include the number of trades for each bond per day or month, the number of zero trading days, an Amihud (2002)-inspired measure for bonds defined as the ratio of the daily absolute change in the bond's price over the daily volume of the bond, and the bid-ask spread using Roll's (1984) measure.[8] Since the evidence in the general corporate bond pricing literature strongly points to bond markets compensating bondholders for bearing liquidity risk, it would be interesting to assess whether this is also the case for shipping bond issues, or whether other shipping-industry-related characteristics are more important for explaining the observed variation in shipping bond spreads.

2.3.3. Public Equity and IPO Performance

This section reviews empirical evidence on public equity financing and shipping IPO performance. It was only in the 1990s that the shipping industry started tapping the equity market as a funding source, and since then, a growing number of shipping companies have viewed public equity capital as an important source of capital. As Figure 2.1 illustrates, the estimated share of public equity, including both IPOs and follow-on offers, in shipping financing is approximately 12.1% during the 2007–2016 period. The comparative advantage of equity financing over debt comes from its strategic flexibility; that is, it comprises a sustainable financial management strategy regardless of shipping market conditions. When the shipping market is bullish, raising equity capital enables shipping companies to capture future growth opportunities, such as for vessel acquisition or replacement and increasing their market share. Conversely, when the market is bearish, equity capital can serve as a buffer against financial distress and as a source of financial flexibility.

One of the stylised facts in companies' public debut is the initial under-pricing, which comprises the difference between the closing price on the first day of trading minus the initial offer price. An under-priced offering indicates that a company sells its shares at a discount,

[8] For details on bond liquidity measures, see Dick-Nielsen *et al.* (2012).

which eventually increases the cost of equity. This peculiarity of the IPO market also manifests in the shipping industry. In this vein, Cullinane and Gong (2002) report as much as 70.64% under-pricing in terms of initial raw returns and 70.70% in terms of market-adjusted abnormal returns in the Chinese transportation IPO market during the 1972–1998 period. Contrary to the fast-growing and volatile Chinese equity market, shipping IPOs in other markets exhibit a relatively lower degree of under-pricing. For example, Merikas *et al.* (2009) find an average of 17.69% under-priced shipping IPOs—in terms of market-adjusted returns—in 14 major stock exchanges around the world during the 1984–2007 period. Investigating the US shipping IPO market, Merikas *et al.* (2010) and Grammenos and Papapostolou (2012b) report under-pricings of 4.44% and 2.69%, respectively.[9]

Explanations for under-pricing in shipping IPOs rely largely on the existence of asymmetric information between participants. Cullinane and Gong (2002) argue that the severe under-pricing of Chinese shipping IPOs is attributed to the higher level of *ex ante* uncertainty among investors for the transportation sector, as their heterogeneous estimates for the intrinsic value of a company lead to the initial over-valuation (Miller, 1977). Grammenos and Papapostolou (2012b) support the partial adjustment theory, which states that investors that provide their positive will to bid for offerings are rewarded in the form of under-pricing.

Another puzzling price anomaly in the IPO market is the long-term underperformance, that is, the observation that IPO companies tend to underperform relative to the market—or the matched companies—in one to five years after their listing date. Grammenos and Arkoulis (1999) examine the performance of the IPOs in the shipping industry for the initial 24 months of trading in the secondary market. The portfolio of the examined shipping IPOs underperformed the local stock market indices by 36.79% 24 months after their initial offering. Moreover, the two-year holding period returns are positively related to the gearing ratio and negatively related to the fleet age of the examined shipping companies. In a related study, Merikas *et al.* (2009) explore the short- and long-term performance for a sample of 143 shipping IPOs during the 1984–2007 period. By calculating buy-and-hold abnormal returns (BHAR), the authors document an average under-pricing for shipping IPOs equal to 17.69% on the first day of the initial offering. This relatively small under-pricing is positively related to the age of the company, the reputation of the stock exchange where the IPO took place, and

[9] Although the two studies are based on a similar period and on the same market (U.S.), there is a difference in the sample size. In Merikas *et al.* (2010), the sample includes 61 shipping IPOs during 1987-2007, while Grammenos and Papapostolou (2012b) examine 51 IPOs during 1987-2008. The variation in the number of observations results from different sampling criteria. For example Grammenos and Papapostolou (2012b) do not consider IPOs of Special Purpose Acquisition Companies (SPAC).

the stock market's conditions during the period when the shipping firm went public. Furthermore, the authors report an average underperformance of 4.40% when comparing the price of the initial listing of the stock to its price after 24 months.

Similarly, post-IPO underperformance is also documented in the initial offerings of port operators. For example, Satta *et al.* (2017) examine a sample of 93 IPOs in the port industry over the 2000–2015 period. Overall, the sample of examined port IPOs experienced poor long-term performance, as both BHAR and CAR measures are negative for 24- and a 36-month time-frames. For example, the authors report a 24-month BHAR equal to 5.13%. Regarding the determinants of IPOs' long-term performance, all the macroeconomic variables possess some degree of explanatory power; they include financial-market-related variables, host country's institutional factors and port-industry-specific variables. Favourable market conditions have been found to increase stock prices and reduce risk perception in the port industry, where a number of institutional investors operate (Rodrigue *et al.*, 2011), and in this way, to favour higher long-term performances. Regarding institutional factors, IPOs issued in host capital markets with a high level of political stability have displayed higher long-term performance, whereas the level of voice and accountability has not been found to impact IPOs' performance. Finally, industry-specific characteristics, such as IPOs issued by port authorities in countries that have started port liberalisation and privatisation processes for a long time, have exhibited lower 36-month BAHRs and CARs.

The empirical literature on public listing of shipping companies has suggested that IPO performance is driven by industry characteristics, such as shipping market conditions and freight rate volatility, as well as general economic factors. However, the impact of some important drivers of IPO performance identified in the general finance literature have not been investigated in shipping IPOs. For instance, given the more recent evolution of corporate governance and ownership structure in the shipping industry, as discussed later in this paper, future research can examine how these trends affect post-shipping IPO performance. For instance, if better corporate governance can result in better motivated, planned and executed IPOs, it is likely that investors will observe a positive association between governance metrics and IPO performance. Further, McBain and Krause (1989) and Bruton *et al.* (2010) find that insider ownership and ownership concentration, respectively, can affect IPO performance, which provides fruitful ground for further research in the shipping industry.

Furthermore, future research should attempt to offer insights concerning the evolution of shipping companies' access to public equity markets. During the post-crisis period, raising funds from capital markets has been relatively scarce, despite the slight recovery in 2010–2011. Whether the shipping IPO market will recover and when remains an open question, and opinions in the industry on this matter diverge significantly.[10,11] The differences in the characteristics and drivers of the shipping public equity markets before and after the 2008 crisis deserves further investigation. For instance, Pribor and Lind (2016) point out that the success of IPOs during the post-crisis period largely depends on segment-specific drivers based on the observation that roughly half of shipping IPOs in the US during the 2013–2015 period were carried out by gas carriers during relatively favourable freight market conditions. One interesting topic of future research would be identifying the key attributes of successful shipping IPOs and assessing their impact within different shipping sub-segments. In addition, it would also be interesting to investigate whether listed shipping companies are willing to strive for a secondary public offering during the post-crisis period. The growth of private placements among listed shipping companies (so-called 'private investment in public equity', or PIPE) in 2016 was compelling, which was not the case before.[12] Due to its characteristics, namely, shorter issuance time and cheaper costs, a PIPE can form an effective financing option for companies facing difficulties in raising equity capital.[13] Chen *et al.* (2010a) find that companies with high levels of information asymmetry and poor operating performance tend to prefer PIPEs over public offerings. Future research can shed light onto the pros and cons of this alternative financing form.

2.3.4. Ship Funds and Their Performance

Shipping funds constitute a distinct source of financing for the shipping industry. Vessels financed through shipping funds are off-balance sheet assets, and thus offer financial flexibility and tax benefits to shipping companies. The German Kommanditgesellschaft (KG) and Norwegian Kommandittselskap (KS) have been regarded as the most successful forms of shipping funds, as from just 2000 to 2008, approximately €20 billion of equity investment in commercial ships was raised in the German KG market alone (Johns and Sturm, 2015).

[10] Lloyd's List, 'Shipping IPOs will return', March 21, 2017.
[11] Shipping Watch, 'Lloyd Fonds: Shipping markets too weak for IPO', March 22, 2016.
[12] IHS Fairplay, 'Shipping sees more signs of life in US capital markets', June 10, 2016.
[13] Hogboom, J. D. 'Private investment in public equity: An overview', New Jersey Law Journal, 177(7), August 16, 2004.

However, since the post-Lehman Brothers financial and economic crisis, there has been limited new financing activity in the primary KG market (Simic *et al.*, 2016). Except for some minor differences, the KG and KS funds are tax-driven leasing schemes, where typically a special purpose company (SPC) is established for the purpose of owning and chartering a single vessel. The management company is in charge of negotiating with banks and selling equities to private or institutional investors, as approximately 70% of vessel acquisition costs are covered from bank loans in the case of KG funds. Prior to 2008, many shipping companies were significantly expanding their fleets via ordering newbuilding vessels or purchasing second-hand ones. Such extensive investment in shipping assets was justified by the record high freight rates and the numerous financing options available at the time, which involved favourable terms and conditions. In particular, the German KG scheme was responsible for financing almost 26% of all containership newbuilding orders during the 2006–2008 period, as well as a third of the world fleet as of March 2013.[14] However, following the KG market collapse during the post-2008 period, more than 300 one-ship companies funded via the KG financing scheme were declared insolvent, rendering the prospects of this form of shipping funds market in doubt. Currently, activity in this market remains low, despite the occasional but weak signs of recovery for the Norwegian KS market.[15,16]

Shipping funds are closed-end funds that are legally treated as limited partnerships. Therefore, shipping funds are not publicly traded once their target capital amounts are raised. Accordingly, potential investors in shipping funds possess limited information regarding the risk-return profile of their investment. These features lead to a lack of reliable performance data due to non-observable market prices during the funds' lifetime. The lack of observable market prices is also the reason why few studies have examined the shipping funds market. Drobetz and Tegtmeier (2013) construct a performance index for the German KG funds based on aggregate data for 323 one-ship companies over the 1996–2007 period. The authors construct indices of German KG funds for the container, dry bulk and tanker shipping sub-segments, as well as an aggregate KG index, using information from cash flow statements of each fund, and they compare their statistical properties with those of existing shipping-related indices. They find that the variation of the constructed indices depends more on vessel price indices, such as Clarksons' newbuilding price index and Clarksons' second-hand price index, than on freight

[14] Journal of Commerce, 'Container ship financing remains available despite collapse of Germany's KG system; March 12th, 2013.
[15] Lloyd's List, 'KG insolvencies accelerate past the 300 mark', November 26, 2013.
[16] Clarksons Platou, Market Report, July 2015.

rate indices, such as the ClarkSea Index.[17] The authors use principal component analysis (PCA) to examine whether common structures and linkages exist between the different indices they construct. The resulting factor loadings indicate that the KG index exhibits peculiar risk-return characteristics. Specifically, the PCA identifies one statistical factor that is specific to KG funds in the sense that only the KG index loads significantly on this particular factor. For this reason, the authors argue that their constructed index constitutes a new index for measuring the development of the market value of equity and distributions in the form of a performance index and incorporates specific information that is primarily of importance for one-ship companies.

In another study, Simic *et al.* (2016) investigate the valuation efficiency of the secondary market for the German KG ship funds. To this end, they examine whether the asset value of shipping funds is derived primarily from the market value of the KG equity traded in the secondary market and the book value of debt. The authors utilise a sample of 341 transactions of container shipping funds executed during the 2007–2012 period. The results reveal that variations in the value of shipping fund can be explained by the ship values derived from the market of second-hand ships, the value of their time-charter contracts and the value of the option to extend the time-charter contracts. They also find that KG funds are traded at a discount relative to their fundamental values, possibly due to the characteristics of closed-end funds; the latter include market illiquidity, lack of information and management costs.

Overall, the literature devoted to ship funds as an alternative source of capital is relatively thin. An interesting and underexplored research avenue in this area would be to examine whether the use of shipping funds as a source of capital exerts a positive influence on shipping companies' financial performance. Future research in the area should also investigate the effect of regulatory changes on shipping funds' performance. Specifically, the new German Capital Investment Act (Kapitalanlagegesetzbuch – KAGB), which came into force in July 2013, sets several rules for improving the financial status and management quality of KG funds. However, strict regulations are likely to prevent KG companies from launching new funds and to hamper private investor participation in the market. In addition, the clause that a single KG fund should invest in several assets, such as vessels, real estate, aircraft and forest, in order to maintain and increase its risk diversification is expected to fundamentally transform the structure and characteristics of these funds.

[17] The ClarkSea Index is a weighted average index of earnings for the main vessel types, where the weighting is based on the number of vessels in each fleet sector.

2.3.5. Other Financing Sources

This section reviews the previous research focussing on alternative sources of shipping finance. Special financing schemes for the shipping industry trace back to the time when commercial shipping originated, namely, since the Bottomry in the Code of Hammurabi in 1792 BCE.[18] During the era of rapid industrialisation in the second half of the 20th century, major shipbuilding countries in East Asia (Japan, South Korea and China) indirectly subsidised their shipbuilding industry by offering loans to shipowners at competitive interest rates, mainly through export credit agencies (ECAs). As traditional bank lending became scarce post-2008, the role of such alternative ship financing sources became instrumental. Much of the funding needs of the shipping industry during other historical market collapses, such as those of the mid-1970s or the early 1980s with the oil crisis, was met through state-backed financing. This type of financing typically entails governments of shipbuilding countries providing incentives to place newbuilding orders to their domestic shipyards, giving rise to shipbuilding credit (Stopford, 2009). In the 1920s, the German and French governments offered favourable credit terms to help their yards win business against the then dominant British shipbuilding industry. During the recession of the 1930s, the Danish, French and German governments all offered government credit schemes to owners. The practice of subsidising credit reappeared in the first major post-Second World War recession of 1958–1963, and it was regulated by the OECD Understanding on Export Credit in 1969 (Stopford, 2009).

While many banks were adversely affected by the recent shipping market collapse as well as the ensuing regulatory constraints, such as the implementation of BASEL III, which forced them to cut back their ship-lending business, the question of whether alternative financing sources can meet the funding requirements of the shipping industry thus far remains unaddressed. Various market sources have highlighted that the resurgence of ECAs of major shipbuilding countries and the recent involvement of PE funds have played a key role in closing the funding gap during the post-2008 era. Although the contribution of ECA financing was quite limited during the pre-crisis period, during which bank loans were easily accessible at attractive leverage and pricing terms, there has been growing interest among the shipping

[18] Bottomry in the maritime jargon is the keel of a vessel. It is a legal arrangement under which a shipowner borrows money from underwriters and distributes a pre-specified amount of money after the ship's safe return. If the voyage is not successful due to *force majeure*, the shipowner is exempted from repayment. In this regard, this form of financing is regarded as the origin of both bank mortgages and insurances.

industry in such government-backed schemes for the past few years (Alexopoulos and Stratis, 2016). At the same time, ECAs—mostly based in China, South Korea and Japan—are willing to expand their lending to shipping companies in an effort to support the domestic shipbuilding industry, which is considered a major driver of their export-driven economies. The growth of ECA financing is highlighted in the rise of the Bank of China, the Korea EXIM Bank, and the Industrial and Commercial Bank of China in the league table of ship-lending banks.[19] Specifically, the lending portfolio of the Bank of China shot up from USD 12 billion in 2012 to USD 21 billion in 2015. Considering that ECAs are playing an increasingly important role in shipping finance, they are directly affecting the shipbuilding and the shipowning businesses. Their importance is expected to increase even further as a result of the increased regulatory environment in shipping and the governments' efforts to promote their shipbuilding industries and exports. As a result, future research should focus on analysing ECAs' lending policies, their lending parameters (which are governed by OECD rules) as well as the credit criteria and credit scoring or rating models that are employed by these institutions in lending practice.

Pires *et al.* (2005) examine the economic significance of the Merchant Marine Fund, a subsidy scheme for Brazilian shipping and shipbuilding companies. The analysis reveals that the ship financing system's effectiveness in reducing capital costs of Brazilian shipping companies is not significant. In another study, Yolland (1979) discusses the use of Eurodollars as a potential funding source for shipping companies amid the depressed market conditions in the mid-1970s.[20] Considering the fact that shipping freight rates are paid primarily in US dollars, the author argues that the Euro-market can be a favourable financing source for shipping companies seeking to reduce their exposure to foreign exchange risk.

Ship leasing is another source of shipping finance with unique characteristics. In general, leasing has been extensively utilised by financially constrained shipowners in the form of sale and leaseback agreements. Under such an agreement, the vessel is sold to a SPC controlled by a new owner (the lessor), and at the same time is chartered back—under a long-term bareboat or time-charter agreement—by the shipowner who originally sold it (the lessee). In this way, the original shipowner cashes in approximately 80–90% of the vessel's fair market value (FMV) while retaining its operation under the lease agreement. Under a finance lease, a purchase obligation exists after the bareboat charter (or time-charter) agreement expires and the lease is

[19] Lloyd's List, 'Asian shipping banks move up top lenders league table', December 2, 2015.
[20] Eurodollars are defined as dollar-denominated deposits at banks outside the U.S.

treated as an on-balance sheet item. In contrast, under an operating lease agreement, there is not a purchase obligation and the lease is treated as an off-balance sheet item. The popularity of both operating and finance leases in shipping became more prevalent following the onset of the financial crisis in 2008 as an alternative source of finance, especially in China (according to Marine Money).

A study by Li (2006) discusses the pros and cons of ship leasing. The author argues that ship leasing can allot shipping business risk equally among the partaking sides. In addition, lessors can benefit from tax redemptions, retaining the company's working capital and longer repayment structures relative to other funding sources. Furthermore, retaining the working capital is possible since the lessee shipping company is not required to make a capital outlay for acquiring a vessel. With respect to financing newbuildings through a leasing scheme, stage payments are made under the building contract. In this case, the interest payable on the funds raised during the construction period can be capitalised into the transaction. However, leasing is not free of issues as a shipping financing source. For example, ship leasing is likely to restrict the lessee's control over the vessel's operations and can often set-off legal conflicts due to early contract termination. In addition, the benefits of leasing as a shipping financing scheme are limited when the shipping company is subject to low creditworthiness and operating profits.

In addition, PE funds comprise another important (alternative) shipping financing source, despite being largely untapped in the shipping finance area prior to 2008. Since then, however, PE companies have played an active role in providing funding required by shipping companies, especially when traditional bank financing became scarce. During the 2007–2016 period, PE accounted for approximately 3.2% of shipping company financing, reaching a peak of USD 7.5 billion in 2013 (see Figure 2.1). The relatively recent surge of PE interest in shipping investment is largely driven by the deadlock in bank lending coupled with the historically low valuations of shipping assets during the post-crisis period. Although the growing presence of PE funds in shipping may positively affect the funding gap discussed earlier, it needs to be noted that such funds typically target investment opportunities at the bottom of the market cycle, which could in turn potentially lead to worsening the prolonged oversupply problem and exert a destabilising impact on the market.[21] Despite its economic importance, PE participation in the shipping industry has not attracted much research to date. Only Abdullah *et al.* (2016) propose a conceptual framework for the use of Islamic PE in shipping. The authors argue that

[21] UNCTAD, Review of Maritime Transport 2014.

Islamic PE can be attractive to retail and institutional investors to promote and develop international shipping in Malaysia, which is also an aim of government policies on shipping and Islamic PE issues.

Future research in the area of PE involvement in the shipping industry can provide valuable contributions by investigating the real economic effect of PE participation in the shipping industry. In this regard, it is worthwhile to examine the relation between the different forms of PE participation and financial performance. Broadly, PE companies' investments in the shipping industry can be divided into (i) acquisition of equity, (ii) bridge or mezzanine finance, (iii) purchase of debt, (iv) sale-leaseback transactions, and (v) formation of joint ventures.[22] Thus, how PE participation affects different performance metrics, such as short- and long-term abnormal stock returns, internal rate of return, accounting profits, operation improvement, and ultimately, company value deserves further investigation.

2.3.6. Capital Structure of Shipping Companies

A company's capital structure is a function of the sources of capital used in the financing of investment projects. As highlighted earlier in this section, shipping companies have gradually diversified their sources of capital by reducing their dependence on traditional bank financing and relying more on alternative sources of capital, such as equity capital (IPOs and seasoned equity offerings, or SEOs), PE funds, ship funds, corporate bonds and alternative financing schemes, such as ship leasing and ECAs.

Since the seminal work of Modigliani and Miller (1958), three major competing theories have been offered to explain the drivers of corporate capital structure, namely, the trade-off theory (Kraus and Litzenberger, 1973), the pecking order theory (Myers and Majluf, 1984) and the market timing theory (Baker and Wurgler, 2002). The trade-off theory posits that the optimal capital structure balances the benefits and costs of debt. In contrast, the pecking order theory and market timing theories essentially imply that there is no optimal capital structure. Instead, the pecking order theory suggests that companies should follow a certain financing hierarchy contingent on the cost of each source of capital. Thus, they should first utilise internal financing where available, followed by debt financing, with equity being raised only as a last resort. Finally, the market timing theory broadly argues that a company's capital structure should be

[22] UNCTAD, Review of Maritime Transport 2013.

driven by the extent to which its equity is misvalued by the market. This theory suggests that a company's capital structure is essentially determined by its past market-timing behaviour and not driven by an optimal financing mix. However, a great deal of research has suggested that none of these three major theories can entirely explain corporate financing decisions, but rather, that capital structure is time-varying and shaped by company-specific and industry-specific factors (Graham and Leary, 2011; Lemmon *et al.*, 2008).

Regarding the literature devoted to the capital structure of shipping companies, Grammenos and Papapostolou (2012a) argue that the capital structure of shipping companies in the 2000s best corresponds to the market timing theory, while the pecking order theory is more representative of the 1990s. The authors argue that the increase in IPOs and the issuing of public debt in the 2000s is driven by shipping companies seeking alternative funding sources, which is consistent with the theoretical prediction of the market timing theory. However, Drobetz *et al.* (2013) study 155 listed shipping companies around the world during the 1992–2010 period and find that there is weak evidence in favour of the market timing theory. Specifically, the authors explore whether listed shipping companies follow a target capital structure and its adjustment dynamics when there are deviations from the target leverage ratio. Their results indicate that when compared with industrial companies from the G7 countries, shipping companies exhibit higher leverage ratios and financial risk. Moreover, asset tangibility is shown to be positively related to leverage, and its economic impact is more pronounced compared to other industries; while profitability and asset risk are inversely related to leverage. Moreover, their results suggest that shipping companies' speed of adjustment to the target leverage ratio is much higher than for other industrial companies. The authors attribute this to the substantial costs of deviations from the target leverage ratio due to shipping companies' high expected costs of financial distress. Finally, Drobetz *et al.* (2013) report that the leverage ratio of shipping companies is significantly higher (41%) than that of the average industrial company in major developed countries (25%).

In another study, Drobetz *et al.* (2016a) investigate the impact of cash flow shocks on investment and financing decisions of shipping companies in different economic conditions. They report that, due to the high volatility in operating cash flows and asset values, the financing behaviour of shipping companies is more sensitive to adverse cash flow effects relative to companies operating in other industries. However, there are differences in financing and investing behaviours between financially healthy and weak shipping companies. While financially healthy companies could increase their long-term debt even in the post-2008 crisis

period, financially weak companies fail to raise sufficient funds regardless of the economic conditions. The authors also examine the importance of financial flexibility by investigating the level of excess cash holdings of shipping companies in different economic situations. They document that financially weak shipping companies tend to have higher cash reserves during 'non-crisis' periods in order to mitigate the adverse effects of cash flow deterioration during 'crisis' periods. However, the authors provide evidence that while financially weak shipping companies had very limited access to the debt markets during the recent crisis, financially healthy companies have still been able to increase long-term debt.

The importance of maintaining a high level of cash holdings (financial flexibility) is also supported by Drobetz *et al.* (2013) in order for shipping companies to overcome the counter-cyclicality in their financial leverage. The authors further argue that shipping companies incorporate risk management considerations into their financing decisions (see also Albertijn *et al.*, 2011; Meulbroek, 2002). Similarly, Nam and An (2017) highlight the importance of financial flexibility by investigating the impact of default risk on company value. They show a positive relationship between Altman's K-Score—instead of Altman's Z-score (where a higher score means lower default risk)—and financial performance, as measured by return on assets (ROA) for a sample of Korean shipping and logistics companies during the 2003–2012 period.[23]

Future research on the highly levered capital structure of shipping companies should provide more insights by investigating the benefits of debt financing with regards to reducing agency costs and facilitating tax savings. Overall, diversification in the sources of finance is arguably the most significant evolution in shipping companies' modern financial management, and as a consequence, it has motivated a significant amount of research. Table 2.5 summarises the current evidence on the available sources of finance and the determinants of capital structure in the shipping industry.

[23] Altman K-Score (1996) is an alternative model of Altman Z-Score (1968) for estimating the default risk of (South) Korean companies. While the original Z-Score model considers five financial ratios (working capital/total assets, retained earnings/total assets, earnings before interest and tax/total assets, equity/debt, sales/total assets), the K-Score model consists of four variables (total assets, retained earnings/total assets, sales/total assets, equity/total assets).

Table 2.5 Summary of Literature on Sources of Finance in Shipping and Capital Structure (sorted by year of publication and names of authors)

STUDY	DESCRIPTION	SAMPLE		MAIN RESULTS
		Observations	Period	
Yolland (1979)	Assessing the use of Eurodollars in shipping finance	Descriptive study	-	• Short-term Eurodollar deposits can be beneficial for long-term ship lending
Grammenos and Arkoulis (1999)	Exploration of the long-term performance of shipping IPOs	27 IPOs	1987–1998	• IPOs underperform stock indices by 37% when calculating 24-month CARs • Long-term performance is positively associated with the shipping market condition and financial leverage at the time of IPOs, but negatively with the fleet age
Leggate (2000)	Investigation of the determinants of bond spreads for a sample of European shipping companies	33 bond issuances	1997–2000	• Credit ratings are negatively associated with bond coupons, but positively with shipping market conditions
Cullinane and Gong (2002)	Investigation of the short-term performance of the Chinese transportation IPOs	84 IPOs	1972–1998	• IPOs are under-priced by 70.76% due to their higher level of uncertainty
Dimitras *et al.* (2002)	Application of the UTADIS method for constructing a credit evaluation model of bank shipping loans	Case study	-	• The following criteria along with their weights are found to be relevant: quality of management (33.97%), credit history (19.59%), financial characteristics (12.35), fleet (10.63%), and special proposal (8.25%)
Grammenos and Arkoulis (2003)	Investigation of factors affecting shipping high yield bonds in the US	30 bond issuances	1993–1998	• Bond spreads of shipping companies are positively related to issuer's financial leverage, but negatively to credit rating and shipping market conditions
Pires *et al.* (2005)	An analysis of the effectiveness of the Brazilian special shipping financing system	Case study	-	• The effectiveness of the Brazilian shipping financing system is not significant for reducing the capital cost of shipping companies
Li (2006)	A review of the advantages and disadvantages of ship leasing	Case study	-	• Advantages of ship leasing: tax redemptions, efficient working capital management and better financing conditions • Disadvantages of ship leasing: limited vessel control and potential legal conflicts
Grammenos *et al.* (2007)	Investigation of factors affecting the pricing of seasoned shipping high-yield bonds in US	40 seasoned bond issuances	1988–2002	• The following factors are important in explaining US shipping bond spreads: credit rating, years to maturity, changes in earnings, yields and US equity market indices
Grammenos *et al.* (2008)	Exploration of the factors explaining and predicting defaults for US-listed shipping bonds	50 bond issuances	2003–2010	• The probability of default is positively associated with leverage and issue amount/total assets, but negatively with liquidity and shipping market conditions
Merikas *et al.* (2009)	Investigation of short- and long-term performance of global shipping IPOs	143 IPOs	1984–2007	• Using market-adjusted returns, IPOs are revealed to undergo under-pricing equal to 18% in the first day and 16% in the long-term • Long-term performance is positively related to the company age and the reputation of the exchange, but negatively to the reputation of the underwriter and the hot IPO market
Merikas *et al.* (2010)	Investigation of short-term performance of shipping IPOs in US	61 IPOs	1987–2007	• IPOs are under-priced by 4.4% when using market-adjusted returns
Grammenos and Papapostolou (2012b)	Testing hypotheses on under-pricing in US shipping IPOs	51 IPOs	1987–2008	• IPOs are under-priced by 2.69% in market-adjusted returns • The partial adjustment theory is supported when explaining under-pricing in IPOs
Drobetz *et al.* (2013)	Analysis of the capital structure choices of shipping companies	1,442 company-years	1992–2010	• Capital structure of shipping companies demonstrates higher speed of rebalancing towards the target leverage ratio. • Financial leverage ratio of shipping companies is positively associated with asset tangibility, but negatively with profitability, asset risk and operational leverage
Drobetz and Tegtmeier (2013)	Constructing and assessing performance indices of German KG funds	323 funds	1996–2007	• The indices appear to depend on ship prices and reflect idiosyncratic risk-return characteristics of KG funds
Gong *et al.* (2013)	A questionnaire-based survey of bank financing practices for shipping projects in Hong Kong	12 banks	2008	• Banks assign higher weighting to loan quality and security • Banks are overall reducing their exposures to shipping after the global financial crisis
Kavussanos and Tsouknidis (2014)	Investigation of factors explaining the bond spreads changes of global shipping bonds	54 bond issuances	2003–2010	• Bond liquidity is the most influential factor in explaining changes in shipping bond spreads as well as stock market volatility and cyclicality in bond and shipping markets
Gavalas and Syriopoulos (2014)	Developing a multi-criteria assessment model for shipping bank loans applications	Case study	-	• The following criteria, along with their weights, are identified: quality of management (36.37%), financial ratios (29.52%), leverage (18.67%) and market characteristics (15.05%)
Drobetz *et al.* (2016a)	Investigation of the financing and investment decisions' sensitivity to changes in cash flows for listed shipping companies	3038 company-years	1989–2012	• The financing decision of shipping companies is more sensitive to adverse cash flow effects compared to companies in other industries • Financing and investing behaviours vary depending on financial conditions of shipping companies • Shipping companies adjust their excess cash holdings to maintain financial flexibility

STUDY	DESCRIPTION	SAMPLE		MAIN RESULTS
		Observations	Period	
Kavussanos and Tsouknidis (2016)	Developing a logit credit scoring model for assessing default risk in shipping bank loans	484 loan-years	1997–2011	• The following variables are important in assessing default risk in shipping bank loans: current and future shipping market conditions, shipowner's chartering policy and loan pricing
Mitroussi et al. (2016)	Application of logit credit scoring model for shipping bank loans	30 loans	2005–2009	• Both financial and non-financial factors explain the performance of shipping bank loans • Borrower's experience and market conditions are important in assessing default risk for shipping bank loans
Simic et al. (2016)	Testing the valuation efficiency of the secondary market for KG funds	341 funds	2007–2012	• The secondary market for KG funds exhibits a high degree of valuation efficiency • KG funds are traded at discount relative to their fundamental values
Lozinskaia et al. (2017)	Investigation of the determinants of observed defaults for shipping companies	826 company-years	2001–2016	• The probability of default for shipping companies is positively associated with overvaluation (Tobin's Q), but negatively associated with GDP growth and company size
Nam and An (2017)	Investigation of the impact of default risk on company value for Korean shipping and logistics companies	2,755 company-years	2003–2012	• The higher the Altman K-Score (the lower default risk), the higher the company value
Satta et al. (2017)	Investigation of the long-term performance of global port operators' IPOs	93 IPOs	2000–2015	• Port IPOs underperform by 12.18% • Port IPO performance is positively associated with political stability of the host capital market, but negatively associated with a bullish stock market, the state-ownership of the issuer and the period of port privatisation in the issuer's country

2.4. Shipping Investment and Valuation Methods

Having reviewed the financing choices and associated implications for companies operating in the shipping industry, this section focusses on investment decisions and their impact on company value, as well as the most common investment valuation methods (capital budgeting) employed in shipping. One of the instrumental factors determining the success or failure of a company is the growth and value creation it achieves through internal and inorganic (M&As) investments. Given the capital intensiveness of shipping investments and the high degree of uncertainty pertaining to the associated assets, the choice of investment projects, along with their profitability, is of critical importance to the value of shipping companies. To this end, this section provides an overview of existing research on the key considerations and factors that affect shipping investment decisions, the core and alternative investment valuation methods employed, the cost of capital and shipping investments, the risk-return trade-off of different market segments, and the value creation potential of inorganic investment decisions in the shipping industry.

2.4.1. Key Considerations in Shipping Investment Decision

A company's value is conditional on the combined value of the assets it holds. Equally, the value of a shipowning company can be derived by taking the present value of the vessels in its fleet. The primary scope of the investment appraisal process within the context of corporate

financial management in shipping companies is to reach value-enhancing investment decisions based on the effects of and interactions among several structural industry-specific factors. Such factors include freight rates, newbuilding and scrapping volumes, demand for shipping services, newbuilding and second-hand vessel prices, ship-building costs and bunker fuel prices, among others (Beenstock, 1985; Strandenes, 1984). Along these lines, an important question the extant literature has attempted to address is what the drivers of shipping investment decisions are.

To address this question, Miyashita (1982) examines the dry bulk segment during the 1963–1976 period and reports several determinants of shipping investments, such as freight rate income per unit of transport capacity, the growth in freight rate income, average vessel size, marginal capital efficiency (freight rates-to-newbuilding prices ratio) and the ratio of broken-up tonnage to total fleet. Xu and Yip (2012) investigate the factors affecting shipping investment decisions by analysing annual newbuilding contracts in 15 major shipbuilding countries during the 1996–2008 period. Their results indicate that spot freight rates, existing fleet size (market supply) and world trade volume (demand for shipping services) are the key determinants of shipowners' contracting decisions. The authors argue that their findings highlight the important role that shipowner's confidence in the freight market plays in making newbuilding investment decisions.

Another strand of research has suggested that shipping investments can be explained in part by heuristics based on behavioural or psychological patterns, such as attitude towards risk, market sentiment, intuition and gut feeling. Along these lines, Berg Andreassen (1990) proposes an investment decision-making stochastic model for the tramp (dry bulk and tanker) sector based on shipowners' attitude towards risk. According to the model, shipowners can be divided into two groups based on their investment behaviour: *'risk averters'* and *'risk lovers'*. The analysis shows that *'risk averters'* tend to adjust their fleet capacity towards a long-term average regardless of shipping market conditions. On the other hand, *'risk lovers'* tend to expand their fleet capacity in volatile markets.

While heuristics-induced decision making possesses benefits in the sense that it allows shipowners to swiftly exploit the dynamics of the shipping market, it can also lead to systematic errors or cognitive biases under certain conditions (Gigerenzer, 1991). This manifests in the rather unpredictable shipping market collapses that can be largely attributed to false consensus or herding behaviour among shipowners, leading to biased investment decision making in relation to newbuilding orders (Scarsi, 2007). Accordingly, Greenwood and Hanson (2015)

find shipowners to be subject to behavioural effects that can explain the fluctuation in vessel prices and, as a result, shipping investment activity. Based on a sample of monthly second-hand vessel prices and time-charter rates in the dry bulk segment during the 1976–2011 period, they find the return on capital of a benchmark investment strategy (operating a newly acquired vessel and selling it one year later) to be highly volatile. However, they document that the returns of the investment strategy are predictable and associated with shipping investment cycles; that is, investment booms are followed by low future returns. They conclude that the association between boom-bust patterns and returns of shipping investment can be explained by two biases, which concurrently affect shipowners' behaviours. First, they tend to be too optimistic concerning the persistence of demand shocks, and second, they are competition negligent in the sense that they underestimate their competitors' investment response to demand shocks. The authors develop a model of industry equilibrium dynamics that shows that errors in shipowners' expectations about future demand and market competition leads companies to overpay for vessels and overinvest during booming markets.

Papapostolou *et al.* (2017) further examine the impact of shipowners' behaviour in shipping investments by decomposing the overall psychology effect into unintentional and intentional herding.[24] Examining newbuilding and scrap tonnage for the 1996–2015 period, they find that the decision of ordering new vessels and scrapping old ones is largely affected by unintentional herding in the shipping industry. This implies that shipowners' herd behaviour is driven by common characteristics (e.g. their information analysis skills, academic background), leading them to make comparable investment decisions. They also report that herding behaviours spill over from the newbuilding market to the scrap market, while the unintentional herding effect in the latter market is more significant during periods of shipping market deterioration. Similarly, Alizadeh *et al.* (2017) investigate the impact of speculative investor behaviour associated with heterogeneous beliefs on the volatility of second-hand dry bulk vessel prices during the 1991–2016 period. For this purpose, they segregate speculative investors in the second-hand market into momentum investors who tend to follow market trends (i.e. buying/selling vessels after a period of high/poor returns from the sale and purchase of vessels) and contrarian investors who tend to follow counter-cyclical strategies (i.e. buying and selling vessels in contrast to the prevailing market sentiment). They report that momentum strategies perform better than contrarian (buy-and-hold) strategies, and also that a higher degree of

[24] While the intentional herding indicates behaviours of less informed or less established investors mimicking reputable peers, the unintentional herding indicates co-movement of investors driven by similar market fundamentals and characteristics.

momentum (contrarian) in investors' participation can lead to an increase (decrease) in the volatility of second-hand vessel prices.

The '*time-to-build*' effect can also influence shipping investment decisions. Since the freight market is highly volatile and its outlook can change rapidly, market conditions are likely to change during the period in which a vessel is being built, which is typically between two to three years. Consequently, shipowners' contracting decisions are more sensitive to vessel employment prospects and freight rate forecasts than the order price. To this end, Kalouptsidi (2014) investigates the impact of newbuilding delivery time on vessel prices. A dynamic entry and exit model for a vessel is estimated using a dataset of second-hand prices, time-charter rates and the newbuilding orderbook in the dry bulk segment. In this setting, the construction lag for a newbuilding vessel represents a combination of adjustment costs and uncertainty in the shipping investment process.[25] The results indicate that the shipping investment level becomes significantly more volatile as the '*time-to-build*' effect declines, implying that shipowners respond to economic conditions more swiftly as the construction lag for a newbuilding vessel reduces.

Finally, Goulielmos and Psifia (2006a; 2006b) focus on the importance of the stochastic properties of freight rates in shipping finance and investment decisions. They analyse monthly trip-charter and time-charter rates during the 1971–2002 period and report that freight rates exhibit long-term persistence (memory). Specifically, the Hurst exponent (*H*) of trip-charter rates (time-charter rates) is found to be between 0.55 and 0.93 (0.59 and 0.95) over the sample period, which rejects the assumption of a normal distribution ($H = 0.5$) employed in standard time-series econometric models.[26] They further argue that the statistical property of long-term persistence in freight rates should be considered by both shipowners and shipping bankers when making investment and financing decisions.

The empirical evidence reviewed in this section suggests that shipping investment decisions tend to be driven by a number of macro-economic and shipping-specific factors, all of which render estimating the value of a particular shipping investment project a challenging task. Accordingly, the next part of this section focusses on investment valuation models, the

[25] Shipping companies are unlikely to be able to adjust their fleet capacity to an increase in demand for shipping services during the vessel construction lag.

[26] The Hurst (*H*) exponent (H, Hurst, 1951) is a quantification of the long-term persistence in a time series. When the value of *H* equals to 0.5, the current value of a time-series is assumed to be independent from past values, which is consistent with the assumption of normality. On the other hand, the value of *H* is 0.51 ~ 1.00 a time-series is assumed to have long-term memory (i.e. the current value is dependent on past values).

limitations of the popular NPV and IRR techniques, and the alternative valuation methods put forward by the shipping finance and investment literature.

2.4.2. Core Investment Valuation Methods

The investment appraisal process deals with the analysis of future cash flows, their degree of uncertainty and their expected value, and it is employed as a tool to facilitate company value maximisation (Peterson and Fabozzi, 2002). The net present value (NPV) is the most widely utilised approach in the investment appraisal context that takes into account the time value of money. However, other valuation approaches, such as the internal rate of return (IRR) and the accounting rate of return (ARR) are also widely used in business practice, while a large number of companies rely on more than one investment appraisal method as part of their financial management decision-making process (see Alkaraan and Northcott, 2006 for a comparison; Graham and Harvey, 2001). In the shipping industry, Cullinane and Panayides (2000) conduct a survey of 65 UK-based shipping companies and report that the IRR is the most commonly employed investment valuation method, followed by the NPV and the payback period approaches. Evans (1984), Goss (1987) and Albertijn *et al.* (2016) present examples of how investment appraisal techniques (NPV and IRR) can be utilised by shipping companies.

Cullinane and Panayides (2000) report that the IRR method is probably favoured due to its simplicity and ease of use. In addition, they also document that shipping practitioners tend to consider qualitative factors (e.g. corporate strategy, vessel employment prospects, investment objectives and investor psychology) to be as important as quantitative estimates from investment valuation (e.g. IRR, NPV and sensitivity analysis) in the investment decision-making process. For instance, small shipping companies are likely to focus on short-term profitability and funding availability when making investment decisions since, by and large, their primary business interest lies with vessel '*asset play*'. On the other hand, large companies place more weight on customer relations, strategic market positioning and long-term fleet replacement. Given the complexity of shipping investments and the fact that they are affected by a number of macro-economic and shipping-specific factors, the next section focusses on the limitations of the popular NPV and IRR approaches and reviews alternative techniques employed in the shipping finance literature.

2.4.3. Alternative Valuation Methods

Despite the benefits and popularity of investment appraisal techniques based on discounted cash flows (i.e. NPV and the IRR), they are also subject to important limitations. First, DCF valuation is sensitive to assumptions related to a number of inputs (for instance, future cash flows, growth rates and discount rates) that are challenging to project with certainty. Second, the DCF method does not take into account non-purely financial factors, such as behavioural effects or managerial flexibility in tackling business contingencies. Third, previous literature had pointed to a misuse of DCF methods. For example, a less rational top management team may regard the DCF as a set of checks (Lai and Trigeorgis, 1995) or utilise it to justify investment decisions that have already been made (Bendall and Manger, 1991). To tackle the drawbacks of the DCF methods, shipping finance literature has examined alternative investment appraisal techniques that can be broadly categorised into MCDM, relative valuation (RV) and real-options analysis (ROA).

The MCDM is a decision-making optimisation process employing multiple criteria. It involves a trade-off between factors that are generally at odds with each other (for example, cost minimisation and quality of management in the service industries). As already mentioned, shipping companies consider not only quantitative (financial), but also qualitative (non-financial) factors in their investment decision-making process. Various MCDM solutions focus on incorporating qualitative elements into the investment valuation process through quantification. Rousos and Lee (2012) propose an analytic hierarchy process (AHP) to a shipowner's market segmentation choice in the dry bulk and tanker segments. As a form of MCDM, the suggested AHP model can complement the traditional DCF methods by adding multicriteria analysis in the evaluation of shipping investments. The model can produce the optimum trade-off between the results provided by the NPV and IRR, the risk profile of a project, and the psychology of the decision maker. Similarly, Clintworth *et al.* (2017) provide support for a AHP-based MCDM solution for shipping investments financed by the European Investment Bank (EIB). The investment decision-making model in this case takes into account not only purely economic aspects (NPV, IRR and economic rate of return, or ERR), but also other factors, such as environmental protection, support for small- and medium-sized companies and regional policies.

The RV technique essentially compares the value of an investment to those of similar assets in the market. For comparability, values are standardised using multiples, such as price-earnings,

value-EBITDA or market-to-book (MTB) value ratios. The RV method does not require assumptions or the forecasting of cash flows. In finance literature, the RV has been widely used for developing trading rules, timing investment or disinvestment decisions, and predicting stock returns (Jaffe *et al*., 1989). Trading rules based on the RV can also be applied to shipping investment decisions. Alizadeh and Nomikos (2007) use the long-term equilibrium (cointegrating) relationship between second-hand vessel prices and time-charter earnings (price-earnings ratio) to construct trading rules for the purchase vessels. According to the trading strategy based on technical analysis, deviations of the price-earnings ratio from its long-term mean could be used as an indicator of investment timing in the second-hand vessel market. For example, a positive difference between the slow (e.g. 12-month) and the fast (e.g. three-month) moving averages of the price-earnings ratio signals a sell decision, while a negative difference signals a buy decision. Similarly, Papapostolou *et al*. (2014) find that market sentiment can serve as a contrarian predictor of future vessel prices in the dry bulk segment; that is, high sentiment in the current phase indicates future market contraction, and vice versa. Moreover, they show that shipping sale and purchase strategies based on sentiment outperform a benchmark buy-and-hold strategy. Merikas *et al*. (2008) claim that the ratio of second-hand or newbuilding prices can be used as an indicator for deciding between purchasing a second-hand vessel and ordering a newbuilding vessel. They further argue that the movement of the ratio depends on the shipping cyclicality and the expectations formed by market participants.

Finally, the ROA technique is an application of the financial option valuation techniques to investment appraisal under uncertainty. Following the implementation of an investment, a company is likely to encounter contingencies during the life of a project. In contrast to the passive role of management implicitly assumed in the DCF, the management may be faced with 'options' related to project size (e.g. expanding, contracting), timing (e.g. deferring, abandoning) or operating strategies (product mixing, operation scale). In this, ROA can be used as a tool to attach a value to the options embedded in certain projects or strategies. The pricing models in real option valuation can be classified in three categories: closed-form solutions, dynamic programming and simulations. For shipping investments, previous studies have primarily examined closed-form solutions and dynamic programming.[27]

[27] An equation is a closed-form solution if the solution of a given problem is derived from a generally-accepted set of functions. Dynamic (optimization) programming is a technique for estimating a composite problem by breaking it down into a group of simpler sub-problems.

Bendall and Stent (2003; 2005; 2007) utilise a dynamic programming approach in ROA to assess the value of options in liner shipping investment in terms of fleet expansion or replacement, service network development and strategic flexibility. In order to derive a closed-form solution for ROA, it is essential to identify the stochastic properties of the cash flows pertaining to a shipping investment. Bjerksund and Ekern (1995) conjecture that cash flows in shipping are characterised by a mean-reverting Ornstein-Uhlenbeck process, implying that freight rates follow a normal distribution and gradually revert to a constant mean following a shock.[28] Based on the assumption that freight rates follow a mean-reverting Ornstein-Uhlenbeck process, they derive a closed-form solution for the valuation of a time-charter contract. Similarly, Jørgensen and De Giovanni (2010) introduce a closed-form solution for the valuation of a time-charter contract with purchasing options (TC-POP), which can be classed as European options in the sense that they can be exercised only at the option's expiration date. In addition, Sødal *et al*. (2008) advocates a closed-form solution for valuing the embedded option to switch a combination carrier that can be deployed in both the dry bulk and the tanker segments. Tvedt (1997) suggests that the valuation of a VLCC reflecting the options of lay-up and scrapping can be approximated using a geometric mean reversion process.

Along these lines, Kyriakou *et al.* (2017b) propose an ROA model for investment valuation and timing in the dry bulk segment based on the exponential mean-reverting property of freight rates. Adland *et al.* (2017) employ an ROA model with a stochastic freight rate differential to estimate optimal triggers for an Aframax-type tanker vessel to switch between 'clean' (refined) oil products and 'dirty' oil products (crude oil and heavy fuel oil) and to gauge the value of the switching option. The authors argue that the value of the switching option has increased over time and is higher than the investment premium associated with buying such a vessel. Rau and Spinler (2016) propose a real options approach for optimal investment decisions in liner shipping under the assumption of oligopolistic competition. They find the number of market participants and the intensity of competition to affect optimal capacity, company values and investments. In an analysis of the relationship between tanker newbuilding orders and time-charter rates using an ROA framework, Dikos and Thomakos (2012) find that tanker owners systematically account for the option's value to weight in their investment decision. Axarloglou *et al*. (2013) utilise a real options framework to investigate the determinants of the time-varying spread between spot (voyage) and time-charter rates. They argue that the time-varying spread

[28] The Ornstein-Ulhenbeck process is a stochastic process which is widely used for describing mean-reverting properties commodity and interest rate pricing.

is as directly related to the shipping business cycle, to demand expectations, and to market volatility. They further argue that the spread is the result of the strategic decision to commit vessels for a short period (long period) of time during a market upturn (downturn), and thus maintain flexibility (commitment).[29]

While investment valuation in the shipping industry may be seen as a complex and challenging task that is riddled with uncertainty in future cash flows and sizeable capital requirements, it becomes obvious that existing research has gone a long way in quantifying extraordinary value driving factors and deriving clear-cut criteria for investment decision making. A summary of the literature on these alternative valuation methods is presented in Table 2.6. Despite these attempts, however, it appears that the impact of behavioural factors on shipping investments has remained relatively under-explored. Baker and Wurgler (2013) argue that the general literature on behavioural finance typically adopts two approaches in rationalising the empirical evidence. While the '*market timing and catering*' approach assumes that arbitrage in markets is imperfect and rational managers can perceive and exploit opportunities arising from mispricing, the '*managerial biases*' approach assumes that managers are biased, but investors are rational. Given anecdotal and empirical evidence pointing that irrationality and behavioural biases are commonplace in the shipping industry, focussing on how behavioural biases affect shipping valuation and investment would offer novel valuable insights, potentially with significant implications for existing research.

Furthermore, one underexplored area in the broader spectrum of evaluating corporate investment decision making in shipping relates to the efficiency of shipping investments. Although existing research has focussed on the outcomes and performance of inorganic M&A investment (reviewed in section 2.4.6), to my knowledge, no study has examined the efficiency of organic corporate investment (i.e. CAPEX). Along these lines, Richardson (2006) employ a measure of total investment efficiency capturing corporate investment that diverges from its expected level, given a set of factors that have been revealed to predict the optimal investment level. This investment efficiency metric captures both internal and inorganic investment and could provide insights into how optimally shipping companies allocate funds for investment purposes, as well as to what extent investment efficiency is rewarded by the market. Given the capital/investment intensive nature of the shipping industry, this constitutes a promising research avenue to explore.

[29] For evidence of ROA in port terminal investments see Zheng and Negenborn (2017).

Table 2.6 Summary of Literature on Shipping Investment and Valuation Methods (sorted by year of publication and names of authors)

STUDY	DESCRIPTION	SAMPLE		MAIN RESULTS
		Observations	Period	
Miyashita (1982)	An investigation of the determinants of the dry bulk shipping investments.	53 quarters	1963–1976	• The determinants of the dry bulk shipping investments are as follows: the shipping service sales volume per unit of transport capacity, growth of the shipping service sales volume, average vessel size, freight rate-to-newbuilding price ratio and the ratio of broken-up tonnage to the total fleet.
Evans (1984)	Practical examples of the use of NPV and IRR in shipping investments.	Case study	-	• Formulas for NPV and IRR calculation for shipping investments are derived.
Goss (1987)	Applications of the use of NPV for shipbuilding loans.	Case study	-	• Formulas for NPV calculation in various shipbuilding loans are derived.
Berg Andreassen (1990)	A risk-adjusted decision-making model for investments in tramp shipping.	Case study	-	• Risk-averse investors tend to adjust their fleet capacity to a long-term mean regardless of the prevailing shipping market conditions. • Risk lovers tend to expand their fleet capacity even during volatile periods of the shipping markets.
Tvedt (1997)	Deriving closed-form solutions for the valuation of VLCC vessels.	Case study	-	• ROA for valuing VLCC vessels taking into account the lay-up and scrapping options.
Cullinane and Panayides (2000)	A questionnaire-based survey of investment appraisal practices applied in shipping investments.	65 companies	2000	• IRR is the most popular method, followed by NPV and payback period. • Qualitative factors are as important as quantitative ones in investment decisions.
Bendall and Stent (2003)	Constructing a binomial tree for ROA in liner shipping.	Case study	-	• Applying ROA to evaluate investments for fleet expansion/replacement in liner shipping.
Bendall and Stent (2005)	Constructing a binomial tree for ROA in liner shipping.	Case study	-	• Comparing the value of managerial flexibility in service network development in liner shipping.
Goulielmos and Psifia (2006a)	Investigation of the statistical properties of trip-charter rates.	379 monthly observations	1971–2002	• Hurst exponent of trip-charter rates ranges between 0.55 and 0.93 over time, which is far from the values of the normal distribution.
Goulielmos and Psifia (2006b)	Investigation of the statistical properties of time-charter rates.	379 monthly observations	1971–2002	• Hurst exponent of time-charter rates ranges between 0.59 and 0.93 over time, which is far from the values of the normal distribution.
Alizadeh and Nomikos (2007)	Investigation of the profitability of trading strategies based on relative valuation.	348 monthly observations	1979–2004	• The deviation of the price-earnings ratio from its long-term average can be used as an indicator of investment timing in the second-hand market.
Bendall and Stent (2007)	Constructing a binomial tree for ROA on fleet replacement strategies in liner shipping.	Case study	-	• Evaluating the performance of ROA in valuing strategic flexibility in liner shipping.
Merikas *et al.* (2008)	The use of second-hand-newbuilding (SH/NB) price ratio for investment decision.	144 monthly observations	1995–2006	• SH/NB ratio is cointegrated with freight rates and can be used as a signal in selecting between newbuilding and second-hand vessels.
Sødal *et al.* (2008)	Deriving closed-form solutions for valuing real options in shipping.	Case study	-	• Proposing ROA for valuing flexibility (switching options) in a combination carrier vessel.
Jørgensen and De Giovanni (2010)	Deriving closed-form solutions for ROA in time-charter with purchasing options.	Case study	-	• Proposing ROA in various strategies in a time-charter contract with purchasing options.
Dikos and Thomakos (2012)	Testing the use of ROA in tanker investment decisions.	455 quarterly observations	1980–2002	• Tanker owners systematically account for the value of waiting in investment decisions.
Rousos and Lee (2012)	Proposing AHP for market segmentation of shipping companies.	Case study	-	• Analysis shows that incorporating qualitative factors can change a shipowner's decision for diversifying the fleet of the shipping company.
Xu and Yip (2012)	Exploring the factors that affect newbuilding investment decisions.	185 country-years	1996–2008	• Spot freight rates, existing fleet size and world trade volume are the main determinants of newbuilding investment decisions. • The cluster effect of major shipbuilding countries is significant.
Axarloglou *et al.* (2013)	Investigation of the determinants of the time-varying spread between short- and long-term charter rates using ROA.	237 monthly observations	1992–2011	• Time-varying risk premium is directly related to the shipping business cycle, the market demand expectations, and the market's volatility. • Shipowners' decision on the commitment of vessels depends on the value of flexibility against the value of commitment.
Kalouptsidi (2014)	Investigation of the impact of time-to-build of newbuildings on shipowners' response to demand shocks in dry bulk market.	1,838 weekly observations	1998–2010	• With reduced time-to-build, the fluctuations in newbuilding order increase considerably.
Papapostolou *et al.* (2014)	Investigation of the predictive power of market sentiment in shipping investment strategies.	192 monthly observations	1996–2012	• Sentiment proxies contain information about future shipping market conditions. • Trading strategy based on sentiment information is more profitable than a buy-and-hold strategy.

STUDY	DESCRIPTION	SAMPLE		MAIN RESULTS
		Observations	Period	
Greenwood and Hanson (2015)	Investigation of the impact of shipowners' behaviours on second-hand prices in the dry bulk market.	420 monthly observations	1976–2011	• A large part of fluctuations in shipping investments is triggered by shipowners' behavioural biases; that is, they are overoptimistic regarding the persistence of demand shocks and competition negligence.
Rau and Spinler (2016)	Application of ROA in liner shipping under oligopolistic market structure.	Case study	-	• Proposing ROA for investment decision in liner shipping under oligopolistic competition.
Adland *et al*. (2017)	Estimation of entry-exit optimal triggers for an Aframax tanker to switch between refined oil products and '*dirty*' oil products.	987 weekly observations	1997–2015	• The value of switching has increased over time and is higher than the additional construction cost of a product tanker.
Alizadeh *et al*. (2017)	Investigation of the impact of heterogeneous investing activities on the volatility of second-hand ship prices.	312 monthly observations	1991–2016	• Higher participation of momentum (contrarian) investors can lead to an increase (decrease) in the volatility of second-hand ship prices.
Clintworth *et al*. (2017)	Fuzzy-AHP-based shipping investment decision model for non-profit financial institutions.	Case study	-	• An investment decision-making model is proposed, reflecting both economic factors (NPV, IRR, ERR) and public factors (environment protection, support for small and medium-sized companies, and regional policies).
Kyriakou *et al*. (2017b)	Closed-form solutions for valuation in the dry bulk segment.	Case study	-	• Proposing ROA for valuing dry bulk investments with options of newbuilding orders based on the exponential mean-reverting property of freight rates.
Papapostolou *et al*. (2017)	Investigation of the impact of herding behaviour in the dry bulk segment.	233 monthly observations	1996–2015	• Unintentional herding affects decisions on newbuilding ordering and scrapping. • The impact of unintentional herding is more significant in the scrapping market during unfavourable shipping market conditions.

2.4.4. Cost of Capital and Systematic Risk in Shipping Investments

This section discusses the estimation issues in the cost of capital in shipping. One of the fundamental inputs for investment valuation is a company's cost of capital. In DCF valuation, for instance, the expected cash flows during a project's life—which effectively determine the value of an investment—are discounted by the cost of capital (or required rate of return) in order to adjust for their riskiness. The cost of capital is also used in alternative valuation methods discussed in the previous section. For instance, cost of capital is typically employed when valuing financial flexibility in ROA, while it is also one of the assessment criteria in MCDM. Given the capital-intensiveness and the long horizon (typically, more than 15–20 years) of shipping investments, the estimation of the cost of capital is of paramount importance in the investment decision-making process. The weighted average of cost of capital (WACC), which weights the required return for each source of capital proportionately, is by and large the most commonly used by corporate financiers (McLaney *et al*., 2004). However, a common issue with WACC arises from estimating the cost of individual funding sources, especially the cost of equity, as it requires a great deal of assumptions and forecasts for a number of inputs (e.g. future equity risk premium and riskiness of the business). Much of the general finance literature has concentrated on asset pricing models and identifying the underlying risk factors that can also be used in estimating the cost of capital. From the capital asset pricing model (CAPM) (Lintner, 1965; Mossin, 1966; Sharpe, 1964) to CAPM variants (Black, 1972; Merton,

1973) and multi-factor models (Fama and French, 1992; Ross, 1976), these models aim to capture the relationship between risk and return.

Survey evidence has suggested that many financiers use CAPM to derive the cost of equity (and thus the WACC) for NPV investment appraisal (Graham and Harvey, 2001; McLaney *et al*., 2004). At the heart of CAPM lies the estimation of the asset beta, which is the sensitivity of an asset's return to market movements (risk). A beta value higher (lower) than one indicates that the asset has a higher (lower) risk or sensitivity than the market (typically, a general market index). Given that the beta reflects a company's business and financial risk, and the fact that shipping is regarded as a volatile business, most research on asset pricing models in the shipping industry has offered the surprising finding that betas of shipping companies are typically lower than or not different from one. Kavussanos and Marcoulis (1997a; 1997b; 2000a; 2000b) find stock betas of US shipping companies to be significantly lower than the market average during the 1985–1995 period. Similarly, Kavussanos *et al*. (2003) and Drobetz *et al*. (2010) find the betas of publicly listed shipping companies across the world to be significantly lower than the used market index in their models during the periods 1996–1999 and 1973–2014, respectively. Kavussanos and Marcoulis (1998) compare stock betas of US shipping companies with those of companies in other transport modes (air, rail, truck) and other industries (electricity, gas, petrol, real estate) during the 1984–1995 period. They argue that shipping is the only transportation sector with betas significantly lower than the beta of the used market index, while the betas of air, rail and truck sectors are not different from one. In addition, shipping stock betas are significantly higher than those of real estate.

Moreover, the existing literature has also examined the characteristics of stock betas in different shipping sub-sectors, in different phases of the shipping business cycle, and in comparison with other industries. Along these lines, Kavussanos *et al*. (2003) find that shipping stock betas vary among the different segments of the shipping industry. More specifically, while they found shipping stock betas in the ferry, tanker, dry bulk and container segments to be significantly lower than the best of the used market indices, they report betas in the drilling segment that are significantly higher than the market, and those in the cruise, offshore and 'diversified' (involving both shipping and non-shipping businesses) segments to be not different from one. There is also empirical evidence on the time-varying properties of shipping stock betas. Tezuka *et al*. (2012) report that betas of Japanese liner shipping companies during the 1980–2006 period are positively associated with the degree of shipping market competition (due to regulatory changes), but negatively associated with the level of shipping market

concentration. Drobetz *et al.* (2016b) find that stock betas of shipping companies around the world during the 1990–2013 period fluctuate with shipping market conditions. In addition, they also report various company-specific and macro-economic determinants of shipping stock betas. Specifically, shipping stock betas are found to be positively related to operating leverage, financial leverage, growth opportunities, default risk, freight rate volatility and the credit spread, but negatively linked to corporate liquidity and industrial production growth.

2.4.5. Determinants of Shipping Stock Returns and Investment Strategies

The findings in the above studies suggesting that the betas of shipping stocks are either lower than or not different from the market average imply that stock returns can be partly explained by non-systematic (idiosyncratic) risk factors. Accordingly, a strand of literature has examined the factors that influence shipping stock returns beyond betas. More specifically, regarding micro-economic factors, Kavussanos and Marcoulis (1997b; 2000b) report that the asset-to-equity (book value) ratio is negatively related to the returns of shipping stocks in the US market during the 1984–1995 period. Panayides *et al*. (2013) find the existence of illiquidity risk premium in the stocks of 76 US shipping companies during the 1960–2009 period. They also report that illiquidity risk is priced in shipping stocks over and above market-wide illiquidity and other risk factors, indicating higher returns for shipping stocks with higher illiquidity, and vice versa. Regarding macro-economic factors, Kavussanos and Marcoulis (2000a; 2000b) find that stock returns of US shipping companies during the 1984–1995 period are positively associated with changes in oil prices, but negatively associated with changes in industrial production. Finally, Drobetz *et al*. (2010) document similar findings regarding the impact of oil prices and industrial production on stock returns of globally listed shipping companies during the 1999–2007 period, as well as the negative impact of the value of the US dollar relative to major currencies.

Turning next to the determinants of stock returns and shipping stock investment strategies, from the perspective of equity investors, the risk-return profile of shipping stocks discussed above offers opportunities for diversifying their portfolios by including an alternative (low correlation) asset class. Conventional wisdom on diversification suggests that investors can reduce their portfolio risk by holding assets of different risk-return profiles. Therefore, investors may achieve more efficient risk-return combinations by diversifying their portfolios with shipping stocks, offering a higher expected return for a given risk level or lower risk for

a given expected return. Cullinane (1995) argues that the construction of a shipping investment (hedging) strategy can be seen as a portfolio optimisation problem. By applying the Markowitz optimisation portfolio framework in the dry bulk market, the author reports that the use of freight futures enables shipowners to effectively hedge their freight rate risk and construct optimal shipping portfolios using different trade routes and types of charter contracts. Grelck *et al.* (2009) examine the impact of including shipping stocks in investment portfolios on diversification efficiency. They find an increase in the Sharpe ratio (the risk-adjusted investment performance) when a shipping index consisting of 41 equally weighted stocks of shipping companies is included in the existing combination of stock and bond indices. They also document that diversification benefits are more pronounced during a bearish market (2000–2003) compared to a bullish market (2004–2007).

Andriosopoulos *et al.* (2013) replicate the performance of shipping indices (a shipping stock composite index, the Baltic Dry Index (BDI), and the Baltic Dirty Tanker Index (BDTI) using stocks traded only in US stock exchanges. This is achieved through the differential evolution algorithm (DEA) and the genetic algorithm (GA) approaches in order to construct two shipping-index-tracking portfolios: the first comprised 65 stocks constituting the Dow Jones composite average (DJCA), and the second comprised 37 shipping stocks traded in the US exchanges. When replicating a shipping stock composite index, the DJCA basket based on the GA outperforms other specifications in terms of its tracking error and its mean excess return. The results are similar when tracking the evolution of the BDI and BDTI shipping indices. However, the tracking errors observed are much higher compared to the performance of the shipping stock composite index due to lower correlations between shipping stocks and physical indices.

Overall, the literature devoted to the risk-return profile of shipping stocks offers important implications for both financiers of shipping companies and financial investors (see Table 2.7). In particular, the analysis of the impact of systematic and unsystematic risks on stock returns is of particular importance for equity and company valuation, portfolio diversification and risk management through hedging. An interesting extension of the previous findings could be the analysis of the difference between company-wide and segment-wide betas among shipping companies running their business in more than one segment. More recently, a fairly large

number of shipping companies have gained control over diversified fleets and a wider range of global supply chain services.[30]

Table 2.7 Summary of Literature on Cost of Capital in Shipping Investments and Shipping Stocks Betas (sorted by year of publication and names of authors)

STUDY	DESCRIPTION	SAMPLE		MAIN RESULTS
		Observations	Period	
Cullinane (1995)	An investigation of optimal shipping investment strategies in the context of portfolio theory.	Case study	-	• Shipping investment strategy can be constructed based on the portfolio optimisation problem. • Shipowners can construct optimal shipping portfolios using a mix of different chartering contracts and freight rate futures.
Kavussanos and Marcoulis (1997a)	An investigation of the betas of shipping stocks in the US.	3,360 company-months	1985–1994	• Betas of shipping stocks are lower than market's beta (one), but not always statistically significant. • Volatility in shipping stock prices can be largely explained by non-systematic risk factors.
Kavussanos and Marcoulis (1997b)	An exploration of the betas of transportation stocks in the US and micro-economic risk factors.	21,912 company-months	1984–1995	• Betas of shipping stocks are lower than one and statistically significant. • Returns of shipping stocks are negatively related to assets-to-equity (book value) ratio.
Kavussanos and Marcoulis (1998)	An empirical study of the betas of shipping stocks in the US and their comparison with stocks in other industries.	21,912 company-months	1984–1995	• Betas of shipping stocks are lower than market's average beta. • Betas of air, rail and truck sectors are not different from the market average. • Betas of real estate stocks are significantly lower than those of shipping stocks.
Kavussanos and Marcoulis (2000a)	A study devoted to the impact of macro-economic factors on shipping stock returns in the US.	19,920 company-months	1985–1995	• Betas of shipping stocks are lower than one and statistically significant. • Returns of shipping stocks exhibit a positive association with changes in oil prices and a negative one with changes in industrial production.
Kavussanos and Marcoulis (2000b)	An investigation of the impact of both macro- and micro-economic factors on shipping stock returns in the US.	19,800 company-months	1985–1995	• Returns of shipping stocks are positively associated with changes in oil prices, but negatively associated with assets-to-equity (book value) ratio and changes in industrial production.
Kavussanos *et al*. (2003)	An empirical study of the betas of publicly listed shipping companies by segments.	3,996 company-months	1996–1999	• On average, betas of shipping stocks are significantly lower than the average beta in the market. • Betas of the drilling sector are significantly higher than the market average, while those of other sectors are either lower (or not different) when compared to the market average.
Grelck *et al.* (2009)	Testing portfolio efficiency when including shipping stocks.	41 stocks	1999–2007	• Inclusion of shipping stocks improves the overall portfolio efficiency. • Benefits from diversification are more significant during bearish markets.
Drobetz *et al.* (2010)	An investigation of the impact of macro-economic factors on global shipping stock returns.	1,728 company-months	1999–2007	• Betas of shipping stocks are lower than one and statistically significant. • Returns of shipping stocks are positively related to the changes in oil prices, but negatively related to the changes in industrial production and the value of the US dollar relative to other major currencies.
Tezuka *et al*. (2012)	An exploration of the time-varying beta of stocks of Japanese liner shipping companies.	3,240 company-months	1980–2006	• Betas of stocks of Japanese liner shipping companies are time-varying. The fluctuations observed are associated with policies and regulation regarding market competition in Japan.
Andriosopoulos *et al*. (2013)	A replication of shipping indexes and construction of portfolios of US stocks.	1,514 daily prices	2006–2012	• The portfolio consisting of Dow Jones stocks constructed (based on a genetic algorithm procedure) produces minimum errors when tracking a shipping stock composite index.
Panayides *et al.* (2013)	An empirical study of the impact of liquidity risk premium on shipping stock returns in the US.	76 companies	1960–2009	• Illiquidity risk is priced in shipping stocks beyond market-wide illiquidity and other risk factors.
Drobetz *et al.* (2016b)	An investigation of the impact of macro- and micro-economic and industry-specific factors on betas of global shipping stocks.	1,363 company-years	1990–2013	• Betas of shipping stocks fluctuate with shipping market cycles. • Betas of shipping stocks are positively affected by operating leverage and financial leverage, growth opportunities, default risk, freight rate volatility and credit spread, but negatively affected by corporate liquidity and changes in industrial production.

[30] For example, a growing number of major companies in the container shipping sector involve port operation, multi-modal transportation (combination of different modes of transportation for door-to-door service) and logistics services.

As documented in Kavussanos *et al.* (2003), shipping stock betas vary according to different segments in the shipping industry, and so stocks of shipping companies with diversified fleets or business sectors/areas might have different risk-return profiles than those of single-segment companies. Indeed, Krüger *et al.* (2015) find that the use of a single discount rate (based on company-wide beta) can lead to sub-optimal investment decision making of conglomerate companies. Given that the previous shipping literature has considered only company-level risk-return profiles, further analysis of the segment-specific beta and its impact on investment decision making could provide valuable insight into the capital budgeting process of shipping companies.

2.4.6. Shipping M&As: Drivers and Value Creation

As highlighted in the previous sections, organic (or internal) investment in the shipowning world primarily entails projects involving the purchase of new vessels. In more recent years, inorganic investment in the form of M&As has gained pace, becoming a fundamental source of growth for shipping companies. In the aftermath of the post-2008 crisis, market consolidation has picked up significantly across an industry that traditionally resisted it, with the total value of shipping M&As in 2015 reaching 31.86 billion, ahead of any other year since the financial crisis struck.[31] Alexandridis and Singh (2016) argue that although the heightened deal activity in more recent years is driven by the low asset values and more pronounced financial distress, it is very likely that, given the highly fragmented nature of the shipping industry, market consolidation is very much likely to continue. In view of the growing importance of inorganic investment in shipping, this section reviews the existing research on its characteristics and influence on company value.

A merger or acquisition can be broadly defined as the corporate activity of combining two or more companies into a new economic entity in the pursuit of shared goals and/or synergistic gains. Business combination tends of be more complex than merely asset combination, however, and involves the re-alignment of corporate resources, as well as the amalgamation of business operations, tangible and intangible assets, client bases, and corporate cultures. Accordingly, there should be sound economic and/or strategic justifications for such capital-intensive and time-consuming investments. In the maritime spectrum, major shipping companies carry out M&As for profit maximisation, enhancing market share, gaining control

[31] Tradewids, 'Shipping plays its part in record M&A year' using data from Dealogic.

over the global supply chain and operational diversification (Brooks and Ritchie, 2006; Heaver *et al.*, 2000). Moreover, the multi-national nature of many shipping corporations involves global supply chains, as well as data synchronisation, scheduling and operations among business partners located in different countries. Therefore, combining shipping and related transportation services (e.g. stevedoring, logistics, warehousing and other ancillary services) can offer a valuable competitive edge to shipping companies, such as expanding the geographical reach and control of a broader logistics chain, while facilitating enhancement of customer service.[32]

With regards to the M&A drivers in the shipping industry, Fusillo (2009) investigates 54 M&A transactions in US liner shipping consummated between 1993 and 2007 and argues that their drivers are consistent with the neo-classical merger theory postulating that M&A activity is a process of natural adjustment to changes in economic environments or industrial shocks (Gort, 1969). The author postulates that liner shipping companies are more likely to become takeover targets, since they are less likely to be able to adjust their business operations in response to a new economic environment given their high fixed costs.[33] Along these lines, a main finding in this study is that the heightened M&A activity in the US liner shipping industry in the late 1990s can be largely attributed to the introduction of the US Ocean Shipping Reform Act (OSRA) in 1998, which technically undermined the roles of the conventional shipping conference system and collusive pricing.[34] More specifically, the author argues that liner shipping companies that are faced with more intense competition, and consequently, increased uncertainty in freight rate earnings, pursue economies of scale through business consolidation as a process of adjustment to a new economic environment. In addition, Fusillo (2009) also report that M&As in the US liner shipping industry is positively associated with excess capacity and negatively related to the level of freight rates. This finding is in stark contrast with the evidence provided by Alexandridis and Singh (2016) pointing to a 50–60% correlation between freight rates and global M&A activity during 1990–2014.[35]

Further on M&A motives, Syriopoulos and Theotokas (2007) and Merikas *et al.* (2011) provide evidence in support of the disciplinary motive for takeovers in the shipping industry, more

[32] For a detailed overview of shipping M&As process and motives, see Alexandridis and Singh (2016).
[33] Liner shipping is much more capital intensive than other sectors in the shipping industry, as its network-based service with regular frequencies requires a substantial amount of capital for acquiring a fleet consisting of multiple vessels. In addition, liner shipping operations require higher overhead costs to deal with shore-based activity and documentation.
[34] The OSRA of 1998 is the amendment to the Shipping Act of 1984 for stimulating market-driven competition in the liner shipping industry.
[35] It is possible that this divergence can be attributed to the somewhat different time-periods and shipping segments examined with more M&As in container/liner shipping being triggered at bad times than good times.

specifically in the form of the poor management hypothesis (e.g. Dietrich and Sorensen, 1984). The authors argue that in the case of Stelmar Shipping—a tanker shipping company that received three bids in 2004 and was finally acquired by a competitor in the same year—part of the reason the company became a takeover target was its inefficient corporate governance coupled with conflicts between founding-family members and major shareholders. Furthermore, Merikas *et al.* (2011) compare the financial performance of 60 shipping companies involved in M&A transactions consummated during 1994–2009. They document that acquirers tend to outperform targets in terms of five financial criteria (ROA, gross margin, enterprise value, debt-to-capital, and debt-to-market capitalisation), highlighting that M&As are motivated by the desire to improve inefficient and less profitable targets.

Finally, Yeo (2013) focusses on the geographical distance between acquiring and target companies as a key determinant of shipping M&A activity, examining 120 transactions in the liner segment consummated during 2006–2007. The results indicate that the geographical distance negatively affects takeover flows; that is, there are more M&A activities among companies located close to each other. The rationale behind the argument is that the information cost increases between acquiring and target companies as the geographic distance does. The author also reports that the larger the company size is—having more expertise and economies of scale—the higher the probability for inter-regional and cross-border M&As.

Despite the sound economic and/or strategic rationale behind M&A activity, one of the stylised facts in the corporate finance literature is that business combinations tend to destroy value for acquiring companies more often than they create value, while the bulk of the gains from the transactions is typically captured by target companies (Bruner, 2002). Accordingly, existing general M&A literature has identified a plethora of determinants for acquisition gains ranging from deal and company characteristics (e.g. method of payment, company size, public status of target, company valuation, etc.) to market-wide factors (e.g. the degree of investor protection, market valuation cycle, competition in the corporate takeover market, etc.). Existing literature on M&As in shipping that focusses on the effect of these value creation drivers has produced results that largely diverge from conventional wisdom.

Turning the focus towards value creation in shipping M&As, Panayides and Gong (2002) examine the stock market reaction to two deals in the liner segment (one between P&O and Nedlloyd, the other between NOL and APL) completed in 1997. They report that the average CARs to acquirers and targets, measured over 11 days around the deal announcement (from

day -5 to +5), are 83% and 148%, respectively.[36] In contrast, Syriopoulos and Theotokas (2007) focus on the tramp sector and examine three bids for acquiring Stelmar Shipping that were carried out during 2004, and they find negative (positive) acquirer (target) returns, consistent with the general consensus in the M&A literature. Using various event windows, they document that the average acquirer CAR ranged from -22.4% to 1.58%, while that of the target is between 5.06% and 22.13%. Moreover, Samitas and Kenourgios (2007) present mixed results concerning the gains of tramp shipping acquirers listed on NYSE and NASDAQ for the 2004–2007 period. They find an average fve-day acquirer CARs of between -0.3% and 0.8% for various event windows while CARs tend to be generally positive for post-announcement windows. Choi and Yoshida (2013) examine the long-term operating performance of two M&A deals of Japanese shipping companies (one between NYK and Showa, the other between OSK and Navix) carried out in 1998. They report enhanced market share of the combined entities driven by the aggregation of their fleets, as well as improvements in asset turnover, profitability and gearing ratio during the five-year post-merger period.

While the above studies offer valuable insights concerning the benefits of shipping M&As, their conclusions can hardly be generalised due to their mostly exploratory nature, as reflected in their restrictive sample sizes and potential sample selection bias. There are three recent studies that provide more comprehensive evidence based on larger samples. Darkow *et al.* (2008) investigate value creation from 200 M&As between logistics companies that took place globally for the 1991–2006 period and report that both acquiring and target companies achieve positive three-day CARs of roughly 1.6% and 10.6%, respectively.[37] Moreover, the synergistic gains, estimated as value-weighted average of abnormal returns for acquirers and targets, seem to be larger for horizontal, cross-border and large-sized deals. Andreou *et al.* (2012), meanwhile, focus on a sample of 285 M&A deals in the US transportation industry (railroad, trucking shipping and freight service) consummated between 1980 and 2009. They report CARs to acquiring and target companies of 2.3% and 24.5%, respectively, during the event window [-10, +1]. In contrast to Darkow *et al.* (2008), they document that vertical integration yields higher synergistic gains relative to horizontal consolidation. It is possible that this divergence can be attributed to differences in the regions examined, time periods and event windows employed in the two studies. In fact, when utilising a pre-announcement window,

[36] CARs in M&As is the sum of the Abnormal Returns (AR), differences between the expected return on a stock and its actual return, over a window of $[-t_1, +t_2]$ centred around the deal announcement.

[37] According to the authors' own definition, the logistics industry covers all sub-sectors with first two-digit Standard Industrial Classification (SIC) code of 40-49 including rail transportation, passenger transportation, trucking, shipping, parcel delivery and related services.

some findings in Darkow *et al.* (2008) skewed towards the pre-announcement period [-20, -1]—similar to that in Andreou *et al.* (2012)—pointing to the outperformance of vertical deals.

Finally, Alexandrou *et al.* (2014) examine the most comprehensive sample consisting of 1,266 global M&A deals in freight shipping, passenger shipping and cargo handling segments during 1984–2011. Consistent with the findings in Darkow *et al.* (2008) and Andreou *et al.* (2012), this study documents that both acquirers and targets realise positive CARs of 1.2% and 3.3% over four days [-3, +1] around the deal announcements. Moreover, a particularly compelling result in this study is the outperformance of acquisitions of publicly listed targets compared to those of private companies. This is inconsistent with previous evidence that acquirers achieve higher gains when buying private targets, which has been largely attributed to the creation of block-holders, leading to better post-merger monitoring (Chang, 1998), as well as, to the liquidity discount of non-tradeable target shares (Faccio *et al.*, 2006). Although Alexandrou *et al.* (2014) discuss possible explanations for the under-performance of private deals, such as the likelihood of private targets attracting hefty premiums due to their superior bargaining power or the strategic importance of private targets (such as access to regional markets and sector-specific know-how), there is no concrete evidence that supports this conjecture, which would require additional investigation into the characteristics of these deals. For example, Conn *et al.* (2005) document that acquisitions of listed targets results in non-negative announcement returns for UK acquirers in cross-border deals. Additionally, Alexandridis *et al.* (2010) report positive announcement returns for public acquisitions in regions where there is less competition in the market for corporate control. Accordingly, the higher announcement returns in acquisitions of listed targets may result from deals in countries where the takeover market is less competitive.

The findings of the extant empirical literature on shipping M&As is summarised in Table 2.8. Further research in the area of inorganic corporate investment in the shipping industry could focus on a number of questions that remain unaddressed. First, prior studies have not examined value creation differentials among various segments within the shipping industry (e.g. dry bulk, tanker, liner, passenger and offshore). Even though Alexandrou *et al.* (2014) provide a comparison among shipping, passenger shipping and cargo handling segments, a more detailed classification differentiating between the various shipowning segments as well as shipping services can provide further insights. Further, the utilisation of standard industrial classification (SIC) codes might fail to provide clear-cut segmentation for service industries, like shipping (Walker and Murphy, 2001). Discrepancies among popular databases in reporting company

SIC codes (Guenther and Rosman (1994) might result in a less than optimal segmentation of shipping companies based on business areas. Accordingly, future research could concentrate on examining the drivers of value creation in M&As based on a more comprehensive and consistent segmentation of shipping companies in business areas or sub-segments of interest.

Second, considering PE as an alternative funding source has become increasingly important amid the current credit deadlock, which has affected traditional funding sources such as bank loans, the participation of PE funds in the market for corporate control in the shipping industry also calls for further investigation.[38] Previous literature has largely suggested that PE transactions enhance the target's shareholder value (Renneboog *et al.*, 2007). Thus, the shareholder wealth effects of shipping M&A deals by PE companies, as well as their determinants, deserves further investigation. Given that the majority of PE-driven M&A deals in shipping were carried out post-2008, when the value of maritime assets was at a historical low, it is also worth investigating whether PE funds have generated gains for their own investors. The extant literature on the performance of PE funds point to great deal of variations in fund performance (e.g. Kaplan and Schoar, 2005; Phalippou and Gottschalg, 2009). A question relevant to the shipping industry, which also possesses significant implications for future trends in shipping financing with respect to the sources of capital utilised, involves whether, in general, PE investment in shipping offers an attractive risk-return profile for investors.

The financing choice in shipping M&As is another underexplored area. Since most transactions require sizeable capital, the choice of the payment currency can significantly affect the ownership and capital structure of the combined entities following the deal completion.[39] From the perspective of an acquiring company, the choice of payment method in M&As involves a trade-off between the ownership dilution from stock-swap offerings and potential financial distress costs from cash offerings (Faccio and Masulis, 2005). Considering the typically highly concentrated ownership of shipping companies, they are likely to opt for cash offers to avoid ownership dilution. However, shipping is a notably highly leveraged industry, which provides an incentive to pay with stock. These contradictory dynamics on the financing choice of shipping M&As, along with their wealth effects, deserve further investigation.

[38] As pointed out in Alexandridis and Singh (2016) around 23% of acquirers in shipping M&A during the period 1990-2014 are financial institutions (i.e. banks, private equity companies and investment holdings).

[39] For example, if an acquirer pays for the deal with cash, an increase in financial leverage of the merged company is expected since issuing debt is the major funding source for cash offers, considering liquidity constraints, lower issuance costs and tax benefits. Alternatively, if a deal is a stock-for-stock exchange, it is likely to end up with creation of additional block-holders.

Table 2.8 Summary of Literature on M&As in Shipping and Value Creation (sorted by year of publication and names of authors)

STUDY	DESCRIPTION	SAMPLE		MAIN RESULTS
		Observations	Period	
Panayides and Gong (2002)	Investigation of short-term value creation (changes in stock returns) in liner shipping M&As.	2 deals	1995–1999	• Synergistic effects are found (Acquirer CAR: 83%; Target CAR: 148%). • Larger share of synergy gains accrues to targets.
Samitas and Kenourgios (2007)	Investigation of short-term value creation in tramp shipping M&As.	15 deals	2004–2007	• Five-day CAR for acquirers is between -0.3% and 0.8%. • CAR for acquirers is generally negative in pre-announcement periods, but positive in post-announcement periods.
Syriopoulos and Theotokas (2007)	Investigation of short-term value creation for M&A of a tramp shipping company.	3 bids	2004	• CAR for target is between 5.06% and 22.13%, while CAR for acquirer is between -22.4% and 1.58%.
Darkow *et al*. (2008)	Investigation of short-term value creation for M&As in the logistics industry.	200 deals	1991–2006	• Synergistic effects are found (Acquirer CAR: 1.6%, Target CAR: 10.60%). • Synergy gains are positively associated with horizontal, cross-border and large-sized deals.
Fusillo (2009)	Investigation of factors stimulating M&As in US liner shipping.	54 deals	1993–2006	• M&A activity is positively associated with excess capacity, demand growth and changes in regulation, but negatively with freight rates.
Merikas *et al*. (2011)	Testing disciplinary motives for takeovers in shipping by comparing financial profiles of constituent companies.	60 companies	1994–2009	• Supporting poor management hypothesis. • Acquirers have better financial profiles than targets in terms of ROA, gross margin, enterprise value and debt-to-capital.
Andreou *et al*. (2012)	Investigation of short-term value creation in US transportation M&As.	285 deals	1980–2009	• Synergistic effects are found (Acquirer CAR: 2.3%, Target CAR: 24.5%). • Vertical integration outperforms horizontal consolidation.
Choi and Yoshida (2013)	Investigation of long-term value creation in Japanese shipping M&As.	2 deals	1998–1999	• Economies of scope is realised. • Consolidated companies exhibit improved financial status, asset turnover and profitability.
Yeo (2013)	Investigation of the impact of geographical distance on shipping M&A activity.	120 deals	2006–2007	• Geographical distance between acquirer and target has a negative impact on M&A intensity in the shipping industry. • The negative impact of distance is mitigated as the size of the acquirer increases.
Alexandrou *et al*. (2014)	Investigation of short-term value creation in global shipping M&As.	1,266 deals	1984–2011	• Synergistic effects are found (Acquirer CAR: 1.2%, Target CAR: 3.3%). • Acquirer CAR is higher in acquisitions of publicly listed targets.

2.5. Corporate Governance of Shipping Companies

Given the high degree of capital intensiveness associated with the shipping industry, along with the more recent trend of attracting external funding from public equity, bond markets and private investors, as highlighted in the previous sections, the governance of shipowning companies is of great importance. This is especially the case with publicly listed shipping companies, where the separation of ownership and control becomes pronounced and information asymmetry and conflicts of interest between shareholders and managers give rise to agency problems (Jensen and Meckling, 1976). Corporate governance entails the legal, institutional and cultural mechanisms to reduce these agency problems (John and Senbet, 1998) and enables shareholders to monitor managers more effectively and align their interests. It also has an important role to play as a key risk management tool, considering that regulators and industry supervisory and policy bodies are more vigilant than ever before. Thus, a structured system of corporate governance that meets the requirements of the regulators, satisfies the

needs of quality-driven business partners and caters to the interests of a shipping company's shareholders is becoming more of a necessity today than ever before.

Shipping companies have traditionally been known as conservative, and this characteristic is reflected well in the concentrated ownership structure prevalent in the shipping industry (Glave *et al.*, 2014). Ownership in a shipowning company tends to be concentrated in the hands of a founding family, and a dual role chairperson-CEO representing the interests of the family is also common practice (Theotokas, 2007). In a survey research on the corporate governance structure of 27 Greek shipping companies, Koufopoulos *et al.* (2010) report relatively small board size (with 4.4 directors on average), low board independence (with only 30% independent directors) and high incidence of CEO-chairperson duality (55.5%). Tsionas *et al.* (2012) find the average ownership of the largest shareholders in 126 publicly listed shipping companies to be 31.15%, and there are no significant variations in the ownership concentration across different institutional environments in North America, Europe and Asia. Pastra *et al.* (2015) examine the findings of the Hellenic Observatory of Corporate Governance (HOCG) concerning board characteristics (age, gender, tenure, cross directorships, independent directors, board size and CEO duality) of Greek-owned publicly listed shipping companies between 2001 and 2012. They argue that in 15 out of 28 companies, the CEO is also the chairman, the typical board size is 6–7 members and directors stay in office for 48.33 months on average. Finally, diversity in corporate boards is poor, with only 13 out of 305 seats being held by women.

Although the subject of corporate governance has attracted a great deal of attention from academics and practitioners alike, there is also a great deal of disagreement concerning the effectiveness of existing governance mechanisms (Shleifer and Vishny, 1997), as well as the impact of different corporate governance dimensions, such as ownership structures and boards of directors. For example, family ownership, which is common among shipping companies, can effectively reduce agency costs by enhancing monitoring (Demsetz and Lehn, 1985) and inciting long-term commitment (Anderson *et al.*, 2003). However, family ownership can also be associated with conflicts of interest between family and non-family members (DeAngelo and DeAngelo, 1985), as well as a managerial entrenchment effect (Gomez-Mejia *et al.*, 2001). The literature on corporate governance in the shipping industry is divided in terms of the effectiveness of most governance elements, with the exception of the positive association between family ownership and financial performance (Randøy *et al.*, 2003; Syriopoulos and Tsatsaronis, 2011).

Randøy *et al.* (2003) examine the corporate governance of 32 publicly listed shipping companies in Norway and Sweden and find financial performance to be positively associated with founding family CEOs and board independence (percentage of outside directors). Syriopoulos and Tsatsaronis (2011) also find a positive relation between founding family CEOs and company performance in a sample of 11 Greek shipping companies listed in US exchanges. Furthermore, there appears to be a curvilinear relation between the financial performance of Greek shipping companies and board ownership (percentage of ownership controlled by board members), where profitability increases with the level of insider ownership at a diminishing and eventually negative rate.[40] Syriopoulos and Tsatsaronis (2012) document that CEO-chairperson duality exerts a negative influence on financial performance in terms of return-on-equity and return-on-assets for 21 US publicly listed shipping companies. Tsionas *et al.* (2012) investigate the association between ownership concentration (ownership of largest shareholder) and company performance for 126 public shipping companies in three major economic blocks (North America, Europe and Asia) and report a positive and bi-directional relationship.

Andreou *et al.* (2014) examine the impact of corporate governance on financial management and company performance. Using a sample of 32 publicly listed US shipping companies, they investigate how earnings management, sub-optimal investment and company performance are affected by three dimensions of corporate governance: ownership structure, board structure and CEO duality. The results indicate that some corporate governance mechanisms can effectively mitigate agency costs, and in effect, improve financial management and performance, ultimately enhancing company value. The authors also document that (i) earnings management is positively associated with board ownership; (ii) the over-investment problem can be mitigated the larger the board size, when a corporate governance committee is in place and the more the busy directors (percentage of directors serving on other companies); (iii) financial performance is positively affected by CEO duality and the presence of a governance committee, but negatively affected by board size[41]; and (iv) that company value is positively associated with board size and the number of busy directors. Table 2.9 provides a summary of the evidence in all papers discussed above.

Considering the perceived importance of corporate governance for the future of the shipping industry, a number of issues deserve further investigation. First, existing research on the role

[40] The association between board ownership and financial performance (profitability) is found to be insignificant for Norwegian and Swedish shipping companies in Randøy *et al.* (2003).
[41] The positive impact of CEO duality on company performance is also consistent with Syriopoulos and Tsatsaronis (2012) findings.

of independent directors has failed to shed light on whether the introduction of such outside monitoring improves performance of shipping companies. In light of the evidence in the general finance literature that stock ownership of independent directors is one of the most consistent predictors of company performance among other corporate governance indices and variables (Bhagat *et al.*, 2008), future research should consider whether independent director ownership in the shipping industry can also serve as an effective interest alignment vehicle that positively affects company performance. Along these lines, the impact of board attributes, such as past specialisation and experience (generalists vs. specialists), of corporate board members and the management team (see, for example, Custódio *et al.*, 2013; Kroll *et al.*, 2008) have largely been overlooked in shipping-oriented research, although they are particularly important dimensions of corporate governance for shipping companies. A third and related point is that the board structure of listed shipping companies that have recently attracted more institutional and PE investors than in the past has evolved significantly over time. However, the effect of this dynamic on corporate financing, investment decisions and company performance in general remains unexplored.

Table 2.9 Summary of Literature on Corporate Governance of Shipping Companies (sorted by year of publication and names of authors)

STUDY	DESCRIPTION	SAMPLE		MAIN RESULTS
		Observations	Period	
Randøy *et al*. (2003)	Investigation of the impact of corporate governance on financial performance of Scandinavian shipping companies.	91 company-years	1996–1998	• Positive impact of founding-family CEO and board independence on financial performance. • Board ownership has no impact on financial performance.
Koufopoulos *et al*. (2010)	Investigation of the corporate governance structure of Greek shipping companies.	27 companies	2006	• High-level CEO influence is found with incidence of CEO duality, small-sized board and low board independence.
Syriopoulos and Tsatsaronis (2011)	Investigation of the impact of corporate governance on financial performance of Greek shipping companies.	55 company-years	2004–2008	• Corporate performance is positively affected by founding-family CEO, but negatively by board independence. • Curvilinear influence of board ownership on corporate performance.
Syriopoulos and Tsatsaronis (2012)	Investigation of the impact of CEO duality on corporate performance of Greek shipping companies listed in the US.	301 company-years	2002–2008	• CEO duality has a negative impact on financial performance.
Tsionas *et al*. (2012)	Investigation of the impact of corporate governance on financial performance of global shipping companies.	126 companies	2009	• Positive impact of ownership concentration on corporate performance. • Company size, stock market liquidity and financial performance are major determinants of ownership concentration.
Andreou *et al*. (2014)	Investigation of the impact of corporate governance on financial management and performance of US shipping companies.	273 company-years	1999–2010	• Concentrated ownership has no significant impact on financial management of shipping companies. • Board size is positively associated with company value, reduced overinvestment problem and higher operational performance.
Pastra *et al*. (2015)	Investigation of board characteristics of Greek-owned publicly listed shipping companies.	28 companies	2001–2012	• In 15 companies, duality between CEO and chairman. • Board size is 6–7 members with a tenure of 48.33 months on average. • Only 13 women (out of 305) in directorships.

2.6. Risk Measurement and Management in Shipping

As highlighted earlier in the paper, operating within the shipping industry entails significant business, operational and financial risks. Perhaps the most important source of risk for a shipping company is the freight-rate risk, which refers to variability in the earnings of a shipping company due to changes in freight rates. This is because volatility in the freight market directly influences the company's profitability. Another important risk is the so-called 'asset-price risk', which arises from fluctuations in the value of the assets (vessels) of the company. Such fluctuations affect not only the book value of the ship-owning company, but also its creditworthiness, since it is directly associated with the ability to service debt obligations. Bunker fuel price fluctuations may also affect the profit margins of shipping companies, as bunker fuel costs, on average, account for more than 60–70% of the total voyage costs. Furthermore, credit risk has a notable impact on the short- and long-term performance of a shipping company, encompassing the uncertainty about whether a counter-party to a transaction will perform its financial obligations in full and on time. Credit risk is focal in the shipping business, as most of the deals, trades and contracts are negotiated directly between the counterparties (bilateral OTC agreements). Interest rate risk constitutes another form of risk pertaining to shipping business, given its capital-intensive nature, and it arises from unanticipated changes in floating interest rates, which can give rise to cash flow and liquidity problems. Finally, foreign exchange rate fluctuation forms another important source of risk in shipping since, due to the international nature of the business, most major revenue streams are in US dollars, while a number of capital expenditures in most cases involve a different currency.

The next section discusses studies devoted to freight rate volatility modelling and the existence of volatility spillovers across the freight rates and vessel prices of different segments and sub-segments of the shipping industry. However, apart from recognising the sources of risk and measuring the associated exposures to each type of risk, shipping market participants also need to manage risks in an effective way. One of the most effective ways to manage risks in the shipping industry is through the use of freight derivative contracts. Thus, sub-sections 2.6.2 and 2.6.3 are devoted to reviewing the empirical evidence associated with the most important features of the freight derivatives asset class.

2.6.1. Freight Rate Volatility and Volatility Spillovers across Shipping Segments

Having discussed the key considerations of shipping investment decisions, the core and alternative investment valuation methods, and the cost of capital and shipping investments, this section focusses on the business risk that shipping companies face, which primarily relates to their ability to generate cash flow. The level and volatility of cash flows generated affect directly investment and valuation methods, as discussed earlier, along with the optimal mix of alternative sources of finance to be used in shipping investments. However, cash flows in the shipping business depend crucially on the shipping company's ability to charter its vessels in attractive freight rates and collect the agreed freight rates on time, along with its ability to correctly time the vessels market and benefit through asset-play (trading of ships). Naturally, cash flows in the shipping industry are affected by the diversification of the fleet its shipping company owns and operates. A fleet that is well diversified in terms of vessel types and sizes provides the benefit of an overall lower risk regarding the shipping company's ability to generate cash flow. However, shipping sub-segments based on vessel type and size exhibit rather distinct characteristics due to the shipping segmentation effect. More specifically, the shipping industry is characterised by a distinct segmentation effect, as the demand for the transportation service varies according to the cargo transported and the size and type of vessels employed.[42] Thus, this section is devoted to the different risk-return choices of shipping investors in terms of the different vessel market segments and the different lengths of charterparties.

Kavussanos (1996; 1997; 2003) was the first to document the segmentation effect in both freight rates and vessel prices for different types and vessel sizes; that is, the smaller the vessel and the lengthier the time-charter contract, the lower the risk from vessel operations and chartering activities, respectively. This segmentation effect is induced by different segments of the shipping industry, typically following fairly distinct business cycles, which are, in turn, primarily driven by the demand for the respective commodities transported (Kavussanos and Visvikis, 2006a). Even if the theory and empirical evidence support the pronounced market segmentation within shipping freight rates and vessel prices, shipping segments are not

[42] Vessels employed in the liner sector are classified into Feeder (100 to 500 twenty-foot equivalent units or TEU), Feedermax (500 to 1,000 TEU), Handysize (1,000 to 2,000 TEU), Sub-Panamax (2,000 to 3,000 TEU), Panamax (3,000 to 4,000 TEU) and Post-Panamax (more than 4,000 TEU). The dry bulk sector differentiates into five categories per cargo-carrying capacity: Handysize (20,000 to 35,000 dwt), Handymax (35,000 to 45,000 dwt), Supramax (45,000 to 55,000 dwt), Panamax (60,000 to 75,000 dwt) and Capesize (more than 80,000 dwt). The tanker sector is also classified in five sub-sectors: Handysize (20,000 to 45,000 dwt), Panamax (50,000 to 80,000 dwt), Aframax (80,000 to 120,000 dwt), Suezmax (130,000 to 160,000 dwt) and Very Large Crude Carriers (VLCC) (more than 160,000 dwt, typically around 250,000 to 300,000 dwt).

completely isolated from each other (Stopford, 2009). This is because vessels of different types and sizes often compete for the same cargo, and as such, create competition among the different market segments. Moreover, several shipping companies hold a well-diversified fleet and enter different market segments if they see a business opportunity. Therefore, demand and supply imbalances in one segment quickly ripple across to other segments of the shipping industry. In this way, the examination of risk (volatility) and returns between freight rates and vessel prices of different shipping segments has been a major research topic in the relevant literature. The investigation of volatility and return spillovers has a number of implications for participants in the shipping market, such as ship-lending financial institutions, investors, regulators, shipowners and charterers alike. Shipping freight rates directly affect the operational cash flows generated by shipping companies, which form a major concern of institutional investors financing shipping projects. Therefore, volatility spillovers indicate the extent to which a diversified fleet can act as an insurance mechanism for a ship-lending bank when assessing the default risk of a specific ship obligor. However, Tsouknidis (2016) has shown that having a well-diversified fleet does not produce tangible benefits during crises periods, as the volatility spillovers are large across shipping market segments.

Several studies have been devoted to the spillovers of information between the returns and volatilities of freight rates between different segments of the shipping industry. Kavussanos (1996; 2003) utilises monthly data on spot and time-charter freight rates for the dry bulk and tanker segments, respectively, revealing a pronounced segmentation effect when modelling the time-varying volatilities (with GARCH-type models) of different vessel sizes. Kavussanos (1997) extends the examination of volatility spillovers into dry bulk second-hand vessel prices and provides empirical evidence supporting the existence of the segmentation effect. In a related study, Chen *et al.* (2010b) investigate daily freight rates over the 1999–2008 period and provide evidence that volatility dynamics between Capesize and Panamax freight rates change over time. Similarly, Drobetz *et al.* (2012) examine daily data over the 1999–2011 period to reveal significant spillovers among time-varying freight rate volatilities for the dry bulk and tanker segments. Finally, Tsouknidis (2016) utilizes shipping freight rate indices for the dry bulk and tanker segments over the 2006-2015 period and reveals that freight rate volatility spillovers are strongly time-varying across the different freight segments. This result is more pronounced during the 2008 global financial crisis. Furthermore, the author also provides evidence that smaller vessels transmit volatility spillovers to larger vessels within the dry bulk

segment, and that there are considerable volatility spillovers transmitted from the tanker to the dry bulk segment during the 2010–2012 period.

The literature on risk-return segmentation provides clear and convincing evidence that different segments within the shipping industry are interconnected and that the associations are time-varying (see Table 2.10). Research topics in the area that deserve further attention include the inter-relationship with shipping freight derivatives, as discussed in Section 2.6.3.

Table 2.10 Summary of Literature on Freight Rate Volatility and Shipping Segmentation Effects (sorted by year of publication and names of authors)

STUDY	DESCRIPTION	SAMPLE		MAIN RESULTS
		Observations	Period	
Kavussanos (1996)	Examination of volatility in freight rates of dry bulk segment.	720 monthly freight rates	1973–1992	• Volatility in dry bulk freight rates is time-varying. • The larger the vessel size and the lengthier the time-charter contract, the higher the volatility in freight rates and vessel prices, respectively.
Kavussanos (1997)	Examination of volatility in the dry bulk second-hand market.	708 monthly prices	1976–1995	• Volatility in second-hand vessel prices is positively related to the size of the vessel.
Kavussanos (2003)	Examination of volatility in the tanker segment.	732 monthly freight rates	1979–1994	• Volatility in tanker freight rates is time-varying. • Volatility is higher in spot freight contracts and larger vessels.
Chen *et al*. (2010b)	Investigation of spillover effects between Capesize and Panamax freight markets.	19,500 daily freight rates	1999–2008	• Markets are interrelated in terms of returns and volatilities. Shipping market conditions affect the degree of the identified spillovers.
Drobetz et al. (2012)	Investigation of the impact of macro-economic variables on volatility in dry bulk and tanker markets.	12,000 daily freight rates	1999–2011	• Yield curve explains volatility in both the dry bulk and tanker freight rate markets. • Asymmetric effects are documented only in the tanker freight rate market.
Tsouknidis (2016)	Investigation of time-varying spillover effects between and within the dry bulk and tanker freight rate markets.	21,578 daily freight rates	1998–2015	• Volatility spillovers are overall large and time-varying between shipping freight rates markets. • The volatility spillovers revealed are more pronounced during and after the global financial crisis period. • The direction of spillovers is from small-sized vessels to large-sized vessels and from tanker to dry bulk freight rate markets.

2.6.2. Measuring Market Risk in Shipping

Kavussanos and Dimitrakopoulos (2007; 2011) develop a framework for measuring market risk in the shipping freight markets by applying two alternative risk measures: value-at-risk (VaR) and expected shortfall (ES). The authors provide an in-depth assessment of the forecasts produced by alternative VaR and ES models for short- and medium-term risk exposures in the tanker sector. The results suggest that the parametric approach of GARCH models and the non-parametric approach of filtered historical simulation produced the most accurate forecasts for short-term (daily) risk. However, when drawing forecasts for long-term risk, the most accurate method is the empirically scaled historical simulation model.

In another study, Lu *et al.* (2007) examine data for a freight rates index of the dry bulk market and report that the most accurate forecasts of market risk (VaR) are produced by the parametric approach of a generalised error distribution (GED) exponential GARCH model. In a similar study, Angelidis and Skiadopoulos (2008) apply a horse-race of several parametric and non-parametric VaR models in the dry bulk and tanker freight rates and suggest that the simplest non-parametric methods are producing the most accurate VaR forecasts.

2.6.3. Managing Business Risks in Shipping with Freight Derivatives

Despite the extreme risks involved in the shipping business, and the importance of effectively managing them, the use of derivatives as a way to mitigate such risks has a relatively short history. Freight derivatives allow for managing exposures in the freight rate, while bunker fuel derivatives are used to manage exposures to unfavourable fluctuations in bunker fuel prices. However, there have been notably fewer studies devoted to freight derivatives than those devoted to other commodity derivatives markets. This can be partially attributed to the difficulty of obtaining accurate data almost until the mid-2000s, when clearing houses (market makers) began offering their freight derivatives services, and in this way, started recording trading activity and prices in a systematic way for this asset class.

The first freight derivatives contract, introduced in 1985 until 2002, was the so-called Baltic International Freight Futures (BIFFEX) contract written on the Baltic Freight Index (BFI) and trading in London International Financial Futures Exchange (LIFFE), while forward freight agreements (FFAs) were introduced in 1992 as OTC derivatives contracts. The FFA contracts are private, principal-to-principal contracts-for-difference (CFDs) between a seller and a buyer, who agree to settle a freight rate for a specified quantity of cargo or type of vessel, usually for one, or a combination, of the major trade routes of the dry bulk, tanker or container sub-sectors of the shipping industry. Kavussanos and Visvikis (2006a; 2011; 2014), Alizadeh and Nomikos (2009) and Kavussanos (2010) provide detailed descriptions and applications of the freight derivatives market; for surveys of the available empirical literature on freight derivative markets, see Kavussanos and Visvikis (2006b; 2008) and Kavussanos *et al.* (2014).

As freight derivatives comprise a relatively new tool for managing risks in shipping, academic researchers have come up with market survey papers in order to assess the awareness and familiarity of the participants in the shipping markets regarding the existence of freight

derivatives and their attitude towards this investment tool. To this end, Cullinane (1991) investigated shipowners' attitudes towards the now non-existent BIFFEX contract. The author collected questionnaire replies from a sample of 85 shipowners residing across four countries (UK, Greece, Hong Kong and Norway). The results suggest that the shipping market participants were fully aware of the existence of the BIFFEX contract as a way to hedge freight rate risk. However, the majority of the surveyed shipowners did not assess the BIFFEX contract as an effective hedging mechanism. In another survey study, Dinwoodie and Morris (2003) explore the attitude of tanker shipowners and charterers towards hedging freight rate risk through FFAs. Their findings suggest that despite the fact that FFAs are widely perceived as an important step towards managing freight rate risk, several respondents were not familiar with them, and the vast majority had never used them. In turn, Kavussanos *et al.* (2007) investigate common perceptions regarding the use of shipping derivatives by Greek shipowners operating within the dry bulk and tanker segments. The results indicate that Greek shipowners are reluctant to use FFAs for managing freight rate risk, mainly because of the issues of thin trading and high credit risk such contracts entail. Professional education relevant to the practical use of shipping derivatives has been revealed to be of paramount importance for the respondents analysed. The following sections investigate the price discovery and hedging effectiveness functions of freight derivatives, their forecasting performance and their impact in the physical freight rate market, along with market microstructure effects and pricing.

2.6.3.1. Price Discovery, Economic Market Relationships and Forecast Performance

One of the most important research questions in the freight derivatives literature is whether trading activity in the derivatives market leads to observed fluctuations in the corresponding spot market. Several empirical studies have been devoted to this issue, as if the derivatives market contains information regarding the future evolution of the spot market, this could be exploited by shipping market participants for realising profits by trading in both markets. The first such empirical studies were from Kavussanos and Visvikis (1999; 2003) and Haigh (2000), who examine the validity of the unbiasedness hypothesis in the early freight derivatives market of BIFFEX using the empirical estimation framework of cointegration techniques. Specifically, Kavussanos and Visvikis (1999; 2003) reveal that the unbiasedness hypothesis in the BIFFEX market holds for futures prices of one- and two-months from maturity. The authors attribute this finding to the fact that these short-

in-maturity freight futures contracts can be considered unbiased forecasts of the realised spot freight prices.

Kavussanos and Visvikis (2004) was the first study in the FFA market, empirically exploring the lead-lag relationships between FFA and spot freight prices. The results reveal a bi-directional causal relationship between spot and FFA returns. However, the causality tests employed suggest that causality from FFA to spot returns runs stronger than in the opposite direction for the great majority of the freight routes investigated. In turn, the results for volatility spillovers suggest that the volatility of the FFA contracts account for a large percentage of the observed volatility of the corresponding spot freight rates across all routes examined. In another study, Kavussanos *et al.* (2004b) explore the relationship between FFA prices and spot prices of the underlying asset at maturity and reveal that FFA prices one and two months prior to maturity form unbiased predictors of the realised spot prices at maturity in all investigated routes. The same results are mixed for the case of three-month FFA contracts.

The unbiasedness hypothesis has also been studied by Alizadeh *et al.* (2007), where the implied forward six-month time-charter rates in the dry bulk freight market have been shown to be efficient and unbiased predictors of the future time-charter freight rates. The authors also report that even if the unbiasedness hypothesis is true on average, shipping market players can still generate economic profits by following technical analysis rules for their chartering strategies. In a related study, Chou and Huang (2010) investigate the interactions between the FFA market and the global steel price index and report that the global steel price index exhibits significant forecasting power for the FFA prices. In a related study, Li *et al.* (2014) explore spillover effects and dynamic correlations between spot freight rates and freight derivatives prices. The results reveal unilateral spillovers from one-month FFA to spot markets returns, while these relationships are bilateral between one-month and two-month FFA contracts. The same bilateral relationships also hold for the case of volatility spillovers effects.

Kavussanos *et al*. (2010; 2014) explore cross-market information flows and spillover effects between the freight derivatives market (FFAs) and commodity futures markets. Their results point to the existence of significant spillover effects between the two, and specifically in the direction from the commodity futures to the freight derivatives market. Thus, shipping market players may benefit by monitoring fluctuations in the commodity futures markets and take appropriate positions in the FFA markets. In a related study, Alexandridis *et al.* (2017c) explore for the first time the interactions across freight rates, freight futures and freight options. The

results reveal considerable information transmission in both returns and volatilities of the three markets examined. Specifically, the freight futures market leads fluctuations observed in the freight rate market, but freight options are shown to lag behind both the spot and future freight markets. Yin *et al.* (2017) explore causality relationships between spot and futures freight markets for the dry bulk segment, along with the effects of exogenous factors, such as market demand and supply forces, along with economic indices. In all cases, the results document that freight rates follow a mean-reverting process that adjusts to their long-term equilibrium levels.

The vast number of studies devoted to the interactions of the spot and derivatives freight markets, and the growing body of empirical evidence documenting that freight derivatives market leads the freight spot market (price discovery function), has triggered a number of studies developing forecasting models for the spot market and assessing their performance. To this end, Chang and Chang (1996) have explored whether BIFFEX contract prices can be used to predict the spot dry bulk shipping market, while Cullinane *et al.* (1999), building on Cullinane (1992), employ the Box-Jenkins autoregressive integrated moving average (ARIMA) methodology in order to empirically test whether the BFI behaviour has been altered due to the exclusion of all Handysize trades from its calculation. The author proposes that this exclusion had a weak impact on improving BFI behaviour as a general freight rates index.

In another study, Batchelor *et al.* (2007) empirically investigate the forecasting performance of a set of time-series models in predicting spot and FFA rates for the Panamax dry bulk segment. The results reveal that using information from FFA prices enhances the forecasting performance of time-series models when predicting spot freight prices for all forecasting horizons up to 20 days ahead. In a related study, Lyridis *et al.* (2013) rely on an artificial neural network (ANN) in order to draw forecasts for FFAs. The ANN model trained and estimated can provide guidance to investors regarding which position (long or short) to take in the derivatives market. In the same vein, Zhang *et al.* (2014) propose a forecasting approach for spot freight rates based on the price discovery function of freight derivatives. The authors suggest that both spot and time-charter freight rates can improve forecasts of the spot freight rates.

2.6.3.2. The Hedging Performance of Freight Derivatives

The hedging function of freight derivatives constituted the main driving force behind their development. For this reason, studies devoted to assessing the hedging performance (effectiveness) of such contracts have been prominent in the extant literature of freight derivatives. Early efforts by Thuong and Vischer (1990), Haralambides (1992), Haigh and Holt (2002) and Kavussanos and Nomikos (2000a; 2000b; 2000c) assessed the hedging effectiveness of the BIFFEX freight derivatives market. Relatively recent studies by Samitas and Tsakalos (2010) investigate how important is the use of financial derivatives for shipping companies and whether the use of such products have a notable (positive) impact on the shipping company's value by mitigating (hedging) specific business risks. The results suggest that the extensive use of derivatives products by shipping companies minimise their risk exposures and enhance their economic growth. In another study, Prokopczuk (2011) assesses the pricing and hedging functions of single-route dry bulk freight futures contracts traded on the now non-existent International Maritime Exchange (IMAREX) market. The results reveal that the inclusion of a second stochastic factor significantly improves the pricing accuracy and hedging effectiveness of these freight futures contracts. In a similar study, Goulas and Skiadopoulos (2012) empirically examine whether the IMAREX freight futures market is efficient over daily and weekly time horizons, revealing that IMAREX contracts are not efficient during shorter (daily) horizons.

For the FFA market, Kavussanos and Visvikis (2010) estimate constant and time-varying (dynamic) hedge ratios using alternative specifications and compare hedging effectiveness both in-sample and out-of-sample. In a related study, Alizadeh *et al.* (2015a) explore the hedging effectiveness of tanker freight derivatives in six major tanker routes. They employ the bivariate Markov regime switching (MRS) GARCH model and reveal the existence of distinct regimes within the tanker freight market. The MRS-GARCH model yields significant improvements in the hedging effectiveness when examined in-sample, but the results are mixed when examined out-of-sample.

In another study, Adland and Jia (2017) explore over time the difference between the Baltic Exchange global trip-charter average and simulated earnings from a fleet of Capesize vessels. The authors utilise this difference as a measure of physical basis risk in the freight derivatives market. The results suggest that the increasing fleet size lowers the basis risk overall, but this diversification effect is relatively small. The authors attribute this to a moving-average effect

in earnings, and to the fact that basis risk is on average larger for shorter hedging durations. In a related study, Alexandridis *et al.* (2017b) introduce a portfolio-based methodological framework to examine the hedging performance of the container freight futures contracts. The authors use constructed portfolios comprising container, dry bulk and tanker freight futures, along with portfolios of physical freight rates, and examine whether there is a benefit from greater risk diversification effects of these combined portfolios. The results reveal that a decrease in freight rate risk up to 48% can be achieved by creating a diversified portfolio of physical freight rates, and an additional decrease of up to 8% in freight rate risk can be achieved by including futures contracts in the portfolio.

2.6.3.3. Market Microstructure Effects in Freight Derivatives

A series of studies have investigated various special topics involving freight derivatives, such as the relationships across freight derivatives returns, trading volume, volatility and trading characteristics. To this end, Kavussanos *et al.* (2004a) explore the effect of FFA trading on the spot market volatility of the dry bulk Panamax segment. The results indicate that after FFA trading was introduced, the spot price volatility was reduced across all investigated routes. In addition, FFA trading in dry bulk Panamax routes exerted a decreasing pressure on the asymmetry of volatility while notably improving the quality and speed of information flow in the spot market. In another study, Koekebakker and Adland (2004) model the forward freight rate dynamics under a term-structure model. Their results indicate that the volatility of the forward curve is relatively high, reaching a peak for the one-year forward freight rate contracts.

Several studies have been devoted to the trading characteristics of FFA contracts. To this end, Batchelor *et al.* (2005) investigate the existence of a positive relationship between the expected volatility and bid-ask spreads in the FFA Panamax market. This relationship is motivated by the rationale that the greater the variability in price, the greater the risk associated with the performance of the brokers. The results reveal the existence of a positive relationship between expected price volatility and bid-ask spreads across the vast majority of the investigated Panamax routes. The authors conclude that an increasing bid-ask spread reflects an expectation for higher future volatility in the FFA Panamax market. In the same vein, Alizadeh (2013) provides empirical evidence of a positive and contemporaneous relationship between price volatility and trading volume in the dry bulk FFA market. The results suggest that an increase in price volatility leads to lower future trading activity. In a related study, Alizadeh *et al.* (2015b)

investigate the existence of liquidity premia in freight derivatives returns. The results indicate that liquidity is priced by the FFA market and that both the Amihud (2002) measure of illiquidity and the bid-ask spread explains a large percentage of the observed variation in freight derivatives returns. Finally, Nomikos and Doctor (2013) explore the profitability of trading rules and market timing strategies in freight rates and freight derivatives across available contracts and maturities. The results suggest that following the proposed trading rules outperforms the return of the buy-and-hold benchmark strategy.

2.6.3.4. Freight Options Pricing

Despite the fact that FFA contracts provide reasonable hedging effectiveness and allow market participants to 'lock' a fixed freight rate over a period of time, they lack the flexibility to offer their users not only the option of maintaining the hedge if the market moves against them, but also of participating in the market when market conditions are favourable. This led to the creation of the freight options contracts that, in exchange for a fee (premium), provide this type of flexibility to their users. Empirical investigations of freight options have primarily concentrated on their pricing mechanism. For example, Tvedt (1998) derives an analytical pricing formula for European futures options on BIFFEX. This analytical formula takes into account special features related to the freight rate market, such as the fact that the lay-up of vessels is always an option, and that the BFI as the underlying asset is never close to zero. For this reason, the authors assume that the BFI and the futures contracts on BFI are restricted downwards to a level above zero. The authors also assume that freight rates are mean reverting because of the existence of frictional capacity adjustments to changes in the demand for sea transportation.

In another study, Koekebakker *et al.* (2007) introduce a mathematical framework for pricing Asian-type freight options. The authors assume that FFAs returns are lognormally distributed prior to the settlement period, but this assumption breaks down in the settlement period. For this reason, they propose an approximate structure in the settlement period for the FFA, deriving a closed-form option pricing formula for Asian call and put options on spot freight rate indices. In a related study, Nomikos *et al.* (2013) extend the lognormal representation of the dynamic process governing the risk neutral spot freight rates and propose a diffusion model that incorporates jumps of random magnitude and arrival to the process. The results reveal that the developed model of freight options' pricing is significantly improved when it incorporates

jumps into the generating process instead of assuming the generic lognormal setting. Similarly, Kyriakou *et al.* (2017a) extend the diffusion model of Nomikos *et al.* (2013) by incorporating the mean-reverting property of freight rates. They find that the freight option valuation model exhibits significantly lower pricing errors than the generic lognormal model.

2.6.3.5. Bunker Fuel and Vessel Values Derivatives

Turning the attention to studies on other shipping derivatives markets, Mayr and Tamvakis (1999) investigate the causal relationship between refinery margins (crack spreads) of gasoline and heating oil futures contracts and physical Brent crude oil traded in the New York Mercantile Exchange (NYMEX). The results reveal a unidirectional Granger-causality relationship from the two-month crack spread contract to crude oil imports. Thus, the authors suggest that crack spreads can serve as a leading indicator for short-term developments in the tanker vessels' demand.

In another study, Alizadeh *et al.* (2004) assess the hedging effectiveness of different crude oil and petroleum futures contracts on bunker fuel prices in Rotterdam, Singapore and Houston. Their results indicate that out-of-sample, the hedging effectiveness varies significantly across the bunker markets when using constant and time-varying hedge ratios. In addition, crude oil futures traded in the International Petroleum Exchange (IPE) exhibit the highest degree of hedging effectiveness for the underlying spot bunker prices in Rotterdam and Singapore. In a related study, Alizadeh and Nomikos (2004) investigate the dynamics of the relationship between oil futures and the corresponding spot oil markets, along with their interactions with tanker spot freight rates. Specifically, the authors empirically examine the existence of a cost of carry relationship in the WTI futures market. In addition, they investigate whether the differential between futures-physical oil markets contains relevant information regarding the future evolution of the tanker freight rates. However, the reported results fail to confirm a statistically strong relationship between the two. This finding points to the existence of arbitrage opportunities between oil futures and tanker spot freight markets. Finally, Wang and Teo (2013) investigate a possible re-planning of the bunkering network configuration and financial hedging to reduce bunker fuel price risk in the container segment. The authors assume that the container liner network is initially planned, and then bunker fuel hedging is performed based on information regarding fuel consumption and the expectations for the future bunker

fuel prices. Thus, the authors highlight the benefits of building an integrated supply chain for bunkers that combines network planning and bunker hedging activities.

Regarding vessel value derivatives, Å dland *et al.* (2004) suggests a framework for pricing the OTC sale and purchase forward rate agreements for dry bulk vessels. They estimate the implied forward price from historical data for vessel prices and the term structure of freight rates. The results indicate that the unbiasedness hypothesis is rejected in all the investigated cases studied, supporting the existence of a risk premium in the vessel derivatives prices.

Table 2.11 summarises the available empirical literature in derivatives and risk management in shipping. For the better part of the last three decades, there has been a number of research streams investigating the major economic functions and market microstructure effects in the freight derivatives market. This market, however, has lost much of its trading volume and liquidity since the international financial crisis of 2008. Future research in the area could potentially investigate the consequences of this major decrease in liquidity, as well as the market conditions that need to prevail in order for the freight derivatives market to regain its trading volume.

Table 2.11 Summary of Literature on Risk Measurement and Management in Shipping (sorted by year of publication and names of authors)

STUDY	DESCRIPTION	SAMPLE		MAIN RESULTS
		Observations	Period	
Thoung and Visscher (1990)	Investigation of the hedging effectiveness of BIFFEX contracts.	154 weekly prices	1986–1988	• BIFFEX contracts can be an effective hedging tool for shippers of grain and coal, with long-haul cargo, and in need of Panamax vessels.
Cullinane (1991)	Questionnaire survey of the use of BIFFEX contracts among shipping companies.	85 companies	-	• Shipping companies are aware of the existence of BIFFEX. • However, BIFFEX is not accepted as a viable hedging tool by most shipping companies.
Cullinane (1992)	Investigation of the forecasting performance of BFI.	1,000 daily prices	1985–1988	• ARIMA models can predict short-term BFI.
Chang and Chang (1996)	Examination of the predictability of dry bulk spot rates using BIFFEX.	15,820 daily prices	1985–1993	• BIFFEX can predict the spot freight rates up to six months.
Tvedt (1998)	Closed-form pricing for options on BIFFEX futures.	Case Study	-	• A pricing model that takes into account special features of shipping derivatives market, such as downward restriction of the prices of underlying assets.
Cullinane (1999)	Examination of the impact of changes in the BFI composition.	600 daily prices	1993–1996	• The exclusion of Handysize routes has a weak impact on improving BFI behaviour as a general freight rates index.
Kavussanos and Nomikos (1999)	Investigation of the unbiasedness hypothesis of freight futures prices.	106 monthly prices	1988–1997	• Short-term freight futures can be regarded as unbiased forecasts of the realised spot freight prices.
Mayr and Tamvakis (1999)	Investigation of the casual relationship between oil product futures and physical crude oil.	148 monthly prices	1985–1997	• There is a causality running from the two-month crack spreads to crude oil imports. • The causality can serve as a leading indicator for short-term tanker vessel demand.
Haigh (2000)	Investigation of cointegration between freight futures and spot freight rates.	111 monthly prices	1985–1999	• BIFFEX futures can be regarded as unbiased forecasts of the spot freight prices. • The futures price for the current month contract outperforms time-series models in forecasting spot prices.

STUDY	DESCRIPTION	SAMPLE		MAIN RESULTS
		Observations	Period	
Kavussanos and Nomikos (2000a)	Investigation of hedging effectiveness of BIFFEX contracts.	267 weekly prices	1992–1997	• Time-varying hedging outperform other models in reducing freight rate risks, but with large basis risk.
Kavussanos and Nomikos (2000b)	Examination of hedging performance of BIFFEX contracts and the impact of the change in contract composition.	487 weekly prices	1988–1997	• The change in BIFFEX composition enhances hedging performance of freight futures contracts.
Kavussanos and Nomikos (2000c)	Comparison of performance of constant and time-varying hedging models.	267 weekly prices	1992–1997	• The GARCH-X model outperforms a simple GARCH and constant hedging specifications.
Haigh and Holt (2002)	Examination of the relationships between freight rates, commodity and foreign exchange futures markets.	715 weekly prices	1985–1998	• Traders can achieve better hedging effectiveness when they incorporate inter-dependence of various futures contracts. • Freight futures are not a crucial hedging tool for traders.
Dinwoodie and Morris (2003)	Questionnaire survey of the use of FFAs among tanker shipowners and charterers.	30 companies	2001	• Although FFAs are widely perceived, the vast majority of respondents had never used them. • Technical education is essential to widespread acceptance.
Kavussanos and Nomikos (2003)	Investigation of the causal relationship between freight futures and spot freight rates.	2,462 daily prices	1988–1998	• Futures prices tend to discover new information more rapidly than spot prices. • Freight futures can be used as unbiased forecasts of the realised spot freight rates.
Alizadeh *et al*. (2004)	Investigation of the hedging bunker price fluctuations using crude oil and petroleum futures.	642 weekly prices	1988–2000	• Hedging performance varies across the different bunker markets. • Crude oil futures exhibit the highest hedging effectiveness for Rotterdam and Singapore spot bunker prices.
Alizadeh and Nomikos (2004)	Examination of the relationships between oil futures and spot oil markets and tanker freight rates.	451 weekly prices	1993–2001	• There is no significant relationship between tanker freight rates and physical-futures differentials in the oil market.
Adland *et al*. (2004)	Estimate implied forward prices for vessel prices and investigate for the unbiasedness hypothesis.	156 monthly prices	1990–2003	• The unbiasedness hypothesis is rejected in all cases • Evidence of the presence of a risk premium.
Kavussanos and Visvikis (2004)	Investigation of the lead-lag relationship in returns and volatilities between shipping spot freight and FFA markets.	1,078 daily prices	1997–2000	• A bidirectional causality between spot and FFA returns is reported. • A unidirectional spillover from FFA to the spot market.
Kavussanos *et al*. (2004a)	Examination of the impact of FFA trading on volatility of spot freight rates.	3,038 daily prices	1989–2001	• FFA trading has a stabilising impact in the spot freight rate market. • FFA trading has an impact on asymmetric volatility and enhances the quality and speed of information flowing.
Kavussanos *et al*. (2004b)	Investigation of the unbiasedness hypothesis of FFA prices.	240 monthly prices	1996–2000	• FFA prices of one- and two-month prior to maturity are unbiased predictors of the realised spot prices.
Koekebakker and Adland (2004)	Examination of the volatility of forward freight rates of time-charters.	555 weekly prices	1992–2002	• Volatility of the forward curve is relatively high, reaching a peak for the one-year forward freight rate contracts.
Batchelor *et al*. (2005)	Examination of the relationship between expected volatility and bid-ask spreads in the FFA market.	897 daily prices	1997–2000	• Positive relationship between expected price volatility and bid-ask spreads in the Panamax FFA market.
Alizadeh *et al*. (2007)	Investigation of the unbiasedness hypothesis of implied forward charter rates in dry bulk shipping.	754 weekly prices	1989–2003	• Implied forward six-month time-charter rates are unbiased predictors of the future freight rates. • Trading rules based on technical analysis generate economic profits.
Batchelor *et al*. (2007)	Examination of the forecasting performance of time-series models for spot freight rates and FFA prices.	1,080 daily prices	1997–2001	• Incorporating information from FFA prices enhances the forecasting performance of time-series models for Panamax spot freight rates.
Kavussanos *et al*. (2007)	Questionnaire survey of the use of shipping derivatives among Greek shipowners.	31 companies	-	• Greek shipowners are reluctant to use FFAs for reduction of freight rate risk due to thin trading volume and high credit risk.
Koekebakker *et al*. (2007)	Deriving a closed-form solution for pricing Asian-style freight options.	Case Study	-	• The proposed model assumes lognormal distribution of the underlying spot freight rates. However, the lognormality breaks down during the settlement period due to the average-based settlement pricing. • To deal with this issue, the model suggests lognormal approximation of volatility of spot fright rates during the settlement period.
Angelidis and Skiadopoulos (2008)	Investigation of the performance of VaR and ETL models in forecasting risks in dry bulk and tanker markets.	1,875 daily prices	1999–2006	• Non-parametric specifications outperform parametric methods.
Chou and Huang (2010)	Investigation of the interactions between dry bulk FFA and steel markets.	396 weekly prices	2002–2009	• The global steel price index exhibits significant forecasting power for the FFA prices.

STUDY	DESCRIPTION	SAMPLE		MAIN RESULTS
		Observations	Period	
Kavussanos *et al*. (2010)	Investigation of the spillover effect between freight rate and commodity derivatives markets.	821 daily freight rates	2005–2008	• Return and volatility spillovers are generally unidirectional from commodity futures to FFAs.
Samitas and Tsakalos (2010)	Investigation of the impact of the use of shipping derivatives on company value.	116 company-quarters	2005–2008	• The use of shipping derivatives has a positive impact on shipping company value by mitigating business risks.
Kavussanos and Dimitrakopoulos (2011)	Derivation of framework for tanker shipping market risk measurement using VaR and ETL.	2,035 daily prices	1998–2006	• Parametric GARCH models and non-parametric filtered historical simulation outperform other specifications in forecasting short-term freight rate risk. • For long-term forecasting, the scaled historical simulation model is the most accurate method.
Prokopczuk (2011)	Examination of pricing and hedging models of IMAREX freight futures.	262 weekly prices	2005–2009	• The inclusion of a second stochastic factor enhances pricing accuracy and hedging effectiveness.
Goulas and Skiadopoulos (2012)	Examination of the market efficiency of dry bulk IMAREX freight futures.	1,073 daily prices	2005–2009	• The IMAREX futures market is not informationally efficient, as trading-strategies-based forecasts can produce a positive risk premium.
Alizadeh (2013)	Investigation of the trading volume-price volatility relationship in the dry bulk FFA market.	217 weekly prices	2007–2011	• Positive and contemporaneous relationship between trading volume and volatility. • Increases in price volatility lead to lower future FFA trading activities.
Lyridis *et al*. (2013)	Examination of the forecasting performance of ANN models for FFA prices.	1,060 daily prices	2005–2009	• Applied connectionist models generally yield better accuracy with high success rates for modelling FFA prices.
Nomikos and Doctor (2013)	Investigation of the profitability of market timing trading strategies in the dry bulk FFA market.	1,699 daily prices	2005–2011	• Trading rules generally outperform the benchmark buy-and-hold strategy.
Nomikos *et al*. (2013)	Valuation framework for options on the average freight rate.	Case Study	-	• A jump diffusion process enhances pricing accuracy of the proposed model.
Wang and Teo (2013)	Business model combining network planning and bunker hedging in container shipping.	Case Study	-	• Integration of network planning and bunker hedging activity enables shipping companies to achieve optimal managerial decisions.
Kavussanos *et al*. (2014)	Investigation of the spillover effect between dry bulk FFA and commodity derivatives market.	868 daily prices	2006–2009	• Agricultural commodity futures informationally lead freight markets.
Li *et al*. (2014)	Investigation of the spillover effects between spot and FFA prices in tanker shipping.	1,489 daily prices	2006–2011	• Unilateral spillovers from 1-month FFA to spot returns. • Bilateral volatility spillovers between spot freight rate and FFA prices.
Zhang *et al*. (2014)	Examination of the forecasting performance of time-series models for Capesize freight rates.	230 weekly prices	2005–2009	• Cointegration relationships between FFA and spot freight rates, and between time-charter and spot rates, enhance forecasting performance of time-series models.
Alizadeh *et al*. (2015a)	Investigation of the hedging performance of tanker FFAs.	442 weekly prices	2005–2013	• Regime-switching GARCH model improves the hedging effectiveness in the in-sample estimation, while the results are mixed in the out-of-sample.
Alizadeh *et al*. (2015b)	Investigation of the impact of liquidity risk on dry bulk FFA returns.	306 weekly prices	2008–2014	• Liquidity risk is priced and has a positive impact on FFA returns.
Adland and Jia (2017)	Examination of the physical basis risk in dry bulk shipping.	2,872 daily prices	2002–2014	• Increasing fleet size lowers the basis risk, but the diversification effect is relatively small.
Alexandridis *et al*. (2017b)	Investigation of information transmission in returns and volatilities of spot, futures and options in shipping.	849 daily prices	2013–2016	• Freight futures market informationally lead spot freight rate market. • Freight options market informationally lag behind both spot freight rate and freight futures markets.
Alexandridis *et al*. (2017c)	Portfolio-based methodological framework aiming to improve freight rate risk management.	263 weekly prices	2011–2016	• Decrease in freight rate risk up to 48% by holding a diversified portfolio of freight rates. • An additional decrease of up to 8% by hedging freight rate risk with futures contracts.
Kyriakou *et al*. (2017a)	Valuation of freight options reflecting mean-reverting property of freight rates.	336 weekly prices	2008–2014	• The jump diffusion model incorporating mean-reverting property of freight rates outperforms the generic lognormal model in terms of pricing accuracy.
Yin *et al*. (2017)	Investigation of the causal relationship between FFA and spot prices in dry bulk shipping.	1,730 daily prices	2007–2013	• Bidirectional causality between FFA and spot freight rates. • Both FFA and spot prices follow a mean-reverting process.

2.7. Summary of Chapter

Three main reasons have led academic researchers to devote a large number of empirical studies to exploring topics in shipping finance: first, the profound importance of the shipping industry in the global transportation system and for the economic welfare of countries; second, the unique characteristics in shipping, such as its highly cyclical, seasonal, volatile and heavily capital-intensive nature; and third, the growing number of shipping companies relying on global capital equity and debt markets to raise the required funds for shipping investments, and the increasing interest and support of governments to provide subsidies. The current survey paper comprises the first attempt, to the best of my knowledge, to provide a comprehensive and in-depth review of the shipping finance and investment literature. It examines 137 shipping finance studies published in 43 scholarly journals between 1979 and 2017, presents a bibliometric review and analysis, highlights the current research gaps, and provides fruitful avenues for future research that can serve as a stepping stone for researchers in the area.

Among the promising future research topics identified in this chapter, the rest of this thesis pays particular attention to M&As in the shipping industry, as significant unfilled research gaps remain in this area. Considering that M&As have a far-reaching impact on the business practice of shipping companies, there are several reasons why consolidation activity in the shipping industry deserves further research attention. First, market concentration largely driven by M&As has been unfolding in the shipping industry for the last few decades. Second, business consolidation has been proposed as one of the solutions for the shipping industry, which is still beleaguered with overcapacity resulting from ordering frenzy during the heyday of the mid-2000s. Finally, given the elevating importance of PE as a source of capital for shipping companies in recent years, participation of PE firms in business consolidation in the shipping industry calls for further research shedding light on the multi-faceted market.

3. MAPPING M&As IN THE SHIPPING INDUSTRY

3.1. Introduction

One of the significant features that has delineated the shipping industry during last three decades is a substantial increase in market concentration. The most notable example is that the combined market share of the 20 leading containership operators in the liner segment has steadily escalated from 59.1% in 2000 to 86.1% in (as of July) 2017 in terms of cargo-carrying TEU capacity.[43] Given that the tendency towards concentration is largely enhanced by expansion of the top five liner operators, whose combined market share has grown from 27.7% to 57.1% during the same period, international shipping transportation market is increasingly dominated by fewer and larger service providers. A similar tendency of market concentration has also been reported in the tanker sector. Merikas *et al*. (2014) document that the CR4, a widely used measure of concentration calculated as the cumulative share of the four largest companies, of the VLCC sector has increased from 10.4% in 1993 to 27.3% in 2010. They also report an increase in the Herfindahl-Hirschman Index (HHI), another commonly accepted measure of market concentration, during the same period. Broadly, fleet expansion of shipping companies can be categorised into internal and external growth options (Cariou, 2008; Slack *et al.*, 2002). Internal or organic growth is attained by newbuilding investment, purchase of second-hand vessels and long-term chartering. Alternatively, external growth is achieved by co-operation agreements (slot sharing, strategic alliances) and M&As. Compared to other expansion strategies, M&As offer the fastest growth option with full control over the newly acquired vessels. In addition, since business consolidation includes not only physical fleets, but also intangible assets, such as the goodwill of specific markets, regional expertise and client-base, M&As provide the merged firms with a valuable competitive edge to pave its way for accomplishing long-term strategic goals.

While horizontal consolidation activity has played a vital role in outlining the market structure of the shipping industry, vertical integration carried out by shipping companies seeking access to a wider range of logistics activity has had a far-reaching effect on supply chain management and the strategies of constituent firms on a global scale. As a growing number of shipping companies attempt to take advantage of the economies of scope by acquisitions of stevedoring business (Heaver *et al.*, 2000), the struggle for initiative in the supply chain between carriers and port operators has been intensified (Midoro *et al.*, 2005). Moreover, in a strategic response

[43] Review of Maritime Transport (UNCTAD), compiled from various issues.

to the concentration among shipping companies, terminal operating companies also seek consolidation. As shipping companies gain more bargaining power, requiring efficient cargo handling on the quayside and minimising the number of calling ports, port operators have to address their customer's needs by a scale increase or extension of their service coverage. As a result, the port operating area has also experienced concentration dominated by few multi-national players involving cargo handling on a global basis (Notteboom and Rodrigue, 2012; Notteboom, 2002). In a similar vein, it has been documented that fewer leading logistics service providers have taken a larger market share (Carbone and Stone, 2005).

Although shipping M&A activity is multifaceted in terms of the industrial segments of participants, transaction types, takeover motives and form of the deal, little is known about various aspects of the market. Findings in previous literature on shipping M&As have largely been based on anecdotal evidence, thus far from generalisation. Brooks and Ritchie (2006) utilise an extensive dataset of maritime M&A deals for the 1996–2000 period and find major motives (aggressive extraction, synergistic and strategic expansion) and importance of minority acquisitions. However, the sample period appears to be insufficient to demonstrate how M&As in shipping have changed over last few decades, and the use of SIC for industrial segmentation is likely to be subject to heterogeneity in the sample. Moreover, the shifts in the economic landscape of the shipping industry after the 2008 market collapse, such as the deadlock in bank lending, depressed shipping asset value and prolonged supply-demand imbalance, foster the market sentiment that further consolidations across shipping and related transportation industries are inevitable, in-depth analysis on shipping M&A market is of particular importance.

In this chapter, I provide an extensive view of the shipping consolidation market based on a sample of M&A deals carried out by shipping and related companies over the 1990–2014 period. However, since several drawbacks have been detected in using the industry classification of the database, which is the most popular source of information concerning M&A deals (e.g. inappropriate segmentation among sub-sectors in shipping, inclusion of transactions between non-shipping companies, incorrect information on individual deals), I categorise all acquiring and target companies into a new industry classification reflecting their actual business areas based on a variety of hand-collected materials. Then, I describe industrial segmentation and deal characteristics of shipping M&A activity linking theoretical hypotheses and explanations in previous literature. Finally, the determinants of acquisition premium and the choice of financing decision are investigated.

The multi-fold analysis in this chapter deals with several unanswered questions in the shipping M&A market that remain quite under-explored and makes important contributions to shipping and corporate finance literature alike. First, by utilising an extensive sample free from bias or heterogeneity, I illustrate the key constituent firms according to their business areas and directions of M&A activity (or acquisitiveness flows) in the shipping industry. The results indicate that horizontal consolidation is prevalent in the liner, port and logistics segments. Vertical integration between those segments for establishing reliable and efficient global supply chain is also salient in shipping M&As. Particularly interesting is the participation of non-shipping companies, such as financial institutions, steel-makers, oil and gas companies and conglomerates.

Second, the sample period of roughly three decades allows for detecting how shipping M&A activity has changed over time. Specifically, this chapter documents three M&A waves in the shipping industry, the first two of which are almost concurrent to the fifth (1993–1999) and the sixth (2003–2007) rounds of M&A frenzies in history, as reported in Alexandridis *et al.* (2012). The third wave is still ongoing amid a prolonged recession in shipping following the 2008 financial crisis. During this period, financial institutions (especially PE funds) play a key role in acquiring shipping and port operating companies for taking advantage of opportunities created by tightened bank lending to the shipping industry and the historical low value of shipping assets.

Third, an analysis of firm- and deal-specific factors reveals that shipping M&A transactions are characterised by several interesting features. Consistent with the international nature of the shipping industry, the share of cross-border deals is approximately 37%, which is fairly higher than the average of other industries (29%). In addition, the evolution of regional M&A activity indicates that Europe has traditionally been the largest market for corporate control in shipping with an average share of 36.4%. However, the share of the European shipping M&A market has been shrinking over the sample period, which is in sharp contrast with the recent rise of intra-Asia deals (East and Southeast Asia combined). With regard to the method of payment, cash is the most popular form of M&A financing in the shipping industry.

Fourth, I find that acquisition premium is negatively associated with the target size, which is consistent with evidence presented in Alexandridis *et al.* (2013). Moreover, supporting the mis-valuation hypothesis (Shleifer and Vishny, 2003) and related empirical evidence (Dong *et al.*,

2006), the higher target mis-valuation, measured by the pre-announcement MTB ratio, is associated with the lower acquisition premium.

Finally, I find that larger acquirers tend to choose cash for M&A financing, since they are likely to be less constrained by financial distress costs (Faccio and Masulis, 2005). In addition, larger deals are more likely to be financed with stock and other forms of payment due to the concern about post-merger integration risk (Hansen, 1987).

The rest of this chapter is structured as follows: Section 3.2 points out drawbacks of the sampling process in previous shipping M&A literature and describes how shipping M&A transactions are selected. Sections 3.3 and 3.4 analyse industrial segmentation, along with deal and firm characteristics, respectively. Section 3.5 investigates the determinants of acquisition premium. Section 3.6 examines the choice of payment method. Section 3.7 concludes this chapter.

3.2. Sample Selection

The sample of M&As in shipping comes from Thomson-Reuters SDC and covers the 1990–2014 period. It comprises completed or withdrawn deals where either the acquirer or the target has an SIC code associated with the shipping industry (4412–4449). [44] Spinoffs, recapitalisations, self-tenders, exchange offers and repurchases are omitted, as they are not classified as M&As. I obtained 6,443 deals that satisfy the above criteria.

Figure 3.1 provides a breakdown of this sample based on the public status of acquiring and target companies. More than 50% of M&As involve both a non-publicly listed acquirer and target, while in 12% of the deals, non-listed acquirers bid for listed targets. Only 5% of M&As involve both a listed acquiring and target company, while in the remaining 28% of the cases, listed firms acquire unlisted ones. Non-listed firms include predominantly private companies, while a very small fraction comprises government organisations or individuals (3% of acquirers and 2% of targets, respectively). The documented public-status profile of shipping M&As is quite similar to that of other industries in Thomson-Reuters SDC.[45] Since the availability of stock price and accounting data is a key requirement for any further analysis of the shipping

[44] The sample also includes deals announced in 2013 and 2014 but still indicated as pending by year-end 2014 when the sample was collected.

[45] A sample of 668,836 M&As for all other industries satisfying the same criteria yields 5.3% Public-to-Public deals, 32.6% Public-to-Non-Public, 53.9% Non-public-to-Non-public and 8.2% Non-public-to-Public.

M&A market, I retain the 2,896 deals where either the acquirer or the target is a publicly listed company.

Figure 3.1 Public Status of Acquirers and Targets in Shipping M&As

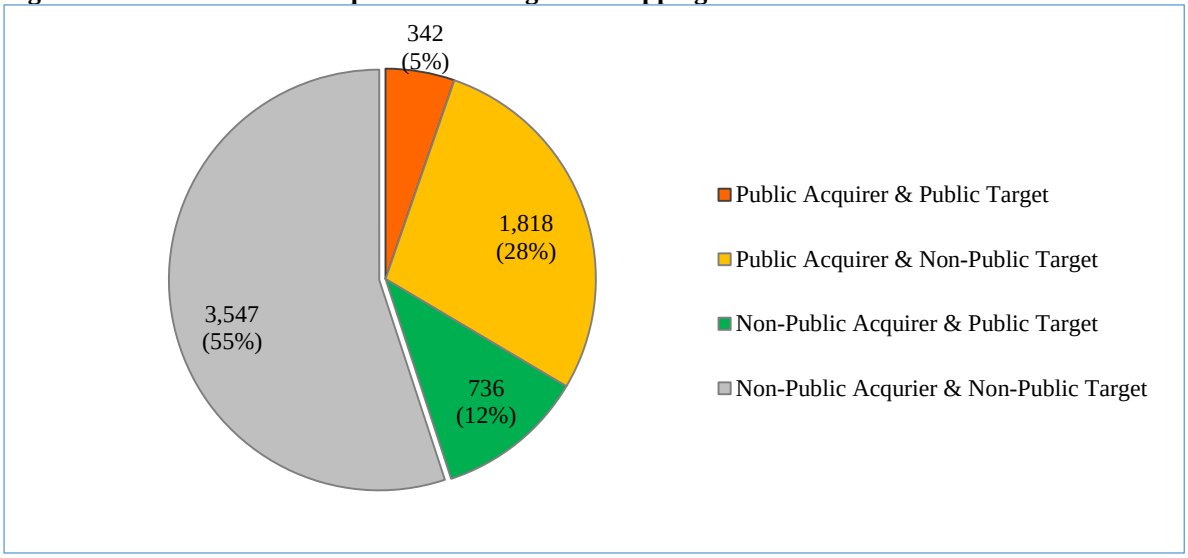


Table 3.1 provides a breakdown of the sample consisting of 2,896 deals according to the SIC code of acquirers and targets, along with the corresponding business descriptions. One key issue with prior research is that it does not provide a comprehensive mapping of the shipping M&A market based on the sector's business areas. Existing research has relied on SIC codes that do not provide a clear-cut categorisation of business segments within the shipping industry. According to Walker and Murphy (2001), the SIC classification system was originally designed in the 1930s with a focus on the manufacturing sector, and thus, it provides a problematic classification for service industries. As a result, the employment of SIC codes may fail to encompass the dynamic developments in shipping since the 1960s (e.g. containerisation, specialisation, non-vessel-owning common carriers).[46] For example, the SIC code 4412 (Deep sea foreign transportation of freight) includes both ship-owning and support services, while business segmentation based on cargo type (e.g. liner, dry bulk, tanker, offshore) is not possible at all using SIC codes.[47] Moreover, the SIC classification in the SDC is often inconsistent with

[46] Non-vessel operating common carriers (NVOCCs) are companies arranging transportation for shippers. Although they do not own ships, NVOCCs legally act as carriers (i.e. shipping companies) and issues their own bill of ladings for cargo owners. As discussed later in this section, not a few number of deals in the sample are carried out by NVOCCs with the SIC code of ship-owning business (4412). However, their business is actually similar to the description of the SIC 4731 (arrangement of transportation of freight and cargo).

[47] In September 2006, Nippon Yusen Kaisha (a Japanese shipping company) acquired RO-RO terminal operations in Zeebrugge and Antwerp (Belgium) from PSA International (a Singaporean port operator) for $ 27 million. While both the acquirer and target have been assigned SIC code 4412 by SDC, the business operations of the two firms are actually quite different: one is a ship-owning firm and the other is a port operator. This is a typical example of vertical, rather than horizontal,

actual business descriptions, and there are frequent classification errors (e.g. ship-owning firms may be classified as a shipping service firm or even a non-shipping business).[48]

Table 3.1 SIC Codes and Corresponding Business Descriptions of Acquiring and Target Companies in Shipping Industry M&As

SIC	Business Description	Acquirers	Targets
4412	Deep sea foreign transportation of freight	1,012	1,111
4424	Deep sea domestic transportation of freight	69	62
4449	Water transportation of freight, not elsewhere classified	68	155
4481	Deep sea transportation of passengers, except by ferry	35	74
4482	Ferries	25	45
4489	Water transportation of passengers, not elsewhere classified	17	29
4491	Marine cargo handling	284	431
4492	Towing and tugboat services	24	39
4499	Water transportation services, not elsewhere classified	1	149
60–67	Finance, insurance, real estate	586	130
40–49	Transportation and public utilities, except water transportation (44)	318	273
Other	Manufacturing, mining, construction, trade, etc.	457	398

Note: SIC code 4432 (Freight transportation on the Great Lakes-St. Lawrence Seaway) in not included in this table, as there are no transactions where either the acquirer or target is a listed company in this segment.

Going through all the transactions, I have identified significant classification flaws with regard to the business description or SIC code of the companies involved, which would possibly result in misleading segmentation. For example, I found that 382 (385) deals where the acquirer (target) with the first two-digit SIC codes other than 44 actually run their business in ship-owning or shipping-related services, and 45 (28) deals where acquirers (targets) are assigned a 44 SIC code, but are not shipping related. This is consistent with the view that SIC codes may fail to segregate firms based on homogeneity in business operations (Clarke, 1989) or industry relatedness (Fan and Lang, 2000). In fact, Guenther and Rosman (1994) and Kahle and Walkling (1996) find discrepancies in more than 70% of the cases in four-digit SIC codes

integration that may be associated with different motives and outcomes. Andreou *et al.* (2012) find that targets gain more from vertical integration in the freight transportation industries (railroad, trucking, shipping and transportation arrangement) whereas Alexandrou *et al.* (2014) report that horizontal deals are more value-enhancing for targets in shipping.

[48] For example SCD classifies Hapag-Lloyd's acquisition of CP Ships in 2005 as an acquisition of a shipping company by a tourism company. This is due to the fact that, according to SDC, the acquirer is TUI AG, the parent of Hapag-Lloyds, which is a multinational travel and tourism company with SIC code 4724 (Travel agencies). A similar misleading classification is also found in Neptune Orient Lines (NOL) - American President Line (APL) deal in 1997. Although both acquirer and target are liner shipping companies, NOL is reported with SIC 4491 (Marine cargo handling).

between databases (Compustat and CRSP), which can in turn affect the quality of findings in finance research.

In a departure from the standard approach followed by previous research on shipping M&As, namely, bundling all deals in the same basket, I follow a comprehensive mapping method of the 2,896 transactions in order to provide a more relevant and complete classification. To this end, I reviewed 1,665 business press articles and hand-collected information regarding companies and M&A deals (e.g. exchange filings, annual reports, analyst reports).[49] This painstaking approach has allowed for acquiring and target companies to be grouped in three broad segments and 11 sub-segments, as illustrated in Table 3.2.[50]

Table 3.2 Business Segmentation in Shipping

Segment	Sub-Segment	Description
Ship-Owning	Tramp	Shipping companies that operate fleets of dry bulk, (dirty and clean) tanker and/or gas carriers
	Liner	Shipping companies that operate fleets of containerships
	Offshore	Shipping companies that operate fleets of offshore-supporting vessels and/or oil-drilling rigs
	Passenger	Shipping companies that operate fleets of ferries and/or cruise vessels
	Diversified	Shipping companies that operate diversified fleets in multiple ship-owning segments
	Other Ship-Owning	Shipping companies that operate fleets of PCTCs, RO-ROs, reefers and/or barges
Shipping Services	Port	Terminal operating and/or stevedoring companies
	Logistics	Companies that provide freight forwarding, warehousing, distribution and/or arrangement of transportation services
	Other Services	Other support services, including ship management, towage, pilotage, dredging and/or manning
Other	Financial	Financial institutions and investment companies (e.g. banks, PE firms, investment holdings)
	Industrial	Agriculture, mining, oil and gas, machinery, steel-making, construction, trade, etc.

As part of the hand-collection process, I also updated key information related to the announcement date, relationship between the acquiring and target companies (e.g. subsidiaries of the same parent company or joint venture partners), the nature of the target in the deal (a company or an asset), the percentage of ownership acquired and the value of the transaction.

[49] The number of hand-collected materials is lower than that of deals as a number of deals are carried by the same acquirers or targets in the sample.

[50] This approach is similar to previous attempts to propose new classification schemes for industries where standardised codes (e.g. SIC, NAICS and GICS) are inappropriate, for example Amit and Livnat (1990) for conglomerates and Kile and Phillips (2009) for high-tech firms, respectively.

This process allowed for identifying and excluding a number of additional cases that cannot be regarded as conventional M&A deals, or where both the acquirer and the target were unrelated to the core shipping industry. First, 213 deals are identified as straightforward acquisitions of assets. Since there are considerable differences between asset acquisitions and direct business consolidation (e.g. integration complexity, synergies, legal considerations), those deals are excluded. Second, I exclude 10 deals that are referred to as equity carve-outs (or partial spinoffs). Third, in 191 cases, I was unable to determine the business area of acquirers and targets due to limited information in the press and other hand-collected material. Since this research is subject to the segmentation of deals according to business areas, I exclude those deals.[51] Finally, I identify and omit 221 deals where both the acquirer and the target are unrelated to the shipping industry. This is attributable to the aforementioned classification inconsistencies related to the SIC code.[52] Following this process, it can be argued with a considerable degree of confidence that I have managed to put together the most comprehensive and bias-free sample of M&As ever used in the shipping industry.

Figure 3.2 depicts annual shipping M&A activity during 1990–2014 for the final sample consisting of 2,261 transactions. In terms of both deal count and deal value, shipping M&A activity reached its peak during the mid-2000s when the global shipping market was at an all-time high.[53] The availability of abundant liquidity coupled with exuberant sentiment and an appetite for growth during a bullish market can explain this trend for consolidation. This is consistent with the evidence presented in Alexandridis *et al.* (2012) concerning a prevalent merger wave between 2003 and 2007, the sixth wave in M&A history. This period corresponds to the second shipping M&A wave (in terms of the number of transactions) in the sample in this section, as one also occurred during the late 1990s, again during a positive period for the shipping industry. Despite the slump after the economic slowdown of 2008, the shipping M&A market remained relatively upbeat, and in fact, activity points to a new wave by 2014. It is important to note that the drivers of this wave were diametrically opposed to the previous one,

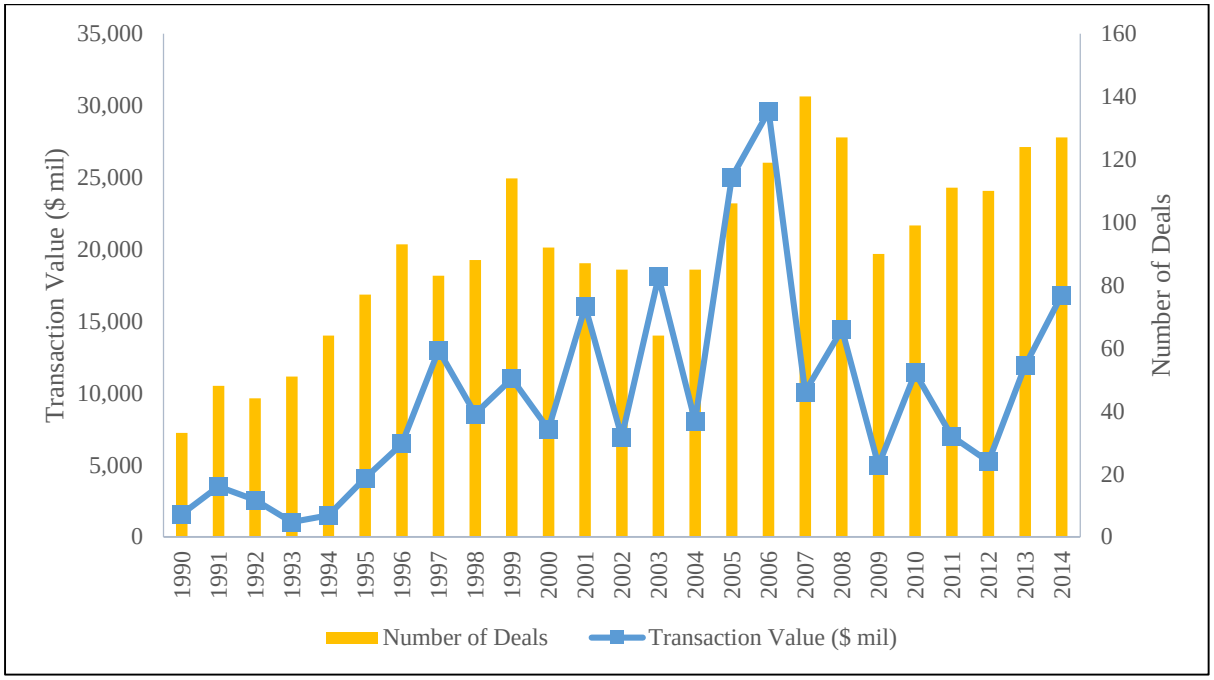
[51] It fails to identify the business area of both the acquirer and target in 66 cases while in the remaining 125 cases either the acquirer's or target's business is unknown. The combined value of 89 of those deals where transaction value information is available from SDC is $9,797 million in 2014 dollars. Including all unidentified deals in the overall sample does not alter the statistics and announcement returns (addressed in the next chapter) significantly.

[52] A salient example in this category is Steady Safe's (SIC code 4412) acquisition of Volgren Indonesia (SIC code 3713), a bus manufacturer, for $ 192 million in 1994. Although the acquirer is also in the business of passenger water transportation through its river taxi service, (as well as others such as bus and taxis limousine services), it is, by no means, hard to be regarded as a shipping service provider.

[53] Although the deal value information is available for only 1,355 deals, the correlation between deal value and number is 50.6%.

since freight rates recorded lows on a number of occasions, and therefore, consolidation this time was propelled by a deteriorating market.

Figure 3.2 Annual Evolution of Shipping M&A Activity



Note: Deal value is based on 1,365 deals with complete transaction value data and converted into 2014 dollars.

3.3. Industrial Segmentation of Shipping M&A Market Participants

In this section, I explore the industrial segmentation of acquirers and targets as a first step to illustrate a comprehensive picture of the shipping M&A market. In addition, I also provide explanations for the driving force behind consolidation activity in each segment. Table 3.3 presents a breakdown of shipping business segments of acquiring and target companies for the sample of 2,261 deals.

As illustrated in Panel A, while the majority of acquirers (45.7%) and target (49.4%) operate in the ship-owning segment, shipping service firms also play a key role in shipping M&As with a 27% (40%) share of acquirers (targets). Moreover, 27.2% of acquirers and 10.6% of targets are firms outside the wider shipping industry. In the ship-owning segment, the largest acquiring group is diversified shipping companies (16.4%) that operate various types of fleets (e.g. Maersk, COSCO, NYK, MOL) followed by those in tramp shipping (10.1%). Regarding target

groups, the two largest categories are tramp (17.3%) in the ship-owning segment and port (17.1%) in the shipping services segment, followed by logistics (12.5%).

Table 3.3 Business Segments of Acquirers Targets in Shipping M&As (number of deals)

Panel A: Business Segments of Acquirers and Targets

	Ship-Owning						Shipping Services			Other	
	Tramp	Liner	Diversified	Offshore	Passenger	Other Ship-Owning	Port	Logistics	Other Shipping Services	Financial	Industrial
Acquirer	228	91	371	164	114	66	251	224	136	221	395
	(10.1%)	(4.0%)	(16.4%)	(7.3%)	(5.0%)	(2.9%)	(11.1%)	(9.9%)	(6.0%)	(9.8%)	(17.5%)
Target	391	118	124	216	156	113	386	282	236	18	221
	(17.3%)	(5.2%)	(5.5%)	(9.6%)	(6.9%)	(5.0%)	(17.1%)	(12.5%)	(10.4%)	(0.8%)	(9.8%)

Panel B: Transactions by Segment

		Target										
		Ship-Owning						Shipping Services			Other	
		Tramp	Liner	Diversified	Offshore	Passenger	Other Ship-Owning	Port	Logistics	Other Shipping Services	Financial	Industrial
Acquirer	Ship-Owning: Tramp	156	2	14	8	3	5	3	1	17	2	17
		(6.9%)	(0.1%)	(0.6%)	(0.4%)	(0.1%)	(0.2%)	(0.1%)	(0.0%)	(0.8%)	(0.1%)	(0.8%)
	Ship-Owning: Liner	3	44	1	3	1	2	3	15	5	2	12
		(0.1%)	(1.9%)	(0.0%)	(0.1%)	(0.0%)	(0.1%)	(0.1%)	(0.7%)	(0.2%)	(0.1%)	(0.5%)
	Ship-Owning: Diversified	53	27	52	27	20	23	45	41	28	6	49
		(2.3%)	(1.2%)	(2.3%)	(1.2%)	(0.9%)	(1.0%)	(2.0%)	(1.8%)	(1.2%)	(0.3%)	(2.2%)
	Ship-Owning: Offshore	3	-	-	110	2	1	2	6	24	1	15
		(0.1%)	(0.0%)	(0.0%)	(4.9%)	(0.1%)	(0.0%)	(0.1%)	(0.3%)	(1.1%)	(0.0%)	(0.7%)
	Ship-Owning: Passenger	2	4	-	2	56	4	6	9	7	14	10
		(0.1%)	(0.2%)	(0.0%)	(0.1%)	(2.5%)	(0.2%)	(0.3%)	(0.4%)	(0.3%)	(0.6%)	(0.4%)
	Ship-Owning: Other Ship-Owning	5	-	-	3	3	33	4	1	5	-	12
		(0.2%)	(0.0%)	(0.0%)	(0.1%)	(0.1%)	(1.5%)	(0.2%)	(0.0%)	(0.2%)	(0.0%)	(0.5%)
	Shipping Services: Port	9	5	4	2	0	1	160	15	17	5	33
		(0.4%)	(0.2%)	(0.2%)	(0.1%)	(0.0)	(0.0%)	(7.1%)	(0.7%)	(0.8%)	(0.2%)	(1.5%)
	Shipping Services: Logistics	4	2	1	1	3	1	14	144	11	2	41
		(0.2%)	(0.1%)	(0.0%)	(0.0%)	(0.1%)	(0.0%)	(0.6%)	(6.4%)	(0.5%)	(0.1%)	(1.8%)
	Shipping Services: Other Shipping Services	5	2	-	3	10	1	2	2	93	-	18
		(0.2%)	(0.1%)	(0.0%)	(0.1%)	(0.4%)	(0.0%)	(0.1%)	(0.1%)	(4.1%)	(0.0%)	(0.8%)
	Other: Financial	60	10	20	28	26	9	47	13	8		
		(2.7%)	(0.4%)	(0.9%)	(1.2%)	(1.1%)	(0.4%)	(2.1%)	(0.6%)	(0.4%)		
	Other: Industrial	91	22	32	29	32	33	100	35	21		
		(4.0%)	(1.0%)	(1.4%)	(1.3%)	(1.4%)	(1.5%)	(4.4%)	(1.5%)	(0.9%)		

3.3.1. Ship-Owning Segment

Panel B of Table 3.3 illustrates the business combination of shipping M&A transactions according to segments of acquirers and targets. In the sample, 29% of the deals involve broadly horizontal integration between ship-owning companies where both the acquirer and the target operate in the ship-owning segment. The diversified and the tramp firms comprise the largest horizontal deal groups with 202 and 188 deals, respectively. On the other hand, congeneric

deals between different ship-owning segments are relatively rare and mostly carried out by diversified shipping companies (9.8%).

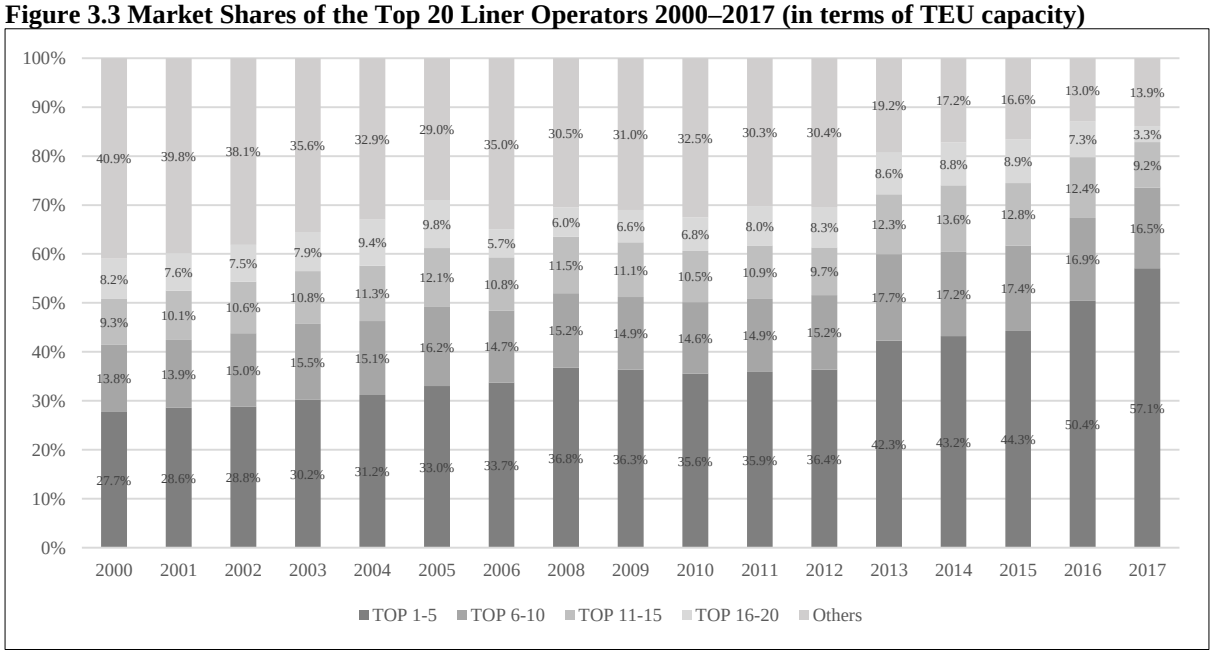
Given that a large number of diversified shipping companies in the sample involve the liner (or container shipping) business, it is worth noting that horizontal consolidation between containership operating firms takes a substantial proportion of M&As in the ship-owning segment. In 112 deals where diversified shipping companies acquired ship-owning targets, acquirers run the liner shipping business as an important part of their shipping portfolios. Aggregated cargo-carrying capacity of those acquirers is approximately 10 million TEU, equivalent to 50.3% of the world containership fleets as of July 2016.[54] However, it was not until the mid-1990s that M&As were regarded as a breakthrough (Brooks and Ritchie, 2006; Song and Panayides, 2002) when container carriers were required to cope with the massive increase in demand resulting from globalised manufacturing and retailing (Das, 2011), as well as regulatory changes provoked by the Ocean Shipping Reform Act (OSRA) of the US in 1998 (Fusillo, 2009). While the OSRA forced liner shipping companies into much tougher competition by technically dwindling the traditional shipping conference system and collusive pricing, which indicates increased risk in freight rate revenues, the rapid transformation towards offshore production, mainly seeking low-cost labour in developing countries, motivated liner operators to extend their geographical reach and improve service frequency. Under these circumstances, liner shipping companies had to strategically rationalise their operations through consolidation pursuing economies of scale and improving utilisation of their assets.

As such, the liner shipping sector has demonstrated a clear tendency of concentration since the late 1990s. For instance, Maersk Line, the largest containership operator in terms of TEU capacity, has taken advantage of M&As to complement organic growth and take a leading position in the market. Particularly, Maersk Line's acquisition of P&O Nedlloyd in 2005 expanded its market share substantially from 10.7% to 15.9%, twice that of the second largest liner operator at that time. Figure 3.3 provides an extensive view of ongoing market concentration in the liner segment by illustrating the evolution of market shares of leading containership operators in terms of TEU capacity. It is obvious that the liner shipping market has become concentrated and dominated by fewer leading companies. While the combined market share of the top 20 companies has increased from 59.1% in 2000 to 86.1% in 2017, it

[54] The TEU figure is based on Alphaliner Top 100 Operators.

is evident that a large part of the increase is attributed to the growth of the top five companies, the combined market share of which has increased from 27.7% to 57.1% during the same period.

Figure 3.3 Market Shares of the Top 20 Liner Operators 2000–2017 (in terms of TEU capacity)



Source: Review of Maritime Transport (UNCTAD), compiled by authors from various issues.

Globalisation in manufacturing also has a far-reaching effect on vertical integration in the shipping M&A market. As an increasing number of manufacturers have outsourced their production on a global basis, operation in collaborative supply chain networks via synchronising flows of information and goods has become a critical success factor. In response to manufacturers' need for logistic management, improved service reliability (e.g. transit time, service frequency) and value-added services, shipping companies, especially in the liner segment, have gained control over a broader scope of activities in the supply chain by integrating port and logistics operations through forward vertical consolidation (Midoro *et al.*, 2005). Along similar lines, Heaver *et al.* (2000) argue that liner shipping companies have increasingly gained control over hinterland activities (i.e. ports, haulage and logistics) and that the balance of power between shipping carriers and terminal operators has tilted in favour of a limited number of large carriers.

Panel B of Table 3.3 illustrates that vertical integration of ship-owning acquirers is also salient in the sample. Approximately 9.8% of the overall sample involves deals where ship-owning

acquirers buy shipping services targets in forward vertical integration deals. Moreover, the majority of these acquirers are liner or diversified ship-owners whose main line of business is associated with liner shipping. This is consistent with the fact that most major liner shipping companies tend to own port and logistics businesses in the form of subsidiaries or assets in an effort to support or complement their core shipping business operations. For example, among the top 20 containership operators, 12 companies with a combined share of 69.8% of the world's liner fleets in terms of TEU own terminal operations.[55]

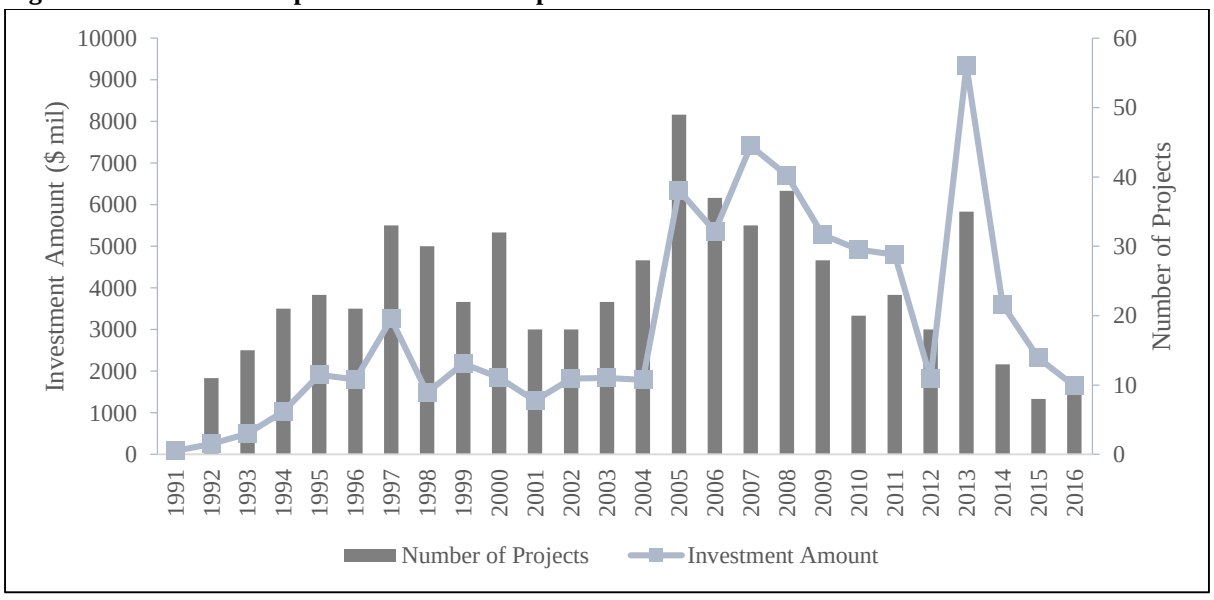
3.3.2. Shipping Services Segment

Similar to the ship-owning sector, acquirers and targets possess the same business area in most deals within the shipping services segment. It appears that M&As have played a pivotal role in the development of the current network of the port segment, since 160 have taken place during the sample period (see Panel B in Table 3.3). Consolidation in the port segment started with the emergence of global terminal operators (GTOs) involved in multi-national port terminal operations on a global basis. Along these lines, Peters (2001) provides three broad categorisations of major GTOs: the first group (e.g. HPH, P&O Ports) pioneering geographic expansion; the second group (PSA International, CSX) seeking international expansion after witnessing successful internationalisation of the first group; and the third group invested by major deep sea liner carriers (Evergreen, CMA CGM), as previously discussed in this section.[56] Horizontal consolidation in the port segment has largely been facilitated by privatisation of port activities since late 1980s when the first wave of GTOs' geographical expansion occurred (De Souza *et al.*, 2003; Midoro *et al.*, 2005; Notteboom, 2002). Since a growing number of port authorities and governments have sought new funding sources for port development and efficient utilisation of cargo handling assets, private terminal operators (mainly GTOs) have participated in port development projects usually through M&As. According to the World Bank, private participation in port development has been accelerated, involving 607 projects with the investment amount of $81 billion during 1991–2016 (see Figure 3.4).

[55] The aggregate share of container shipping companies is from Alphaliner Top 100 Operators as of July 2016 and the number of terminal-owning shipping companies is based on Drewry Global Container Terminal Operators Annual Review and Forecast.
[56] Nevertheless, it should be noted that all port operating acquirers of the third group (i.e. subsidiaries of shipping companies) in the sample are classified as liner or diversified ship-owning companies. This is for the reason that their consolidations are strategically decided by their parent carriers for supporting the core shipping business despite recent emergence of hybrid GTOs that are established by liner carriers, but handle both in-house volume and third-party business (e.g. APM Terminals, NYK Line).

Another driving force in the port horizontal consolidation is a chain reaction of port operators (or stevedoring companies) confronted with concentration in the ship-owning segment. As the concentration trend has unfolded in the shipping industry, shipping companies have acquired increasing bargaining power over port operators during the last few decades (Heaver *et al.*, 2000). In recent decades, for example, liner carriers with wider control over whole supply chain and sizeable cargo-carrying capacity have been able to re-arrange their calling ports for rationalising transhipment activity and multi-modal transportation, which means that port operators are required to deal with the risk of losing major customers. Accordingly, terminal operators pursue scale increase through consolidation as an effective means to respond to the concentration in the liner shipping sector (Notteboom, 2002). Reflecting concentration in the port operating segment, Notteboom and Rodrigue (2012) report increasing market share of the top 10 terminal operators from 41.5% in 2001 to 64.6% in 2009 in terms of world container handling throughput. One of the notable examples of growth via horizontal consolidation in the port segment is DP World, the fourth largest terminal operator, with 33.4 million TEU container throughput in 2012 (5.4% of the world market share).[57] In particular, its acquisitions of CSX in 2005 and P&O Ports in 2006, largely backed by sovereign wealth fund of Dubai, widened the gap between the top four operators (namely, PSA International, HPH, APM Terminals and DP World) and other global players.[58]

Figure 3.4 Private Participation in Port Development 1991–2016



Source: World Bank, Private Participation in Infrastructure Database
Note: The total number of projects during 1991–2016 is 607. However, investment amount is based on the dataset of 534 projects with complete information on investment value. As of July 2017, there is no deal reported year-to-date.

[57] Drewry, "Top Ten Global Terminal Operators", Press release, 27th August 2013.
[58] Drewry Annual Review of Global Container Terminal Operators.

The sample also presents the intense consolidation activity in the logistics segment, where 144 purely horizontal deals took place during the sample period.[59] M&As in the logistics segment are also propelled by globalisation in manufacturing and retailing. Since global or multi-national companies increasingly take advantage of offshore manufacturing and concentrate on their focal points, their logistics operations have been outsourced to specialist logistics service providers, so-called 'third-party logistics'. In order to satisfy the needs of globalised customers, logistics service providers should expand both geographical and service coverages. M&As have been regarded as the fastest way of up-scaling and are preferred by leading logistics companies, as reported by Carbone and Stone (2005). The logistics segment has also been undergoing market concentration, as fewer and larger logistics companies have increased their market shares. For instance, the top 100 logistics companies controlled a third of the estimated $270 billion annual market sales in 2015, and the aggregate annual sales of seven elite companies exceeds that of the other top 25 competitors.[60]

3.3.3. Other Segment

Acquirers outside the wider shipping industry (i.e. other segment) also play an important role in the shipping M&A market. Specifically, one of the major parts in this segment is investor-led transactions by a growing number of financial institutions entering the shipping industry, such as investment banks, PE investors and hedge funds. The involvement of financial institutions in the shipping industry significantly varies among segments in regards to the driving force and timing of the investment. Comparable to the horizontal consolidation in the port segment, financial institutions' acquisitions of port assets or stevedoring companies have primarily been motivated by port privatisation since late 1980s. In addition, their investment has also led to higher valuation (in terms of price-to-EBITDA), since the timing was largely concurrent with the booming period (2000–2007) of the shipping industry (Notteboom and Rodrigue, 2012). In the ship-owning segment, financial investment is especially driven by the stellar growth of PE funds in recent years targeting opportunities created by the deadlock in bank financing for shipping companies, as well as plummeting values of shipping assets since

[59] Note that this sample is still insufficient to provide comprehensive description of M&As in the logistics segment. Since I focus on the shipping industry and regard others as ancillary or supporting business in order to keep the sample manageable, the SIC code 4731 (Arrangement of Transportation of Freight and Cargo) which appears to include deals by a large number of logistics service providers are not included in the sample.

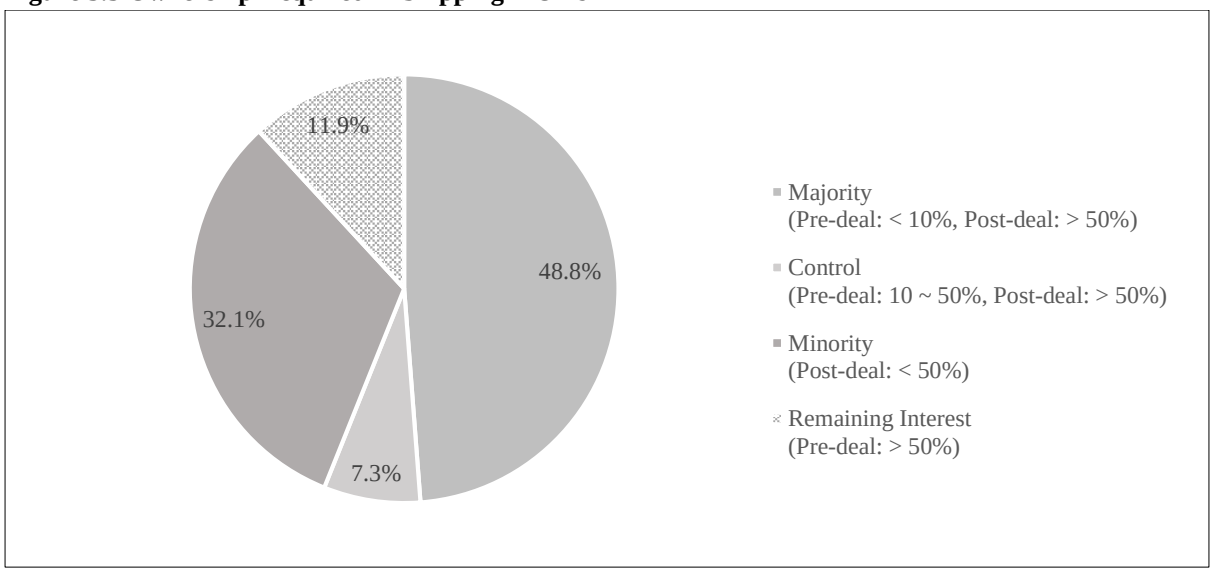
[60] Supply Chain Brain, "Top 25 Third-Party Logistics Providers Extend Their Global Reach", (http://www.supplychainbrain.com/content/sponsored-channels/kenco-logistic-services-third-party-logistics/single-article-page/article/top-25-third-party-logistics-providers-extend-their-global-reach)

the global economic downturn of 2008. The annual influx of PE funds into the shipping market is estimated at roughly $5 billion and $7 billion in 2013 and 2014, respectively.[61]

3.4. Deal and Firm Characteristics

Based on the segmental distribution of the shipping M&A market discussed in the previous section, this section analyses deal- and firm-specific characteristics of acquiring and target companies. Figure 3.5 provides the sample distribution by the percentage of the target's shares acquired through shipping M&A deals. The percentage of shares acquired is the pre-to-post announcement change in the ownership of the target firm. Transactions are partitioned into four groups: (1) majority, where the acquirer owns less than 10% of the target's share prior to the announcement of the deal and seeks to acquire more than 50% after its completion; (2) control, where the acquirer owns between 10% and 50% prior to the acquisition announcement and seeks to acquire more than 50% after the deal; (3) minority stake purchases ('minority'), where the acquirer owns less than 50% after the deal; and (4) acquisition of remaining interest ('remaining interest'), where the acquirer owns more than 50% prior to the announcement. In over half of the transactions (56%), acquirers seek to gain a controlling stake in the target companies.

Figure 3.5 Ownership Acquired in Shipping M&As



[61] The estimated figures are from Bloomberg for 2013 and Hellenic Shipping News for 2014, respectively.
(http://www.bloomberg.com/news/articles/2014-02-18/private-equity-funds-bet-5-billion-on-shipping-rebound-freight)
(http://www.hellenicshippingnews.com/private-equity-funds-pour-at-least-7-billion-into-shipping-in-2014/)

Table 3.4 presents firm- and deal-specific statistics for the sample of 2,261 M&A transactions in the shipping industry. Deals are partitioned according to target segments, and all monetary values are reported in 2014 dollars. Since a large fraction (44%) of the sample consists of deals of post-announcement target ownership less than 50% or acquisitions of remaining interest (see Figure 3.5 above), I also report descriptive statistics for the sub-sample of deals of post-announcement ownership over 50% (i.e. majority and control groups in Figure 3.5) separately in Panel B, which ensures that this chapter's analysis satisfies the criterion that most M&A studies employ.[62]

3.4.1. Size-Related Factors

In the overall sample, the largest deals are carried out in the passenger ship-owning group with an average transaction value of $320 million, followed by the liner and diversified ship-owning groups and port with an average of $286 million, $284 million and $282 million, respectively (see Panel A of Table 3.4). The smallest group is logistics with an average deal value of $61 million. However, in the majority and control subsample (M&C henceforth), the largest deals occurred in the diversified ship-owning segment with an average deal value of $684 million, followed by port, passenger and liner (see Panel B of Table 3.4). The largest bidder in terms of market size (market capitalisation measured four weeks prior to the acquisition announcement) and total assets (at the year-end prior to the announcement) is the acquiring group 'other'. This is corroborated by the fact that the 'other' group mainly consists of conglomerates and financial institutions (banks, PE firms and investment holdings), which are generally much larger than shipping other ancillary service firms.

On average, acquirers are approximately five times as large as targets in terms of market capitalisation measured four weeks prior to the deal announcement. The size gap between acquirers and targets becomes as much as roughly seven times wider in terms of total assets measured at the end of year prior to the transaction announcement. The findings for the average sizes of acquirers and targets are similar in the M&C subsample. However, the size

[62] Nonetheless, it does not necessarily mean that deals of post-announcement ownership over targets less than 50% and acquisitions of remaining interest do not have any impact of business of combined entities or additional value created through shipping M&As. For example, an acquirers can gain an effectively controlling interest in a target with 30% ~ 50% of ownership in case target's bylaw requires a majority of votes, rather than a majority of shares outstanding, for approval of important managerial decisions (DePamphilis, 2009).

Table 3.4 Summary Statistics for Deal- and Firm-Specific Factors in Shipping M&As

The sample includes all shipping M&As in the Thomson-Reuters SDC between 1990 and 2014 that satisfy the same criteria described in the previous section. Statistics are reported for the entire sample and target segments. All monetary values are in millions of 2014 dollars. DEAL VALUE is the transaction value. ACQUIRER SIZE (TARGET SIZE) is the market capitalisations of the acquirer (target) four weeks prior to the transaction announcement. ACQUIRER ASSETS (TARGET ASSETS) are from the year-end prior to the deal announcement. ACQUIRER MTB (TARGET MTB) is the market-to-book ratio of the acquirer (target) four weeks prior to the deal announcement and winsorised at the top and bottom 1% levels. RELATIVE SIZE is the target-to-acquirer relative market value four weeks prior to the deal announcement (winsorised at the top and bottom 1% levels). TARGET SIZE/DEAL VALUE is the target market capitalisation over the transaction value four weeks prior to the deal announcement (winsorised at the top and bottom 1% levels). PREMIUM is the offer price over the target's share price four weeks prior to the deal announcement for observations with values between zero and two. Values beyond the range [0, 2] are winsorised. CROSS-BORDER is the share of transactions where the acquirer and target are located in different domiciles. PUBLIC TARGET is the share of publicly listed targets. ALL CASH is the percentage of deals financed with pure cash. ALL STOCK includes pure stock transactions, and MIXED/OTHERS comprises all remaining others. It should be noted that statistics for financing mix are based on a sample of 815 deals with the complete method of payment data. M&C (majority and control) groups include the deals of post-announcement target ownership over 50%.

			Ship-Owning Target										Shipping Services Target							Others Target	
		All	All Ship-Owning Target	Tramp Target	Liner Target	Diversified Target	Offshore Target	Passenger Target	Other Ship-Owning Target	Intra-Segment Deal	Shipping Services Acquirer	Others Acquirer	All Shipping Services Target	Port Target	Logistics Target	Other Shipping Services Target	Intra-Segment Deal	Ship-Owning Acquirer	Others Acquirer	Ship-Owning Acquirer	Shipping Services Acquirer
Panel A: All Sample																					
Observations		2,261	1,118	391	118	124	216	156	113	672	54	392	904	386	282	236	458	222	224	140	99
Deal	Mean	180.4	211.6	195.3	286.3	283.6	140.0	320.8	97.9	252.2	132.8	152.1	166.2	281.9	61.3	80.4	192.1	61.1	211.6	62.9	90.5
Value	Median	24.4	39.8	39.4	31.6	38.6	50.9	53.3	18.1	51.3	45.4	26.5	15.4	33.6	9.6	9.1	17.5	11.2	14.7	13.3	15.4
($ mil.)	N	1365	717	242	60	86	151	109	69	433	36	248	505	228	137	140	258	119	128	81	62
Acquirer	Mean	2,836.2	2,642.3	3,282.2	2,672.2	1,776.9	1,272.9	5,316.0	2,627.5	1,768.4	4,157.5	4,864.9	3,219.5	5,105.6	2,472.1	1,447.6	2,977.5	2,169.8	5,399.1	2,285.2	1,602.3
Size	Median	478.2	422.0	308.9	882.3	958.3	261.7	622.7	385.7	477.2	400.0	254.2	605.2	1,352.8	329.1	306.5	648.5	296.6	1,055.0	335.7	332.7
($ mil.)	N	905	367	114	40	30	107	37	39	260	15	92	430	173	126	131	227	120	83	58	50
Target	Mean	549.0	579.9	698.1	619.6	856.9	367.7	431.9	139.6	516.7	425.6	657.4	415.3	583.7	171.6	211.4	458.0	363.2	394.9	624.0	928.4
Size	Median	155.1	177.4	125.7	164.5	325.2	265.3	157.0	70.8	190.7	108.2	164.8	117.5	169.5	86.8	29.1	83.5	196.1	128.7	87.9	50.4
($ mil.)	N	539	370	128	23	65	75	57	22	184	12	174	133	77	39	17	48	10	75	24	12
Acquirer	Mean	7,411.2	9,561.9	12,642.9	7,637.1	8,429.2	7,546.5	13,284.6	3,886.9	3,688.5	4,036.1	30,561.9	6,573.8	8,949.5	5,460.5	4,399.5	3,804.0	3,760.9	19,267.1	3,757.5	1,240.4
Assets	Median	894.5	916.0	778.7	1,348.2	2,770.7	643.1	1,801.7	829.7	906.8	499.4	1,036.4	967.7	1,775.8	1,056.3	468.5	686.5	1,048.1	2,371.7	935.4	487.8
($ mil.)	N	1431	615	200	82	39	145	77	72	449	32	134	656	268	195	193	360	178	118	85	75
Target	Mean	995.9	1,007.7	777.1	1,593.4	2,202.8	612.0	1,033.8	309.4	939.3	1,204.8	1,065.8	496.1	649.8	373.4	230.3	565.5	525.2	412.0	3,667.7	655.0
Assets	Median	300.5	442.4	413.7	798.4	1,499.1	329.1	687.1	145.1	447.7	279.7	520.8	143.6	176.4	122.9	19.6	110.0	240.0	148.6	176.3	93.5
($ mil.)	N	895	570	203	36	85	104	89	53	288	24	258	255	137	72	46	116	32	107	48	22
Relative	Mean	0.90	0.88	0.39	0.25	1.81	1.20	1.04	0.27	0.89	0.29	0.90	1.21	1.71	1.34	0.27	0.20	3.32	0.10	0.56	0.04
Size	Median	0.24	0.33	0.24	0.25	2.55	0.50	0.07	0.02	0.37	0.29	0.19	0.10	0.09	0.10	0.25	0.17	0.17	0.08	0.47	0.04
	N	119	89	27	8	11	25	14	4	63	2	24	21	7	9	5	7	7	7	6	3
Target Size	Mean	15.62	18.97	21.95	5.51	24.24	23.80	8.01	14.98	17.54	7.06	21.77	8.16	5.62	15.47	2.06	4.91	12.85	9.93	8.00	7.63
/Deal Value	Median	2.77	2.84	2.02	1.86	6.32	3.69	1.87	10.30	2.10	1.48	5.25	2.26	2.18	4.20	0.82	1.98	4.40	2.19	3.38	5.36
	N	432	299	97	20	53	63	49	17	160	11	128	103	56	32	15	41	8	54	20	10
Premium	Mean	27.6%	24.9%	21.9%	35.4%	18.4%	23.8%	34.6%	23.1%	25.3%	45.2%	22.1%	34.0%	36.8%	26.9%	40.8%	35.7%	13.5%	36.0%	29.5%	49.4%
	Median	14.7%	12.3%	11.3%	17.7%	5.1%	13.7%	28.8%	3.8%	14.1%	32.3%	9.0%	23.1%	26.3%	13.1%	36.9%	30.9%	10.3%	18.6%	28.7%	30.0%
	N	357	256	85	17	39	57	42	16	138	11	107	82	42	28	12	31	7	44	12	7
Acquirer	Mean	3.45	2.83	1.84	2.31	2.30	3.34	3.50	4.06	2.88	2.62	2.71	3.82	3.45	4.98	3.23	4.96	2.04	3.23	4.15	4.00
MTB	Median	1.73	1.64	1.24	1.47	1.48	1.67	2.32	2.86	1.52	2.59	1.73	1.84	1.63	1.92	1.97	2.52	0.99	1.48	1.61	1.76
	N	965	390	114	39	29	118	43	47	282	17	91	460	186	132	142	245	129	86	56	59
Target	Mean	2.02	1.94	1.85	2.07	1.40	1.67	3.50	1.16	2.01	0.91	2.08	2.29	2.57	1.76	2.20	1.89	1.83	2.63	1.83	1.44
MTB	Median	1.07	1.00	0.97	1.15	0.77	1.07	1.19	0.69	1.15	0.65	0.86	1.32	1.46	1.09	1.01	1.26	1.77	1.34	1.16	0.22
	N	479	327	115	19	59	67	47	20	162	10	155	124	74	37	13	47	9	68	23	5
Cross-Border		36.7%	38.7%	41.2%	49.2%	36.3%	41.7%	28.8%	30.1%	44.5%	35.2%	29.3%	35.5%	31.3%	39.0%	38.1%	40.2%	37.8%	23.7%	29.3%	34.3%
All Cash		65.8%	65.8%	67.3%	64.5%	78.0%	62.2%	65.5%	55.0%	61.0%	45.0%	78.1%	66.2%	71.8%	66.7%	59.4%	57.9%	74.6%	74.7%	62.8%	65.2%
All Stock		12.0%	12.0%	16.0%	16.1%	12.0%	10.2%	5.5%	7.5%	13.9%	20.0%	7.3%	11.9%	12.8%	19.0%	5.0%	13.8%	9.0%	10.8%	18.6%	6.5%
Mixed/Others		22.2%	22.2%	16.7%	19.4%	10.0%	27.6%	29.1%	37.5%	25.1%	35.0%	14.6%	21.9%	15.4%	14.3%	35.6%	28.3%	16.4%	14.5%	18.6%	28.3%
Public Target		39.1%	54.8%	58.1%	33.9%	79.0%	49.1%	59.6%	43.4%	44.6%	48.1%	73.2%	23.2%	30.6%	23.4%	11.0%	17.0%	10.8%	48.2%	32.9%	16.2%

			Ship-Owning Target										Shipping Services Target							Others Target	
		All	All Ship-Owning Target	Tramp Target	Liner Target	Diversified Target	Offshore Target	Passenger Target	Other Ship-Owning Target	Intra-Segment Deal	Shipping Services Acquirer	Others Acquirer	All Shipping Services Target	Port Target	Logistics Target	Other Shipping Services Target	Intra-Segment Deal	Ship-Owning Acquirer	Others Acquirer	Ship-Owning Acquirer	Shipping Services Acquirer
Panel B: Majority and Control																					
Observations		1,269	570	189	73	42	119	87	60	392	32	146	554	194	188	172	322	134	98	73	72
Deal	Mean	264.8	326.0	290.0	417.1	684.6	186.1	476.4	164.9	383.9	175.2	214.4	236.9	472.9	78.2	101.5	239.8	79.3	415.2	71.9	109.2
Value	Median	41.6	86.8	94.9	52.3	136.7	82.8	94.5	63.2	94.0	92.6	58.6	19.4	81.5	12.0	11.9	18.3	15.2	71.4	15.0	14.5
($ mil.)	N	766	376	128	37	26	83	64	38	253	24	99	306	117	87	102	179	69	58	38	46
Acquirer	Mean	2,424.9	2,079.3	1,617.3	1,921.9	2,071.6	884.6	7,647.1	2,361.3	1,888.1	5,656.9	2,041.4	2,973.2	5,451.7	1,759.2	1,589.7	2,944.9	1,808.0	4,809.7	824.8	1,772.0
Size	Median	414.2	314.3	259.9	557.7	1,072.9	195.6	622.7	597.5	464.7	387.1	125.2	594.7	1,372.5	184.4	336.9	680.2	292.1	1,033.4	252.4	319.1
($ mil.)	N	621	242	78	30	11	71	21	31	176	10	56	304	105	89	110	169	81	54	36	39
Target	Mean	480.2	458.4	348.6	762.2	669.0	377.4	546.6	121.0	550.6	118.0	325.5	649.4	943.5	121.9	347.3	784.6	150.9	610.3	197.4	31.8
Size	Median	164.5	181.3	117.7	267.0	216.1	269.9	215.9	65.0	215.9	108.2	170.1	132.3	186.7	55.6	159.4	131.5	153.3	132.3	79.1	28.1
($ mil.)	N	221	155	57	13	22	29	27	7	97	6	52	51	30	11	10	22	4	25	9	6
Acquirer	Mean	4,908.0	4,969.9	3,907.3	6,309.9	6,696.6	2,551.6	12,131.2	3,524.7	3,463.2	4,884.7	11,042.6	5,513.6	8,399.4	2,536.6	5,296.7	3,504.5	3,361.6	17,043.8	2,783.4	1,312.3
Assets	Median	737.8	754.6	585.3	1,231.7	2,418.1	472.9	2,049.1	879.1	879.2	388.8	272.9	800.5	1,510.5	820.0	507.0	586.1	1,031.4	2,257.6	850.8	444.9
($ mil.)	N	934	382	124	58	17	92	44	47	289	21	72	450	156	140	154	266	116	68	48	54
Target	Mean	718.8	892.0	734.8	1,649.7	1,645.9	453.5	1,112.7	326.6	1,051.6	236.2	675.2	506.9	784.8	173.3	318.9	571.7	133.2	503.7	320.8	250.3
Assets	Median	239.1	391.5	357.3	844.2	1,354.0	248.1	598.1	126.9	469.5	75.7	384.1	102.6	163.5	54.6	43.2	92.5	86.8	149.9	68.6	37.3
($ mil.)	N	364	217	82	15	25	39	40	16	139	12	66	118	57	30	31	71	12	35	14	15
Relative	Mean	0.62	0.74	0.32	0.20	1.18	1.90	0.10	0.35	0.62	0.42	1.81	0.19	0.11	-	0.27	0.29	0.15	0.13	0.30	0.04
Size	Median	0.24	0.26	0.25	0.11	0.53	0.63	0.02	0.04	0.26	0.42	0.14	0.20	0.05	-	0.25	0.25	0.17	0.14	0.30	0.04
	N	59	46	16	5	3	12	7	3	40	1	5	10	5	-	5	3	3	4	2	1
Target Size	Mean	5.44	7.04	1.48	2.38	11.98	24.33	1.45	0.95	4.05	1.08	14.07	1.76	1.42	3.14	1.12	2.51	1.78	1.04	2.16	2.38
/Deal Value	Median	1.04	1.11	1.05	0.78	1.11	1.71	1.16	0.98	1.14	1.13	0.99	0.89	0.92	1.41	0.79	0.90	0.78	0.92	1.20	1.23
	N	200	138	52	12	18	25	26	5	89	6	43	47	26	11	10	21	4	22	9	6
Premium	Mean	34.3%	33.2%	28.3%	58.3%	16.1%	32.2%	45.7%	26.3%	33.4%	39.1%	31.8%	36.2%	40.8%	24.6%	35.9%	36.7%	22.5%	38.5%	30.0%	53.7%
	Median	26.6%	24.8%	18.2%	23.7%	12.8%	21.1%	37.0%	26.1%	24.2%	38.1%	18.0%	31.5%	34.4%	14.8%	35.9%	35.5%	17.8%	26.4%	23.8%	30.0%
	N	180	127	49	10	16	23	25	4	82	6	39	41	23	9	9	18	4	19	7	5
Acquirer	Mean	3.76	2.90	1.78	2.41	3.31	3.91	3.16	3.28	2.91	2.97	2.87	4.26	3.93	5.68	3.41	5.83	2.14	2.53	5.02	4.11
MTB	Median	1.88	1.69	1.26	1.47	2.33	2.18	2.57	2.31	1.66	2.65	1.71	1.99	1.68	2.21	2.03	2.84	0.92	1.28	1.99	1.76
	N	653	256	77	31	13	77	23	35	194	10	52	318	105	95	118	177	87	54	34	45
Target	Mean	2.36	2.16	1.96	2.97	1.16	1.14	4.54	1.10	2.28	1.25	2.02	2.99	3.68	1.44	2.51	2.64	1.77	3.46	2.17	2.35
MTB	Median	1.21	1.09	1.27	1.15	0.77	0.90	1.21	0.66	1.10	0.65	1.00	1.57	1.59	1.68	1.40	1.57	1.77	1.35	1.12	1.72
	N	189	133	53	11	19	23	21	6	82	4	47	46	28	10	8	20	3	23	7	3
Cross-Border		36.7%	38.6%	42.3%	46.6%	35.7%	41.2%	28.7%	28.3%	43.4%	31.3%	27.4%	36.8%	29.9%	42.0%	39.0%	41.9%	31.3%	27.6%	27.4%	30.6%
All Cash		54.8%	53.1%	54.5%	62.5%	68.4%	45.2%	58.3%	40.7%	50.8%	41.2%	63.3%	54.9%	62.5%	50.0%	52.0%	49.6%	61.1%	64.3%	52.0%	66.7%
All Stock		15.4%	16.8%	22.7%	20.8%	21.1%	16.1%	5.6%	7.4%	16.8%	23.5%	15.0%	14.5%	12.5%	29.6%	5.3%	15.7%	11.1%	14.3%	24.0%	5.1%
Mixed/Others		29.8%	30.1%	22.7%	16.7%	10.5%	38.7%	36.1%	51.9%	32.4%	35.3%	21.7%	30.6%	25.0%	20.4%	42.7%	34.8%	27.8%	21.4%	24.0%	28.2%
Public Target		24.4%	38.4%	41.8%	20.5%	66.7%	34.5%	50.6%	20.0%	35.5%	40.6%	45.9%	12.1%	18.0%	10.1%	7.6%	10.2%	4.5%	28.6%	20.5%	12.5%

gap between acquirers and targets is considerably reduced when it comes to the acquisitions of publicly listed targets, which take a proportion of 39.1% (24.4%) in the overall sample (the M&C sample). Specifically, the relative size measured using the ratio of target-to-acquirer market capitalisations four weeks prior to the deal announcement is 0.90 in the overall sample, which indicates that acquiring and target companies are similar in market size when both of them are publicly listed. The increased relative market size in the subsample of both publicly listed acquirers and targets appears to be driven primarily by two types of transactions: intra-segmental (or horizontal) deals within the ship-owning segment and acquisitions of ship-owning targets by 'other' acquirers.

3.4.2. Acquisition Premium

Premium is the offer price over the target's share price four weeks prior to the deal announcement with values between zero and two. Values beyond the range [0, 2] are winsorised as in Officer (2003). In shipping M&As, premium is generally higher in acquiring shipping service targets (34.0%) and lower in acquisitions of ship-owning targets (24.9%) when compared with the average of all transactions.

In order to detect variations in the premium offered by target segments, *t*-tests for mean differences are performed, the results of which are presented in Table 3.5. The first two columns indicate the mean differences between the sample average and target segments for the overall sample and the M&C subsample, respectively. The third column provides the mean difference between the overall sample and the M&C sample by target segments. The average premium offered in the M&C subsample is higher than that in the overall sample by 6.7%, and the difference is significant at the 5% level. This is quite reasonable from the perspective that the premium can be considered the price at which the acquirer gains control over the target (i.e. over 50% of ownership). In the overall sample, the tramp and diversified ship-owning targets receive a significantly lower premium than the sample average, while the port targets are paid with a significantly higher premium. Although the direction of the sign remains unchanged in the M&C subsample, the magnitude and statistical significance vary across target segments. In the M&C subsample, the diversified ship-owning targets are paid with a significantly lower premium than the subsample average, while the line and passenger ship-owning targets gain a significantly higher premium.

Table 3.5 Mean Difference in Premium Offered by Target Segments

This table presents mean differences in the premium offered by target segments. The first two columns report the mean difference between the sample average and target segments for the overall sample and the M&C subsample, respectively. The third column provides the mean difference between the overall sample and the M&C subsample by target segments. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Target Segment		Mean Difference (Segment - Average)		Mean Difference (M&C - All)
		All Sample	M&C Sample	
All		-	-	6.7% **
Ship-Owning Target	All Ship-Owning Target	-2.7%	-1.1%	8.3% **
	Tramp Target	-5.7% *	-6.0%	6.3%
	Liner Target	7.8%	24.0% *	22.9%
	Diversified Target	-9.2% *	-18.2% ***	-2.2%
	Offshore Target	-3.8%	-2.1%	8.4%
	Passenger Target	7.0%	11.4% *	11.1%
	Other Ship-Owning Target	-4.5%	-8.0%	3.2%
	Intra-Segment	-2.3%	-0.9%	8.1% *
	Shipping Services Acquirer	17.6%	4.8%	-6.1%
	Others Acquirer	-5.4%	-2.5%	9.6%
Shipping Services Target	All Shipping Service Target	6.4%	1.9%	2.1%
	Port Target	9.2% *	6.5%	4.0%
	Logistics Target	-0.7%	-9.7%	-2.3%
	Other Shipping Services Target	13.2%	1.6%	-4.9%
	Intra-Segment	8.1%	2.4%	0.9%
	Ship-Owning Acquirer	-14.1% **	-11.8%	9.0%
	Others Acquirer	8.4%	4.2%	2.5%
Others Target	Ship-Owning Acquirer	1.9%	-4.4%	0.5%
	Shipping Service Acquirer	21.8%	19.4%	4.2%

3.4.3. Market Valuation

Firm over-valuation is measured using the MTB ratio, which is the market value over the book value of shares four weeks prior to the acquisition announcement and winsorised at the top and bottom 1% levels. It appears that acquirers are generally more highly valued with the average MTB ratio of 3.45 than targets with 2.02 in the overall sample despite the exceptions in the tramp and passenger ship-owning targets. A similar observation of MTB differential is also found in the M&C subsample. The average MTB of acquirers is 3.76, much higher than that of targets with 2.36, with exceptions in the tramp, liner and passenger ship-owning targets.

Table 3.6 reports MTB differentials between acquiring and target firms over the sample period. It is evident that both acquirer and target MTBs fluctuate over time. The acquirer MTB peaks at 4.80 in the first half of the 2000s, while the target MTB peaks at 2.56 in the second half of the 2000s. Dong *et al.* (2006) find that the MTB differential between acquirers and targets affects the choice of payment method. The smallest MTB differential between acquirers and targets is 0.88 during the 2004-2009 period. Regardless of post-announcement ownership over

the target, the MTB differential between constituent firms over the sample period is similar in the M&C sample.

Table 3.6 Valuation Differentials by Year of Announcement

An MTB (T MTB) is the market-to-book ratio of the acquirer (target) four weeks prior to the deal announcement and winsorised at the top and bottom 1% levels. M&C means a subsample consisting of deals with post-announcement target ownership over 50%. Panel A reports MTBs for all deals in the overall sample. Panel B reports MTBs for a subsample of deals where both acquirer and target are publicly listed companies. The statistical significance is obtained using *t*-tests for means and Wilcoxon tests for medians. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

			All	1990–1994	1995–1999	2000–2004	2005–2009	2010–2014
Panel A: All Sample								
All	A MTB	Mean	3.45	3.70	3.90	4.80	3.45	2.66
		Median	1.73	2.27	2.39	1.88	1.92	1.36
		N	965	20	43	184	371	347
	T MTB	Mean	2.02	2.12	1.55	2.00	2.56	1.65
		Median	1.07	1.27	1.00	0.79	1.35	1.00
		N	479	19	53	89	156	162
	A MTB - T MTB	(Mean)	1.43***	1.58*	2.35***	2.80***	0.88**	1.01***
		(Median)	0.65***	1.00**	1.39***	1.09***	0.57***	0.36***
M&C	A MTB	Mean	3.76	3.95	4.97	5.61	3.81	2.69
		Median	1.88	2.31	2.67	2.18	1.93	1.63
		N	653	16	24	115	257	241
	T MTB	Mean	2.36	4.32	1.59	2.02	3.35	1.74
		Median	1.21	1.99	1.13	0.81	1.51	1.00
		N	189	4	22	46	61	56
	A MTB - T MTB	(Mean)	1.39***	-0.38	3.38***	3.60***	0.46	0.95***
		(Median)	0.68***	0.32	1.54***	1.36***	0.42	0.63***
Panel B: Public Acquirer and Target Sample								
All	A MTB	Mean	2.47	1.33	2.49	2.31	2.50	2.74
		Median	1.44	1.20	2.36	2.02	1.35	1.19
		N	141	6	11	28	59	37
	T MTB	Mean	2.11	2.77	1.86	2.05	2.68	1.20
		Median	1.23	1.68	1.17	0.99	1.33	1.11
		N	146	8	26	31	52	29
	A MTB - T MTB	(Mean)	0.36	-1.44	0.63	0.26	-0.18	1.54*
		(Median)	0.22**	-0.47	1.19*	1.03**	0.02	0.08
M&C	A MTB	Mean	2.41	1.56	2.60	2.39	2.84	1.78
		Median	1.55	1.51	2.13	2.32	1.38	1.10
		N	66	4	6	15	27	14
	T MTB	Mean	2.65	4.32	1.80	2.21	4.28	0.90
		Median	1.18	1.99	0.69	0.82	1.70	0.74
		N	72	4	15	21	21	11
	A MTB - T MTB	(Mean)	-0.23	-2.76	0.79	0.18	-1.43	0.88*
		(Median)	0.37**	-0.48	1.44	1.50*	-0.32	0.36

The higher acquirer MTB than that of the target is generally consistent with the theoretical prediction of the mis-valuation hypothesis. According to Shleifer and Vishny (2003), acquisitions are largely driven by efforts of over-valued acquirers to buy targets at a price below fundamental value or less over-valued than themselves. However, since the current sample includes both public and unlisted acquiring and target firms, the above results might not correspond to the findings in the previous studies using transactions of only publicly listed acquirers and targets. For the sake of comparison, I thus report MTB statistics for a subsample that consists of deals where both acquirer and target are publicly listed companies in the shipping M&As (see Panel B of Table 3.6). Strikingly, although acquirer MTBs are slightly higher than target MTBs, the acquirer-target valuation differentials by period are not significant if post-announcement target ownership (overall sample) is not considered. More compelling is that target MTB is numerically higher than acquirer MTB in the M&C group, despite no statistical significance. The only exception is the 2010–2014 period when the average MTBs of acquirers and targets are 2.74 and 1.20 in the overall sample, respectively. Similar MTB differentials are found in the M&C subsample.

3.4.4. Nationality Mix and Geographical Distribution

Consistent with the international nature of the shipping industry, cross-border deals constitute 37% of M&As in the sample. Despite a similar proportion of cross-border deals (39.6%) in the maritime transport M&As during 1995–2000, Brooks and Ritchie (2006) conclude that shipping does not significantly differ from other industries in terms of the nationality mix of acquiring and target firms for the reason that domestic deals take the majority of the sample. However, I find cross-border deals to constitute 29% of all 393,106 M&A transactions in Thomson-Reuters SDC that satisfy the same criteria as the sample in this chapter (i.e. after excluding transactions by both non-public acquirer and target). Similarly, Conn *et al.* (2005) report that the proportion of cross-borders deals is 26% on a global scale during 1986–2000. As such, evidence in this section apparently supports that inter-border transactions are more widespread in the shipping industry than others.

Table 3.7 reports the regional distribution of shipping M&A activity through the sample period. In addition to the relatively high share of cross-border deals, another particularly interesting observation in the regional distribution is that North America is not a major M&A market in shipping. The proportion of intra-North American deals reaches only 6.2% in shipping M&A

activity. This is in sharp contrast with findings in other M&A studies. For example, approximately 61% of all publicly listed targets are from either the US or Canada in Alexandridis *et al.* (2010), who investigate the association between the level of competition and abnormal returns from M&As around the world.[63] Similarly, intra-North America transactions (the US and Canada) constitute 33.3% of all M&A transactions in Thomson-Reuters SDC that satisfy the same criteria as the sample in this paper, confirming the unique feature in the geographical spreading of shipping M&A activity. Instead, intra-European deals comprise 36.4% of the global shipping M&A activity, even though their contribution has been shrinking from 48.8% in the 1990–1994 period to 29.4% in the 2010–2014 period. On the other hand, the share of deal activity in Southeast and East Asia combined has grown significantly from 14.1% to 39.1% during the sample period. China (including Hong Kong), Singapore, Malaysia and Japan are the most particular contributors of shipping M&A activity in the Asian region (untabulated). Alexandrou *et al.* (2014) report a fairly similar regional distribution of shipping M&A activity during 1984–2011, but without presenting annual development.

Table 3.7 Regional Distribution (number of deals)

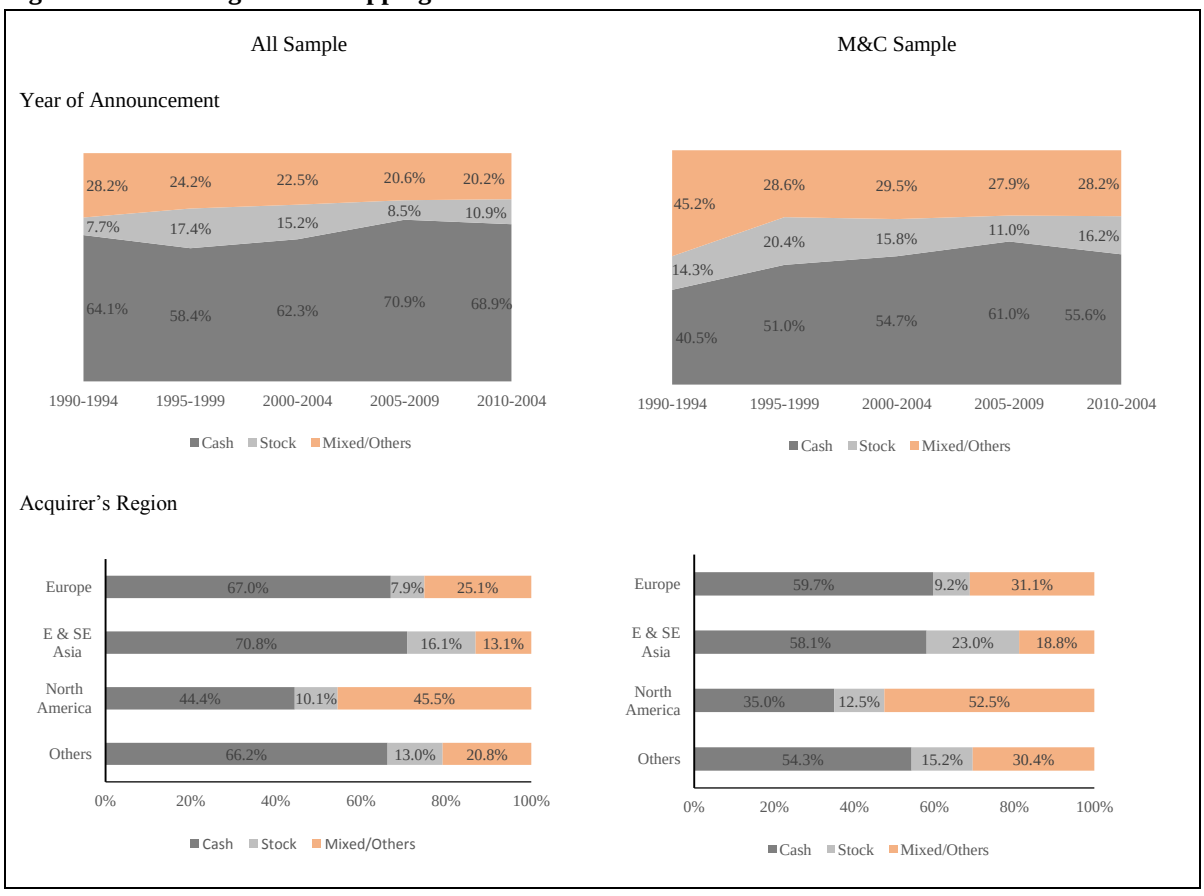
	All	1990 –1994	1995 –1999	2000 –2004	2005 –2009	2010 –2014
All	2,261	240	455	413	582	571
Domestic	1,432	148	266	249	363	406
	(63.3%)	(61.7%)	(58.5%)	(60.3%)	(62.4%)	(71.1%)
Cross-Border	829	92	189	164	219	165
	(36.7%)	(38.3%)	(41.5%)	(39.7%)	(37.6%)	(28.9%)
Inter-Region	469	57	108	90	116	98
	(20.7%)	(23.8%)	(23.7%)	(21.8%)	(19.9%)	(17.2%)
Europe	823	117	187	149	202	168
	(36.4%)	(48.8%)	(41.1%)	(36.1%)	(34.7%)	(29.4%)
Southeast Asia	361	20	56	74	102	109
	(16.0%)	(8.3%)	(12.3%)	(17.9%)	(17.5%)	(19.1%)
East Asia	286	14	35	46	77	114
	(12.6%)	(5.8%)	(7.7%)	(11.1%)	(13.2%)	(20.0%)
North America	140	23	32	18	36	31
	(6.2%)	(9.6%)	(7.0%)	(4.4%)	(6.2%)	(5.4%)
Oceania	7	6	22	12	20	10
	(3.1%)	(2.5%)	(4.8%)	(2.9%)	(3.4%)	(1.8%)
Central & South America	55	3	7	10	9	26
	(2.4%)	(1.3%)	(1.5%)	(2.4%)	(1.5%)	(4.6%)
South Asia	23	0	1	8	11	3
	(1.0%)	(0.0%)	(0.2%)	(1.9%)	(1.9%)	(0.5%)
Africa	20	0	3	4	6	7
	(0.9%)	(0.0%)	(0.7%)	(1.0%)	(1.0%)	(1.2%)
Middle East	14	0	4	2	3	5
	(0.6%)	(0.0%)	(0.9%)	(0.5%)	(0.5%)	(0.9%)

[63] It should be noted that the sample of Alexandridis et al. (2010) includes only domestic transactions. Thus, the share of North American deals in their study is not directly comparable to the finding in this section since the North American group in this sample includes M&A transactions between the countries, which are not domestic deals.

3.4.5. Method of Payment

Concerning the method of payment, 65.8% of a sample of 815 shipping M&A transactions with complete payment data is purely cash-paid (see Table 3.4).[64] Despite a slightly lower share of cash offers (54.8%) in the M&C sample of 513 deals with complete payment data, cash remains the dominant form of M&A financing in the shipping industry. Figure 3.6 provides detailed information on the financing mix in the shipping M&As grouped by the year of announcement and acquirer's geographical region. It is notable that the proportion of cash-financing M&As in the shipping industry increased during the second half of the 2000s (see the upper part of Figure 3.6). This corroborates this chapter's analysis on the M&A wave over the same period, namely, that the main driver was the availability of abundant liquidity and low-interest financing, as discussed earlier in this chapter. Although the share of cash payment

Figure 3.6 Financing Mix in Shipping M&As



[64] Unfortunately, to the best knowledge of author, there is no comparable literature documenting the distribution of the method of payment in shipping M&As and explaining the reasons for the remarkable share of cash-paid deals. Although Andreou *et al.* (2012) and Alexandrou *et al.* (2014) investigate the value creation effect in shipping M&A according to the method of payment, both studies fail to describe the comprehensive distribution of financing mix. While the sample in Andreou *et al.* (2012) includes deals by US-listed companies only and consists of different modes of transportation, Alexandrou *et al.* (2014) do not provide the number of observations for each financing source.

marginally contracted due to credit crunch after the financial crisis and subsequent collapse in the shipping market in 2008, cash financing is still prevalent in shipping M&As. While the popularity of cash payment in shipping M&A financing is also noticeable in most regions, the only exception is the North American region, where the share of cash financing is much lower than other regions (see the lower part of Figure 3.6).[65] This can be attributed to the market-oriented financial system in the US and Canada, where stock markets play a major role in allocating capital and exerting corporate control.

3.5. Determinants of Acquisition Premium

This chapter's initial analysis on deal and firm characteristics reveals several unique features in shipping M&A activity, such as a relatively common occurrence of cross-border deals, geographical divergence of acquirer and targets other than the North America region and the prevalence of cash offers, as well as variations among segments within the shipping industry. On top of that, I further explore potential associations between deal- and firm-specific factors, as earlier studies on M&As have found that those factors are not independent, but inter-related. In this section, I first investigate the determinants of premiums in shipping M&A deals.

The takeover premium is the difference between the offer price and target value prior to the deal announcement. Since offer price is determined in negotiation between constituent firms, it can be viewed that an acquisition premium reflects how much envisaged synergistic gains from M&As are channelled into acquiring and target firms. In this regard, Walkling and Edmister (1985) argue that a premium is positively associated with potential acquisition-related benefits, but negatively with the bargaining power of acquiring firms. Previous literature on M&As has provided evidence concerning the determinants of offer premiums from deal and firm characteristics (e.g. the method of payment, acquirer's public status, horizontal transactions, nationality mix, firm size and firm valuation) to market-wide factors (e.g. stock market runup, competition in the market for corporate takeover). In sharp contrast, there is no relevant empirical evidence on takeover premiums for business consolidation in the shipping industry. Accordingly, this section fills this gap by providing evidence on the determinants of acquisition premiums in shipping M&As.

[65] Financing mix by regions of targets shows only a marginal difference.

3.5.1. Univariate Tests

3.5.1.1. Deal and Firm Characteristics

Previous literature has identified a plethora of driving forces behind variations in takeover premiums. I examine the impact of the method of payment, acquirer's public status, stock market valuation, horizontal deals and nationality mix, the results of which are presented in Table 3.8. Huang and Walkling (1987) document that acquirers pay higher premiums in cash-financed deals than in equity offers, since shareholders of target companies require compensation for the immediate tax liability of capital gains in cash transactions (Ayers *et al.*, 2003). In Panel A of Table 3.8, I compare premiums in shipping M&As in both cash- and stock-financed deals. Although the mean difference is not significant due to the low number of observations in equity offers, it is obvious that acquirers in cash deals are likely to pay heftier premiums than in stock-for-stock exchanges by 12.43% (6.84%) in the M&C sample (the overall sample). Moreover, the median difference based on Wilcoxon tests is statistically significant at conventional levels.

Panel B of Table 3.8 presents premiums by the acquirers' public status. Bargeron *et al.* (2008) find that publicly listed acquirers generally pay a higher premium than private ones, especially when managerial ownership is low. I also test the difference of takeover premiums in shipping M&As between public and non-public acquirers. However, no significant or striking patterns in premiums by acquiring firms' public status are found. The acquisition premium is also affected by stock market valuation. Bouwman *et al.* (2009) report that the average premium is significantly lower when acquisitions take place during booming markets. In light of that, I also classify the sample deals by stock market valuation (high versus others) based on de-trended monthly price-earnings ratio of the S&P500 index.[66] The results reveal that acquiring firms pay lower premiums during high market valuation, but the difference is insignificant for both the mean and median level (see Panel C of Table 3.8).

Officer (2003) find that premiums are generally larger in intra-industry deals than inter-industry transactions. To test the effect of intra-industry acquisitions, deals in the sample are grouped into horizontal, defined as transactions within the ship-owning and shipping services segments, and others. However, the results are mixed, indicating that premiums in horizontal deals are slightly lower in mean difference, but higher in median difference (see Panel D of

[66] For classification of high market valuation, the price-earnings ratio of each month is partitioned into above and below the average of preceding five years. The top half of the above-average are defined as high-valued markets.

Table 3.8). In reporting gains in shipping M&A transactions, Alexandrou *et al.* (2014) argue that insignificant abnormal returns for acquiring firms in cross-border deals are attributable to hefty premiums, as foreign acquirers are seeking access to specific regional markets. However, as seen in Panel E of Table 3.8, there is no significant difference in premiums between cross-border and domestic deals.

Table 3.8 Premium by Deal and Firm Characteristics

This table reports premiums by method of payment, acquirer's public status, market high valuation, horizontal deals and nationality mix. High Valuation indicates that the acquisition is announced within a high-valuation market using a de-trended monthly price-earnings ratio of the S&P500, in line with Bouwman *et al*. (2009). Horizontal includes deals within either ship-owning or shipping services segments. The statistical significance is based on *t*-tests for means and Wilcoxon tests for medians. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

	All Sample			M&C Sample		
Panel A: Method of Payment						
	Cash	Stock	(Cash - Stock)	Cash	Stock	(Cash - Stock)
Mean	27.06	20.22	6.84	33.43	21.00	12.43
Median	15.73	2.71	13.02**	26.67	2.71	23.96***
N	202	21		109	19	
Panel B: Acquirer Public Status						
	Public	Non-Public	(Public - Non-Public)	Public	Non-Public	(Public - Non-Public)
Mean	27.31	27.77	-0.46	36.95	32.28	4.67
Median	13.91	14.81	-0.90	26.52	26.84	-0.32
N	132	225		78	102	
Panel C: High Valuation						
	High	Others	(High - Others)	High	Others	(High - Others)
Mean	26.88	27.98	-1.10	30.67	36.62	-5.95
Median	17.65	12.63	5.02	25.51	27.37	-1.86
N	126	231		70	110	
Panel D: Horizontal Deals						
	Horizontal	Others	(Horizontal - Others)	Horizontal	Others	(Horizontal - Others)
Mean	27.24	27.91	-0.67	34.02	34.67	-0.65
Median	16.88	12.80	4.08	26.71	25.19	1.52
N	169	188		100	80	
Paned E: Nationality Mix						
	Cross-Border	Domestic	(Cross-Border - Domestic)	Cross-Border	Domestic	(Cross-Border - Domestic)
Mean	27.88	27.42	0.46	36.44	32.85	3.59
Median	17.65	14.29	3.36	28.06	26.26	1.80
N	136	221		73	107	

3.5.1.2. Firm Sizes

Furthermore, I examine the size effect in determining acquisition premiums. Moeller *et al.* (2004) find that larger acquirers tend to pay heftier premiums. This is consistent with what the hubris hypothesis explains: overconfident managers are more likely to overpay due to the overestimation of their ability to create synergies from combined entities (Malmendier and Tate, 2008). I also investigate the possible association between acquirer size and premium in shipping M&As. To mitigate time-series fluctuations by the year of announcement, observations of acquirer size, measured using acquirer market capitalisations four weeks prior to the transaction announcement, are ranked into terciles in each year. The results indicate a positive relationship between acquirer size and acquisition premium. The average premium paid by the large acquirer group (large) is 35.8% in the overall sample, which is significantly higher than that paid by the small group (small) by 24.4% (see Table 3.9). The positive association (as well as the significant mean difference) is also observed in the M&C subsample with the increase in the average of premiums for each acquirer size tercile.

However, predictions regarding the association between target size and premium are rather contradictory. In a similar vein to the hubris hypothesis on acquirer size, empire-building managements tend to pay larger premiums for large targets, as they overestimate their ability to run the combined entities. In addition, larger targets are more likely to have bargaining power in negotiating offer prices, resulting in higher premiums. By contrast, given the high value-at-stake involving the acquisition of large-scale targets, for example, post-merger integration is more complex than combining relatively smaller targets, which might lead to elevating uncertainty in synergy realisation. Accordingly, managers of acquiring firms may more deliberately evaluate the intrinsic value of targets, potentially resulting in lower offer prices. In support of this view, Alexandridis *et al.* (2013) document a negative relation between target size and premium: larger targets are acquired at a discount relative to smaller ones. They attribute the negative association between target size and premium to potential post-merger integration complexity. The finding regarding M&As in the shipping industry is consistent with the negative relation between target size and premium in Alexandridis *et al.* (2013). The larger target size, measured using target market capitalisations four weeks prior to the deal announcement, is associated with the lower acquisition premium, as seen in Table 3.9. In each year, targets are ranked into terciles by the amount of market capitalisations. The average premium paid in the top target size tercile (large) is 17.6% (25.2%), and the mean difference

from the bottom tercile (small) is 21.9% (17.3%), with significance at the 1% level in the overall sample (M&C sample).

Table 3.9 Premium by Acquirer and Target Size
A Size (T Size) is the market capitalisations of the acquirer (target) four weeks prior to the transaction announcement. In each year, A Size and T Size are ranked into terciles, with Small being the lowest size. Premium is the offer price over the target's share price four weeks prior to the deal announcement for observations with values between zero and two. Values beyond the range [0, 2] are winsorised. The statistical significance is obtained using t-tests for means and Wilcoxon tests for medians. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

		All Sample				M&C Sample			
		Small	Medium	Large	(Large - Small)	Small	Medium	Large	(Large - Small)
A Size	Mean	69.99	586.96	7,866.62	7,796.63***	69.14	518.32	6,687.20	6,618.05***
	Median	55.54	478.20	3,813.70	3,758.15***	53.69	414.15	3,094.37	3,040.69***
	N	301	303	301		207	207	207	
Premium	Mean	11.36	26.60	35.77	24.41***	21.11	44.38	39.59	18.48*
	Median	4.01	14.68	22.89	18.89*	9.20	21.12	28.94	19.74
	N	10	28	44		5	15	30	
T Size	Mean	45.92	216.48	1,377.28	1,331.35***	68.46	240.85	1,137.99	1,069.54***
	Median	32.53	149.59	869.00	836.47***	40.57	131.98	682.96	642.39***
	N	181	177	181		73	75	73	
Premium	Mean	39.50	28.01	17.62	-21.88***	42.51	35.62	25.25	-17.26***
	Median	21.21	15.82	10.34	-10.87**	27.24	28.51	21.61	-5.63
	N	107	124	119		59	59	62	

3.5.1.3. Firm Valuations

Previous literature has provided evidence concerning the relation between valuations and acquisition premiums (Ang and Cheng, 2006; Dong *et al.*, 2006). Specifically, Dong *et al.* (2006) find the association between premium and valuation to depend on the MTBs of acquirer and target: the higher acquirer (target) MTB, the higher (lower) the premium. Table 3.10 presents how the premium is related to the degrees of acquirer and target MTBs. Panel A and Panel B report statistics for the overall sample and the subsample of both publicly listed acquirers and targets, respectively. Since MTBs vary over time, as seen earlier in this chapter (see Table 3.6), acquirer and target MTBs in each year are ranked into terciles. This yearly sorting ensures that the results remain free from potential swings in the time-series.

The findings confirm the negative association between target valuation and acquisition premium. In all four groups partitioned according to public status and post-announcement target ownership, the average premium in the top tercile (large) is higher than that in the bottom tercile (small). The most salient result occurs in the M&C group of the public acquirer and

target subsample (see the right-hand side of Panel B). In this subsample, the mean difference of the premium between the top and bottom terciles of target MTB is 51.1%, and this is significant at the 1% level. The mean differences in the other three groups are also significant at conventional levels. In contrast, the relation between acquirer MTB and premium in the sample is generally opposed to the findings of Dong *et al.* (2006). Although the mean differences are insignificant in most subsamples, the results is this paper indicate that higher

Table 3.10 Premium by Acquirer and Target MTB Ratios

A MTB (T MTB) is the market-to-book ratio of the acquirer (target) four weeks prior to the deal announcement and winsorised at the top and bottom 1% levels. In each year, MTBs are ranked into terciles, with Small being the lowest tercile. Premium is the offer price over the target's share price four weeks prior to the deal announcement for observations with values between zero and two. Values beyond the range [0, 2] are winsorised. M&C means a subsample consisting of deals with post-announcement target ownership over 50%. Panel A reports MTBs for all deals in the overall sample. Panel B reports MTBs for a subsample of deals where both acquirer and target are publicly listed companies. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

		All Sample				M&C Sample			
		Small	Medium	Large	(Large - Small)	Small	Medium	Large	(Large - Small)
Panel A: Overall Sample									
A MTB	Mean	0.67	1.87	7.78	7.11***	0.71	2.13	8.40	7.69***
	Median	0.63	1.70	4.67	4.05***	0.63	1.80	5.03	4.40***
	N	323	319	323		219	215	219	
Premium	Mean	39.18	17.88	32.03	-7.15	40.75	31.94	38.51	-2.24
	Median	29.71	3.28	12.73	-16.98	29.71	15.70	13.83	-15.88
	N	26	33	24		20	15	13	
T MTB	Mean	0.41	1.11	4.52	4.11***	0.58	1.23	5.23	4.65***
	Median	0.42	1.09	2.36	1.94***	0.54	1.10	2.38	1.83***
	N	161	157	161		64	61	64	
Premium	Mean	31.75	22.96	22.43	-9.31**	40.23	27.46	27.68	-12.54**
	Median	18.05	14.46	14.81	-3.24	32.08	26.26	18.09	-13.99
	N	96	101	104		48	51	50	
Panel B: Public Acquirer and Target Sample									
A MTB	Mean	0.78	2.06	4.60	3.82***	1.10	1.88	4.33	3.23***
	Median	0.67	1.71	3.05	2.38***	0.77	1.72	3.15	2.38***
	N	46	49	46		21	24	21	
Premium	Mean	43.36	17.15	27.39	-15.97	52.27	34.73	22.50	-29.77**
	Median	29.71	3.28	8.87	-20.84	36.03	16.16	11.62	-24.41
	N	26	29	25		17	17	11	
T MTB	Mean	0.53	1.24	4.53	4.01***	0.72	1.49	5.88	5.17***
	Median	0.47	1.27	2.37	1.90***	0.65	1.12	2.25	1.60***
	N	49	48	49		23	26	23	
Premium	Mean	41.93	24.99	13.21	-28.72***	70.14	24.72	19.00	-51.14***
	Median	35.87	6.30	9.61	-26.27***	56.41	26.35	15.7	-40.71***
	N	28	36	34		16	21	21	

acquirer MTB is associated with a lower premium. Specifically, the mean difference in premium between the top and bottom terciles in the M&C group of the public acquirer and target subsample is 29.8% and significant at the 5% level.

3.5.2. Multivariate Tests

The results of the univariate tests indicate that target size and valuation are the two most significant determinants of premiums in shipping M&A transactions. In this section, I test the robustness of the two factors in multivariate regressions by controlling other variables. Table 3.11 illustrates the results of OLS regressions of acquisition premiums in shipping M&As. In regressions (1)–(3), the main explanatory variable is the logarithm of target size (lnTSIZE).[67] In regression (2), I include several indicator variables: CASH, CROSS BORDER, HIVAL, HORIZONTAL and NON-PUBLIC, with a value of one for acquisitions with 100% cash financing, different nationalities of acquirers and targets, occurring during high valuation markets using the de-trended monthly price-earnings ratio of the S&P500 index, within either ship-owning or shipping services segments and by non-publicly listed acquirers, respectively. The coefficient of target size is negative and statistically significant at the 1% level after controlling the dummy variables. The signs of the dummy variable coefficients are largely consistent with the results of univariate tests, with the exception of CASH, but there is no statistical significance. In regression (3), logarithms of acquirer size (lnASIZE) and valuation (lnAMTB) are included. The negative coefficient of target size is still significant at the 5% level. The signs of acquirer size and valuation are consistent with the results of univariate tests, but they are not statistically significant.

The main explanatory variable of regressions (4)–(6) is the logarithm of the target MTB ratio (lnTMTB), and the regression design is the same as regressions (1)–(3). The negative impact of target valuation is statistically significant in all specifications for the overall sample, except in regression (5) where it unexpectedly flips sign. One interesting observation in the group of regressions is that there are positive coefficients of cash deals, and it is significant in regression (6) for the whole sample. Finally, both main explanatory variables of target size and valuation are included in regressions (7)–(9), and the signs of coefficients generally remain unchanged and are significant at conventional levels in the both (all and M&C) samples.

[67] In order to obtain regression residuals being homoscedastic, the independent variables in money term (T SIZE, A SIZE) or market multiples (T MTB, A MTB) are transformed into logarithm.

Table 3.11 Multivariate Regressions of Premium

The table reports OLS regression estimates of acquisition premium on target size, target market-to-book and other characteristics. lnTSIZE (lnASIZE) is the natural logarithm of target (acquirer) market capitalisations four weeks prior to the deal announcement. lnTMTB (lnAMTB) is the natural logarithm of target (acquirer) market-to-book ratio four weeks prior to the deal announcement. CASH, CROSS BORDER, HIVAL, HORIZONTAL and NON-PUBLIC are indicator variables with a value of one for acquisitions with 100% cash financing, different nationalities of acquirers and targets, occurring during a high valuation market using the de-trended monthly price-earnings ratio of the S&P500, within either ship-owning or shipping services segments and by non-public acquirer, respectively. *p* values are reported in brackets. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: All Sample									
lnTSIZE	-9.289***	-9.811***	-7.973**				-6.656***	-6.534***	-5.694*
	(0.000)	(0.000)	(0.018)				(0.000)	(0.000)	(0.065)
lnTMTB				-5.008***	1.449***	-21.549***	-3.263**	-3.349**	-22.791***
				(0.001)	(0.001)	(0.000)	(0.022)	(0.020)	(0.000)
CASH		-0.959	12.788		4.036	14.767*		4.705	13.278
		(0.816)	(0.238)		(0.341)	(0.098)		(0.233)	(0.129)
CROSS BORDER		4.377	8.905		4.206	12.389		4.677	14.632
		(0.314)	(0.499)		(0.824)	(0.246)		(0.263)	(0.165)
HIVAL		-4.587	-6.431		4.368	7.494		-2.414	7.266
		(0.302)	(0.562)		(0.794)	(0.427)		(0.574)	(0.431)
HORIZONTAL		-0.658	2.545		7.326	-1.766		-6.254	1.019
		(0.929)	(0.878)		(0.411)	(0.893)		(0.393)	(0.937)
NON-PUBLIC		-2.825			4.387			-2.843	
		(0.532)			(0.837)			(0.505)	
lnASIZE			4.248			3.587			5.306**
			(0.166)			(0.115)			(0.030)
LNAMTB			-3.591			-3.743			-2.276
			(0.327)			(0.215)			(0.455)
C	75.420***	78.378***	26.647	25.260***	6.324***	-13.115	60.203***	57.332***	-0.763
	(0.000)	(0.000)	(0.397)	(0.000)	(0.000)	(0.577)	(0.000)	(0.000)	(0.975)
Obs.	350	350	78	301	301	69	297	297	69
Adj. R^2	0.138	0.158	0.167	0.040	0.091	0.429	0.120	0.163	0.463
Time-Fixed	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Industry-Fixed	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Panel B: M&C Sample									
lnTSIZE	-5.579***	-6.343***	-10.328**				-2.790*	-2.454	-11.066***
	(0.000)	(0.002)	(0.035)				(0.088)	(0.166)	(0.008)
lnTMTB				-8.733***	-9.062***	-24.583***	-8.270***	-8.811***	-28.186***
				(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
CASH		-0.640	25.832		3.642	16.655		4.221	18.662
		(0.917)	(0.111)		(0.493)	(0.197)		(0.427)	(0.111)
CROSS BORDER		7.063	16.508		6.648	15.870		8.079	22.385*
		(0.271)	(0.366)		(0.230)	(0.239)		(0.151)	(0.074)
HIVAL		-7.005	-18.548		2.685	9.083		1.824	6.736
		(0.279)	(0.324)		(0.639)	(0.566)		(0.751)	(0.635)
HORIZONTAL		4.140	19.102		-6.897	4.377		-5.749	13.154
		(0.678)	(0.417)		(0.456)	(0.799)		(0.534)	(0.405)
NON-PUBLIC		-6.603			-7.618			-7.420	
		(0.340)			(0.206)			(0.217)	
lnASIZE			4.119			5.547			9.418***
			(0.397)			(0.115)			(0.009)
LNAMTB			-4.392			-7.358			-4.176
			(0.457)			(0.094)*			(0.302)
C	62.900***	71.185***	28.994	32.729***	30.689***	-36.416	47.288***	41.931***	-20.348
	(0.002)	(0.000)	(0.513)	(0.000)	(0.001)	(0.263)	(0.000)	(0.001)	(0.491)
Obs.	180	180	47	149	149	42	149	149	42
Adj. R^2	0.053	0.077	0.271	0.087	0.169	0.570	0.106	0.181	0.665
Time-Fixed	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Industry-Fixed	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes

3.6. Choice of Payment Method

In this section, I examine the determinants of payment method in shipping M&As. The choice of payment method is a key element in the deal-structuring process and has various implications for both acquiring and target firms. Considering the size of capital required for acquisitions of other firms, the M&A financing decision exerts a significant influence on the corporate governance and capital structure of the combined entities. For instance, if the acquirer pays for the deal with cash, an increase in the financial leverage ratio of the merged company is expected.[68] Alternatively, if a deal is a stock-for-stock exchange, it is likely to end with the creation of additional block-holders. In addition, making a decision regarding M&A currency is a process pertaining to how the potential gains and risks resulting from business consolidation are shared between acquiring and target firms. As such, a plethora of explanations have been suggested to account for the financing decision in M&A transactions. The determinants of acquirers' decision regarding the financing mix in M&As can be broadly categorised into three groups: the concern for losing corporate control, financial constraint and information asymmetry. Considering several characteristics of the shipping industry, the investigation of financing mixes in shipping M&As is of utmost importance. First, the ownership structure of shipping companies is generally known to be concentrated, and managers tend to combine ownership and corporate control. Thus, it is likely that shipping companies prefer to pay M&A transactions with cash in order to avoid ownership dilution. Second, given the fact that bank financing constitutes the major source of capital in shipping, shipping companies that may have a limited capability of raising additional debt are likely to choose stock-for-stock exchange as M&A currency. Third, since asset tangibility is positively associated with debt-raising capacity, it can be conjectured that shipping companies whose main assets are ships may choose cash-financed M&A deals. Given the lack of empirical evidence regarding shipping M&As, this section examines the impact of shipping industry characteristics on the choice of payment method. In this regard, this section first reviews potential determinants of financing mix in corporate consolidation in the shipping industry, followed by the explanatory power of those factors in Tobit and logit regressions.

[68] According to Pecking Order Theory (Myers and Majluf, 1984), companies have priority when they raise capital in the order of internal funds, debt issuance and equity capital. In this regard, the argument that cash-financed M&A deals can increase the financial leverage of the combined entities is hardly able to hold when internal funds are used as a form of payment. However, the extant literature largely assumes that issuing debt (e.g. bank loans and corporate bonds) is the major funding source for cash offers, considering liquidity constraints, lower issuance costs and tax benefits. Thus, a cash-financed M&A transaction can increase post-merger financial leverage, and consequently financial distress costs.

3.6.1. Determinants of Payment Method

3.6.1.1. Corporate Control Loss

From the perspective of acquiring companies, the choice of payment method involves the trade-off between concern for corporate governance dilution from stock offering and an increase in financial distress costs from cash offering (Faccio and Masulis, 2005). Thus, managers who value corporate control are more likely to prefer cash financing, since they are reluctant to dilute ownership by issuing stock (Amihud *et al.*, 1990; Ghosh and Ruland, 1998; Jung *et al.*, 1996; Martin, 1996). Especially when a target is a private company closely held by a few owners, acquisition financed by stock is likely to lead to the emergence of new block-holders. In the shipping industry, ownership is generally concentrated, and the largest shareholder is either a manager or a board member (Tsionas *et al.*, 2012). Accordingly, it can be argued that shipping company managers who already combine ownership and control tend to choose cash for acquisition payment to avoid ownership dilution. This is also associated with the regional distribution of shipping M&A activity, as discussed previously in this chapter. Given that the majority of deals in the sample were carried out in Europe, where corporate ownership is much more concentrated (Faccio and Lang, 2002), it can be conjectured that cash is used more frequently as a form of payment in shipping M&As.

In order to capture the risk of losing corporate control, the ownership structure of target firms prior to the deals should be considered, as acquisitions of targets with concentrated ownership are more likely to create new block-holders of combined entities. However, since information regarding the ownership structure of shipping companies is not available, I use the proxy, CONTROL LOSS, computed using deal size divided by the sum of the acquirer's market size and deal size. Given that corporate ownership of shipping companies is generally concentrated (Randøy *et al.*, 2003; Syriopoulos and Tsatsaronis, 2011; Tsionas *et al.*, 2012), and consequently, the emergence of post-merger block-holders is expected in stock-financed deals, the likelihood of cash financing is expected to be positively associated with the relative deal size.

3.6.1.2. Debt-Raising Capacity and Financial Constraints

The debt-raising capacity of acquiring firms is also a critical factor for the choice of M&A financing mix. Assuming that cash-financed M&A deals are funded by debt, acquirers with

high leverage ratio or financial distress costs possess a limited ability to issue additional debt, and thus prefer stock financing. In this regard, I first employ the acquirer's LEVERAGE, calculated as debt-to-asset ratio at the year-end prior to the deal announcement. Given that bank lending is a major funding source for shipping companies, the concern about financial distress costs seemingly fails to account for the large fraction of cash payment in shipping M&A deals.[69] This is because shipping is notably a high-leveraged industry, as Drobetz *et al.* (2013) report that the average leverage ratio (debt-to-assets) of listed shipping companies is 41% while that of other industries in major countries is 25%.

However, as asset tangibility is found to be positively associated with debt level (Hovakimian *et al.*, 2001), shipping companies whose assets are mostly vessels can possess higher collateral value, and consequently raise additional debt. This is consistent with the finding of Drobetz *et al.* (2013) that the ratio of fixed-to-total assets is positively related to the leverage ratio in capital structure of listed shipping companies. In their sample, the average asset tangibility of shipping companies is 63%, more than twice of that of other industries (28.9%). Accordingly, I include COLLATERAL, the ratio of tangible assets (property, plant and equipment) to total assets of shipping acquirers at the year-end prior to M&A announcement.

In a similar vein to the rationale behind the impact of the corporate collateral value, larger acquirers generally possess lower financial distress costs, and as a consequence, better access to debt market and more favourable interest rates. Thus, I include the size of the acquirer proxied by ASSET, the value of the acquirer's total asset at the year-end prior to the deal announcement. Finally, as another measure of acquirers' financial constraints, I assess the importance of CASH HOLDING, the ratio of cash and equivalents over the total assets at the year-end prior the deal announcement.

3.6.1.3. Information Asymmetry

Hansen (1987) proposes that acquirers choose stock financing to share the post-merger risks when they are concerned about the intrinsic value of target firms. The asymmetric information about target value is likely to rise as the target size increases. This is consistent with Alexandridis *et al.* (2013), documenting that a negative association between the deal size and

[69] For the period 2007-2016, approximately 70% of external financing of shipping companies comes from bank debts (Marine Money International, January 2017).

the abnormal returns for acquiring firms due to complexity in post-merger integration. Thus, the explanatory power of DEAL SIZE for the choice of payment method in shipping M&As is examined.

Information asymmetry is also found in the value of acquirer. Myers and Majluf (1984) predict that over-valued companies prefer stock financing when insiders are better informed. In this regard, I consider the acquirer MTB, calculated using the market value over the book value of shares four weeks prior to the acquisition announcement. In addition, I include ASSET GROWTH, the percentage annual increase in total assets of acquiring firms prior to the deal announcement.

3.6.2. Data Description

For analysing the determinants of payment method in shipping M&As, I partition the initial sample of 815 deals with payment data into three groups: ALL CASH, including 100% cash-financed deals; MIXED CASH, including partially cash-financed deals; and NO CASH, including 100% stock-financed deals or payments consisting of stock and others. However, data unavailability, such as stock prices and accounting measures, reduces the number of observations to 543 deals. Table 3.12 provides descriptive statistics for the data variables by the method of payment and the business areas of acquirers.

Based on the overall sample, it is noticeable that cash financed deals possess a significantly lower CONTROL LOSS (0.099) than mixed (0.211) and no cash (0.212) deals (see Panel A). While similar distributions are found in ship-owning and other acquirer groups, the gap becomes narrow in the shipping service group. Another interesting observation is that cash-financed acquirers are much larger than other groups in terms of total assets (ASSET), and they also possess a significantly higher asset growth rate (ASSET GROWTH).

While the deal size of cash-financed deals is much smaller than that of other groups (0.38 times compared to MIXED, 0.49 times compared to NO CASH), each acquirer type exhibits variations: the smallest deal size is found in all cash, mixed and no cash in ship-owning, shipping services and others acquiring groups, respectively. With regard to other variables, no significant variations or patterns are found by method of payment or acquirers' business areas.

Table 3.12 Descriptive Statistics by Method of Payment

All Cash includes 100% cash-financed deals. Mixed includes partially cash-financed deals. No Cash incudes deals that are 100% stock-financed or payments consisting of stock and others. CONTROL LOSS is the ratio of deal value to the sum of market capitalisations of the acquirer four weeks prior to the deal announcement and deal value winsorised at the top and bottom 5% levels. LEVERAGE is the ratio of total debt to total assets of the acquirer at the year-end prior to the deal announcement winsorised at the top and bottom 1% levels. DEAL VALUE is the transaction value. ASSET is from the year-end prior to the deal announcement. COLLATERAL is obtained using the ratio of tangible assets (Property, Plant and Equipment) to total assets of the acquirer at the year-end prior to the deal announcement. MTB is the market-to-book ratio of the acquirer four weeks prior to the deal announcement winsorised at the top and bottom 1% levels. CASH HOLDING is the ratio of cash and equivalents to total assets of the acquirer at the year-end prior to the deal announcement. ASSET GROWTH is the growth rate of the acquirer's total assets in the year prior to the deal announcement winsorised at the top and bottom 1% levels.

		All			Ship-Owning			Shipping Services			Others		
		All Cash	Mixed	No Cash	All Cash	Mixed	No Cash	All Cash	Mixed	No Cash	All Cash	Mixed	No Cash
Panel A: All Sample													
CONTROL LOSS	Mean	0.099	0.211	0.212	0.105	0.264	0.227	0.084	0.117	0.164	0.107	0.255	0.231
	Median	0.033	0.130	0.172	0.034	0.231	0.182	0.031	0.064	0.077	0.107	0.241	0.218
	N	208	60	84	114	29	44	66	21	21	28	10	19
LEVERAGE	Mean	0.311	0.268	0.327	0.356	0.344	0.399	0.266	0.218	0.227	0.255	0.153	0.299
	Median	0.305	0.299	0.322	0.337	0.348	0.406	0.260	0.225	0.205	0.232	0.112	0.234
	N	283	75	111	146	36	56	100	27	34	37	12	21
COLLATERAL	Mean	0.482	0.461	0.500	0.532	0.590	0.590	0.474	0.383	0.448	0.310	0.247	0.344
	Median	0.493	0.487	0.546	0.574	0.624	0.630	0.471	0.375	0.429	0.301	0.190	0.316
	N	283	75	111	146	36	56	100	27	34	37	12	21
ASSET	Mean	5,296.7	2,921.8	2,430.4	4,495.0	2,242.8	3,596.4	2,666.2	606.4	1,122.2	14,350.2	10,975.8	1,197.1
	Median	773.0	530.4	483.4	1091.6	793.4	779.2	527.6	458.8	388.8	1876.5	697.2	262.6
	N	285	74	109	148	35	57	96	28	31	41	11	21
CASH HOLDING	Mean	0.127	0.139	0.148	0.130	0.137	0.141	0.111	0.117	0.145	0.155	0.192	0.169
	Median	0.096	0.108	0.090	0.096	0.111	0.098	0.086	0.070	0.075	0.127	0.163	0.057
	N	283	75	111	146	36	56	100	27	34	37	12	21
DEAL SIZE	Mean	142.0	372.1	291.7	148.2	600.5	388.3	146.0	90.6	244.0	113.1	257.5	84.7
	Median	19.3	53.3	51.4	21.6	123.6	55.2	14.3	15.3	54.5	27.4	62.9	21.6
	N	326	85	132	172	43	69	103	30	40	51	12	23
MTB	Mean	3.33	3.76	2.38	2.68	2.82	2.76	4.48	5.47	2.14	3.24	3.46	1.65
	Median	1.47	2.16	1.61	1.18	2.02	1.72	2.05	2.37	1.61	1.70	1.99	0.97
	N	225	58	81	123	30	43	73	18	23	29	10	15
ASSET GROWTH	Mean	0.265	0.176	0.122	0.243	0.263	0.129	0.324	0.133	0.102	0.195	0.013	0.133
	Median	0.082	0.071	0.038	0.072	0.085	0.023	0.105	0.092	0.059	0.083	0.029	0.044
	N	283	75	111	146	36	56	100	27	34	37	12	21
Panel B: M&C Sample													
CONTROL LOSS	Mean	0.108	0.216	0.240	0.112	0.275	0.264	0.094	0.103	0.178	0.140	0.309	0.257
	Median	0.043	0.130	0.213	0.043	0.275	0.266	0.033	0.060	0.078	0.122	0.323	0.220
	N	121	54	69	63	26	35	46	20	18	12	8	16
LEVERAGE	Mean	0.306	0.266	0.317	0.340	0.336	0.384	0.276	0.213	0.235	0.275	0.170	0.276
	Median	0.308	0.309	0.299	0.334	0.347	0.378	0.278	0.225	0.212	0.240	0.112	0.232
	N	173	63	93	81	30	46	75	25	29	17	8	18
COLLATERAL	Mean	0.498	0.465	0.497	0.537	0.602	0.580	0.485	0.355	0.468	0.366	0.296	0.335
	Median	0.536	0.487	0.552	0.574	0.624	0.631	0.487	0.365	0.430	0.408	0.235	0.297
	N	173	63	93	81	30	46	75	25	29	17	8	18
ASSET	Mean	3,715.5	3,311.7	2,088.0	4,977.2	2,541.7	3,300.4	2,241.0	627.0	1,034.9	3,726.1	14,827.9	510.9
	Median	762.3	522.0	413.3	1,343.1	793.4	700.6	502.8	458.8	364.7	1,211.1	370.7	68.8
	N	173	63	90	84	29	46	72	26	26	17	8	18
CASH HOLDING	Mean	0.125	0.133	0.161	0.133	0.118	0.157	0.107	0.125	0.153	0.169	0.218	0.187
	Median	0.084	0.088	0.096	0.084	0.098	0.103	0.069	0.070	0.082	0.127	0.234	0.068
	N	173	63	93	81	30	46	75	25	29	17	8	18
DEAL SIZE	Mean	192.7	416.4	331.0	216.7	692.5	462.7	157.9	96.4	255.6	208.6	293.9	88.7
	Median	25.3	90.7	59.7	31.1	138.0	123.7	17.5	17.8	54.9	39.1	132.2	35.4
	N	196	72	109	97	36	55	77	28	35	22	8	19
MTB	Mean	3.77	3.81	2.53	2.84	2.77	3.01	5.36	5.59	2.27	2.53	3.55	1.51
	Median	1.67	2.08	1.66	1.18	2.03	1.87	2.18	2.32	1.76	1.64	1.56	0.81
	N	133	52	66	69	27	35	51	17	19	13	8	12
ASSET GROWTH	Mean	0.358	0.190	0.098	0.334	0.289	0.148	0.385	0.151	0.050	0.355	-0.060	0.049
	Median	0.112	0.071	0.034	0.117	0.084	0.023	0.112	0.098	0.038	0.068	-0.004	0.044
	N	173	63	93	81	30	46	75	25	29	17	8	18

3.6.3. Tobit Regression Results

The potential associations between payment method and explanatory variables are assessed in Tobit specifications (see Appendix B). In the Tobit regressions, the dependent variable is the percentage of cash use, the value of which is within the interval between zero and one. In order to correct heteroscedasticity, *z*-statistics calculated from quasi-maximum likelihood are used for statistical significance, and independent variables in monetary terms (ASSET, DEAL VALUE) and market multiples (MTB) are transformed into logarithm. To identify variations in the significance of each independent variable by the acquirer's business areas, regression results of ship-owning, shipping services and others are also provided.

The robustness of the Tobit regression results is assessed by including additional independent variables possibly related to information asymmetry. I consider the public status of target firms, similarity of business areas and nationality mix. Thus, I include indicator variables UNLISTED T, HORIZOTAL and CROSS BORDER, which are equal to one for acquisitions of non-public targets, within either ship-owning or shipping services segments and different nationalities of constituent firms, respectively. In addition, for further estimation of asymmetric information about acquirers, I consider the cumulative daily return (RUNUP) and weekly volatility (STDEV) of acquirer stocks for the past 12 and 24 months (two years) prior to the deal announcement, respectively.

Table 3.13 presents the results of Tobit regressions for the overall sample and the M&C sample in Panel A and Panel B, respectively. Based on the overall sample in Panel A, Tobit estimates for the sample, including all business areas of acquirers, are indicated in regressions (1) and (2). I find the use of cash in shipping M&As to be positively associated with the size of the acquirer's total assets (lnASSET) and its growth rate (ASSET GROWTH), but negatively with deal size (lnDEALVALUE). Based on the *z*-statistics, the coefficients of the three independent variables are significant at conventional levels. Although the coefficients are not significant, I also find negative coefficients of financial leverage (LEVERAGE), target public status (UNLISTED T) and nationality mix (CROSS BORDER), which is consistent with previous evidence (Faccio and Masulis, 2005). However, the signs of other coefficients, such as concern for corporate control loss (CONTROL LOSS), debt-raising capacity (COLLATERAL, CASH HOLDING) and some proxies of information asymmetry (MTB, HORIZONTAL, RUNUP) are inconsistent with the predictions of existing hypotheses or empirical evidence in the previous literature. The results remain unchanged in the M&C sample (see Panel B).

Table 3.13 Tobit Regressions of Cash Financing by Acquirer's Segments

The table reports Tobit regression estimates of the percentage of cash financing. CONTROL LOSS is the ratio of deal value to the sum of market capitalisations of the acquirer four weeks prior to the deal announcement and deal value winsorised at the top and bottom 5% levels. LEVERAGE is the ratio of total debt to total assets of the acquirer at the year-end prior to the deal announcement winsorised at the top and bottom 1% levels. COLLATERAL is obtained using the ratio of tangible assets (Property, Plant and Equipment) to total assets of the acquirer at the year-end prior to the deal announcement. lnASSET is the logarithm of the acquirer's total assets from the year-end prior to the deal announcement. CASH HOLDING is the ratio of cash and equivalents to total assets of the acquirer at the year-end prior to the deal announcement. lnDEAL VALUE is the logarithm of the transaction value. lnMTB is the logarithm of the market-to-book ratio of the acquirer four weeks prior to the deal announcement winsorised at the top and bottom 1% levels. ASSET GROWTH is the growth rate of the acquirer's total assets in the year prior to the deal announcement winsorised at the top and bottom 1% levels. UNLISTED T, HORIZONTAL and CROSS BORDER are indicator variables equal to one for acquisitions of unlisted targets, different nationalities of acquirers and targets, and within either ship-owning or shipping services segments. RUNUP is the cumulative stock price returns of the acquirer over the year prior to the deal announcement. STDEV is the annualised standard deviation of daily stock returns of the acquirer during the two years prior to the deal announcement.

	All				Shipping				Shipping Services				Others			
	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
Panel A: All Sample																
CONTROL LOSS	-1.534	-1.650	-1.507	-1.560	-2.218	-2.646*	-2.527	-2.971*	4.109	3.823	4.200	3.668	-3.333	-3.986	-2.855	-3.160
LEVERAGE	-1.095	-1.594*	-0.832	-1.350	-1.389	-1.706	-1.081	-1.300	-0.779	-1.687	0.037	-1.031	-3.220	-2.956	-1.850	-1.718
COLLATERAL	-0.108	0.052	-0.298	-0.038	-1.594	-1.305	-2.352**	-1.992*	0.826	1.618	0.610	1.490	1.573	1.311	0.093	-0.059
lnASSET	0.288***	0.277***	0.266**	0.259**	0.190	0.176	0.107	0.096	0.785***	0.805***	0.798**	0.803**	0.296	0.251	0.224	0.211
CASH HOLDING	-0.451	-0.678	-0.630	-0.870	-1.752	-1.680	-2.373	-2.571	-0.764	-0.821	0.425	0.032	0.430	0.341	-0.857	-0.700
lnDEAL VALUE	-0.282***	-0.251***	-0.280***	-0.243**	-0.218*	-0.163	-0.160	-0.118	-0.753***	-0.769***	-0.775***	-0.780***	0.033	0.047	0.118	0.129
lnMTB	0.034	0.079	0.027	0.087	-0.070	-0.012	-0.006	0.035	0.456*	0.470*	0.402	0.409	0.061	0.015	0.094	0.061
ASSET GROWTH	0.399*	0.336	0.561**	0.490*	0.329	0.284	0.832*	0.828*	0.827	0.749	0.735	0.723	-0.410	-0.371	-2.396*	-2.337*
UNLISTED T			-0.462	-0.417			-0.359	-0.262			-0.819	-1.124			-0.500	-0.512
HORIZONTAL			-0.028	-0.156			-0.338	-0.174			-0.007	0.290				
CROSS BORDER			-0.256	-0.238			-0.070	-0.063			-0.822	-0.704			0.459	0.510
RUNUP			0.056	-0.008			-0.466	-0.360			0.355	0.152			-0.263	-0.292
STDEV			-0.029	0.022			-0.255	-0.583			-0.515	-0.325			-0.018	0.012
C	1.053	-0.367	1.628	0.000	2.883**	1.642	4.289**	3.004	-2.014	-4.394**	-1.138	-3.459	-0.244	0.831	0.599	0.892
Obs.	330	330	307	307	176	176	161	161	104	104	99	99	50	50	47	47
McFadden R^2	0.433	0.445	0.472	0.484	0.430	0.444	0.483	0.494	0.496	0.526	0.539	0.571	0.436	0.439	0.497	0.498
Time-Fixed	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Industry-Fixed	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No

	All				Shipping				Shipping Services				Others			
	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
Panel B: M&C Sample																
CONTROL LOSS	-0.056	-0.284	-0.001	-0.184	-0.234	-0.707	-0.724	-1.125	4.683	3.451	3.861	2.390	-3.473	-4.840	-0.050	-2.587
LEVERAGE	-0.716	-1.046	-0.697	-1.001	-1.443	-1.543	-1.286	-1.212	-0.690	-1.146	-0.433	-0.946	-1.228	-0.732	2.530	5.890*
COLLATERAL	-0.287	-0.103	-0.264	-0.092	-1.126	-1.000	-1.741	-1.737	0.494	1.159	0.403	1.230	1.452	1.059	-0.743	-2.558
lnASSET	0.375***	0.351***	0.393***	0.370***	0.332**	0.308*	0.261	0.231	0.730**	0.667**	0.718**	0.652**	0.093	0.005	0.324	0.213
CASH HOLDING	-0.921	-1.051	-0.906	-1.036	-1.844	-1.840	-1.866	-1.967	-1.570	-1.430	-0.084	0.001	-0.070	0.278	-2.447	-2.599
lnDEAL VALUE	-0.376***	-0.347***	-0.377***	-0.339***	-0.387**	-0.340**	-0.315*	-0.283	-0.681***	-0.609**	-0.658**	-0.580**	0.149	0.218	-0.095	-0.157
lnMTB	0.122	0.147	0.133	0.163*	0.010	0.043	0.077	0.105	0.517*	0.477*	0.440	0.368	0.065	-0.043	0.225	0.069
ASSET GROWTH	0.497**	0.443**	0.726***	0.676**	0.298	0.271	0.793*	0.836*	1.375	1.247	1.144	1.129	-0.024	0.063	-3.027*	-2.623**
UNLISTED T			-0.198	-0.136			-0.298	-0.258			-0.654	-0.918			2.262	3.788**
HORIZONTAL			-0.231	-0.382			-0.254	-0.158			-0.320	0.014				
CROSS BORDER			-0.189	-0.177			0.102	0.202			-0.677	-0.741			1.094	2.591**
RUNUP			0.126	0.044			-0.374	-0.298			0.598	0.495			0.900	1.751**
STDEV			0.119	0.182			0.172	-0.328			-0.473	-0.462			0.162	0.497*
C	0.266	-0.665	0.355	-0.677	1.637	1.026	2.400	2.116	-2.136	-3.623**	-1.064	-2.634	-0.114	0.992	-3.194	-1.856
Obs.	229	229	211	211	118	118	106	106	80	80	76	76	31	31	29	29
McFadden R^2	0.452	0.462	0.498	0.506	0.443	0.453	0.509	0.514	0.534	0.554	0.577	0.599	0.402	0.412	0.510	0.584
Time-Fixed	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Industry-Fixed	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No

In Tobit regressions (3) and (4), I test the explanatory power of the determinants of M&A financing for ship-owning acquirers. In regression (3), I find a negative coefficient of deal size in both the overall and M&C samples. However, as indicated in regression (4), I find a positive and significant relation between cash payment and acquirer's asset growth. The significance of the acquirer's asset growth is still robust in the M&C sample. For shipping service acquirers, the negative coefficient of deal size and the positive coefficient of the acquirer's assets are significant after controlling other factors in both the overall and M&C samples (see regressions (5) and (6)). Moreover, the findings from regression (6) are consistent with previous evidence despite statistical insignificance. Specifically, the percentage of cash is positively related to concern for control loss (CONTROL LOSS) and acquirer's debt-raising capacity (COLLATERAL), but negatively to information asymmetry (UNLISTED T, CROSS-BORDER, STDEV). The columns of regression (7) and (8) illustrate the estimation results for non-shipping acquirers, but no meaningful implication is found. The only significant variable is the acquirer's asset growth in regression (8). However, the association between cash payment and asset growth is negative, which is inconsistent with the previous expectation.

3.6.4. Logit Regression Results

In this section, I assess the determinants of the payment method in shipping M&As in logit regressions (see Appendix C). The reason for employing the logit estimation is that this methodology can reflect the binary characteristics of the financing decision: cash or non-cash (stock and others). Assuming that the percentage of cash in M&A payment is not linearly associated with the independent variables, logit estimation can possess an advantage of better specification in describing the M&A financing decision. Accordingly, I divide the sample into two groups. The cash group consists of deals where the percentage of cash is over 80%, and the non-cash group includes all other deals (stock financing, mixed with others, cash-below-80%). In logit regression, the cash group takes the value of one and the non-cash group takes the value of zero.

Table 3.14 provides the results of logit regressions of the choice of payment method in shipping M&As. I find that the results of Tobit regressions generally still hold in logit estimation. In regressions (1) and (2), the use of cash is positively associated with the acquirer's assets and asset growth, but negatively with the deal size, which is consistent with the result of Tobit

Table 3.14 Logit Regressions of Cash Financing by Acquirer's Segments

This table reports logit regression estimates of M&A financing, taking the value of one for cash financing (the percentage of cash is between 80% and 100%) and zero otherwise. CONTROL LOSS is the ratio of deal value to the sum of market capitalisations of the acquirer four weeks prior to the deal announcement and deal value winsorised at the top and bottom 5% levels. LEVERAGE is the ratio of total debt to total assets of the acquirer at the year-end prior to the deal announcement winsorised at the top and bottom 1% levels. COLLATERAL is obtained using the ratio of tangible assets (Property, Plant and Equipment) to total assets of the acquirer at the year-end prior to the deal announcement. lnASSET is the logarithm of the acquirer's total assets from the year-end prior to the deal announcement. CASH HOLDING is the ratio of cash and equivalents to total assets of the acquirer at the year-end prior to the deal announcement. lnDEAL VALUE is the logarithm of the transaction value. lnMTB is the logarithm of the market-to-book ratio of the acquirer four weeks prior to the deal announcement winsorised at the top and bottom 1% levels. ASSET GROWTH is the growth rate of the acquirer's total assets in the year prior to the deal announcement winsorised at the top and bottom 1% levels. UNLISTED T, HORIZONTAL and CROSS BORDER are indicator variables equal to one for acquisitions of unlisted targets, different nationalities of acquirers and targets and within either ship-owning or shipping services segments. RUNUP is the cumulative stock price returns of the acquirer over the year prior to the deal announcement. STDEV is the annualised standard deviation of daily stock returns of the acquirer during the two years prior to the deal announcement.

	All				Shipping				Shipping Services				Others			
	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
Panel A: All Sample																
CONTROL LOSS	-1.409	-1.751	-1.604	-1.868	-2.007	-2.619*	-2.472*	-3.116**	4.620	4.691	5.148	4.979	-5.359	-5.554	-6.014	-5.104
LEVERAGE	-0.758	-1.425	-0.245	-0.870	-0.925	-1.483	-0.651	-1.093	-1.145	-2.148	-0.064	-1.086	-1.661	-1.617	0.964	0.585
COLLATERAL	0.207	0.413	0.003	0.294	-0.831	-0.456	-1.524	-1.127	1.507	2.404*	1.480	2.495	1.648	1.666	-0.410	-0.216
lnASSET	0.327***	0.331***	0.252**	0.256**	0.154	0.143	0.045	0.041	0.925***	1.020***	0.936***	0.998**	0.474	0.465	0.319	0.376
CASH HOLDING	-0.097	-0.387	-0.253	-0.593	-1.254	-1.241	-1.836	-2.221	-0.303	-0.421	0.952	0.661	1.835	1.589	-0.903	-0.972
lnDEAL VALUE	-0.281***	-0.257***	-0.273***	-0.247**	-0.218*	-0.162	-0.172	-0.127	-0.739***	-0.820***	-0.784***	-0.845***	-0.066	-0.065	0.105	0.078
lnMTB	0.066	0.109	0.041	0.099	0.037	0.086	0.073	0.117	0.395	0.456	0.354	0.410	-0.257	-0.247	-0.361	-0.317
ASSET GROWTH	0.373*	0.332	0.504**	0.457*	0.247	0.209	0.653	0.678	0.844	0.868	0.790	0.875	-0.058	-0.075	-3.815	-4.094
UNLISTED T			-0.573*	-0.560			-0.468	-0.395			-1.070	-1.424			-1.372	-1.290
HORIZONTAL			-0.151	-0.269			-0.402	-0.270			-0.144	0.119				
CROSS BORDER			-0.160	-0.112			0.058	0.088			-0.754	-0.679			1.934	1.849
RUNUP			0.122	0.074			-0.336	-0.252			0.404	0.256			-1.145	-1.154
STDEV			-0.685	-0.731			-0.584	-0.794			-1.007	-0.853			-4.050	-4.106
C	-0.452	-2.119**	0.805	-1.078	1.504	0.168	3.300	1.868	-4.068**	-6.753***	-2.831	-5.316*	-2.246	-1.975	1.726	-0.330
Obs.	330	330	307	307	176	176	161	161	104	104	99	99	50	50	47	47
McFadden R^2	0.116	0.151	0.130	0.169	0.115	0.157	0.140	0.179	0.161	0.210	0.205	0.253	0.262	0.264	0.395	0.398
Time-Fixed	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Industry-Fixed	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No

	All				Shipping				Shipping Services				Others	
	(1)		(2)		(3)		(4)		(5)		(6)		(7)	(8)
Panel B: M&C Sample														
CONTROL LOSS	-0.345	-0.963	-0.707	-1.335	-0.760	-1.453	-1.431	-2.207	7.197*	6.046	7.881*	6.255	-7.722	-67.868
LEVERAGE	-0.486	-1.047	-0.207	-0.685	-1.619	-2.026	-1.777	-1.900	-1.184	-1.702	-0.907	-1.440	1.581	17.570
COLLATERAL	0.041	0.355	0.004	0.304	-0.665	-0.355	-1.245	-1.203	1.538	2.275	1.880	2.797	2.310	-1.160
lnASSET	0.467***	0.444***	0.398**	0.351*	0.297	0.283	0.210	0.171	1.094***	1.073***	1.151**	1.093**	0.385	-2.793
CASH HOLDING	-0.968	-1.284	-0.994	-1.327	-2.507	-2.590	-2.861	-3.262	-1.039	-1.030	0.724	0.806	1.122	2.029
lnDEAL VALUE	-0.434***	-0.398***	-0.421***	-0.363**	-0.438**	-0.389**	-0.414*	-0.375	-0.850***	-0.807**	-0.913***	-0.845**	-0.058	0.907
lnMTB	0.180	0.218	0.186	0.225	0.092	0.141	0.159	0.216	0.647*	0.626	0.692	0.648	-0.256	-1.267
ASSET GROWTH	0.601**	0.568**	0.841**	0.807**	0.304	0.266	0.859	0.969	1.287	1.290	1.210	1.296	0.408	0.370
UNLISTED T			-0.566	-0.499			-0.686	-0.623			-0.758	-1.130		
HORIZONTAL			-0.513	-0.669			-0.594	-0.491			-0.752	-0.455		
CROSS BORDER			-0.112	-0.087			0.289	0.511			-0.571	-0.707		8.325
RUNUP			0.207	0.118			-0.229	-0.063			0.790	0.738		-11.934
STDEV			-0.861	-1.029			-0.098	-0.936			-0.789	-0.760		-34.953
C	-1.179	-2.788**	0.275	-1.308	1.236	0.193	2.944	2.420	-5.379**	-7.377***	-4.504	-6.233	-2.720	30.960
Obs.	229	229	211	211	118	118	106	106	80	80	76	76	31	
McFadden R^2	0.163	0.199	0.187	0.219	0.172	0.206	0.215	0.244	0.206	0.237	0.251	0.281	0.359	
Time-Fixed	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	No
Industry-Fixed	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No

regression. One different observation from Tobit regression is the negative and significant impact of target public status. Consistent with the information asymmetry hypothesis, acquirers are less likely to use cash in acquisitions of non-public targets. For ship-owning acquirers, the only significant result is the negative coefficient of the deal size in the M&C sample. With the exception of the result of regression (4) for the M&C sample, the use of cash among ship-owning acquirers is negatively associated with deal size.

Consistent with the results of Tobit regression, the use of cash in the financing decision of shipping service acquirers is positively associated with the size of the acquirer's assets, but negatively with the deal size. Moreover, in this acquirer group, the concern for corporate control loss wields a significant influence on the use of cash for M&A payment when the post-announcement ownership over the target is over 50% (see Panel B). For the others acquiring group, no significant association with the use of cash is found.

3.7. Summary of Chapter

In this chapter, I attempt to draw an all-encompassing map of M&As in the shipping industry. For this purpose, I obtain an extensive sample of shipping M&As during 1990–2014 from Thomson-Reuter SDC with industrial classification criteria that can include a broad range of shipping M&A activity. Since classification flaws leading to the inclusion of heterogeneous deals and ambiguous (or misleading) segmentation are detected in the previous shipping M&A literature, deals in the sample are categorised into a new segmentation consisting of three broad sectors and 11 sub-sectors based on information in a variety of hand-collected materials. This process allows for sifting out deals that are not considered shipping M&As and for providing a clear-cut categorisation within the shipping industry.

The multitudinous analysis on shipping M&A activity in this chapter presents several interesting findings. While some of the findings are consistent with those in the previous M&A studies in corporate finance literature, others are shipping-specific, reflecting idiosyncratic features of the industry. First of all, reviewing the annual volume of transactions, shipping M&As come in waves, and the period is quite similar to those in M&A history. In terms of both the number of transactions and deal value, shipping M&A activity reached its peak during the mid-2000s concurrent to the sixth M&A wave. It is generally known that M&As at that time were largely triggered by a conjoint of availability of low-interest financing and a market sentiment that was enthusiastic for growth. Despite a substantial decline following the 2008

financial crisis, recent years have witnessed a revival of shipping M&A activity. This ongoing round of the M&A wave in the shipping industry is mainly driven by financially troubled shipping companies that regard business consolidation as a method of industry rationalisation to adjust current over-supply, as well as financial investors who seek investment opportunities in shipping assets at a considerable discount from fundamental values due to the prolonged recession.

Second, the segment analysis on shipping M&A activity reveals that both horizontal concentration and vertical integration play a key role in shaping the shipping industry. Horizontal transactions that are salient in the liner (including diversified) shipping, port and logistics segments have been motivated primarily by competition-promoting deregulation in shipping, privatisation of port operation, a requirement of global-wide service coverage resulting from offshore manufacturing, and ongoing globalisation. As such, the three segments demonstrate a clear tendency towards concentration and are dominated by fewer and larger leading players. Vertical integration in the shipping industry is primarily led by liner (including diversified) shipping companies. To serve customer needs for coordinating production lines on a global basis, shipping companies have extended their operations to cover a wider range of supply chain management, such as stevedoring, distribution and land transportation.

Third, I find shipping-specific features in geographical distribution of M&A deals. In terms of nationality mix, cross-border transactions constituent a fairly large proportion of shipping M&A activity, confirming that shipping is truly an international business. Compared with findings in previous M&A studies and statistics in the entire database that satisfy similar sample selection criteria, the share of cross-border deals in shipping is considerably higher than in other industries. In addition, another striking geographical feature in shipping M&As is that the North American region is a relatively minor market. Instead, Europe and Asia (combining East Asia and Southeast Asia) are the largest business consolidation markets for the shipping industry. Particularly noticeable is the rise of the Asian shipping M&A market in most recent years.

Fourth, cash is a dominant form of financing in shipping M&As. Consistent with the explanation that the M&A wave in shipping during the second half of the 2000s was largely driven by ample bank credit, the use of cash as an M&A payment was the most popular during a similar period. Despite a marginal decline due to a deadlock in bank lending after the 2008

financial crisis, cash still outweighs other forms of M&A financing as a currency for M&A deals.

Fifth, I find that acquisition premiums are negatively associated with the target size, which is consistent with the results of Alexandridis *et al.* (2013). Moreover, supporting the mis-valuation hypothesis (Shleifer and Vishny, 2003) and related empirical evidence (Dong *et al.*, 2006), the higher target mis-valuation is associated with the lower acquisition premium.

Finally, I find that M&A financing in the shipping industry is associated with the size of acquirers and target firms. While cash-financed deals are likely to be carried out by larger acquirers, the probability of stock financing is higher as the deal size increases.

4. VALUE CREATION IN SHIPPING M&As

4.1. Introduction

Business consolidation has played a critical role in shaping the current concentrated structure of the shipping industry. Since the shipping M&A market is multi-faceted with various types of participants, there are plenty of motivations that lead firms to pursue business consolidation. While the drivers of M&As can vary among different types of transactions, participants and industries, the most frequently quoted are complementing organic growth, pursuing operational or financial synergies, enhancing market position and business diversification. In the maritime spectrum, leading players have also taken advantage of M&As for fleet expansion and diversification, cost reduction, access to regional markets (including clients and specialty) and wider control over the global supply chain (Alexandridis and Singh, 2016).

Given the motives behind individual transactions, the primary goal of business consolidation is value enhancement for the shareholders of companies involved through, for example, materialisation of synergistic gains or improvement of market power and operational efficiency. Particularly, from the acquirer's viewpoint, since an M&A deal can be *de facto* regarded as an investment project requiring a sizeable capital injection, it should provide the acquiring firm with discernible benefits. Nonetheless, the general consensus in corporate finance literature is that M&As tend to be value destroying for acquiring firms, while the bulk of gains from the transactions are channelled to shareholders of target firms. In the vast majority of studies assuming that the stock market is fully efficient in assessing potential value creation from M&As, abnormal returns for shareholders of acquiring firms around transaction announcement have been found to be negative or, at best, negligible, while those for target shareholders are significantly positive (Bruner, 2002). In a stark contrast to previous evidence in the corporate finance literature, research focussing on business consolidation in the shipping and related transportation service industries has documented that both acquiring and target firms can achieve positive gains in M&A transactions. With a few exceptions, most of those studies have found that acquirers realise positive CARs with statistical significance around the deal announcement, although a larger share of gains is still captured by targets (Alexandrou *et al.*, 2014; Andreou *et al.*, 2012; Darkow *et al.*, 2008; Panayides and Gong, 2002).

Previous literature in the corporate finance area devoted to the value creation effect in M&A activity has proposed several explanations for the tendency of value destruction for acquiring firms, including managerial hubris or overconfidence (Malmendier and Tate, 2008; Roll, 1986),

overpayment of acquisition premium (Eccles *et al.*, 1999; Varaiya and Ferris, 1987), managerial entrenchment (Harford *et al.*, 2012; Masulis *et al.*, 2007) and complexity in post-merger integration (Alexandridis *et al.*, 2013; Shrivastava, 1986), to name a few. In contrast, the most commonly quoted explanation for the positive abnormal returns for acquiring firms in shipping M&As is that shipping business consolidation is driven by a strategic decision for enhanced operational productivity, which results in a positive response from the stock market. In an industry characterised by high asset tangibility and volatility in earnings and asset value, the ability to utilise assets to their full potential constitutes a critical success factor for future business proliferation, and M&As can provide valuable opportunities for redistributing resources that might previously have been allocated in an inappropriate manner.

Further, it is well known that since the success of business amalgamation depends on a plethora of factors, gains from M&As are driven by deal- or firm-specific or market-wide characteristics, such as method of payment (Faccio and Masulis, 2005; Travlos, 1987), the involved companies' size in terms of market capitalisations (Alexandridis *et al.*, 2013; Moeller *et al.*, 2004), the public status of the target (Chang, 1998; Faccio *et al.*, 2006), pre-announcement market-to-book valuations of companies involved (Dong *et al.*, 2006), the degree of investor protection among countries (Bris and Cabolis, 2008), market valuation or cycle (Bouwman *et al.*, 2009), the degree of competition in the corporate takeover market (Alexandridis *et al.*, 2010) and cultural incompatibility (Ahern *et al.*, 2015). Existing shipping M&A studies have found some interesting associations between value creation drivers and abnormal returns that contradict conventional wisdom in corporate finance or are believed to be shipping-specific. For example, Alexandrou *et al.* (2014) find that acquisitions of publicly listed targets that generally tend to be value destroying (Faccio *et al.*, 2006; Loderer and Martin, 1990) for acquiring firms creates higher acquirer gains than those of private firms in shipping M&As. It is also revealed that cross-border deals outperform domestic deals in terms of synergistic gains (Alexandrou *et al.*, 2014; Darkow *et al.*, 2008), confirming that shipping and related transportation services are truly international industries.[70]

While the above studies offer some valuable insights concerning the value creation effect in shipping business consolidation by documenting that both acquiring and target firms achieve tangible gains from M&As and that the impact of deal characteristics differs from conventional

[70] Nonetheless, it should be noted that the two studies document different results in relations between acquirer gains and nationality mix. Darkow *et al.* (2008) report higher abnormal returns to acquirers in cross-border deals than in domestic deals. However, this relation is converse in Alexandrou *et al.* (2014).

wisdom, they draw conclusions based on either anecdotal observations that can barely be generalised or on a sample that is too extensive and might be subject to heterogeneity or ambiguous classification across different segments within the shipping industry. Especially since the SIC system fails to provide a clear-cut categorisation of business areas within the shipping industry, as discussed in the previous chapter, it is problematic to overlook possible variations in the value creation effect across different segments (e.g. tramp, liner, offshore, passenger, port, logistics). Indeed, despite a general conclusion regarding positive acquirer gains, there is evidence that acquirers in the tramp sector experience negative or zero gains (Samitas and Kenourgios, 2007; Syriopoulos and Theotokas, 2007).[71] Moreover, although a large share of shipping M&As have been undertaken by non-shipping acquirers in more recent years, such as financial institutions and conglomerates, previous studies have failed to consider their motives and ability to improve the valuations of the targets.

To this end, this chapter investigates the value creation effect and the determinants of acquisition gains in shipping M&A transactions during 1990–2016 using a carefully selected sample. The most notable contribution of this chapter lies in the sample, which can reflect deal characteristics and actual business areas of companies involved in shipping M&As. As explained in great detail in the previous chapter, I went through all transactions with hand-collected information and constructed a comprehensive map of M&A activity in the shipping industry. Using the ever bias-free sample, this chapter provides valuable insights concerning the effectiveness of business combinations within the shipping industry and highlights some specific features regarding how the gains vary by deal characteristics and segments.

Consistent with evidence in the previous shipping M&A studies, I also find that both acquirer and target firms benefit from business consolidation activity, though much larger gains are channelled into target firms. The five-day CARs to acquirers and targets are 1.6% and 7.6%, respectively. Moreover, the synergistic gain calculated using the market value-weighted average of CARs is 2.9%, and all the gains are statistically significant at the conventional levels. While this paper's finding of positive acquirer gains contradicts one of the stylised facts in the general corporate finance literature, it suggests that M&A transactions in the shipping industry are value enhancing and driven by pursuit of synergistic value (Berkovitch and Narayanan, 1993).

[71] In Samitas and Kenourgios (2007), while the five-day CARs are negative before and around the deal announcement, those of post-announcement period are generally positive.

Further analysis on the impact of deal- and firm-specific factors and variations in value creation among the segments within the shipping industry also indicates divergence from findings in the previous M&A literature. Although those relationships do not strongly hold in the multivariate analysis, univariate analysis offers rather interesting observations. First, acquirer returns are positive even in acquisitions of publicly listed targets that typically tend to be value destroying for acquiring firms (Faccio *et al.*, 2006; Loderer and Martin, 1990). Despite the relative outperformance of buying private firms, acquisitions of public firms create the five-day CAR for acquirers of 1% with statistical significance when the target ownership acquired exceeds 50%. Second, consistent with the international nature of the shipping industry, cross-border deals outperform domestic deals for both acquirers and targets, and the higher gain in cross-border transactions is pronounced for ship-owning acquirers, implying that extending the geographical reach provides a competitive edge for shipping companies. Third, contradicting the evidence of negative gains in stock-financed deals (Martin, 1996; Travlos, 1987), acquirers achieve positive abnormal returns in equity offers. Particularly interesting is that acquirer gains in equity offers are numerically higher than those in cash offers, which are largely regarded as, at least, less value destroying. The higher acquirer gains in stock-for-stock deals are largely driven by the acquisition of private targets, consistent with Chang (1998) and Fuller *et al.* (2002). Fourth, although acquirers in most segments achieve positive abnormal returns with statistical significance, acquirer CARs for liner shipping companies are below the sample average, while those for tramp and offshore companies are significantly higher. Finally, abnormal returns for acquiring and target firms in the shipping M&A deals are relatively well explained by the size-related factors (market capitalisations, total assets) of companies involved, consistent with the findings in Moeller *et al.* (2004) and Alexandridis *et al.* (2013).

The rest of this chapter is structured as follows: Section 4.2 describes the dataset and sample statistics. Section 4.3 documents the empirical results based on aggregate and segment analyses. Section 4.4 provides a summary of the chapter.

4.2. Sample Description

This section describes the sample of shipping M&As during 1990–2014. However, the sample in this thesis is explained in great detail in the previous sections. Accordingly, no further sample description is provided in this section in order to conserve space. For the details of the sample, see Table 3.4 in Section 3.4.

4.3. Empirical Results

4.3.1. Aggregate Analysis

4.3.1.1. CARs and Synergistic Gains

In order to calculate CARs in shipping M&As, stock prices of acquirers and targets are downloaded from the Thomson Reuters Datastream. The CAR is calculated by adding the market-adjusted return for days *t-n* to *t+n*, where *t* is the transaction announcement day and *n* is from one to five. Daily market return is calculated using the corresponding country's Datastream value-weighted market index return (see Appendix D). CARs are winsorised at the top and bottom 1% levels to remove outliers.

Table 4.1 reports five-day CARs to acquirers and targets. The sample is partitioned into four groups according to pre- and post-announcement target ownership, as noted in the previous chapter, in order to identify potential difference in the value creation effect by the level of ownership over target firms: (1) majority, deals where acquirers own less than 10% of targets' share prior to the transaction announcement and seek to acquire more than 50% after its completion; (2) control, deals where acquirers own between 10% and 50% prior to the acquisition announcement and seek to acquire more than 50% after the deal; (3) minority, where acquirers own less than 50% after the deal; and (4) remaining interest, deals where acquirers own more then 50% prior to the deal announcement. Similar to findings in the previous literature on M&As in the shipping industry, I also find that both acquiring and target firms in shipping realise positive gains through consolidation activity. On average, the five-day CARs are 1.6% and 7.6% for acquirers and targets, respectively.[72] Except for the acquirer CAR in the remaining interest group, all other abnormal returns are statistically significant at conventional levels across the levels of target ownership acquired.

Alexandrou *et al.* (2014) find target abnormal returns to be positively associated with the level of ownership acquired through shipping M&A transactions, whereas the relation between acquirer abnormal returns and the level of ownership is non-monotonic. They report that acquiring firms achieve 2.0% of CAR [-3, +1] when they purchase controlling stake (50% ~ 99.9%) of target ownership after deal completion. However, when the target ownership sought

[72] There is no significant variations in 3-day to 11-day CARs.

are 100% and less than 50%, the abnormal returns are 0.6% and 0.7% over the same event window, respectively, and the mean differences from the controlling stake group are statistically significant. I also find comparable relations between the level of target ownership and abnormal returns to acquirers and targets.[73] Both acquirers and target in the majority and the control groups achieve more abnormal returns than those in the minority and remaining interest groups. The five-day CAR to the acquirers in the control group is 2.5%, slightly higher than that in the majority group, but there is no statistical difference in the mean. However, the

Table 4.1 CARs by Pre-and-Post Announcement Target Ownership

CAR is the five-day cumulative abnormal return calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorised at the top and bottom 1% levels. Transactions are partitioned into four groups according to the pre- to post-announcement changes in ownership of the target firm: (1) majority, deals where acquirers own less than 10% of targets' share prior to the transaction announcement and seek to acquire more than 50% after its completion; (2) control, deals where acquirers own between 10% and 50% prior to the acquisition announcement and seek to acquire more than 50% after the deal; (3) minority, where acquirers own less than 50% after the deal; and (4) remaining interest, deals where acquirers own more than 50% prior to the deal announcement. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

		Acquirer	Target
ALL	Mean	1.6% ***	7.6% ***
	Median	0.3%	3.1% ***
	N	1,378	658
(1) Majority	Mean	2.2% ***	14.4% ***
	Median	0.6%	9.6% ***
	N	820	163
(2) Control	Mean	2.5% ***	9.7% ***
	Median	0.1%	6.9% ***
	N	93	64
(3) Minority	Mean	0.9% **	4.1% ***
	Median	0.2%	1.7% ***
	N	301	355
(4) Remaining Interest	Mean	-0.1%	7.3% ***
	Median	-0.4%	1.2%
	N	164	76
Mean Difference	(1) - (2)	-0.3%	4.7% **
	(1) - (3)	1.3% **	10.3% ***
	(1) - (4)	2.2% ***	7.1% ***

[73] Nonetheless, it should be noted that the classification of the level of target ownership in this paper does not match exactly with that in Alexandrou et al. (2014). Since they consider only post-announcement target ownership, there might be potential difference in grouping the deals. For instance the deals in Remaining Interest group of this chapter's sample could be included in their controlling stake (50% ~ 99.9%) or full ownership (100%) groups.

acquirer CARs in the minority and the remaining interest groups are considerably lower than that in the majority group by 1.3% and 2.2%, respectively, with a significant difference in mean. For shareholders of target firms, the abnormal returns are, in general, positively associated with the level of target ownership. The average five-day CAR to target firms is 14.4% in the majority group, significantly higher than those in the control, minority and remaining interest groups by 4.7%, 10.3% and 7.1%, respectively.

From the analysis of CARs according to the level of target ownership, it becomes obvious that the inclusion of the minority and remaining interest groups dilutes the wealth creation effects for the shareholders of acquiring and target firms. Accordingly, I perform further analysis with the deals in the overall sample and in the combined majority and control groups (M&C sample henceforth) separately. Table 4.2 presents CARs to acquirers and targets, as well as synergy gains. In the M&C sample, the five-day CARs to acquirers and targets are 2.1% and 13.3%, respectively. Both are higher than corresponding abnormal returns in the overall sample, and the mean differences are significant at conventional levels. Synergy is calculated using the market value-weighted average of abnormal returns, and market value is the size of market capitalisations four weeks prior to the transaction announcement. The average combined benefit to acquirers and targets is 2.9% (1.9%) in the M&C sample (overall sample), confirming that shipping M&A activity can create additional value. Except the median of acquirer CAR in the overall sample, both means and medians of all gains are positive and statistically significant at conventional levels.

Table 4.2 CARs to Acquirers and Targets, and Synergy

CAR is the five-day cumulative abnormal return calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the deal announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index is used. Abnormal returns are winsorised at the top and bottom 1% levels. Synergy is calculated using market value-weighted average abnormal returns, and market value is the size of market capitalisations four weeks prior to the deal announcement. All sample includes all deals, while the M&C sample consists of deals in the majority and control groups. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

	All Sample			M&C Sample			Mean Difference (M&C - All)		
	Acquirer CAR	Target CAR	Synergy	Acquirer CAR	Target CAR	Synergy	Acquirer CAR	Target CAR	Synergy
Mean	1.6%***	7.6%***	1.9%***	2.2%***	13.1%***	2.9%***	0.6%*	5.5%***	0.9%
Median	0.3%	3.1%***	1.4%**	0.5%*	8.5%***	2.8%***			
N	1,378	658	94	913	227	41			
Max	61.9%	61.9%	22.3%	61.9%	61.9%	22.3%			
Min	-23.1%	-23.1%	-19.4%	-23.1%	-23.1%	-9.1%			

4.3.1.2. CARs by Deal Characteristics

Since the success of business amalgamation largely depends on a plethora of factors, the previous literature has identified determinants of the gains from M&A activity. The factors can be deal- or firm-specific or market-wide, including method of payment (Travlos, 1987), market capitalisation of the acquirer (Moeller *et al.*, 2004), public status of the target (Faccio *et al.*, 2006), pre-announcement market-to-book valuations of bidder and target (Dong *et al.*, 2006), the degree of investor protection among countries (Bris and Cabolis, 2008), market valuation or cycle (Bouwman *et al.*, 2009), the degree of competition in the corporate takeover market (Alexandridis *et al.*, 2010) and the complexity in combining business or the size of transaction value (Alexandridis *et al.*, 2013), to name a few.

As presented in Table 4.3, further analysis reveals several relations between gains from M&As and deal characteristics in the shipping industry. First, bidders realise more gains from acquisitions of non-publicly listed targets than from those of publicly listed targets. The five-day acquirer CAR is 2.3% (1.9%) in bidding non-public targets in the M&C sample (overall sample), which is significantly higher compared to bidding publicly listed targets. Second, cross-border deals create more value for both acquiring and target firms than domestic deals. Although the mean difference is significant only for target CARs in the M&C sample, abnormal returns in cross-border deals is numerically higher than those in domestic deals. Finally, acquirer CARs in both cash- and stock-financed deals are positive, and acquiring firms achieve numerically less gains when they pay for the deals with cash. The five-day CAR to acquirers in cash offers is 2.3% (1.6%) in the M&C sample, lower than in an equity offer, but the mean difference is insignificant.

The finding on the association between acquirer CAR and target public status is inconsistent with the result in Alexandrou *et al.* (2014), who investigate the impact of the public status of target firms on abnormal returns in shipping M&As. They document that the four-day acquirer CAR over the event window of [-3, +1] are 2.1% and 0.9% in acquisitions of public targets and private targets, respectively, and the mean difference is significant at the 1% level. However, there are plausible explanations for the outperformance in the acquisition of private targets compared to bidding public companies. The higher acquirer gain from buying non-public targets can be attributable to the so-called ‘liquidity discount’ (Fuller *et al.*, 2002; Koeplin *et al.*, 2000). That is, non-public targets have less negotiation power than publicly listed firms due to a lack of liquidity, as they cannot be readily traded in the market. As Alexandridis *et al.*

(2010) document a negative association between the level of competition and acquisition premium, acquirers are less likely to overpay to private targets. Moreover, acquisition of a private target ends with the emergence of block-holders when closely held targets are paid with stock (Chang, 1998). Those block-holders can play a pivotal role in monitoring efficient post-merger consolidation activity. The previous literature has generally concluded that acquiring firms gain more in purchasing non-publicly listed targets than in purchasing publicly listed targets. Fuller *et al.* (2002) and Moeller *et al.* (2004) document positive bidders' gains in

Table 4.3 CARs to Acquirer and Target by Deal Characteristics

CAR is the five-day cumulative abnormal return calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. Abnormal returns are winsorised at the top and bottom 1% levels. Non-public targets include private, subsidiary and all other public statuses except 'public'. Cross-border is a group of deals where the acquirer and target are located in different domiciles. Cash (stock) is a group of deals financed with pure cash (stock), and mixed/others comprises all remaining others. M&C means a subsample consisting of deals with post-announcement target ownership over 50%. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

		All Sample		M&C Sample	
		Acquirer CAR	Target CAR	Acquirer CAR	Target CAR
By Target Public Status					
Public Target	Mean	0.3%		1.0% *	
	Median	0.1%		0.2%	
	N	219		95	
Non-Public Target	Mean	1.9% ***		2.3% ***	
	Median	0.4%		0.5%	
	N	1159		818	
Mean Difference (Non-Public - Public)		1.5% ***		1.3% **	
Cross-Border vs Domestic					
Cross-border	Mean	1.9% ***	8.3% ***	2.5% ***	16.9% ***
	Median	0.7%	3.3%	1.0%	10.8%
	N	507	235	330	80
Domestic	Mean	1.5% ***	7.2% ***	2.0% ***	11.0% ***
	Median	0.1%	3.0%	0.2%	7.4%
	N	871	423	583	147
Mean Difference (Domestic - Cross-Border)		-0.4%	-1.0%	-0.5%	-5.8% **
By Method of Payment					
Cash	Mean	1.6% ***	10.8% ***	2.3% ***	14.5% ***
	Median	0.4%	4.4%	0.9%	10.8%
	N	276	253	170	111
Stock	Mean	2.6% **	3.4%	3.2% **	3.1%
	Median	0.5%	3.2%	0.5%	3.9%
	N	84	24	67	19
Mixed/Others	Mean	3.4% ***	15.7% ***	3.8% ***	18.6% ***
	Median	1.7%	9.0%	1.7%	14.0%
	N	142	29	123	23
Mean Difference (Cash - Stock)		-0.9%	7.4% ***	-0.9%	11.4% ***

acquisitions of private and subsidiary targets, whereas negative gains are found when buying public firms in the US M&As. Conn *et al.* (2005) and Faccio *et al.* (2006) report similar results in UK and European M&As, respectively.

I also find that cross-border deals outperform domestic deals for both acquiring and target firms. The mean difference in acquirer CAR is not significant, while that in target CAR is significant. Since cross-border deals are associated with additional frictions, including differences in cultures (Ahern *et al.*, 2015), accounting standards and financial regulations (Rossi and Volpin, 2004), there have been contradicting findings regarding the association between abnormal return and inter-border transaction. Eckbo and Thorburn (2000) report higher abnormal return with Canadian acquirers than US acquirers in acquisitions of Canadian targets. Conn *et al.* (2005) find that UK acquirers gain less in cross-border than in domestic deals. On the other hand, Doukas and Travlos (1988) report that multinational companies achieve more abnormal returns when they expand geographical reach. Danbolt and Maciver (2012) find that both acquirers and targets gain more abnormal returns in cross-border deals than domestic acquisitions. Specifically, an increase in abnormal returns to target firms is significant when they are sold to acquirers from countries with superior governance systems. Harris and Ravenscraft (1991) find that target firms achieve higher abnormal returns when acquired by foreign bidders with relatively strong currency. In shipping M&As, Alexandrou *et al.* (2014) find that CAR to target is higher in cross-border deals, as well as providing more combined economic value in terms of dollars. However, contrary to the results in this paper, they find that CAR to acquirers is higher in domestic deals. They explain that cross-border deals are strategically decided for better synergistic value, and the higher (lower) gain to target (acquirer) in those deals is attributable to entry premium. Given the international nature of the shipping industry, it is likely that shipping companies buy foreign firms for strategic reasons, such as enhancing market share or side-lining competitors from specific markets. However, as revealed in the previous chapter, I fail to find any evidence in the sample that shipping acquirers pay additional or excessive premiums for entering foreign markets. The average premium in domestic deals in the M&C sample is 32.9%, while that in cross-border deals is 36.4%, and the mean difference is insignificant (see Table 3.8). Instead, one possible explanation for the results of numerically higher acquirer CARs in cross-border transactions is the relatively strong bargaining power of bidders. In the M&C sample, the relative asset size (acquirer over target) is 7.8 times in cross-border deals, which is significantly higher than 5.5 times in domestic

deals.[74]

The relation between acquirer abnormal returns and method of payment is of particular interest in this study, as the results are opposed to general conclusions in previous M&A research. Since Travlos (1987) documented greater abnormal returns to acquiring firms in cash offers than in equity offers, it is generally evidenced that acquirers suffer losses from stock-financed deals, whereas deals paid with cash are, at least, non-value-destructive (Brown and Ryngaert, 1991; Draper and Paudyal, 2006; Martin, 1996). One of the most frequent arguments for the higher abnormal return to acquirers in cash bids is the signalling effect; that is, the stock market perceives cash offers as indicators that acquirers are confident in future returns after deal completion. However, there is also an argument that the impact of the financing method in M&A transactions on abnormal return is not constant, but instead varies according to a number of variables. For example, Chang (1998) show that acquirers experience a positive abnormal return in stock-financed deals when targets are privately held firms, while cash offers for private targets do not have significant abnormal returns to acquirers. Fuller *et al.* (2002) report a similar finding in that abnormal returns to acquirers in buying non-public targets increase when deals are stock-financed. Nationality mix also matters. Conn *et al.* (2005) present that acquirers achieve slightly higher abnormal returns in cash-financed deals than in non-cash-financed deals when targets are located in the same countries. On the other hand, in cross-border deals, non-cash deals create positive abnormal returns to acquirers, while cash-financed deals do not have any significant gain. Accordingly, I further investigate acquirer CARs according to a combination of deal characteristics.

Table 4.4 presents CAR to acquirers according to target public status, nationality mix and method of payment. Based on the results in the M&C sample, it is clear that the impact of each deal-specific factor on acquirer abnormal return depends on a combination of other factors. First, the higher abnormal return to acquirer in acquisitions of non-public targets compared to those of publicly traded targets is significant only in stock-financed deals. On average, the mean difference in five-day CARs to acquirer between acquisitions of public and non-public targets is 6.4% and significant at the 1% level in stock-financed deals, while that in cash-financed deals is 0.9% without statistical significance. In addition, the association between target public status and M&A financing varies according to nationality mix. While the higher acquirer's gain in acquisitions of non-public targets is pervasive across the methods of payment

[74] In the all sample, relative asset size is 8.8 times in cross-border deals, while that in domestic deals is 5.5 times.

Table 4.4 CAR to Acquirers by Deal Characteristics

CAR is the five-day cumulative abnormal return calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. Abnormal returns are winsorised at the top and bottom 1% levels. Non-public targets include private, subsidiary and all other public statuses except 'public'. Cross-border is a group of deals where the acquirer and target are located in different domiciles. Cash (stock) is a group of deals financed with pure cash (stock), and mixed/others comprises all remaining others. The combined number of observations of the method of payment is less than that of the overall group, as information on financing mix is available only for 815 deals. The left-hand side reports statistics for all deals, while the right-hand side reports those for the M&C subsample consisting of deals with post-announcement target ownership over 50%. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

			All Sample				M&C Sample			
			All	Public Target	Non-Public Target	(Non-Public - Public)	All	Public Target	Non-Public Target	(Non-Public - Public)
All	All	Mean	1.6% ***	0.3%	1.9% ***	1.5% ***	2.2% ***	1.0% *	2.3% ***	1.3% *
		Median	0.3%	0.1%	0.4%		0.5%	0.2%	0.5%	
		N	1,378	219	1,159		913	95	818	
	Cash	Mean	1.6% ***	0.1%	2.2% ***	2.1% **	2.3% ***	1.6% *	2.5% ***	0.9%
		Median	0.4%	0.0%	0.5%		0.9%	0.6%	1.1%	
		N	276	81	195		170	42	128	
	Stock	Mean	2.6% **	-1.4%	4.2% **	5.6% ***	3.2% **	-1.3%	5.1% **	6.4% ***
		Median	0.5%	0.2%	0.7%		0.5%	0.1%	1.1%	
		N	84	25	59		67	20	47	
	Mixed/Others	Mean	3.4% ***	0.4%	3.7% ***	3.2%	3.8% ***	1.8%	4.0% ***	2.2%
		Median	1.7%	-0.2%	2.0%		1.7%	0.3%	1.9%	
		N	142	14	128		123	12	111	
	(Cash - Stock)		-1.0%	1.5%	-2.0%		-0.9%	2.9% **	-2.6%	
Domestic	All	Mean	1.5% ***	-0.9% *	1.9% ***	2.8% ***	2.0% ***	-1.4% **	2.4% ***	3.8% ***
		Median	0.1%	-0.4%	0.3%		0.2%	-0.7%	0.5%	
		N	871	134	737		583	52	531	
	Cash	Mean	1.6% ***	-1.3% **	2.7% ***	4.1% ***	2.1% ***	-0.8%	2.9% ***	3.6% ***
		Median	0.5%	-0.6%	1.1%		0.9%	-0.7%	1.6%	
		N	189	54	135		122	25	97	
	Stock	Mean	2.1%	-2.9% *	3.6% *	6.5% **	2.9%	-2.0%	4.6% *	6.6% **
		Median	0.1%	-1.0%	0.3%		0.2%	-0.5%	0.6%	
		N	57	13	44		46	12	34	
	Mixed/Others	Mean	3.6% ***	-5.1% **	4.4% ***	9.4% ***	4.1% ***	-4.0% *	4.6% ***	8.6% ***
		Median	1.9%	-2.7%	2.1%		1.9%	-2.7%	2.1%	
		N	92	7	85		80	5	75	
	(Cash - Stock)		-0.6%	1.5%	-0.9%		-0.7%	1.3%	-1.7%	
Cross-Border	All	Mean	1.9% ***	2.2% **	1.8% ***	-0.4%	2.5% ***	4.0% ***	2.3% ***	-1.7%
		Median	0.7%	1.5%	0.5%		1.0%	3.8%	0.8%	
		N	507	85	422		330	43	287	
	Cash	Mean	1.6% *	3.0% **	1.0%	-2.0%	2.8% *	5.1% **	1.5%	-3.6%
		Median	0.3%	1.3%	0.0%		0.8%	3.9%	-0.3%	
		N	87	27	60		48	17	31	
	Stock	Mean	3.5% **	0.3%	6.0% **	5.7% *	3.9% *	-0.2%	6.5% **	6.6% *
		Median	2.2%	2.1%	3.4%		2.2%	2.1%	3.4%	
		N	27	12	15		21	8	13	
	Mixed/Others	Mean	2.8% **	5.9%	2.3% **	-3.6%	3.3% **	5.9%	2.8% **	-3.1%
		Median	1.5%	5.4%	1.4%		1.4%	5.4%	1.3%	
		N	50	7	43		43	7	36	
	(Cash - Stock)		-1.8%	2.7%	-5.0% *		-1.2%	5.3% **	-5.0%	
(Domestic - Cross-Border)										
	All		-0.4%	-3.1% ***	0.1%		-0.5%	-5.4% ***	0.1%	
	Cash		-0.1%	-4.3% ***	1.7%		-0.7%	-5.9% ***	1.4%	
	Stock		-1.3%	-3.2%	-2.3%		-1.1%	-1.9%	-1.9%	
	Mixed/Others		0.8%	-11.0% **	2.0%		0.7%	-9.9% **	1.8%	

in domestic deals, inter-border acquirers have significantly higher returns in acquisitions of non-public targets only when the deals are equity offers.

Second, the numerically higher CAR to acquirers in stock-financed deals compared to cash offers is largely driven by acquisitions of non-public targets. The association between acquirer CAR and method of payment varies depending on the target's public status. Consistent with findings in Travlos (1987), cash-financed deals create significantly higher abnormal return to acquirers than stock-financed deals in acquisitions of publicly listed targets. Although the relation remains the same in both domestic and cross-border deals, the mean difference in acquirer CAR between cash- and stock-financed deals is significant only in cross-border deals. On the other hand, despite no significance in mean difference, acquirers have numerically higher abnormal return in equity offers than in cash offers when targets are non-public firms. This is also consistent with findings in Chang (1998) and Fuller *et al.* (2002).

Third, the association between CAR to acquirers and nationality mix also varies according to the target's public status. The result of higher acquirer CAR in cross-border deals than in domestic deals is significant when targets are publicly listed firms. In acquisitions of publicly listed firms, acquirers achieve 4.0% of the five-day CAR in cross-border deals, while they suffer significantly negative five-day CARs (-1.4%) in domestic deals. The mean difference is significant at the 1% level, and the association is pervasive across payment methods. On the other hand, in acquisitions of non-public firms, acquirers have numerically higher abnormal return in domestic deals than in cross-border deals.

4.3.1.3. The Impact of Firm Valuation on CARs

Another strand of M&A literature focusses on the relations between abnormal returns and valuations of acquiring and target firms. Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004) suggest theoretical models that market-wide mis-valuation triggers M&A waves and affects acquisition performance and the choice of financing mix. According to their hypothesis, over-valued acquirers, measured by higher MTB and Tobin's Q, are more likely to overpay, and consequently, acquirer abnormal return is negatively associated with the degree of over-valuation. Dong *et al.* (2006) perform empirical tests on the relations between CARs and two valuation proxies (MTB and price-to-residual income) using the sample of M&A deals during 1987–2000. Although the results varies according to the periods (between 1980s and 1990s) and test models (between uni-variate and multi-variate models), they generally

conclude that target valuation is negatively associated with CARs to both acquirers and targets, while acquirer valuation is positive associated with target CAR, but negatively with acquirer CAR. On the other hand, Lang *et al.* (1989) and Servaes (1991) argue that higher valuation is a proxy for a firm's performance and growth potentiality. Accordingly, higher acquirer valuation is positively associated with abnormal return. Bouwman *et al.* (2009) find that acquirers experience higher abnormal returns in a high valuation market despite long-term underperformance due to herding behaviour of management.

Table 4.5 analyses how abnormal returns relate to valuations of acquirers and targets in shipping M&As. The MTB ratio is used as a proxy for valuation and measured using the market

Table 4.5 CARs to Acquirer and Target by MTB Ratio Terciles

ACAR (TCAR) is the five-day cumulative abnormal return to acquirer (target) calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorised at the top and bottom 1% levels. MTB is the market-to-book ratio of the acquirer (target) four weeks prior to the deal announcement and winsorised at the top and bottom 1% levels. In each year, MTBs are ranked into terciles with 'small' as the lowest tercile. Panel A reports CARs for all deals in the overall sample. Panel B reports CARs for a subsample of deals where both acquirer and target are publicly listed companies. M&C means a subsample consisting of deals with post-announcement target ownership over 50%. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

			Acquirer MTB Terciles				Target MTB Terciles			
			Small	Medium	Large	(Large - Small)	Small	Medium	Large	(Large - Small)
Panel A: Overall Sample										
ACAR	All Sample	Mean	2.7% ***	1.1% **	1.9% ***	-0.8%	1.9% **	-0.8%	0.9%	-1.0%
		Median	0.6%	0.8% *	0.5%		0.1%	0.0%	1.3%	
		N	291	289	313		33	43	49	
	M&C Sample	Mean	3.2% ***	1.7% ***	2.8% ***	-0.4%	5.0% ***	-0.4%	2.6%	-2.4%
		Median	0.6%	1.2% **	0.9% *		4.4% **	0.3%	1.5%	
		N	204	195	213		20	21	19	
TCAR	All Sample	Mean	7.6% ***	8.1% ***	9.0% ***	1.3%	10.1% ***	6.9% ***	8.6% ***	-1.5%
		Median	3.4%	4.4% **	1.8%		3.8% **	4.7% ***	4.2% ***	
		N	44	46	28		144	127	140	
	M&C Sample	Mean	14.8% ***	12.9% ***	13.5% **	-1.2%	13.9% ***	15.4% ***	10.9% ***	-2.9%
		Median	8.7% **	6.6% *	3.8%		7.8% **	11.6% ***	6.8% ***	
		N	22	19	12		52	53	54	
Panel B: Public Acquirer and Target										
ACAR	All Sample	Mean	-0.4%	0.2%	0.9%	1.3%	1.6% *	-0.7%	0.6%	-1.0%
		Median	0.2%	0.2%	1.0%		0.1%	0.7%	1.3%	
		N	35	40	41		39	41	41	
	M&C Sample	Mean	0.7%	2.5%	1.4%	0.6%	3.2% **	1.2%	2.4%	-0.8%
		Median	1.4%	3.1% *	-0.3%		2.7% **	0.0%	1.9%	
		N	16	18	21		17	22	17	
TCAR	All Sample	Mean	8.3% ***	7.8% ***	8.9% ***	0.6%	11.9% ***	7.5% ***	5.0% ***	-7.0% **
		Median	4.3% *	4.2% **	2.4%		4.3% *	4.1% *	4.9% ***	
		N	41	42	34		46	43	44	
	M&C Sample	Mean	14.2% ***	18.1% ***	7.2% *	-7.0%	17.9% ***	14.6% ***	6.0% **	-11.8% **
		Median	7.1% *	12.2% ***	1.4%		10.8% **	11.6% ***	6.2% ***	
		N	19	20	14		21	23	19	

and book values of share four weeks prior to the acquisition announcement (winsorised at the top and bottom 1% levels). In each year, acquirers and targets are ranked based on their MTBs, respectively, and partitioned into terciles. The yearly sorting ensures that the findings in this paper are not affected by any fluctuations in the time-series. Since the MTB ratios and significance in mean difference are already documented in the previous chapter, only CARs for each tercile and mean difference are reported in the table (see Table 3.10).[75] In addition, the current sample includes both public and non-public acquirers and targets. I separately report the results for a sub-sample that consists of deals where both acquirer and target are publicly traded firms in Panel B, for the sake of comparison with the findings in the previous research.

The results demonstrate no significant association between acquirer MTB and abnormal returns to acquirers and targets. Moreover, apart from significance in the mean difference between the top and bottom terciles, the relation between acquirer valuation and CAR varies across post-announcement target ownership and public status of acquiring and target firms. The results support only the negative association between target MTB and target CAR when both acquirer and target are publicly listed firms (see Panel B). The results are robust across post-announcement target ownership. In the M&C sample, the average CAR to target is 6.0% in the top tercile of target MTB, significantly lower by 11.8% than in the bottom tercile.

4.3.1.4. Firm Size and CARs

I further examine the size effect in abnormal returns on acquiring and target firms. Moeller *et al.* (2004) find smaller acquirers to realise positive abnormal returns, while larger firms suffer negative abnormal returns. They attribute the negative abnormal returns for larger acquirers to overpayment, since hubris is more of a problem in larger firms. On the other hand, Alexandridis *et al.* (2013) find the negative association between acquirer size and abnormal returns for the acquirer to be driven primarily by losses from acquisitions of large-sized targets. In addition, although they document that larger targets tend to be paid with less premium, acquisitions of those large targets still more value-destructive to acquirers due to complexity in post-merger consolidation.

To estimate the relation between size-related factors and abnormal returns for acquiring and

[75] Note that all mean differences in MTBs between top and bottom terciles are significant across post-announcement target ownership and public status of acquirers and targets.

target firms in shipping M&A activity, the sample is partitioned into terciles based on acquirer and target sizes, respectively. Acquirer (target) size refers to the market capitalisations of the acquirer four weeks prior to the transaction announcement. Since the sample includes both public and non-public firms, I also consider deal value (or transaction value) and total assets of acquirers and targets. Asset values are from the year-end prior to the deal announcement. To ensure that the findings remain free from any time-series swings, I sort the size-related factors in each year.

Table 4.6 reports the associations between size-related factors and CARs to acquirers and targets in shipping M&As.[76] I find evidence supporting the negative relation between acquirer size and acquirer CAR in Moeller *et al.* (2004). Based on the M&C sample, acquirers in the top tercile (large) of acquirer size realise five-day CARs of 1.5%, while those in the bottom tercile (small) earn 5.2% (see Panel A). The mean difference between top and bottom terciles is significant at the 1% level, and the association remains unchanged in the overall sample. Similarly, I also find a negative association between the acquirer's assets and CARs to acquiring firms. The five-day CAR to acquirer in the top tercile of acquirer asset is 1.0% in the M&C sample, which is significantly lower than that (4.3%) in the bottom tercile (see Panel B). On the other hand, acquirer CARs according to deal value and target size (and asset) fail to reveal any remarkable pattern or relation.

In addition, CARs to targets are positively associated with acquirer size-related factors, but negatively associated with target size-related factors. With regard to acquirer size, the five-day CAR to target in the top tercile is 20.5%, and significantly higher than 5.5% in the bottom tercile (see Panel A) in the M&C sample. The negative association between acquirer size and target CAR is robust in the overall sample. Similarly, target CAR is also negatively associated with acquirer assets. The five-day CAR to target firms in the top tercile of acquirer asset is 14.5% in the M&C sample (see Panel B). The mean difference from the bottom tercile is significant at the 1% level. On the other hand, target CAR is negatively associated with target size and asset (see Panels D and E). The CAR to targets in the top tercile of target size is 12.6%, and significantly lower than that (18.1%) in the top bottom. In addition, target CAR in the top tercile of target asset (12.7%) is also significantly lower than that in the bottom tercile (18.4%). The negative associations between target CARs and target size-related factors are identical in the overall sample.

[76] Since the statistics for acquirer and target sizes, deal value and significance in mean difference between top and bottom terciles are already documented in the previous chapter (see Table 3.9), only CAR for each tercile and mean difference are reported in the table.

Table 4.6 CARs to Acquirer and Target by Acquirer Size (Assets), Deal Value and Target Size (Assets)

ACAR (TCAR) is the five-day cumulative abnormal return to acquirer (target) calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorised at the top and bottom 1% levels. Acquirer (target) size is the market capitalisations of the acquirer (target) four weeks prior to the transaction announcement. Acquirer (target) assets are from the year-end prior to the deal announcement. Deal value is the transaction value. M&C means a subsample consisting of deals with post-announcement target ownership over 50%. The size-related variables are ranked into terciles in each year, with 'small' as the lowest tercile. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

		ACAR				TCAR			
		Small	Medium	Large	(Large - Small)	Small	Medium	Large	(Large - Small)
Panel A: By Acquirer Size									
All	Mean	4.8% ***	0.8% *	1.0% **	-3.8% ***	6.5% **	5.8% **	13.1% ***	6.6% **
	Median	1.7% **	0.0%	0.5%		2.7%	1.8%	6.9% **	
	N	276	281	275		20	45	48	
M&C	Mean	5.2% ***	1.9% ***	1.5% ***	-3.7% ***	5.5% *	10.5% **	20.5% ***	15.0% ***
	Median	1.7% **	0.0%	0.9% **		2.5%	9.0% **	15.6% ***	
	N	193	194	186		9	17	27	
Panel B: By Acquirer Assets									
All	Mean	3.5% ***	1.2% ***	0.4% *	-3.1% ***	3.7% **	12.1% ***	7.7% ***	4.0% *
	Median	0.6%	0.2%	0.5% **		0.8%	6.8% ***	3.8% **	
	N	419	396	411		46	63	90	
M&C	Mean	4.3% ***	1.5% ***	1.0% **	-3.4% ***	5.1% **	21.6% ***	14.5% ***	9.4% ***
	Median	1.3% *	0.3%	0.6% *		2.5%	14.0% **	11.0% ***	
	N	279	275	263		21	22	38	
Panel C: By Deal Value									
All	Mean	2.0% ***	1.6% ***	1.6% ***	-0.4%	7.8% ***	8.2% ***	11.5% ***	3.7% **
	Median	0.0%	0.5%	0.8% *		2.5% *	2.7% **	7.0% ***	
	N	270	287	268		125	156	191	
M&C	Mean	2.7% ***	2.5% ***	2.3% ***	-0.4%	16.1% ***	12.4% ***	15.7% ***	-0.5%
	Median	-0.1%	0.8%	1.2% *		8.7% **	9.9% ***	10.8% ***	
	N	185	185	155		33	62	98	
Panel D: By Target Size									
All	Mean	0.3%	0.8%	0.3%	0.0%	11.4% ***	9.9% ***	6.8% ***	-4.6% ***
	Median	0.8%	0.1%	0.5%		5.7% ***	4.3% ***	4.1% ***	
	N	48	43	55		153	142	156	
M&C	Mean	2.7% **	1.0%	1.7%	-1.0%	18.1% ***	11.7% ***	12.6% ***	-5.4% *
	Median	2.2% *	0.1%	0.9%		12.6% ***	8.1% ***	8.4% ***	
	N	25	20	25		52	61	66	
Panel E: By Target Assets									
All	Mean	1.6% *	-0.3%	1.8% ***	0.2%	11.6% ***	7.3% ***	6.0% ***	-5.6% ***
	Median	0.3%	-0.3%	1.4% **		4.7% ***	2.9% ***	2.9% ***	
	N	116	92	92		144	207	237	
M&C	Mean	2.2% **	0.4%	1.9% *	-0.3%	18.4% ***	11.7% ***	12.7% ***	-5.8% *
	Median	0.5%	1.0%	1.2%		14.6% ***	7.1% ***	8.7% ***	
	N	69	56	40		42	74	86	

4.3.2. Segment Analysis

4.3.2.1. CARs by Market Segment

In this section, I further investigate potential value creation differentials among segments. Table 4.7 presents CARs by business segments of acquiring and target firms. The CAR in each segment is compared to the average of all deals in the sample (both overall and M&C samples). Panel A reports CARs by the acquirer's segments. Based on the M&C sample, except for liner ship-owning acquirers and targets of logistics acquirers, all acquirers and targets achieve positive five-day CARs with statistical significance across segments. Specifically, offshore

Table 4.7 CARs to Acquirer and Target by Business Segments

ACAR (TCAR) is the five-day cumulative abnormal return to acquirer (target) calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorised at the top and bottom 1% levels. Panel A reports CARs to acquirer and target by the acquirer's business segment, while Panel B reports CARs by the target's business segment. M&C means a subsample consisting of deals with post-announcement target ownership over 50%. (Segment - All) indicates mean the difference in CAR between each segment and sample. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

			All	Ship-Owning						Shipping Services			Others	
				Tramp	Liner	Diversified	Offshore	Passenger	Other	Port	Logistics	Other	Financial	Industrial
Panel A: By Acquirer Business Segment														
ACAR	All	Mean	1.6% ***	3.4% ***	0.4%	1.2% **	2.6% ***	0.7%	1.3%	1.2% *	2.0% ***	2.5% ***	1.9%	1.2% **
		Median	0.3%	0.6%	-0.3%	0.3%	0.8%	-0.3%	0.5%	0.0%	0.2%	1.2% *	0.3%	0.9% **
		N	1,378	110	64	276	107	82	46	178	177	104	50	184
	(Segment - All)			1.8% *	-1.2% *	-0.5%	1.0%	-0.9% *	-0.3%	-0.5%	0.3%	0.9%	0.2%	-0.4%
	M&C	Mean	2.2% ***	3.8% **	0.7%	1.0% **	4.0% ***	1.9% **	1.6% *	2.0% **	1.9% **	2.5% ***	4.5% *	2.4% ***
		Median	0.5% *	0.7%	-1.1%	0.2%	3.2% ***	-0.4%	1.0%	0.2%	-0.1%	1.3% *	0.8%	1.7% **
		N	913	74	43	159	73	57	32	110	142	90	25	108
	(Segment - All)			1.6%	-1.5%	-1.2% **	1.8% *	-0.3%	-0.6%	-0.2%	-0.3%	0.3%	2.3%	0.2%
TCAR	All	Mean	7.6% ***	11.6% ***	11.1% **	6.1% ***	7.3% **	9.9% ***	11.3% **	8.0% ***	3.0% *	16.4% ***	7.2% ***	5.4% ***
		Median	3.1% ***	6.6% ***	3.1%	3.4% **	2.5%	2.2%	15.3% ***	2.7%	1.3%	13.4% ***	2.6% *	1.8% *
		N	658	84	19	98	35	29	11	41	30	19	137	155
	(Segment - All)			4.0% **	3.5%	-1.5%	-0.3%	2.3%	3.7%	0.4%	-4.6% **	8.8% **	-0.4%	-2.2% **
	M&C	Mean	13.1% ***	18.1% ***	19.1% **	10.3% ***	13.0% **	10.5% **	22.3% ***	15.5% ***	2.3%	23.0% ***	13.3% ***	8.7% **
		Median	8.5% ***	14.9% ***	11.9% *	8.0% ***	5.9%	2.2%	23.4% ***	13.3% ***	0.8%	18.6% ***	5.0%	4.7%
		N	227	33	8	38	16	15	5	18	12	11	38	33
	(Segment - All)			5.0% *	6.0%	-2.8%	-0.1%	-2.6%	9.2% ***	2.4%	-10.8% ***	9.9% **	0.2%	-4.4%
Panel B: By Target Business Segment														
ACAR	All	Mean	1.6% ***	2.0% ***	1.3% **	-0.8%	2.9% ***	0.7%	2.1% **	0.9% **	1.4% **	2.3% ***	5.9% **	1.7% ***
		Median	0.3%	0.7%	0.1%	-2.1%	1.4% *	-0.1%	0.9%	0.2%	0.2%	0.1%	3.5%	0.4%
		N	1,378	175	86	43	126	82	63	249	202	179	14	159
	(Segment - All)			0.4%	-0.3%	-2.4% **	1.2%	-1.0%	0.5%	-0.7%	-0.2%	0.6%	4.3% *	0.1%
	M&C	Mean	2.2% ***	1.9% **	1.8% **	1.1%	4.8% ***	1.9% **	3.1% ***	1.2% *	1.5% **	2.2% **	9.9% *	2.5% ***
		Median	0.5% *	0.9%	0.1%	-1.0%	3.2% **	0.4%	0.9%	0.3%	0.2%	0.1%	5.7%	0.4%
		N	913	116	62	18	80	48	43	144	149	141	7	105
	(Segment - All)			-0.3%	-0.4%	-1.1%	2.6% *	-0.3%	0.9%	-1.0%	-0.7%	0.0%	7.7%	0.3%
TCAR	All	Mean	7.6% ***	8.3% ***	9.2% ***	4.6% ***	7.3% ***	6.0% ***	1.9%	9.5% ***	7.6% ***	19.6% ***	7.6%	8.1% ***
		Median	3.1% ***	4.0% ***	2.6%	3.5% **	2.5% *	3.0% **	0.8%	3.5% **	1.3%	16.3% ***	0.2%	3.0%
		N	658	168	37	77	84	77	29	76	51	16	7	36
	(Segment - All)			0.7%	1.6%	-3.0% **	-0.3%	-1.6%	-5.7% ***	1.9%	0.0%	12.0% **	0.0%	0.5%
	M&C	Mean	13.1% ***	16.3% ***	15.6% **	5.7% *	7.7% **	9.4% ***	11.4% **	16.1% ***	15.5% **	23.3% ***	43.7%	12.3% **
		Median	8.5% ***	12.2% ***	9.6% *	4.6%	2.5%	7.3% ***	6.6%	6.1% *	5.6%	23.4% ***	43.7%	11.6% **
		N	227	59	15	19	31	34	6	24	14	9	1	15
	(Segment - All)			3.2%	2.5%	-7.4% **	-5.3% *	-3.7% *	-1.7%	3.0%	2.4%	10.2% *	30.6%	-0.8%

ship-owning acquirers achieve significantly higher CARs than the sample average by 1.8%. On the other hand, diversified ship-owning acquirers earn significantly lower abnormal returns than the average by 1.2% in the five-day CAR. For the other segments, CARs hardly differ from the average. Regarding abnormal returns to target (also based on the M&C sample), target firms of tramp and other ship-owning, and other shipping service acquirers, realise significantly higher CARs than the average by 5.0%, 9.2% and 9.9%, respectively. However, target firms of logistics acquirers earn 10.8% less CAR than the average.

Since the sample includes not only purely horizontal consolidations, but inter-segmental deals (e.g. vertical integrations, congeneric deals and diversifications), it is less likely that CARs by acquirers correspond to those by target segments. Accordingly, I also explore variations in abnormal returns among target sectors (see Panel B). Different from CARs by acquirer business segments, except for acquirers of diversified ship-owning targets and targets in the financial segment, all other acquirers and targets realise positive CARs with statistical significance. While acquirers of offshore ship-owning targets still earn significantly higher CARs than the sample average by 2.6% (in the M&C sample), abnormal returns to acquirers of other target segments do not vary significantly. On the other hand, abnormal returns to targets according to target segments demonstrate considerably different patterns from those according to acquirer segments. The CARs to diversified, offshore and passenger ship-owning targets are significantly lower than the average by 7.4%, 5.3% and 3.7%, respectively. Only other shipping service targets realise significantly higher CAR than the average by 10.2%.

The above analysis of the relation between abnormal returns and business areas demonstrates that the value creation effect in shipping M&As varies among segments. In addition, it might be conjectured that abnormal return in each segment is not constant, but affected by business areas of acquirers or targets. Accordingly, I examine abnormal returns by a combination of business segments of acquiring and target firms (transaction type henceforth). To present meaningful and manageable findings, I classify all deals into eight transaction types based on main sectors: (1) ship-owning acquirer and target, (2) ship-owning acquirer and shipping service target, (3) ship-owning acquirer and other target, (4) shipping service acquirer and target, (5) shipping service acquirer and ship-owning target, (6) shipping service acquirer and other target, (7) other acquirer and ship-owning target, and (8) other acquirer and shipping service target. The types (1) and (4) can be broadly regarded as horizontal consolidations (including congeneric deals), types (2) and (5) are vertical integrations (or related-diversifications), and others are diversifications. This classification ensures that I can document

more comprehensive and detailed findings than previous research on shipping M&As. For example, Alexandrou *et al.* (2014) report abnormal returns in shipping M&As across three main sectors (freight shipping, passenger shipping, cargo handling) based on the acquirer's SIC codes. Although they document abnormal returns in focus-increasing (horizontal deals) and diversification (vertical deals) deals for the entire sample, the impact of the two types of transactions on each sector is not dealt with. Similarly, Andreou *et al.* (2012) investigate M&As in four major transportation modes (railroad, trucking, shipping, freight forwarding), reporting abnormal returns in intra- and inter-segment transactions without variations among segments. Moreover, as noted in the previous chapter, classification based on SIC in the two studies fails to provide clear-cut segmentation within the shipping industry.

Table 4.8 presents abnormal returns to acquirers and targets by transaction types and mean differences in CARs between each transaction type and the sample average. Based on the M&C sample, acquirers earn positive and significant abnormal returns in most transaction types except (5) shipping service acquirer and ship-owning target. Target firms also realise positive and significant abnormal returns except for (2) ship-owning acquirer and shipping service target and (6) shipping service acquirer and other target. Despite statistical insignificance of the CARs to acquirers or targets in the three transaction types of (2), (5) and (6), they are numerically positive, confirming that shipping M&A activity is, at least, non-value-destructive.

The results of the *t*-test for mean difference in CARs indicate that the magnitude of abnormal return varies among transaction types. In general, acquirers gain more in acquisitions of targets in different segments, while targets gain more in takeovers from acquirers in the same segment, which is consistent with the findings in Alexandrou *et al.* (2014). More specifically, based on the M&C sample, although the abnormal returns to ship-owning acquirers exhibit only marginal variations according to target segments (2.1%, 2.3% and 1.8% in acquisitions of ship-owning, shipping service and other targets, respectively), shipping service acquirers achieve much lower five-day CARs in acquisitions of shipping service targets (1.5%) than those of ship-owning (2.8%) and other (4.1%) targets. Specifically, the mean difference between the sample average and CAR to shipping service acquirers in purchasing other targets is significant at the 10% level.

Table 4.8 CARs to Acquirer and Target by Transaction Types

ACAR (TCAR) is the five-day cumulative abnormal return to acquirer (target) calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorised at the top and bottom 1% levels. M&C means a subsample consisting of deals with post-announcement target ownership over 50%. (Segment - All) indicates mean difference in CAR between each segment and sample. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

	Business Segment			ACAR		TCAR	
	Acquirer	Target		All Sample	M&C Sample	All Sample	M&C Sample
	All	All	Mean	1.6% ***	2.2% ***	7.6% ***	13.1% ***
			Median	0.3%	0.5% *	3.1% ***	8.5% ***
			N	1,378	913	658	227
(1)	Ship-Owning	Ship-Owning	Mean	1.5% ***	2.1% ***	9.1% ***	13.8% ***
			Median	0.4%	0.7% *	4.2% ***	10.2% ***
			N	417	272	230	101
			(Segment - All)	-0.1%	-0.1%	1.5%	0.7%
(2)	Ship-Owning	Shipping Services	Mean	2.2% **	2.3% **	5.5% **	11.0%
			Median	0.1%	0.1%	3.4% *	9.0%
			N	175	114	13	3
			(Segment - All)	0.6%	0.1%	-2.1%	-2.1%
(3)	Ship-Owning	Other	Mean	1.1% *	1.8% **	8.6% ***	17.8% **
			Median	0.3%	0.0%	3.3%	14.0% **
			N	93	52	33	11
			(Segment - All)	-0.5%	-0.4%	1.0%	4.7%
(4)	Shipping Services	Shipping Services	Mean	1.5% ***	1.5% **	8.5% ***	16.4% ***
			Median	0.2%	0.0%	2.9% *	10.8% ***
			N	351	261	58	26
			(Segment - All)	-0.2%	-0.7%	0.9%	3.3%
(5)	Shipping Services	Ship-Owning	Mean	2.0%	2.8%	8.0% **	10.3% **
			Median	0.1%	0.1%	2.4%	12.5% ***
			N	28	21	22	10
			(Segment - All)	0.3%	0.6%	0.4%	-2.8%
(6)	Shipping Services	Other	Mean	3.1% ***	4.1% ***	6.1%	6.3%
			Median	1.0%	1.3%	1.5%	0.6%
			N	80	60	10	5
			(Segment - All)	1.5% *	1.9% *	-1.5%	-6.8%
(7)	Other	Ship-Owning	Mean	2.3% ***	4.4% ***	4.4% ***	8.3% ***
			Median	0.9%	1.5%	1.8% **	4.7% *
			N	130	74	220	53
			(Segment - All)	0.6%	2.1% *	-3.2% ***	-4.8% *
(8)	Other	Shipping Services	Mean	0.2%	0.9% *	12.0% ***	19.6% ***
			Median	0.5%	1.6% **	4.3% **	8.1%
			N	104	59	72	18
			(Segment - All)	-1.4% ***	-1.3% **	4.4% **	6.5%

On the other hand, targets generally realise higher abnormal return in deals with acquirers in the same segment. The five-day CARs to ship-owning targets are 13.8%, 10.3% and 8.3% when the business segments of acquirers are ship-owning, shipping service and other, respectively. Especially, CARs to ship-owning targets in takeovers from other acquirers is significantly lower than the sample average by 4.8% at the 10% significance level. Similarly, the five-day CAR to shipping service targets is higher in deals with shipping service acquirers (16.4%) than those with ship-owning acquirers (11.0%). However, shipping service targets realise the highest CAR when purchased by acquirers in the other segment (19.6%). Abnormal

return to acquiring firms in the other segment is very distinguishable by target segment. Other acquirers realise significantly higher and lower CARs than the sample average in acquisitions of ship-owning targets (4.4%) and shipping service targets (0.9%), respectively.

4.3.2.2. CARs by Market Segment and Period

In the previous chapter, aggregate fluctuations in shipping M&A activity are observed. In terms of the number of deals, the shipping acquisition market reached its first peak in the late-1990s, and the second one in the mid-2000s. A number of previous studies on M&As have found consolidation markets during different periods to be characterised by different factors. For example, Alexandridis *et al.* (2012) identify that the sixth merger wave during 2003–2007 was driven by relatively abundant liquidity. Moreover, compared to the fifth wave during 1993–1999, deals during the sixth wave are characterised by lower acquirer over-valuation, more cash offers, less takeover competition and less management hubris. Strikingly, they find that despite the lower premium during the sixth wave, acquiring firms still suffer as much losses as during the fifth wave. Dong *et al.* (2006) also present differences in the association between valuation and abnormal returns to acquirers between the 1990s and 2000s.

Accordingly, I examine variations in CARs to acquiring and target firms in shipping M&As by periods, as presented in Table 4.9. Based on the M&C sample (see Panel B), CARs to both acquirers and targets are generally positive and statistically significant, with the exception of acquirer CAR in the 1990–1994 period. Despite the numerically negative abnormal returns to acquirers during 1990–1994, there is no statistical significance. In addition, acquirers generally achieve the highest five-day CAR during 2005–2009, while targets do so during 2010–2014.

However, abnormal returns to acquirers according to periods vary among transaction types.[77] First, ship-owning acquirers realise the highest CAR during 2005–2009 in acquisition of ship-owning and shipping service targets (see transaction types (1) and (2) in Panel B). In target acquisitions in the other segment, ship-owning acquirers achieve marginally higher CAR in 2000–2004 than in 2005–2009. Second, shipping service acquirers achieve the highest CAR during 2010–2014 regardless of targets' business segments (see transaction types (4), (5) and (6) in Panel B). Third, acquirers in the other segment have the highest CAR during 2010–2014

[77] Due to low numbers of observations in each transaction type, however, target CAR by periods do not reveal any consistent pattern.

Table 4.9 CARs to Acquirer and Target by Periods

ACAR (TCAR) is the five-day cumulative abnormal return to acquirer (target) calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorised at the top and bottom 1% levels. M&C means a subsample consisting of deals with post-announcement target ownership over 50%. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Transaction Type		ACAR 1990–1994	ACAR 1995–1999	ACAR 2000–2004	ACAR 2005–2009	ACAR 2010–2014	TCAR 1990–1994	TCAR 1995–1999	TCAR 2000–2004	TCAR 2005–2009	TCAR 2010–2014
Panel A: All Sample											
All	Mean	0.6%	1.0%**	1.2%**	2.4%***	2.1%***	3.8%***	7.3%***	9.4%***	6.7%***	9.3%***
	Median	-0.3%	0.3%	0.1%	0.7%	0.4%	1.1%	1.8%	5.1%***	4.7%***	2.7%*
	N	118	295	259	367	339	76	138	125	173	146
(1)	Mean	0.7%	0.4%	1.4%**	2.8%***	1.9%*	5.1%**	7.4%***	11.4%***	8.4%***	12.2%***
	Median	-0.3%	0.3%	0.4%	1.1%	0.4%	1.5%	1.6%	8.4%***	6.2%***	3.7%
	N	46	102	84	103	82	19	60	51	65	35
(2)	Mean	0.6%	1.1%**	2.4%**	4.8%**	-0.1%	4.3%	-	0.0%	7.8%**	7.9%
	Median	-0.4%	0.8%*	0.5%	0.2%	-1.1%	4.3%	-	-0.6%	3.4%	7.9%
	N	14	30	26	61	44	2	-	3	7	1
(3)	Mean	1.9%	1.5%	-1.0%	2.2%	0.3%	10.7%	0.3%	15.3%**	13.7%**	-1.5%
	Median	0.6%	0.3%	0.5%	-0.5%	-0.6%	5.1%	-2.3%	10.0%	10.7%**	-1.3%
	N	12	20	11	26	24	5	8	8	8	4
(4)	Mean	-0.9%	1.3%	0.9%	0.7%	3.4%***	1.2%	3.7%	11.5%**	8.2%**	13.5%**
	Median	-1.8%*	0.3%	-0.1%	0.6%	1.3%	-1.3%	3.3%	15.0%**	2.0%	2.7%
	N	24	73	75	86	93	6	12	10	15	15
(5)	Mean	-6.3%	3.7%	-	-0.1%	2.7%	10.3%**	7.7%**	0.2%	1.3%	12.9%
	Median	-6.3%	0.0%	-	1.5%	2.2%	5.6%	7.8%**	-2.4%	1.3%	-1.7%
	N	2	14	-	6	6	6	8	3	1	4
(6)	Mean	1.5%	0.2%	3.4%*	2.7%**	5.7%**	-11.4%	38.8%	3.7%	12.0%	14.5%
	Median	0.9%	3.5%	0.3%	0.6%	1.3%	-11.4%	38.8%	0.6%	12.0%	14.5%
	N	5	13	21	21	20	2	1	5	1	1
(7)	Mean	2.8%*	0.8%	1.3%	2.4%**	3.8%*	2.1%	7.1%**	6.2%***	2.0%	4.7%**
	Median	2.1%	0.7%	1.5%	1.6%*	0.4%	1.0%	0.9%	4.5%**	1.8%	3.3%*
	N	11	29	23	33	34	33	38	38	51	60
(8)	Mean	-0.7%	2.5%*	-1.3%	1.5%*	-1.0%	3.6%	13.9%**	14.5%*	8.8%***	14.6%***
	Median	-0.7%	0.8%	-0.5%	2.1%**	0.0%	1.0%	5.2%	4.5%	5.3%**	2.4%
	N	4	14	19	31	36	3	11	7	25	26
Panel B: M&C Sample											
All	Mean	-0.2%	1.7%***	2.0%***	3.1%***	2.4%***	9.8%**	12.8%***	15.2%***	10.5%***	15.5%***
	Median	-0.7%	0.3%	0.3%	1.2%**	0.6%	9.9%**	7.5%***	14.2%***	6.6%***	7.7%**
	N	69	189	159	258	238	18	49	51	59	50
(1)	Mean	0.6%	1.2%*	3.1%***	3.8%***	0.7%	3.4%	11.3%***	12.8%***	14.5%***	22.7%***
	Median	-1.0%	0.7%	1.9%**	3.1%***	0.1%	1.5%	7.7%**	10.2%***	9.7%***	12.9%**
	N	29	69	51	72	51	5	26	29	27	14
(2)	Mean	-1.1%	1.1%	1.8%	6.5%**	-1.0%	9.0%	-	-	12.0%	-
	Median	-0.1%	0.7%	0.1%	0.2%	-1.2%	9.0%	-	-	12.0%	-
	N	10	18	13	41	32	1	-	-	2	-
(3)	Mean	-3.7%	1.6%	2.9%	2.3%	1.4%	28.8%	10.7%	24.3%	23.9%	-1.7%
	Median	-3.7%	0.2%	0.3%	-1.1%	0.6%	28.8%	10.7%	11.6%	23.9%	-1.7%
	N	1	16	5	14	16	2	2	3	2	2
(4)	Mean	-1.8%	1.1%	0.6%	0.6%	4.0%***	3.7%	4.8%	25.6%***	10.9%**	53.0%***
	Median	-1.7%	0.0%	-0.9%	0.5%	1.5%	0.9%	2.4%	23.2%***	6.6%	48.6%***
	N	15	48	56	67	75	3	6	5	9	3
(5)	Mean	-6.3%	5.2%	-	1.8%	2.6%	23.3%*	8.5%**	-	-	-2.9%
	Median	-6.3%	-0.4%	-	4.7%	2.2%	23.3%*	11.6%***	-	-	-2.9%
	N	2	10	-	4	5	2	7	-	-	1
(6)	Mean	0.6%	4.2%*	5.0%*	2.9%**	5.5%*	-11.4%	38.8%	0.6%	-	14.5%
	Median	0.6%	5.3%**	3.0%	0.6%	1.3%	-11.4%	38.8%	0.6%	-	14.5%
	N	4	7	14	19	16	2	1	1	-	1
(7)	Mean	3.6%	2.6%	3.5%	4.2%**	6.5%**	19.2%	22.0%*	12.0%**	2.1%	4.9%
	Median	1.8%	1.2%	1.5%	2.7%*	1.1%	10.8%	4.9%	12.7%**	1.4%	3.1%
	N	6	16	12	19	21	3	6	10	14	20
(8)	Mean	-1.9%	3.4%	-2.3%	2.0%**	0.8%	-	55.2%	27.2%	5.3%*	21.1%**
	Median	-1.9%	1.8%	-1.5%	2.5%*	1.7%*	-	55.2%	17.1%	5.3%*	4.4%
	N	2	5	8	22	22	-	1	3	5	9

Table 4.10 CARs to Acquirer and Target by Shipping Market Cycles

ACAR (TCAR) is the five-day cumulative abnormal return to acquirer (target) calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorised at the top and bottom 1% levels. M&C means a subsample consisting of deals with post-announcement target ownership over 50%. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Transaction Type	ACAR						TCAR					
	(1) 1990 –2001	(2) 2002 –2008	(3) 2009 –2014	Mean Difference (1) - (2)	Mean Difference (1) - (3)	Mean Difference (2) - (3)	(1) 1990 –2001	(2) 2002 –2008	(3) 2009 –2014	Mean Difference (1) - (2)	Mean Difference (1) - (3)	Mean Difference (2) - (3)
Panel A: All Sample												
All Mean	1.0%***	2.0%***	2.0%***	-1.1%***	-1.0%**	0.0%	7.0%***	7.5%***	8.7%***	-0.5%	-1.7%	-1.2%
Median	0.2%	0.5%	0.5%				2.1%**	5.0%***	2.9%**			
N	517	464	397				271	207	180			
(1) Mean	0.7%*	2.0%***	2.4%**	-1.4%**	-1.7%*	-0.3%	7.8%***	9.2%***	11.8%***	-1.4%	-4.0%	-2.6%
Median	0.2%	0.5%	0.9%				2.2%*	6.2%***	5.6%**			
N	182	132	103				108	73	49			
(2) Mean	1.3%**	4.7%**	-0.4%	-3.4%*	1.7%*	5.1%**	1.3%	5.9%*	12.4%	-4.6%	-11.2%*	-6.6%
Median	0.5%	0.2%	-1.2%				-0.4%	3.4%	12.4%			
N	53	71	51				4	7	2			
(3) Mean	1.1%	1.7%	0.4%	-0.6%	0.7%	1.3%	9.2%**	4.9%**	11.4%**	4.3%	-2.1%	-6.5%
Median	0.5%	-0.1%	-0.5%				2.5%	3.6%*	6.2%			
N	35	32	26				16	9	8			
(4) Mean	1.3%*	0.3%	2.9%***	1.0%	-1.6%*	-2.6%**	3.0%	11.0%***	12.2%**	-8.0%**	-9.2%*	-1.2%
Median	-0.1%	0.0%	1.3%*				1.8%	6.9%**	2.7%			
N	135	111	105				21	20	17			
(5) Mean	2.5%	5.4%*	-0.8%	-2.9%	3.3%	6.2%*	8.8%***	0.5%	12.9%	8.3%**	-4.1%	-12.4%
Median	-0.2%	5.0%*	0.6%				6.3%**	-0.5%	-1.7%			
N	16	4	8				14	4	4			
(6) Mean	-0.2%	3.3%**	6.1%**	-3.5%*	-6.3%**	-2.8%	3.7%	6.3%	14.5%	-2.6%	-10.8%	-8.2%
Median	0.6%	0.6%	2.0%				-0.4%	2.4%	14.5%			
N	24	31	25				4	5	1			
(7) Mean	1.0%	2.5%**	3.5%**	-1.5%	-2.5%	-1.0%	5.2%***	4.6%***	3.2%*	0.6%	2.0%	1.4%
Median	0.8%	1.5%	0.8%				1.2%	4.3%***	1.5%			
N	48	40	42				85	64	71			
(8) Mean	1.1%	0.6%	-0.9%	0.5%	2.0%*	1.5%	13.2%**	9.7%***	13.3%***	3.5%	-0.1%	-3.6%
Median	-0.2%	1.6%**	0.1%				4.5%	7.9%**	2.4%			
N	24	43	37				19	25	28			
Panel B: M&C Sample												
All Mean	1.5%***	2.8%***	2.3%***	-1.4%**	-0.9%	0.5%	13.5%***	11.1%***	15.2%***	2.4%	-1.7%	-4.1%
Median	0.2%	0.9%*	0.8%*				10.2%***	8.4%***	7.1%**			
N	323	316	274				87	79	61			
(1) Mean	1.4%**	4.0%***	1.0%	-2.5%***	0.5%	3.0%***	10.4%***	14.4%***	19.8%***	-4.1%	-9.4%*	-5.3%
Median	0.5%	3.1%***	0.4%				9.7%***	10.0%***	10.8%**			
N	121	84	67				44	36	21			
(2) Mean	1.0%	5.7%**	-0.6%	-4.7%**	1.5%	6.2%**	9.0%	12.0%	-	-3.0%	-	-
Median	0.4%	0.1%	-1.2%				9.0%	12.0%	-			
N	32	45	37				1	2	-			
(3) Mean	1.8%	2.1%	1.4%	-0.3%	0.3%	0.6%	28.2%**	5.5%	11.1%	22.7%*	17.1%	-5.6%
Median	0.2%	-0.6%	0.6%				21.1%*	5.5%	13.4%*			
N	18	18	16				5	2	4			
(4) Mean	1.2%	0.1%	3.5%***	1.0%	-2.3%*	-3.4%***	7.0%*	15.8%***	41.4%**	-8.8%*	-34.4%**	-25.6%*
Median	-0.8%	0.0%	1.4%				2.4%	23.2%***	48.6%**			
N	91	88	82				10	12	4			
(5) Mean	3.3%	6.7%*	0.0%	-3.4%	3.2%	6.6%	11.8%***	-	-2.9%	-	14.6%	-
Median	-0.6%	8.2%*	0.6%				13.4%***	-	-2.9%			
N	12	3	6				9	-	1			
(6) Mean	0.8%	4.7%**	6.0%**	-3.9%*	-5.2%**	-1.3%	5.4%	0.6%	14.5%	4.7%	-9.2%	-13.9%
Median	-0.2%	3.0%*	1.7%				0.4%	0.6%	14.5%			
N	16	24	20				3	1	1			
(7) Mean	2.5%	4.2%**	6.4%**	-1.7%	-3.8%	-2.1%	21.4%**	4.9%**	4.8%	16.5%**	16.6%**	0.1%
Median	0.8%	1.5%	1.3%				7.2%	4.7%*	1.8%			
N	24	27	23				11	21	21			
(8) Mean	1.9%	0.7%	0.8%	1.3%	1.1%	-0.2%	34.2%*	5.3%*	21.1%**	28.9%*	13.1%	-15.8%*
Median	1.8%	0.7%	1.8%**				36.1%**	5.3%*	4.4%			
N	9	27	23				4	5	9			

in acquisitions of ship-owning targets and during 2005–2009 in acquisitions of shipping service targets.

From another period perspective, I also examine how abnormal returns in shipping M&As vary by shipping market cycles. For this purpose, the sample period is arbitrarily divided into three phases centred on the 2002–2008 period when shipping companies experienced an unprecedentedly booming market. This classification is also consistent with the waves of shipping M&A activity reviewed in the previous chapter.

Table 4.10 illustrates relations between abnormal returns and shipping market condition. Based on the M&C sample (see Panel B), there is no period when acquirers and targets have negative abnormal returns. Interestingly, a negative correlation exists between CARs to acquirers and targets. Although the negative correlation does not hold strongly across different transaction types, acquirer CAR generally increases from the 1990–2001 period to the 2002–2008 period, and decreases from the 2002–2008 period to the 2009–2014 period, and vice versa for target CAR. In addition, ship-owning acquirers achieve the highest five-day CAR during the 2002–2008 period regardless of target business segments (see transaction types (1), (2) and (3)). In 2002–2008, the mean difference in CAR from those in other periods are significant except when targets firms are in the other segment.

4.3.2.3. CARs by Market Segment and Deal Characteristics

Earlier in this chapter, I reviewed how abnormal returns in shipping M&As differ depending on deal characteristics, as well as variations in the impact of those characteristics by combinations of other factors. In this section, I examine variations in the impact of deal-specific factors by transaction type. Table 4.11 reports abnormal returns to acquirers by target public status, nationality mix and method of payment. Based on the M&C sample, although acquirers achieve more abnormal returns in acquisitions of non-public targets than those of public targets in transaction types (1), (2), (4), (5), (7) and (8), the mean difference in the five-day CARs is significant only in transaction types (2) and (5). Acquirers have significantly negative returns in acquisitions of publicly listed targets in transaction type (5).

With regard to nationality mix, the segment analysis presents very mixed results depending on transaction type. Although the mean difference in CARs to acquirers between domestic and cross-border deals is significant only in transaction (5), the direction of mean difference differs across transaction types. Specifically, different from the numerically higher CAR to acquirers

Table 4.11 CAR to Acquirer and Deal Characteristics by Transaction Type

ACAR is the five-day cumulative abnormal return to acquirer calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorised at the top and bottom 1% levels. M&C means a subsample consisting of deals with post-announcement target ownership over 50%. Non-public target includes private, subsidiary and all other public statuses except 'public'. Cross-border is a group of deals where the acquirer and target are located in different domiciles. Cash (stock) is a group of deals financed with pure cash (stock), and mixed/others comprises all remaining others. The combined number of observations concerning the method of payment is less than that of the overall group, as information on financing mix is available only for 815 deals. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Transaction Type			Target Public Status			Domestic vs Cross-Border			Method of Payment			
			Public	Non-Public	Mean Difference (Non-Public - Public)	Domestic	Cross-Border	Mean Difference (Domestic - Cross-Border)	Cash	Stock	Mixed/Others	Mean Difference (Cash - Stock)
(1)	All	Mean	-0.1%	2.0%***	2.1%***	1.5%***	1.6%***	-0.1%	1.8%**	2.2%*	3.4%***	-0.4%
		Median	-0.4%	0.7%*		0.1%	0.8%		0.5%	1.2%	2.1%*	
		N	101	316		241	176		88	30	56	
	M&C	Mean	1.4%*	2.3%***	0.8%	1.8%***	2.5%***	-0.6%	2.6%***	2.2%	4.0%***	0.4%
		Median	0.2%	0.9%**		0.5%	1.2%*		1.2%*	0.6%	2.2%**	
		N	60	212		165	107		55	24	48	
(2)	All	Mean	2.3%	2.2%**	-0.1%	1.1%*	4.4%**	-3.3%*	4.0%	2.9%	6.4%	1.1%
		Median	0.5%	0.1%		-0.2%	0.5%		0.3%	2.2%	2.5%	
		N	12	163		114	61		11	4	3	
	M&C	Mean	-1.5%	2.5%**	4.0%**	1.1%	5.3%*	-4.2%	6.9%	1.3%	8.4%	5.5%
		Median	-0.6%	0.1%		-0.3%	0.7%		-8.1%	1.1%	8.4%	
		N	5	109		80	34		4	3	2	
(3)	All	Mean	3.4%***	0.6%	-2.8%**	0.8%	1.9%	-1.1%	0.1%	3.1%	-4.3%	-3.0%
		Median	2.2%**	-0.4%		-0.4%	0.5%		0.4%	0.7%	-1.5%	
		N	17	76		66	27		16	4	3	
	M&C	Mean	2.5%	1.7%**	-0.8%	1.2%	3.2%*	-2.0%	2.3%	3.3%	-1.2%*	-1.0%
		Median	0.3%	-0.2%		-0.4%	0.3%		1.9%	-1.1%	-1.2%*	
		N	3	49		37	15		8	3	2	
(4)	All	Mean	0.3%	1.5%***	1.2%	1.9%***	0.9%*	1.0%	1.5%*	0.4%	2.0%*	1.2%
		Median	-0.1%	0.2%		0.2%	0.0%		0.6%	-1.8%	0.3%	
		N	21	330		213	138		58	20	37	
	M&C	Mean	-0.4%	1.6%***	2.0%	2.0%**	0.9%*	1.1%	1.7%*	1.4%	2.0%	0.3%
		Median	-1.2%	0.1%		-0.1%	0.3%		0.9%	-1.3%	0.3%	
		N	10	251		156	105		43	17	35	

(5)	All	Mean	-1.9%	3.5%	5.5%*	-1.6%	11.0%*	-12.6%*	-2.2%	-5.8%*	-1.9%	3.6%
		Median	-0.4%	0.1%		-0.6%	2.9%		-0.8%	-4.7%	-1.4%	
		N	8	20		20	8		7	4	5	
	M&C	Mean	-3.8%*	5.5%	9.3%**	-1.5%	16.6%	-18.1%*	-1.8%	-5.8%*	-1.3%	4.0%
		Median	-1.9%	1.3%		-0.6%	4.6%		-0.8%	-4.7%	-0.5%	
		N	6	15		16	5		5	4	4	
(6)	All	Mean	4.3%**	3.0%***	-1.3%	3.3%**	2.7%**	0.6%	2.4%**	13.4%	10.0%**	-11.1%
		Median	3.4%**	0.7%		1.0%	1.0%		1.0%	13.4%	5.7%	
		N	6	74		54	26		24	2	11	
	M&C	Mean	6.8%**	3.9%***	-2.9%	4.5%***	3.2%**	1.3%	2.5%**	31.3%	13.3%**	-28.8%
		Median	8.8%**	0.9%		1.3%	2.1%*		1.0%	31.3%	5.8%	
		N	3	57		42	18		22	1	9	
(7)	All	Mean	-0.4%	3.5%***	3.9%***	2.4%**	2.0%*	0.4%	-0.9%	12.3%*	8.2%*	-4.2%
		Median	0.0%	1.4%		1.0%	0.8%		0.0%	2.8%	7.6%*	
		N	42	88		93	37		22	9	10	
	M&C	Mean	2.7%	4.5%***	1.8%	4.7%***	3.6%**	1.1%	1.2%	13.5%*	8.0%*	-5.4%
		Median	1.0%	1.5%		1.5%	1.7%		1.5%	2.8%	5.9%	
		N	6	68		49	25		9	8	9	
(8)	All	Mean	-0.2%	0.3%	0.5%	0.1%	0.3%	-0.2%	0.0%	0.2%	2.5%	2.3%
		Median	-0.7%	0.8%*		-0.1%	1.4%**		-0.6%	-0.5%	1.7%	
		N	12	92		70	34		19	9	10	
	M&C	Mean	0.1%	1.0%*	0.9%	1.1%	0.6%	0.5%	-1.1%	0.1%	1.1%	1.1%
		Median	0.1%	1.8%***		1.5%**	1.9%**		0.5%	-0.9%	1.5%	
		N	2	57		38	21		8	6	7	

in cross-border deals in Table 4.3, acquirers achieve higher abnormal returns in domestic deals in transaction types (4), (6), (7) and (8). However, the results indicate that ship-owning acquirers (in transaction types (1), (2) and (3)) earn more returns in cross-border deals than in domestic deals, which is consistent with the international nature of the shipping industry.

In addition, I also find that the association between acquirer CAR and method of payment varies among transaction types. Different from the numerically higher CAR to acquirers in equity offers in Table 4.3, acquirers gain more in cash-financed deals in transaction types (1), (2), (4), (5) and (8). However, there is no significance difference in mean between cash- and stock-financed deals across transaction types.

Table 4.12 illustrates abnormal returns to targets by nationality mix in shipping M&As. Based on the M&C sample, ship-owning targets achieve significantly higher abnormal returns only

Table 4.12 CAR to Target by Nationality Mix

CAR is the five-day cumulative abnormal return to target firm calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorised at the top and bottom 1% levels. M&C means a subsample consisting of deals with post-announcement target ownership over 50%. Cross-border is a group of deals where the acquirer and target are located in different domiciles. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Transaction Type		All Sample			M&C Sample		
		Domestic	Cross-Border	(Domestic - Cross-Border)	Domestic	Cross-Border	(Domestic - Cross-Border)
(1)	Mean	7.9%***	10.5%***	-2.7%	11.2%***	16.7%***	-5.5%*
	Median	3.9%	5.1%		9.2%	11.0%	
	N	124	106		53	48	
(2)	Mean	2.0%	7.6%**	-5.6%*	0.6%	16.2%	-15.6%
	Median	0.6%	5.7%*		0.6%	16.2%	
	N	5	8		1	2	
(3)	Mean	11.2%***	2.6%	8.6%**	20.6%**	5.5%	15.1%*
	Median	5.1%	1.0%		21.1%**	5.5%	
	N	23	10		9	2	
(4)	Mean	6.1%***	12.7%***	-6.6%*	13.0%***	21.7%**	-8.7%
	Median	2.7%	3.6%		7.5%**	19.7%**	
	N	37	21		16	10	
(5)	Mean	12.1%**	-0.6%	12.6%***	11.5%***	-0.1%	11.6%
	Median	8.6%**	-0.5%		13.4%***	-0.1%	
	N	15	7		9	1	
(6)	Mean	-2.4%	14.7%*	-17.1%**	-2.7%	19.6%	-22.3%
	Median	0.6%	12.0%*		0.6%	19.6%	
	N	5	5		3	2	
(7)	Mean	4.8%***	3.3%**	1.4%	6.4%**	15.3%**	-8.9%
	Median	1.8%*	1.4%		3.0%	7.1%	
	N	158	62		42	11	
(8)	Mean	11.9%***	12.4%***	-0.5%	19.5%**	20.3%*	-0.8%
	Median	3.1%	8.6%**		8.1%	16.4%	
	N	56	16		14	4	

when acquired by ship-owning companies (see transaction type (1)). This is inconsistent with the numerically higher abnormal returns to ship-owning acquirers in cross-border deals regardless of the business segments of targets indicated in Table 4.11. On the other hand, despite no significance in mean difference, shipping service targets earn higher CAR in cross-border deals across acquirer business segments (see transaction types (2), (4) and (8)).

I also examine the association between target CAR and method of payment. However, due to the low number of observations, results are available only in transaction types (1) and (4), which are intra-segmental deals in the ship-owning and shipping services segments, respectively. Thus, only the meaningful and significant results are reported here (the tabulated results for the full sample are available in Appendix E). Consistent with the findings in Table 4.3, both ship-owning and shipping service targets achieve higher abnormal returns in cash-financed deals, and the mean difference in CAR from stock-financed deals is significant. Specifically, ship-owning targets realise the five-day CARs of 15.3% and 5.8% in cash and equity offers, respectively, when acquirers are ship-owning firms. Similarly, the five-day CARs to shipping service targets are 22.3% and 10.8% in cash and equity offers, respectively.

4.3.2.4. The Impact of Firm Valuation on CARs by Market Segment

In this part, I extend the previous analysis on the association between abnormal returns and valuations of acquirers and targets into each transaction type. Earlier in this chapter, I failed to find any relation between acquirer valuation and abnormal returns. Only abnormal return to targets is negatively associated with target valuation when both acquirers and targets are publicly listed firms. However, the segment analysis reveals a meaningful relation between valuations and abnormal returns in some transaction types. Due to the low number of observations, however, results are unavailable for some transaction types. Thus, I present results in selected transaction types with statistical significance in the M&C sample. The tabulated results for the full sample are available in Appendices F and G for acquirer and target valuations, respectively.

Table 4.13 analyses how abnormal returns relate to acquirer MTB as a proxy of valuation in each transaction type in shipping M&As. Acquirers and targets are ranked based on their MTBs in each year, respectively, and partitioned into terciles. Based on the M&C sample, I find significant relations between acquirer MTB and CAR for ship-owning acquirers. The results

indicate that CAR to ship-owning acquirers is positively associated with acquirer MTB in intra-segmental deals (see transaction type (1)), but negatively in inter-segmental deals (see transaction types (2) and (3)). The mean differences in CARs between large and small terciles are significant at conventional levels in the three transaction types. However, the relation between acquirer MTB and target CAR is significant only in transaction type (1). The CAR to ship-owning target is 8.7% in the top tercile of ship-owning acquirer MTB, and significantly lower than that in bottom tercile by 12.0%.

Table 4.13 CARs and Acquirer Valuation by Transaction Type

ACAR (TCAR) is the five-day cumulative abnormal return to acquirer (target) calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorised at the top and bottom 1% levels. A MTB is the market-to-book ratio of the acquirer four weeks prior to the deal announcement and winsorised at the top and bottom 1% levels. In each year, MTBs are ranked into terciles, with small as the lowest tercile. The left-hand side reports statistics for all deals, while the right-hand side reports those for the M&C subsample consisting of deals with post-announcement target ownership over 50%. (Large - Small) indicates the mean difference in CAR between top and bottom terciles. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Transaction Type			All Sample				M&C Sample			
			Small	Median	Large	(Large - Small)	Small	Median	Large	(Large - Small)
(1)	A MTB	Mean	0.74	1.85	6.05	5.31***	0.90	2.04	5.74	4.84***
		Median	0.68	1.55	4.12		0.75	1.59	3.62	
		N	94	94	94		66	62	66	
	ACAR	Mean	2.3%**	1.0%*	2.1%**	-0.1%	1.5%*	1.3%*	4.0%***	2.5%**
		Median	1.5%*	0.3%	0.9%		1.4%*	0.3%	2.9%**	
		N	76	85	89		56	56	62	
	TCAR	Mean	13.5%***	11.1%**	5.8%*	-7.7%*	20.6%***	17.9%**	8.7%*	-12.0%*
		Median	6.7%*	7.3%*	-0.2%		12.6%**	16.2%**	2.5%	
		N	25	16	18		16	8	13	
(2)	A MTB	Mean	0.65	1.45	4.08	3.43***	0.60	1.57	4.39	3.79***
		Median	0.60	1.43	1.98		0.46	0.92	2.46	
		N	42	45	42		27	33	27	
	ACAR	Mean	8.7%**	0.7%	-1.0%	-9.7%***	10.5%**	-0.9%	0.5%	-10.0%**
		Median	0.6%	0.3%	-0.8%		1.3%	-0.1%	-0.6%	
		N	40	44	42		26	32	27	
	TCAR	Mean	-	8.9%**	0.6%	-	-	9.0%	12.0%	-
		Median	-	7.1%*	0.6%		-	9.0%	12.0%	
		N	-	5	1		-	1	2	
(3)	A MTB	Mean	1.05	3.80	7.65	6.60***	1.92	2.40	9.74	7.83**
		Median	1.14	1.80	2.93		1.16	1.90	3.38	
		N	18	20	18		13	8	13	
	ACAR	Mean	0.8%	2.3%*	1.7%	0.9%	3.4%**	4.8%	-0.2%	-3.5%*
		Median	2.3%**	0.0%	0.3%		1.3%	3.9%	-1.1%	
		N	17	20	17		12	8	13	
	TCAR	Mean	15.3%	0.2%	0.0%	-15.3%	-	2.8%	-0.6%	-
		Median	9.0%	0.2%	-0.6%		-	2.8%	-0.6%	
		N	3	1	3		-	1	1	

Table 4.14 illustrates the relation between target valuation and abnormal returns to acquiring and target firms. Consistent with the findings in Table 4.5, CAR to targets is negatively associated with target MTB, while there is no significant relation with CAR to acquirers. Specifically, the negative association between target MTB and CAR to targets is significant in transaction types (1) and (8). In other transaction types, there is not enough observations or the relation is not significant. In intra-segmental deals in the ship-owning segment, the five-day CAR to target in the top tercile of target MTB is 8.8%, significantly lower than that in the bottom tercile by 13.2% (see transaction type (1)). When shipping service targets are acquired by firms in the other segment, target CAR in the top tercile is only 0.9%, which is not significant, while that in the bottom tercile is 21.8%.

Table 4.14 CAR and Target Valuation by Transaction Type

ACAR (TCAR) is the five-day cumulative abnormal return to acquirer (target) calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorised at the top and bottom 1% levels. T MTB is the market-to-book ratio of the target four weeks prior to the deal announcement and winsorised at the top and bottom 1% levels. In each year, MTBs are ranked into terciles, with small as the lowest tercile. The left-hand side reports statistics for all deals, while the right-hand side reports those for the M&C subsample consisting of deals with post-announcement target ownership over 50%. (Large - Small) indicates the mean difference in CAR between top and bottom terciles. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Transaction Type			All Sample				M&C Sample			
			Small	Median	Large	(Large - Small)	Small	Median	Large	(Large - Small)
(1)	T MTB	Mean	0.49	1.23	4.36	3.87***	0.60	1.16	5.13	4.54***
		Median	0.46	1.12	2.05		0.58	1.08	1.84	
		N	53	56	53		27	28	27	
	ACAR	Mean	1.3%	-0.1%	1.2%	-0.2%	3.3%	2.4%	3.0%*	-0.2%
		Median	-0.1%	-0.4%	2.2%		1.6%	1.2%	2.1%	
		N	16	19	25		10	15	14	
	TCAR	Mean	14.8%***	11.8%***	5.7%***	-9.1%***	21.8%***	14.8%***	8.6%***	-13.2%***
		Median	6.6%**	10.3%***	3.2%**		12.2%**	13.1%***	6.9%***	
		N	49	44	48		23	22	22	
(8)	T MTB	Mean	0.70	1.65	5.76	5.06***	0.79	1.72	8.35	7.56**
		Median	0.58	1.35	2.94		0.67	1.35	2.94	
		N	21	26	21		7	9	7	
	ACAR	Mean	2.4%	1.9%	0.9%	-1.5%	5.0%	5.0%	0.9%	-4.2%
		Median	5.0%	2.9%*	0.9%		5.0%	5.0%	0.9%	
		N	3	3	1		1	1	1	
	TCAR	Mean	18.5%***	10.2%**	9.7%*	-8.8%	28.6%**	29.1%**	0.9%	-27.8%**
		Median	14.7%***	1.1%	4.1%		17.1%	28.5%**	1.9%	
		N	17	21	15		5	5	6	

4.3.2.5. Firm Size and CARs by Market Segment

Finally, I investigate the effect of size-related factors on abnormal returns according to

transaction types. Earlier in this chapter, I find CAR to acquirers to be negatively associated with size-related factors of the acquirer. In addition, CAR to targets is found to be positively related with size-related factors of the acquirer, but negatively with those of the target. In this section, I further examine variations in those associations among transaction types. For this purpose, acquirers and targets in each transaction type are ranked based on five size-related factors (acquirer size and asset, deal value, and target size and asset) and partitioned in terciles, respectively. Due to a low number of observations, results are unavailable for some transaction types. Thus, I report results in selected transaction types with statistical significance in the M&C sample. The tabulated results for the full sample are available in Appendices H through K. Since no significant association between target size and abnormal returns to acquiring and target firms is found, those results are not discussed here.

Table 4.15 illustrates statistics for acquirer size terciles and corresponding CARs to acquirers and targets. In transaction type (5), the mean difference in acquirer size between the top and bottom tercile is not significant. Similar to the findings in Table 4.6, acquirer CAR is negatively

Table 4.15 CARs and Acquirer Size by Transaction Type

ACAR (TCAR) is the five-day cumulative abnormal return to the acquirer (target) calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorised at the top and bottom 1% levels. 'A size' is the market capitalisations of the acquirer four weeks prior to the transaction announcement. In each year, 'A sizes' are ranked into terciles, with small as the lowest tercile. The left-hand side reports statistics for all deals, while the right-hand side reports those for the M&C subsample consisting of deals with post-announcement target ownership over 50%. (Large - Small) indicates mean difference in CAR between top and bottom terciles. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Transaction Type		All Sample				M&C Sample			
		Small	Median	Large	(Large - Small)	Small	Median	Large	(Large - Small)
Panel A: A size									
(1)	Mean	107.42	547.07	4,679.20	4,571.78***	124.16	481.79	5,034.46	4,910.30***
	Median	57.94	468.98	2,762.53		51.68	414.15	2,566.58	
	N	86	88	86		59	58	59	
(2)	Mean	159.26	982.41	5,280.85	5,121.59***	124.83	778.69	4,639.25	4,514.42***
	Median	67.60	302.43	2,243.97		92.86	292.11	1,340.79	
	N	41	38	41		26	29	26	
(3)	Mean	158.60	832.50	5,940.99	5,782.39***	214.55	742.99	1,516.79	1,302.25**
	Median	65.07	303.04	2,201.10		91.04	140.34	1,154.16	
	N	19	20	19		12	12	12	
(4)	Mean	124.84	949.35	7,995.21	7,870.36***	164.36	891.25	8,166.56	8,002.21***
	Median	64.71	712.88	4,462.06		67.47	680.16	4,244.46	
	N	74	79	74		53	63	53	
(6)	Mean	144.07	1,068.29	3,563.26	3,419.19***	151.15	1,089.88	4,447.18	4,296.03**
	Median	22.34	459.90	1,456.31		15.55	346.34	1,456.31	
	N	17	16	17		11	17	11	
(7)	Mean	130.17	1,466.35	13,584.29	13,454.12**	47.51	1,458.10	4,683.53	4,636.02**
	Median	47.54	299.86	3,976.54		31.11	117.49	798.70	
	N	29	34	29		18	20	18	
(8)	Mean	571.55	2,571.59	13,597.79	13,026.24***	910.13	2,439.55	11,079.54	10,169.42***
	Median	136.04	789.73	6,844.11		136.04	627.19	5,018.54	
	N	26	31	26		18	18	18	

Panel B: ACAR									
(1)	Mean	4.4%***	1.8%**	0.7%	-3.7%***	4.3%***	2.4%**	1.2%	-3.2%**
	Median	3.5%***	0.3%	0.4%		4.0%***	1.5%	0.3%	
	N	79	80	75		55	54	50	
(2)	Mean	6.7%**	2.9%	-1.4%*	-8.1%***	9.4%**	1.7%	-1.4%	-10.9%***
	Median	2.3%	-0.3%	-0.3%		2.3%	-0.2%	-0.7%	
	N	39	36	41		26	27	26	
(6)	Mean	8.0%**	3.3%	2.7%	-5.4%*	11.3%**	3.6%**	3.3%	-8.0%*
	Median	6.0%*	1.4%	-0.3%		9.9%**	3.4%**	-0.3%	
	N	17	15	17		11	16	11	
(8)	Mean	0.5%	-0.7%	0.0%	-0.4%	-0.4%	0.5%	1.7%**	2.1%**
	Median	1.5%	0.3%	0.9%		0.3%	1.9%	1.9%**	
	N	23	27	25		16	15	18	
Panel C: TACR									
(1)	Mean	4.7%	9.7%**	15.4%***	10.8%**	6.2%	21.1%**	18.9%***	12.8%**
	Median	2.5%	4.1%	12.2%***		2.5%	13.2%	13.0%***	
	N	10	19	29		6	6	25	

associated with acquirer size in transaction types (1), (2) and (6). However, I find a positive relation between acquirer size and CAR in transaction type (8). Regarding abnormal return to target, the positive association with acquirer size is significant only in transaction type (1).

The associations between acquirer asset and abnormal returns to acquirers and targets are similar to the findings in acquire size (See Table 4.16). Abnormal return to acquirers is negatively associated with acquirer asset in transaction types (2) and (4). Specifically, in transaction type (2), acquirer CAR in the top tercile of acquirer asset is negative and significantly lower than that in the bottom tercile by 9.4%. Consistent with the finding in acquirer size, the positive relation between acquirer asset and abnormal returns to targets is significant only in transaction type (1).

Table 4.16 CARs and Acquirer Asset by Transaction Type

ACAR (TCAR) is the five-day cumulative abnormal return to acquirer (target) calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorised at the top and bottom 1% levels. 'A asset' is the total asset of the acquirer at the year-end prior to the deal announcement. In each year, 'A assets' are ranked into terciles, with small as the lowest tercile. The left-hand side reports statistics for all deals, while the right-hand side reports those for the M&C subsample consisting of deals with post-announcement target ownership over 50%. (Large - Small) indicates mean difference in CAR between top and bottom terciles. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Transaction Type		All Sample				M&C Sample			
		Small	Median	Large	(Large - Small)	Small	Median	Large	(Large - Small)
Panel A: A Asset									
(1)	Mean	324.63	1,246.65	9,576.64	9,252.01***	295.99	1,122.90	8,995.09	8,699.10***
	Median	161.17	878.80	5,108.87		138.31	879.23	4,671.92	
	N	148	153	148		96	97	96	
(2)	Mean	252.45	2,072.27	9,165.27	8,912.81***	372.79	2,903.64	6,832.33	6,459.54***
	Median	147.76	1,064.46	8,007.61		171.87	1,112.34	5,120.38	
	N	57	64	57		38	40	38	

(3)	Mean	735.37	2,995.81	7,414.44	6,679.07***	1,102.89	3,584.81	3,662.52	2,559.64**
	Median	249.04	935.42	5,705.65		182.15	976.14	1,717.17	
	N	30	25	30		16	16	16	
(4)	Mean	170.88	872.23	10,442.76	10,271.88***	174.77	819.80	9,488.76	9,313.99***
	Median	121.27	724.03	3,530.23		121.27	599.87	2,817.68	
	N	119	122	119		89	88	89	
(6)	Mean	331.93	806.89	2,759.78	2,427.85***	386.45	753.80	3,006.00	2,619.55***
	Median	61.40	450.03	2,380.44		104.34	399.10	2,900.95	
	N	22	31	22		16	22	16	
(7)	Mean	485.63	5,701.24	84,946.35	84,460.72***	232.68	1,806.51	32,293.28	32,060.61**
	Median	87.71	1,554.53	18,964.60		55.51	286.39	4,935.47	
	N	45	44	45		23	26	23	
(8)	Mean	923.90	5,949.31	51,140.59	50,216.68***	1,232.48	2,442.75	50,932.68	49,700.20***
	Median	306.96	2,286.62	14,615.90		263.57	1,276.03	12,500.39	
	N	38	41	39		21	26	21	
Panel B: ACAR									
(2)	Mean	4.6%***	4.6%**	-1.7%**	-6.3%***	7.5%***	2.3%	-1.8%**	-9.4%***
	Median	1.9%	0.1%	-0.9%		3.7%*	-0.6%	-1.2%	
	N	53	51	55		35	33	37	
(4)	Mean	2.7%**	1.6%**	0.0%	-2.7%**	2.9%**	1.2%	0.6%	-2.4%*
	Median	0.1%	0.9%	0.0%		-0.1%	0.0%	0.5%	
	N	102	116	98		80	87	71	
Panel C: TCAR									
(1)	Mean	-0.8%	13.2%***	10.3%***	11.1%***	-0.5%	18.4%***	16.8%***	17.3%*
	Median	0.5%	8.4%**	6.7%**		1.4%	13.3%**	13.0%***	
	N	24	35	43		8	18	28	

In the previous analysis in Table 4.6, I find that CARs to acquirers and targets have no significant association with deal value. However, the segment analysis indicates the significant impact of deal value on CARs in several segments (see Table 4.17). In transaction type (2), acquirer CAR is negatively associated with deal value. On the other hand, the relation between target CAR and deal value varies among segments. When the acquirers are ship-owning firms, target CAR is positively related to deal value (see transaction types (1) and (3)). However, in intra-segmental deals in the shipping service segment, target CAR is negatively associated with deal value (see transaction type (4)).

Table 4.17 CARs and Deal Value by Transaction Type

ACAR (TCAR) is the five-day cumulative abnormal return to acquirer (target) calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorised at the top and bottom 1% levels. Deal value is the transaction value. In each year, deal vals are ranked into terciles, with small as the lowest tercile. The left-hand side reports statistics for all deals, while the right-hand side reports those for the M&C subsample consisting of deals with post-announcement target ownership over 50%. (Large - Small) indicates mean difference in CAR between top and bottom terciles. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Transaction Type	All Sample				M&C Sample			
	Small	Median	Large	(Large - Small)	Small	Median	Large	(Large - Small)
Panel A: Deal Value								

(1)	Mean	9.66	74.88	669.51	659.86***	23.12	138.86	992.61	969.50***
	Median	5.28	52.04	316.80		12.69	96.94	546.99	
	N	145	143	145		84	85	84	
(2)	Mean	4.14	24.24	156.15	152.01***	8.12	26.12	203.72	195.61***
	Median	1.17	10.69	78.27		1.25	15.21	114.00	
	N	38	42	39		23	23	23	
(3)	Mean	6.58	22.54	164.16	157.57***	7.50	44.81	175.60	168.10**
	Median	3.47	11.00	87.18		3.60	12.01	35.15	
	N	26	29	26		11	16	11	
(4)	Mean	5.48	31.36	539.59	534.11***	7.23	36.22	693.60	686.37***
	Median	3.55	17.53	147.10		4.30	18.31	245.32	
	N	86	86	86		58	63	58	
(5)	Mean	15.74	89.90	292.77	277.03***	11.78	133.05	398.83	387.06**
	Median	7.98	45.38	149.52		8.85	105.99	154.13	
	N	12	12	12		7	10	7	
(6)	Mean	6.36	32.60	238.38	232.03**	61.24	40.20	244.43	183.19*
	Median	1.47	17.42	102.85		3.97	29.60	94.63	
	N	20	22	20		15	17	14	
(7)	Mean	7.40	51.97	385.23	377.83***	17.38	119.92	494.66	477.29***
	Median	3.94	30.07	175.06		7.64	72.23	336.70	
	N	86	76	86		33	32	34	
(8)	Mean	6.49	43.19	569.81	563.31***	21.31	425.18	796.98	775.67**
	Median	3.63	15.97	153.23		8.87	79.86	354.83	
	N	44	40	44		18	22	18	
Panel B: ACAR									
(2)	Mean	1.8%	3.5%*	-0.1%	-1.9%	5.6%*	0.6%	-0.6%	-6.2%*
	Median	0.3%	-0.4%	-0.4%		-0.6%	-0.7%	0.3%	
	N	32	33	34		20	18	22	
Panel C: TCAR									
(1)	Mean	7.0%***	8.5%***	15.0%***	8.0%***	8.8%**	11.3%***	20.8%***	12.0%***
	Median	2.6%	2.5%	11.0%***		3.5%	12.9%***	14.5%***	
	N	56	55	66		24	28	37	
(3)	Mean	-5.7%**	13.7%*	9.7%**	15.4%***	-1.7%	20.2%*	22.5%**	24.3%*
	Median	-5.8%**	9.6%	6.3%*		-1.7%	19.0%*	22.5%**	
	N	5	5	14		2	4	2	
(4)	Mean	12.4%**	9.2%**	13.7%**	1.3%	31.3%**	20.4%**	15.4%**	-15.9%**
	Median	5.0%	4.2%	6.8%*		26.7%**	18.4%**	6.7%	
	N	10	17	15		4	6	12	

Table 4.18 reports statistics for target asset in each tercile and corresponding CARs to acquiring and target firms. Segmental analysis presents rather different results from the previous analysis. Earlier in this chapter, I find a negative relation between target CAR and target asset, as well as no significant relation with acquirer CAR. However, there is no significant relation between target CAR and target asset by segment. Rather, acquirer CAR is positively related with target asset in ship-owning intra-segmental deals (see transaction type (1)).

Table 4.18 CARs and Target Asset by Transaction Type

ACAR is the five-day cumulative abnormal return to acquirer calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorised at the top and bottom 1% levels. T asset is the total asset of the target at the year-end prior to the deal announcement. In each year, T assets are ranked into terciles, with small as the lowest tercile. The left-hand side reports statistics for all deals, while the right-hand side reports those for the M&C subsample consisting of deals with post-announcement target ownership over 50%. (Large - Small) indicates mean difference in CAR between top and bottom terciles. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Transaction Type		All Sample				M&C Sample			
		Small	Median	Large	(Large - Small)	Small	Median	Large	(Large - Small)
Panel A: T Asset									
(1)	Mean	188.59	652.38	2,044.45	1,855.86***	168.75	778.31	2,196.02	2,027.27***
	Median	140.83	581.09	1,354.39		117.65	646.49	1,438.69	
	N	101	94	93		47	45	47	
(4)	Mean	36.42	303.96	1,451.50	1,415.08***	40.32	260.05	1,401.69	1,361.37***
	Median	18.15	163.54	869.96		16.65	122.93	616.19	
	N	41	39	36		24	23	24	
(7)	Mean	139.22	662.81	2,570.59	2,431.37***	137.94	484.56	1,413.91	1,275.97***
	Median	91.78	525.24	1,807.92		73.87	364.50	1,071.74	
	N	82	99	77		20	25	21	
(8)	Mean	58.88	186.03	988.49	929.61***	84.97	469.76	927.71	842.74***
	Median	41.17	152.25	528.21		36.04	146.77	483.52	
	N	37	34	36		10	14	11	
Panel B: ACAR									
(1)	Mean	0.5%	2.1%	0.5%	0.0%	-0.5%	2.4%	2.9%**	3.4%*
	Median	-0.1%	-0.4%	0.1%		0.7%	-0.4%	1.6%	
	N	46	27	40		28	20	22	

4.3.3. Multivariate Regressions on Determinants of CARs

In this section, I use a multivariate framework to test the robustness of the relations between abnormal returns and factors examined earlier in this chapter. Furthermore, I report the estimation results according to business segments (ship-owning, shipping services and other) and shipping market cycles (1990–2001, 2002–2008 and 2009–2014).

For controlling firm- and deal-specific variables that are found to affect acquirer abnormal returns, each sample is estimated in two specifications. In the first specification, I control variables that are found to affect acquirer abnormal returns in the univariate tests. I find that acquiring firms achieve positive abnormal returns in cross-border (CROSS-BORDER), cash-financed (CASH), stock-financed (STOCK) and publicly listed target (PUBLIC TARGET) deals. Moreover, the results of univariate tests also indicate that acquirers achieve higher abnormal returns when the business segments of targets differ (DIVERSIFICATION). On the other hand, CAR to acquirers is found to be negatively associated with acquirer size-related

factors (market size and total asset). I therefore include a logarithm of acquirer total asset (lnA ASSET) at the end of year prior to the deal announcement as an explanatory variable.[78] The second specification for each sample includes two additional controls that are insignificant in the univariate tests, but have been found to influence acquirer abnormal return in the previous literature. One is acquirer market-to-book ratio (lnA MTB), as in Dong *et al.* (2006), and the other is deal size (lnDEAL VALUE), as in Alexandridis *et al.* (2013). Moreover, I also consider value creation effects in high valuation markets (HIVAL) using the de-trended monthly price-earnings ratio of the S&P500, as in Bouwman *et al.* (2009), and the pre-announcement runup of the acquiring firms using the cumulative stock returns over the year prior to the deal announcement.

Table 4.19 reports the OLS regression results where the dependent variable is the five-day abnormal return to acquirers. Although the direction of sign and significance varies across business segments and periods, the results indicate that acquirer asset, cross-border, stock financing, diversification and acquirer runup comprise major determinants of abnormal return to acquiring firms. Specifically, the negative impact of acquirer asset on CAR to acquirers is quite consistent across business segments and shipping market cycles. The results are robust after controlling market-to-book ratio, deal size, high valuation market and runup. Based on the M&C sample (see Panel B of Table 4.19), I find that CARs to acquiring firms are higher in cross-border and diversification deals, which is consistent with the results of univariate tests. In addition, abnormal returns for acquirers are negatively related to runup.[79]

However, as noted in section 4.3.3, there are variations across business segments of acquiring firms. For ship-owning acquirers, the coefficients of cross-border and cash-financed are positive and statistically significant at the 1% and 5% levels, respectively. On the other hand, the coefficient of acquirer asset is negative and significant at the 1% level. The significance of coefficients of acquirer asset remain robust after controlling market-to-book ratio and deal value. The negative coefficient of runup also holds for ship-owning acquirers. In the shipping service segment, acquirer CAR is positively related to diversification deals, but negatively

[78] Although acquirer size (market capitalisation four weeks prior to the acquisition announcement) is also found to be negatively associated with acquirer abnormal return in the previous sections, either acquirer total asset or acquirer size have to be chosen due to the concern for multicollinearity. The correlation between the two size-related factors is 79.4% (79.5%) in the all sample (M&C sample). I select acquirer asset as an explanatory variable due to the much larger number of observations. In addition, there is no significant difference in the results of multivariate regression estimations when I perform the tests with acquirer size.

[79] The negative relation between pre-announcement run-up in the stock price of acquiring firms and announcement returns implies that the possibility of information leakage is not serious since the event study analysis generally assumes that abnormal returns prior to the announcement is evidence of information leakage in the pre-announcement period.

Table 4.19 Acquirer Return Regression

This table reports OLS regression estimates of acquirer abnormal returns on the size of acquirer assets and other deal- and firm-specific characteristics. Acquirer return is the five-day cumulative abnormal returns calculated by adding the market-adjusted returns for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. Abnormal returns are winsorised at the top and bottom 1% levels. CROSS-BORDER, CASH, STOCK and PUBLIC TARGET are indicator variables that take the value of one for acquisitions with different nationalities of acquirers and targets, pure cash financing, pure stock financing and publicly listed targets, respectively. DIVERSIFICATION is an indicator variable that takes the value of one when the acquirer and targets are in different segments among ship-owning, shipping services and others, and zero otherwise. lnA ASSET is the logarithm of acquirer total assets at the year-end prior to the deal announcement. lnA MTB is the logarithm of the market-to-book ratio of the acquirer four weeks prior to the deal announcement and winsorised at the top and bottom 1% levels. lnDEAL VALUE is the logarithm of the transaction value. HIVAL is an indicator variable that takes the value of one when acquisitions occur in a high valuation market using the de-trended monthly price-earnings ratio of the S&P500 index. RUNUP is the cumulative stock price returns of the acquirer over the year prior to the deal announcement. *p*-values are reported in brackets. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

	All Acquirers		Ship-Owning Acquirers		Shipping Service Acquirers		Other Acquirers		1990–2001		2002–2008		2009–2014	
Panel A : All Sample														
CROSS-BORDER	0.012**	0.007	0.018**	0.018	0.006	-0.005	0.008	0.016	0.011	0.002	0.014	-0.004	0.011	0.018
	(0.032)	(0.436)	(0.019)	(0.142)	(0.526)	(0.728)	(0.527)	(0.462)	(0.211)	(0.926)	(0.147)	(0.758)	(0.280)	(0.210)
CASH	0.002	0.001	0.014	0.014	-0.009	-0.017	-0.018	-0.027	-0.006	-0.007	0.006	0.002	0.003	-0.005
	(0.731)	(0.947)	(0.126)	(0.274)	(0.488)	(0.264)	(0.230)	(0.186)	(0.632)	(0.748)	(0.627)	(0.890)	(0.829)	(0.734)
STOCK	0.013	0.002	0.015	0.020	-0.009	-0.077***	0.052**	0.042	0.034*	-0.026	0.001	0.011	0.006	0.002
	(0.241)	(0.877)	(0.352)	(0.298)	(0.693)	(0.005)	(0.023)	(0.150)	(0.090)	(0.416)	(0.956)	(0.585)	(0.753)	(0.921)
PUBLIC TARGET	-0.006	-0.008	-0.013	-0.011	0.010	0.025	-0.008	-0.011	-0.009	0.009	-0.019	-0.025	0.014	0.015
	(0.419)	(0.465)	(0.198)	(0.478)	(0.614)	(0.336)	(0.577)	(0.641)	(0.418)	(0.743)	(0.191)	(0.110)	(0.353)	(0.428)
DIVERSIFICATION	0.009	0.008	0.006	-0.007	0.014	0.017			0.008	-0.012	0.023**	0.028*	-0.007	-0.002
	(0.146)	(0.414)	(0.441)	(0.609)	(0.205)	(0.287)			(0.469)	(0.661)	(0.030)	(0.051)	(0.545)	(0.882)
lnA ASSET	-0.009***	-0.014***	-0.010***	-0.015***	-0.011***	-0.016***	-0.003	-0.011***	-0.005*	-0.014**	-0.008***	-0.011***	-0.013***	-0.016***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.189)	(0.007)	(0.058)	(0.023)	(0.001)	(0.001)	(0.000)	(0.000)
lnAMTB		-0.005*		-0.007*		-0.019***		0.010*		0.026**		-0.015***		0.013**
		(0.082)		(0.094)		(0.007)		(0.074)		(0.010)		(0.000)		(0.027)
lnDEALVALUE		0.004*		0.001		0.006*		0.005		-0.001		0.007**		-0.001
		(0.054)		(0.692)		(0.056)		(0.300)		(0.794)		(0.010)		(0.795)
HIVAL		-0.002		-0.014		-0.007		0.006		0.010		-0.010		-0.007
		(0.795)		(0.299)		(0.652)		(0.779)		(0.609)		(0.434)		(0.662)
RUNUP		-0.035***		-0.044***		0.014		-0.076***		-0.057**		-0.028**		-0.056***
		(0.000)		(0.000)		(0.392)		(0.000)		(0.010)		(0.022)		(0.000)
C	0.058***	0.095***	0.072***	0.130***	0.079***	0.106***	0.029	0.056	0.033	0.086	0.042**	0.052*	0.108***	0.158***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.006)	(0.169)	(0.206)	(0.190)	(0.195)	(0.048)	(0.086)	(0.000)	(0.000)
Obs.	1,226	531	607	259	408	171	211	101	378	66	459	227	389	238
Adj. R^2	0.046	0.114	0.057	0.150	0.067	0.182	0.064	0.335	0.023	0.311	0.050	0.203	0.094	0.161
Time-Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No
Industry-Fixed	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: M&C Sample														
CROSS-BORDER	0.016**	0.011	0.027***	0.017	0.009	-0.005	0.002	0.013	0.023*	-0.023	0.019	0.010	0.010	0.014

	All Acquirers		Ship-Owning Acquirers		Shipping Service Acquirers		Other Acquirers		1990–2001		2002–2008		2009–2014	
	(0.023)	(0.350)	(0.005)	(0.311)	(0.459)	(0.818)	(0.901)	(0.718)	(0.062)	(0.404)	(0.110)	(0.555)	(0.444)	(0.468)
CASH	0.007	0.002	0.031**	0.023	-0.009	-0.022	-0.031	-0.041	0.005	0.000	0.015	0.008	0.005	-0.008
	(0.423)	(0.880)	(0.013)	(0.173)	(0.555)	(0.265)	(0.224)	(0.275)	(0.755)	(0.991)	(0.319)	(0.657)	(0.744)	(0.691)
STOCK	0.017	-0.006	0.019	0.011	0.010	-0.071**	0.046	0.028	0.069***	0.003	-0.008	-0.011	0.008	-0.001
	(0.208)	(0.757)	(0.294)	(0.633)	(0.718)	(0.044)	(0.148)	(0.538)	(0.005)	(0.936)	(0.743)	(0.683)	(0.729)	(0.965)
PUBLIC TARGET	-0.006	-0.007	-0.019	-0.021	-0.007	0.017	-0.008	0.001	-0.029	0.005	-0.008	-0.034	0.019	0.016
	(0.601)	(0.676)	(0.190)	(0.313)	(0.811)	(0.685)	(0.811)	(0.980)	(0.112)	(0.876)	(0.723)	(0.204)	(0.393)	(0.559)
DIVERSIFICATION	0.012	0.016	0.005	-0.007	0.028**	0.025			0.009	0.023	0.023*	0.037*	0.003	0.007
	(0.116)	(0.243)	(0.584)	(0.689)	(0.046)	(0.247)			(0.542)	(0.551)	(0.085)	(0.059)	(0.853)	(0.748)
lnAASSET	-0.010***	-0.017***	-0.011***	-0.015***	-0.010***	-0.010	-0.004	-0.015*	-0.009***	-0.004	-0.009***	-0.014***	-0.011***	-0.015***
	(0.000)	(0.000)	(0.000)	(0.002)	(0.001)	(0.114)	(0.291)	(0.051)	(0.006)	(0.746)	(0.002)	(0.005)	(0.000)	(0.003)
lnAMTB		-0.007		-0.010*		-0.021**		0.010		0.042***		-0.016***		0.014
		(0.100)		(0.055)		(0.021)		(0.265)		(0.001)		(0.001)		(0.113)
lnDEALVALUE		0.004		0.001		0.004		0.005		0.002		0.004		0.000
		(0.103)		(0.836)		(0.384)		(0.531)		(0.757)		(0.256)		(0.975)
HIVAL		0.014		0.008		0.008		0.031		0.014		0.021		0.002
		(0.282)		(0.668)		(0.712)		(0.403)		(0.521)		(0.285)		(0.932)
RUNUP		-0.026**		-0.032*		0.026		-0.098***		-0.086**		-0.014		-0.048***
		(0.024)		(0.050)		(0.261)		(0.001)		(0.021)		(0.438)		(0.006)
C	0.065***	0.100***	0.074***	0.127***	0.074***	0.079	0.039	0.041	0.062*	-0.033	0.052*	0.047	0.102***	0.161***
	(0.000)	(0.002)	(0.000)	(0.001)	(0.001)	(0.131)	(0.225)	(0.585)	(0.058)	(0.721)	(0.052)	(0.263)	(0.000)	(0.000)
Obs.	817	339	392	163	305	121	120	55	234	45	313	139	270	155
Adj. R^2	0.051	0.109	0.097	0.203	0.067	0.195	0.073	0.414	0.070	0.385	0.063	0.294	0.093	0.167
Time-Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No
Industry-Fixed	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes

related to acquirer asset (see Panel B). Interestingly, stock financing is found to affect abnormal returns to acquiring firms negatively in this segment. Consistent with Alexandridis *et al.* (2013), I find the negative and significant coefficient of the deal size. For acquirers in the other segment, the negative impact of runup is significant in both samples.

The negative impact of acquirer asset on CARs to acquirers is robust across different periods. Except in the specification of controlling acquirer valuation and deal size in the 1990–2001 period (in the M&C sample), the coefficient of acquirer asset is negative and significant at the 1% level. On the other hand, the significance of other explanatory variables (cross-border, stock financing, acquirer valuation) are not robust across different specifications or shipping market cycles.

Finally, Table 4.20 reports the OLS regression results where the dependent variable is the five-day abnormal returns to targets.[80] Similar to the patterns in multivariate regressions for acquirer CARs, the direction of sign and significance vary across business segments and periods for target CARs. Specifically, no significant patterns in the relation between target CARs and independent variables are found in the M&C sample. Accordingly, discussion in this section is based on the results for the overall sample. It is found that target CARs are positively associated with CASH (when the deal is paid 100% in cash), but negatively with DIVERSIFICATION (when the acquirer and target are involved in different business segments) and TASSET (the size of the target's total assets). The impact of cash payment and diversification is largely driven by target firms in the ship-owning segment, while the negative association between target CARs and assets is attributable to target firms in the shipping services segment.

[80] Due to the low number of observations, the regression result for Other Targets in the M&C sample is not reported here.

Table 4.20 Target Return Regression

This table reports OLS regression estimates of target abnormal returns on the size of target assets and other deal- and firm-specific characteristics. Target returns are the five-day cumulative abnormal returns calculated by adding the market-adjusted returns for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. Abnormal returns are winsorised at the top and bottom 1% levels. CROSS-BORDER, CASH and STOCK are indicator variables that take the value of one for acquisitions with different nationalities of acquirers and targets, pure cash financing and pure stock financing, respectively. DIVERSIFICATION is an indicator variable that takes the value of one when the acquirer and targets in the different segments among ship-owning, shipping services and others, and zero otherwise. lnTASSET is the logarithm of target total assets at the year-end prior to the deal announcement. lnTMTB is the logarithm of the market-to-book ratio of the target four weeks prior to the deal announcement and winsorised at the top and bottom 1% levels. *p*-values are reported in brackets. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

	All Targets		Shipping Targets		Shipping Service Targets		Other Targets		1990–2001		2002–2008		2009–2014	
Panel A: All Sample														
CROSS-BORDER	0.026*	0.026	0.019	0.007	0.049	0.061	-0.025	0.014	0.019	0.005	0.009	0.008	0.063*	0.070*
	(0.064)	(0.137)	(0.249)	(0.752)	(0.146)	(0.120)	(0.663)	(0.790)	(0.405)	(0.902)	(0.602)	(0.703)	(0.091)	(0.075)
CASH	0.049***	0.049***	0.059***	0.052**	0.033	0.042	-0.032	-0.072*	0.038*	0.017	0.055***	0.062***	0.046	0.033
	(0.000)	(0.003)	(0.000)	(0.010)	(0.282)	(0.227)	(0.562)	(0.089)	(0.081)	(0.652)	(0.003)	(0.002)	(0.152)	(0.314)
STOCK	-0.047	-0.039	-0.031	-0.017	-0.046	0.081	-0.420**	-0.374***	-0.086	-0.029	-0.070	-0.042	0.022	0.002
	(0.196)	(0.372)	(0.423)	(0.716)	(0.723)	(0.571)	(0.016)	(0.004)	(0.115)	(0.719)	(0.174)	(0.464)	(0.807)	(0.984)
DIVERSIFICATION	-0.028**	-0.036**	-0.037**	-0.051**	0.004	0.012			-0.010	-0.023	-0.043**	-0.042**	-0.034	-0.042
	(0.048)	(0.040)	(0.019)	(0.012)	(0.892)	(0.744)			(0.669)	(0.568)	(0.018)	(0.036)	(0.307)	(0.218)
lnTASSET	-0.015***	-0.013**	-0.008	-0.009	-0.029***	-0.026**	-0.037**	-0.015	-0.007	0.000	-0.006	-0.005	-0.036***	-0.025**
	(0.001)	(0.027)	(0.123)	(0.239)	(0.007)	(0.033)	(0.011)	(0.193)	(0.283)	(0.998)	(0.327)	(0.515)	(0.001)	(0.033)
lnTMTB		-0.005		0.001		-0.034***		0.025		-0.036***		-0.003		0.007
		(0.319)		(0.926)		(0.005)		(0.136)		(0.004)		(0.657)		(0.482)
C	0.157***	0.141**	0.105***	0.161***	0.216***	0.146*	0.350***	0.195*	0.130**	0.039	0.103*	0.085	0.271***	0.227**
	(0.000)	(0.010)	(0.003)	(0.003)	(0.001)	(0.060)	(0.001)	(0.061)	(0.026)	(0.745)	(0.078)	(0.183)	(0.008)	(0.029)
Obs.	588	411	422	285	131	103	35	23	220	88	199	170	169	153
Adj. R^2	0.063	0.069	0.060	0.077	0.075	0.158	0.315	0.527	0.041	0.142	0.099	0.104	0.116	0.110
Time-Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No
Industry-Fixed	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: M&C Sample														

	All Targets		Shipping Targets		Shipping Service Targets		Other Targets	1990–2001		2002–2008		2009–2014	
CROSS-BORDER	0.070**	0.049	0.053	0.010	0.108	0.079	0.025	0.032	-0.048	0.009	0.012	0.194**	0.158*
	(0.018)	(0.135)	(0.110)	(0.806)	(0.141)	(0.292)	(0.773)	(0.532)	(0.599)	(0.781)	(0.711)	(0.016)	(0.057)
CASH	0.008	0.024	0.002	0.002	0.063	0.086	-0.204**	-0.026	-0.066	0.047	0.063*	-0.023	-0.023
	(0.778)	(0.431)	(0.938)	(0.953)	(0.389)	(0.209)	(0.032)	(0.601)	(0.476)	(0.136)	(0.050)	(0.715)	(0.707)
STOCK	-0.128**	-0.097	-0.107**	-0.076	-0.266	0.021	-0.780***	-0.193**	-0.105	-0.103*	-0.066	-0.112	-0.111
	(0.016)	(0.102)	(0.049)	(0.234)	(0.262)	(0.929)	(0.001)	(0.034)	(0.464)	(0.084)	(0.289)	(0.370)	(0.424)
DIVERSIFICATION	-0.036	-0.061*	-0.040	-0.069*	-0.046	-0.044		0.079	0.065	-0.093***	-0.080**	-0.103	-0.114*
	(0.215)	(0.055)	(0.223)	(0.065)	(0.500)	(0.524)		(0.152)	(0.477)	(0.005)	(0.015)	(0.133)	(0.097)
lnTASSET	-0.010	-0.011	0.008	0.006	-0.055**	-0.050**	-0.027	-0.004	-0.015	0.008	0.005	-0.016	-0.021
	(0.260)	(0.295)	(0.426)	(0.613)	(0.029)	(0.037)	(0.286)	(0.818)	(0.578)	(0.424)	(0.635)	(0.537)	(0.440)
lnTMTB		-0.028**		-0.014		-0.069**			-0.030		-0.001		-0.039*
		(0.020)		(0.347)		(0.012)			(0.407)		(0.930)		(0.080)
C	0.243***	0.189*	0.065	0.143	0.453***	0.351**	0.667***	0.267**	0.106	-0.019	-0.029	0.305*	0.375
	(0.003)	(0.055)	(0.358)	(0.128)	(0.004)	(0.030)	(0.001)	(0.042)	(0.687)	(0.877)	(0.821)	(0.084)	(0.043)
Obs.	202	159	147	113	43	37	12	68	34	76	71	58	54
Adj. R^2	0.100	0.134	0.073	0.083	0.228	0.442	0.936	0.176	0.208	0.225	0.227	0.258	0.298
Time-Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No
Industry-Fixed	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes

4.4. Summary of Chapter

In this chapter, I investigate the value creation effect of M&As in the shipping industry. Using an extensive sample of shipping M&A deals occurring during 1990–2014, I examine abnormal returns to acquiring and target firms across different business sectors, periods and transaction types. Overall, the results indicate that both acquiring and target firms in the shipping industry achieve positive and significant abnormal returns from M&A transactions, though a much larger part of gains from consolidation is captured by target firms. On average, the five-day CARs to acquirers and targets are 1.6% and 7.6%. Specifically, the positive acquirer gain in shipping M&As conflicts considerably with evidence in the general M&A literature. In the review of empirical evidence on gains from M&As, Bruner (2002) concludes that abnormal returns to bidders is not significant despite some exceptions. However, the finding of positive and significant abnormal return to acquiring firms in this paper is consistent with evidence in the existing shipping M&A studies.

This study reveals several interesting observations concerning the relations between abnormal return and deal- and firm-specific factors in shipping M&As, some of which are consistent with evidence in the previous M&A literature, while others are believed to be specific to the shipping industry. Although the findings are based on univariate analysis, and not strongly confirmed in multivariate analysis, they offer fruitful avenues for future research. First, the results indicate that acquirer gain is positive when targets are non-publicly listed companies. Specifically, consistent with the finding in Chang (1998), the higher CAR to acquirer in acquisitions of private targets is noticeable in stock-financed deals. However, there is an observation that acquiring firms realise positive gains with statistical significance, even in acquisitions of publicly listed targets that have broadly been regarded as value-destroying deals in the previous M&A literature. Second, cross-border deals outperform domestic deals for both acquirers and targets, confirming that shipping is truly an international industry. Third, CARs to acquirers and targets are positive in both cash and equity offers. This finding differs from general findings in the previous M&A literature. Specifically, the positive abnormal return to acquirers in stock-financed deals is statistically significant and numerically higher than acquirer CARs in cash offers. The higher acquirer gain is found to be largely driven by acquisitions of non-public targets. Fourth, market valuations generally fail to account for abnormal return to acquirers and targets. Only the negative association between target CAR and target valuation is found in deals between publicly listed acquirers and targets. Fifth, CAR to acquiring firms is negatively related to size-related factors of acquirers (market size and total asset). Sixth, target abnormal

return is positively associated with size-related factors of acquirers, but negatively with those of targets.

Furthermore, the segment analysis reveals variations in abnormal returns to acquirers and targets according to business segments. Acquiring firms generally achieve higher gains from diversification deals, while targets realise higher gains from horizontal deals. Additionally, the outperformance of cross-border deals is salient among ship-owning acquirers, while abnormal returns for other types of acquirers in cross-border deals are not significant or are lower than those in domestic deals. Consistent with evidence in the existing M&A studies, I find that cash offers create more value for acquirers in horizontal deals in the ship-owning and shipping service segments, although the mean difference from equity offers is not significant. Acquirer MTB is positively associated with acquirer CAR in horizontal deals, but negatively in diversification deals in the ship-owning segment. The negative association between target MTB and target CAR is also found in horizontal deals in the ship-owning segment and non-shipping bidders' acquisitions of ship-owning targets.

Overall, the findings in this chapter suggest that shipping M&As are mutually beneficial for both acquiring and target firms and are positively perceived in the stock market. In addition, I also highlight variations in acquisition gains according to deal characteristics (method of payment, nationality mix, public status) and business segments of involved firms.

5. CONCLUSIONS AND SUGGESTIONS FOR FURTHUR RESEARCH

5.1. Summary of Findings and Conclusions

This thesis offers an exhaustive insight on investment, financing and M&A activity in the shipping industry from various perspectives ranging from the evolution of research contributions to empirical evidence on deal and firm characteristics and the value creation effect. For this purpose, Chapter 2 examines how progress has been made in research on shipping finance and investment (including M&As). While profound changes in the business practice of shipping finance and investment since the 1990s have triggered a voluminous body of research in this area, to date, there have been no attempts to present comprehensive review of published academic achievements. However, in sharp contrast, a great deal of academic interest has addressed theoretical development, conceptualisation and future research directions in areas relevant to transportation. Accordingly, this chapter aims to fill the research gap by analysing 137 scholarly articles published in 43 academic journals during 1979–2017. From the findings in the bibliometric section, it is obvious that the shipping finance and investment literature has gradually expanded its academic focus to address contemporary issues in the shipping industry, including alternative funding sources, investment valuation, corporate governance and risk management. Research development on the topic of business consolidation in the maritime spectrum has also been remarkable, mainly focussing on announcement returns in M&As. Furthermore, a comprehensive synthesis of research findings on shipping finance and investment has offered an invaluable source of information for both academic researchers and shipping practitioners. As indicated in the synthesis of research findings, shipping financial management is largely influenced by industry-specific characteristics. Thus, managers of shipping companies need to understand the potential associations between those factors for better investment and financing decision making. In addition, the future research agendas that this chapter highlights based on the critical discussion can serve as a stepping stone for researchers in this area.

Chapter 3 illustrates consolidation activity in the shipping industry over the last few decades, and several interesting characteristics are highlighted. The review of research developments in the area of shipping finance and investment indicates that, despite increasing academic attention paid to shipping M&As since the 2000s, business consolidation activity in the shipping industry remains largely unmapped. Specifically, while most extant shipping business consolidation studies have focussed on M&A motivations and the value creation effects in

horizontal transactions in some specific segments in the shipping (e.g. liner and port) and related transportation (e.g. logistics service providers) industries, they have been less likely to consider other key aspects of acquisition activity, such as takeover premiums and M&A financing. Moreover, the sample selection criteria employed in previous shipping M&A research have been found to be problematic due to ambiguity in their categorisation of various sub-sectors within the shipping industry and the inclusion of irrelevant acquirers and targets.

Using a dataset of 2,261 carefully selected M&A transactions in the shipping industry during 1990–2014, Chapter 3 provides a clear-cut categorisation of constituent firms by business areas consisting of three broad sectors and 11 sub-sectors. The findings in Chapter 3 shed light on several important aspects in shipping M&As that have remained largely under-explored in the previous literature devoted to business consolidation in the shipping industry. The analysis on business areas reveals that while intra-segmental deals in the liner ship-owning, port and logistics segments are major pillars of shipping M&A activity, other types of transactions, such as vertical integration between transportation service providers across different supply chain sectors, diversification towards non-shipping areas and participation of financial and industrial acquirers, are also noticeable. Moreover, Chapter 3 presents several deal and firm characteristics that outline shipping M&A activity. First, cross-border transactions are more frequently carried out in shipping than in other industries. Second, while Europe has been the major M&A market for shipping companies, the share of the Asian region is growing significantly. Finally, the vast majority of shipping M&A deals are paid with cash.

In addition, Chapter 3 examines the determinants of acquisition premiums. The results indicate that the size and valuation of target firms comprise the main drivers of premiums paid in shipping M&As. Specifically, while the prediction regarding the relation between target size and premium is rather conflicting, the results document that acquisition premium is negatively associated with target size in shipping M&As, which is consistent with the findings in Alexandridis *et al.* (2013). In addition, the negative relation between premium and target valuation reported in Chapter 3 provides empirical support for the mis-valuation hypothesis (Dong *et al.*, 2006; Shleifer and Vishny, 2003). Chapter 3 further investigates M&A payment choice in the shipping industry. Since financing mix in the business consolidation has a significant impact on post-merger capital structure and corporate governance, previous studies have suggested a variety of explanations for the choice of payment method. Chapter 3 examines the impact of the concern for corporate control loss, debt-raising and financial distress costs, and information asymmetry between constituent firms. Supporting the theoretical prediction of

Hansen (1987) that an increase in information asymmetry leads to the acquirers' choice of stock-for-stock exchange, the results indicate that the use of cash is negatively associated with the level of the deal size. In addition, larger acquirers generally prefer cash financing due to their relatively lower level of financial constraints. The findings of Chapter 3 commonly suggest that managers of shipping companies should pay particular attention to the deal structuring process. Since post-merger integration requires the time-consuming and costly task of combining physical assets, the managerial system and the corporate culture of constituent firms, the deal structuring process should ensure that the inherent risks are clearly considered and that acquisition gains are properly shared between acquiring and target firms through the choice of financing mix and the size of the offer premium.

Chapter 4 provides empirical evidence concerning the value creation effect in shipping M&As. Despite the assumption that the rationale behind business consolidation is firm value maximisation through synergistic gain, the general conclusion in the corporate finance literature is that M&As tend to be value destroying for acquirers, while the vast majority of gains created around the deal announcement is captured by target firms. Contrary to this phenomenon, most shipping and transportation M&A studies report significantly positive CARs for acquirers, though much larger gains are still channelled to targets (Alexandrou *et al.*, 2014; Andreou *et al.*, 2012; Darkow *et al.*, 2008; Panayides and Gong, 2002; Samitas and Kenourgios, 2007). However, as discussed in Chapter 3, the samples used in those studies fail to provide a detailed categorisation of various segments within the shipping industry or else include (exclude) irrelevant (shipping-related) transactions. Accordingly, taking advantage of the carefully selected dataset, Chapter 4 investigates the value creation effect for acquiring and target firms and variations in abnormal returns by business areas and deal- and firm-specific factors.

Consistent with the findings in the previous studies on shipping business consolidation, the results in Chapter 4 indicate that the five-day CARs for both acquiring and target firms are positive in shipping M&As. With a few exceptions in the liner or diversified segments, acquirers and targets in most segments achieve positive gains. The segment analysis finds that bidders generally achieve more gains in acquisitions of targets in different segments, while horizontal deals are more value enhancing for targets. Furthermore, CARs by deal and firm characteristics also demonstrate variations, some of which are distinct from previous evidence in the general corporate finance literature, while others are consistent. First, despite the outperformance of acquisitions of non-publicly listed targets (Chang, 1998), acquirers still

achieve significantly positive abnormal returns when targets are publicly listed firms, which largely tends to be value destroying. Second, given the importance of the global network facilitating efficient and cost-effective supply chain management, cross-border deals outperform domestic deals for both acquiring and target firms. Third, distinct from previous evidence (e.g. Travlos, 1987), stock-financed deals create positive abnormal returns for acquirers, and the acquirer CARs in stock-to-stock exchange are numerically higher than those in cash offers. Finally, consistent with the hubris hypothesis (Moeller *et al.*, 2004), acquirer gains are negatively associated with firm size.

Chapter 4 also documents variations in acquisition gains by business areas of involved firms. First, while CARs to acquiring firms are positively associated with diversification deals, target firm achieve higher gains in horizontal transactions. Second, ship-owning acquirers realise significantly higher acquisition gains in cross-border deals than in domestic transactions. Finally, CARs to ship-owning and non-shipping acquirers are negatively associated with firm valuation of shipping targets. Based on the findings in Chapter 4, it can be argued that M&A activity in the shipping industry is value enhancing for combined entities, and that the impact of the value creation drivers can be altered by some industrial or sector-specific characteristics. Shipping companies seeking inorganic growth through M&As should be aware of those associations from their engagement in the cultivation and integration process.

Overall, this thesis revisits previous evidence on business consolidation and offers valuable insights into the characteristics and value creation effect in the shipping M&A activity. By highlighting several shipping-specific features in terms of business areas, the payment method, nationality mix, premium, firm size and valuations in shipping M&As, the findings in this thesis extend the understanding of the market for corporate takeover.

5.2. Suggestions for Further Research

Despite several important contributions, the findings in this thesis can be extended and further developed for a better understanding of M&As in the shipping industry. Accordingly, this section sets potential fruitful avenues for future research.

First of all, evidence concerning the choice of payment method in shipping M&As in Chapter 3 can be further investigated by highlighting the impact of pre-merger corporate ownership of constituent firms on post-merger corporate control. According to Stulz (1988), acquirers with

concentrated ownership tend to choose cash financing, since the corporate control of major shareholders is threatened in stock-to-stock exchange. However, it is likely that the association between the choice of cash and the voting rights of major shareholders is non-linear, as the desire to maintain corporate control is not strong when the ownership of acquiring firms is already well diffused or the dominant position is not affected by stock-financed deals. In line with this argument, Faccio and Masulis (2005) report that an acquirer's tendency to choose cash financing is particularly significant when the controlling shareholders' voting right is in the range of 20–60%. Similarly, Martin (1996) document the positive association between the use of cash and management ownership at an intermediate level between 5% and 25%. Furthermore, the likelihood of cash financing to avoid loss of corporate control is also affected by the pre-merger ownership structure of target firms. When a target is controlled by a small number of dominant shareholders, stock-to-stock exchange can result in creating additional block-holders, which is likely to threaten the voting power of major shareholders of acquiring firms. Thus, future research can offer valuable insight into M&A financing in the shipping industry by investigating how the choice of payment method is affected by the possibility of corporate control loss by incorporating pre-merger ownership of acquiring and target firms.

Second, the result of the positive gains for both acquiring and target firms in Chapter 4 can be further developed to examine takeover motives in the shipping industry. While motivations for takeover are broadly categorised into synergy, hubris and agency problem, previous literature on the value creation effect in M&As suggests that those motivations can be distinguished by examining the associations between gains for the acquirer, target and combined firms. Berkovitch and Narayanan (1993) propose a set of correlations between the gains to separate the different motives. Specifically, M&As driven by synergistic motive are value enhancing, and the positive gains created from the deals are channelled into both acquiring and target firms (Bradley *et al.*, 1988; Seth *et al.*, 2000). Thus, gains for targets are positively associated with those for acquirers and combined firms. When acquisitions are motivated by managers' over-estimation of potential synergies (hubris), there are zero gains and those deals are nothing more than a transfer of wealth from acquirers to targets (Roll, 1986). Accordingly, gains for targets are negatively associated with those for acquirers. Since hubris-driven deals fail to create additional gains, there is no correlation between target and total gains. Finally, if acquisitions are driven by agency motives, self-interested managers of acquiring firms tend to maximise their own wealth at the expense of their shareholders (Jensen, 1986). As a consequence, M&As

are value destroying and gains for targets are negatively associated with those for the acquirer and combined firms.

While the general conclusion of this thesis indicates that shipping M&As are motivated by synergy gains, based on the finding that both acquiring and target firms achieve positive abnormal returns around the announcement date, most of extant studies point out that motives for takeovers can exist concurrently (Bradley *et al.*, 1988; Goergen and Renneboog, 2004; Seth *et al.*, 2000). For instance, Hodgkinson and Partington (2008) argue that the agency motive could exist even in deals with positive gains for both acquiring and targets firms when there are some synergistic by-products. Thus, future research can offer further insight into the value creation effect by investigating takeover motivations in shipping M&As.

Third, pertaining to the above point, future research can address the potential association between acquisition gains and evolution in the corporate governance of shipping companies, which is especially under-explored. As reviewed in Chapter 2, the transformation of shipping companies from family-owned to corporate entities questions the impact of corporate governance on firm performance in the shipping industry, traditionally labelled as conservative. Given that acquisitions are regarded as investment projects seeking to complement organic growth, it can be conjectured that there exist variations in abnormal returns by attributes and quality of corporate governance among shipping companies, as reported in Andreou *et al.* (2014) that board size, presence of governance committee and busy directors are negatively associated with over-investment problem. Alexandridis *et al.* (2017a) find that hubris in large-size deals, which previously tend to be value destroying (Malmendier and Tate, 2008), has diminished during the post-2008 period, and positive abnormal returns for acquiring firms are largely attributed to improvements in corporate governance quality. Accordingly, research on this topic can offer valuable contributions to the areas of both corporate governance and business consolidation alike.

Finally, another interesting extension of this thesis is to investigate the impact of horizontal consolidation on the market structure and the potential anti-competition effect in the shipping industry. Since business consolidation could result in market concentration and, as a consequence, adverse price effects (i.e. price increase from collusion), M&As have been under intense scrutiny by anti-trust authorities. Notable examples in the shipping industry are the rejections of the P3 Network, a strategic alliance of the three largest liner operators (Maersk Line, MSC and CMA CGM) by the Chinese government in 2014, and the Ocean Network

Express, a consolidation of the liner segments of three major Japanese shipping companies (NYK, MOL and K-Line) by the US Federal Maritime Commission in 2017.

However, the anti-competition effects from business consolidation remain a matter of on-going debate with two conflicting views. The traditional view of structure-conduct-performance (SCP) emphasises reductions in competition and collusions in an oligopolistic or oligopsonistic market (e.g. Bain, 1951). By contrast, the efficiency structure hypothesis argues that market concentration is an outcome of better performance of efficient participants (e.g. Demsetz, 1973). Thus, it is important to examine the relation between concentration following M&As and contestability in the shipping market. While Sys (2009) and Luo *et al.* (2014) find consolidation to fuel concentration in the liner segment, Lam *et al.* (2007) highlights that the container shipping market still remains contestable. However, the finding in Merikas *et al.* (2014) that increase in market concentration positively influences spot freight rates in the VLCC tanker sector allegedly suggests the collusive pricing. Accordingly, it is necessary to analyse how M&As affect competition and contestability in the shipping market more comprehensively.

A promising direction for this topic may be the investigation of the abnormal returns of rival firms around the announcement date. Since the early works of Eckbo (1983) and Stillman (1983) rejecting the collusive pricing effect based on the finding that rivals earn positive abnormal returns on merger announcements, but negative on anti-trust complaints, there have been a plethora of alternative explanations, such as the 'acquisition probability hypothesis' (Song and Walkling, 2000) and the 'future growth hypothesis' (Gaur *et al.*, 2013) by taking advantage of rivals' stock market reaction. Moreover, Fee and Thomas (2004) argue that sources of acquisition gains (e.g. collusion on price, efficiency gains) can be identified by examining the associations with abnormal returns of customer, supplier and rival firms upon announcement. Thus, by examining the rival's reaction to the deal announcement, future research can provide evidence on sources of acquisition gains, market contestability and up- and down-stream effects in shipping M&As.

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Zheng, S. and Negenborn, R. R. (2017). Terminal investment timing decisions in a competitive setting with uncertainty using a real option approach. *Maritime Policy & Management, 44*(3), 392-411.

Appendix

A. List of Authors in Shipping Finance and Investment Literature (sorted by name)

Author	Paper Count	Author	Paper Count	Author	Paper Count
Abdullah, A.	1	Huang, B.-C.	1	Psifia, E. M.	2
Abouarghoub, W.	1	Huang, C.-H.	1	Qi, G.	1
Adland, R.	7	Ioardanis, S.	1	Randøy, T.	1
Alexandridis, G.	1	Ishii, M.	1	Rau, P.	1
Alexandrou, G.	1	Ishizaka, M.	1	Richter, T.	1
Alizadeh, A. H.	11	Jenssen, J.	1	Rousos, E.-P.	1
An, Y. H.	1	Jia, H.	2	Sahoo, S. R.	1
Andreou, P. C.	2	Jørgensen, P. L.	1	Samitas, A. G.	2
Andriosopoulos, K.	2	Juell-Skielse, A.	1	Satta, G.	1
Angelidis, T.	1	Kalouptsidi, M.	1	Schiereck, D.	1
Arkoulis, A. G.	2	Kappou, K.	1	Schilling, D.	1
Assis, L. F.	1	Karli, C.	1	Schröder, H.	2
Axarloglou, K.	1	Kassim, S.	1	Shi, W.	1
Bang, H.-S.	1	Kaup, C.	1	Simic, A. K.	1
Batchelor, R.	3	Kavussanos, M. G.	24	Skiadopoulos, G.	2
Bendall, H.	3	Kenourgios, D. F.	1	Sødal, S.	2
Berg-Andreassen, J. A.	1	Koekebakker, S.	5	Souza, C. M.	1
Boulougouris, E.	1	Koufopoulos, D.	1	Spinler, S.	1
Cape, M. B.	1	Koutrouboussis, G.	1	Stent, A. F.	3
Chang, H. B.	1	Kyriakou, I.	5	Syriopoulos, T. C.	5
Chang, Y.-T.	1	Lagoudis, I. N.	1	Tamvakis, M. N.	1
Chen, S.	1	Lambertides, N.	1	Tegtmeier, L.	3
Choi, N. Y. H.	1	Lauenstein, P.	1	Teo, C.-C.	1
Chou, M.-T.	1	Lee, B. S.	2	Tezuka, K.	1
Clintworth, M.	1	Leggate, H. K.	1	Thanopoulou, H.	1
Constantinidou, I.	1	Li, K. X.	1	Theotokas, I. N.	2
Cullinane, K. P. B.	7	Li, Y.	1	Thomakos, D. D.	1
Daleziou, S.	1	Louca, C.	2	Thomas, H. M.	1
Darkow, I.-L.	1	Lozinskaia, A.	1	Thuong, L. T.	1
De Giovanni, D.	1	Luo, M.	1	Tigka, N.	1
Dikos, G. N.	1	Lyridis, D.	1	Triantafyllou, A.	1
Dimitrakopoulos, D. N.	3	Marcoulis, S. N.	5	Tsakalos, I.	1
Dimitras, A. I.	1	Mason, K. J.	1	Tsatsaronis, M.	2
Dinwoodie, J.	1	Mayr, T. P.	1	Tsionas, M. G.	1
Doctor, K.	1	Meersman, H.	1	Tsouknidis, D. A.	4
Doumpos, M.	1	Meier, I.	1	Tvedt, J.	2
Down, J.	1	Menachof, D. A.	2	Van de Voorde, E.	1
Drobetz, W.	6	Menzel, C.	1	van Dellen, S.	1
Evans, J. J.	1	Merika, A. A.	3	Vischer, S. L.	1
Fan. L.	1	Merikas, A. G.	7	Visvikis, I. D.	11
Forrest, M.	1	Mitroussi, K.	1	von der Wense, L.	1
Fusillo, M.	1	Miyashita, K.	1	Wambach, M.	1
Gavalas, D.	1	Morris, J.	1	Wang, X.	1
Gong, S. X.	3	Nam, H. J.	1	Woo, S.-H.	1
Goss, R.	1	Nomikos, N. K.	12	Xu, J. J.	1
Goulas, L.	1	Notteboom, T.	1	Yang, Z.	1
Goulielmos, A. M.	2	Nounis, C.	1	Ye, H.-Q.	1
Goulielmou, M. A.	1	Panayides, P. M.	5	Yeo, H.-J.	1
Gounopoulos, D.	4	Papapostolou, N. C.	9	Yin, J.	1
Grammenos, C. Th.	5	Parola, F.	1	Yip, T. L.	3
Greenwood, R.	1	Penikas, H.	1	Yolland, J. B.	1
Grelck, M. B.	1	Persico, L.	1	Yoshida, S.	1
Haider, J. J.	1	Petropoulos, T.	1	Zacharioudakis, P.	1
Haigh, M. S.	2	Pettit, S. J.	1	Zarkos, S.	1
Haller, R.	1	Pires, F. C. M.	1	Zeng, Q.	1
Hanson, S. G.	1	Polemis, D.	1	Zeng, Y. Y.	1
Hansson, D.	1	Pouliasis, P. K.	6	Zhang, J.	1
Hassan, R.	1	Prigge, S.	2	Zhao, X.	1
Holt, M. T.	1	Prokopczukm M.	1		

Note: The table presents the number of scholarly publications per author over the 137 surveyed papers in the shipping finance and investment literature (176 individual authors in total)

B. Tobit Estimation[81]

In the estimation, the Tobit model is defined as follows:

$$y_i^* = \beta' x_i + u_i$$

where y_i^* is the latent variable, β is a $n \times 1$ vector of unknown parameters, x_i is a $n \times 1$ vector of known constants and u_i are residuals that are assumed to be normally distributed with zero mean and variance σ^2. Since the dependent variable is the share of cash in M&A currency, it has both left and right censoring points of 0 and 100, respectively;

$$\begin{aligned} y_i &= L_{1i} \quad \text{if } y_i^* \le L_{1i} \\ &= y_i^* \quad \text{if } L_{1i} < y_i^* < L_{2i} \\ &= L_{2i} \quad \text{if } y_i^* \le L_{2i}, \end{aligned}$$

where L_{1i} (0) and L_{2i} (100) are the lower and upper limits, respectively.

The log likelihood function for estimation of the parameters β and σ is given as:

$$\begin{aligned} L\left(\beta, \sigma \middle| \, y_i, x_i, L_{1i}, L_{2i}\right) \\ &= \sum_{y_i = L_{1i}} \log F((L_{1i} - \beta' x_i)/\sigma\,) + \sum_{L_{1i} < y_i < L_{2i}} \log f((y_i - \beta' x_i)/\sigma) \\ &+ \sum_{y_i = L_{2i}} \log(1 - F((L_{2i} - \beta' x_i)/\sigma)), \end{aligned}$$

where F and f are cumulative distribution and density functions, respectively. Denoting $\Phi[(L_{1i} - \beta' x_i)/\sigma]$ and $\Phi[(L_{2i} - \beta' x_i)/\sigma]$ by Φ_{1i} and Φ_{2i}, respectively, and correspondingly for ϕ_{1i} and ϕ_{2i}, by definitions, the conditional expectation of $y_i$is

$$E\left(y_i \middle| \, L_{1i} < y_i^* < L_{2i}\right) = \beta' x_i + \sigma \frac{\phi_{1i} - \phi_{2i}}{\Phi_{2i} - \Phi_{1i}}$$

In addition, the unconditional expectation of y_i is

$$E(y_i) = \Phi_{1i} L_{1i} + \beta' x_i (\Phi_{2i} - \Phi_{1i}) + \sigma(\phi_{1i} - \phi_{2i}) + (1 - \Phi_{2i}) L_{2i}.$$

[81] For more details of Tobit models, see Amemiya (1984) and Maddala (1986).

C. Logit Estimation[82]

In the estimation, the logit model is defined as follows:

$$y_i^* = \beta' x_i + u_i$$

where y_i^* is the latent variable, β is a $n \times 1$ vector of unknown parameters, x_i is a $n \times 1$ vector of known constants and u_i are residuals that are assumed to be logistically distributed. Since the dependent variable is Cash when the share of cash is over 50% or not,

$$y_i^* = 1 \quad \text{if the share of cash is over } 50\%$$

$$= 0 \quad \text{otherwise}$$

The logistic function of any random variable F is defined as:

$$F(z_i) = \frac{1}{1 - e^{-z_i}}$$

Denoting P_i by the probability that $y_i = 1$ (i.e. the share of cash is over 50%), the logit estimation would be

$$P_i\left(y_i = 1 \middle| \beta' x_i\right) = F(\beta' x_i) = \frac{1}{1 - e^{-\beta' x_i}}$$

[82] For more details of logit models, see Brooks (2014).

D. Acquirer and Target Cumulative Abnormal Returns

Following Brown and Warner (1985), stock returns around the announcement date is estimated in a standard market model using OLS as following:

$$E(R_{it}) = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$

where $E(R_{it})$ is the return of firm i at time t, the announcement date, and R_{mt} is the corresponding country's Datastream value-weighted market index return.

The market model parameters, 'α' and 'β', are estimated over one year prior to the deal announcement from trading day -255 to -6. The minimum observation length is required to be 60 days. Cumulative abnormal returns over the event window [t_1, t_2] are calculated as following:

$$CAR_{i(t_1,t_2)} = \sum_{t_1}^{t_2} AR_{it}$$

where $AR_{it} = R_{it} - E(R_{it})$ and $t_2 - t_1$ is the length of event window.

E. CAR to Target by Method of Payment

CAR is the five-day cumulative abnormal return to target firm calculated by adding the market-adjusted return for days t-2 to t+2, where t is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorized at the top and bottom 1% levels. M&C means a subsample consisting of deals with post-announcement target ownership over 50%. Cross-border is a group of deals where the acquirer and target are located in different domiciles. Cash (Stock) is a group of deals financed with pure cash (stock) and Mixed/Others comprises all remaining others. The combined number of observations of the method of payment is less than that of all group as information on financing mix is available only for 815 deals. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Transaction Type		All Sample				M&C Sample			
		Cash	Stock	Mixed/Others	(Cash - Stock)	Cash	Stock	Mixed/Others	(Cash - Stock)
(1)	Mean	13.4%***	5.5%*	25.2%***	7.9%**	15.3%***	5.8%*	26.1%***	9.6%**
	Median	7.0%***	2.5%	22.8%***		12.2%***	5.7%*	24.6%***	
	N	91	17	11		51	13	10	
(2)	Mean	4.4%*	-	9.0%	-	0.6%	-	9.0%	-
	Median	2.4%	-	9.0%		0.6%	-	9.0%	
	N	6	-	1		1	-	1	
(3)	Mean	7.5%	-	20.6%**	-	12.1%	-	20.6%**	-
	Median	-0.6%	-	23.9%**		2.8%	-	23.9%**	
	N	11	-	3		5	-	3	
(4)	Mean	12.3%***	8.6%**	-0.3%	3.7%	22.3%***	10.8%*	-0.3%	11.5%**
	Median	4.3%	8.1%*	0.4%		28.2%***	10.8%*	0.4%	
	N	22	3	3		11	2	3	
(5)	Mean	23.0%*	0.5%	16.0%*	-15.4%	10.0%	0.5%	16.0%*	-15.4%
	Median	15.1%	0.5%	16.0%*		11.6%*	0.5%	16.0%*	
	N	4	2	2		3	2	2	
(6)	Mean	13.8%*	-23.1%	0.4%	-	18.0%	-23.1%	0.4%	-
	Median	13.3%*	-23.1%	0.4%		14.5%	-23.1%	0.4%	
	N	6	1	1		3	1	1	
(7)	Mean	6.6%***	-16.2%	1.7%	-	8.2%**	-16.2%	-1.3%	-
	Median	1.8%	-16.2%	2.9%*		4.4%	-16.2%	-1.3%	
	N	79	1	6		23	1	1	
(8)	Mean	12.8%***	-	33.2%	-	17.7%**	-	33.2%	-
	Median	5.3%*	-	33.2%		8.1%	-	33.2%	
	N	34	-	2		14	-	2	

F. CARs and Acquirer Valuation by Transaction Type (Full)

ACAR (TCAR) is the five-day cumulative abnormal return to acquirer (target) calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorized at the top and bottom 1% levels. A MTB is the market-to-book ratio of the acquirer four weeks prior to the deal announcement and winsorised at the top and bottom 1% levels. In each year MTBs are ranked into terciles with Small being the lowest tercile. The left-hand side reports statistics for all deals, while the right-hand side reports those for the M&C subsample consisting of deals with post-announcement target ownership over 50%. (Large - Small) indicates mean difference in CAR between top and bottom terciles. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Transaction Type			All Sample				M&C Sample			
			Small	Median	Large	(Large - Small)	Small	Median	Large	(Large - Small)
(1)	A MTB	Mean	0.74	1.85	6.05	5.31***	0.90	2.04	5.74	4.84***
		Median	0.68	1.55	4.12		0.75	1.59	3.62	
		N	94	94	94		66	62	66	
	ACAR	Mean	2.3%**	1.0%*	2.1%**	-0.1%	1.5%*	1.3%*	4.0%***	2.5%**
		Median	1.5%*	0.3%	0.9%		1.4%*	0.3%	2.9%**	
		N	76	85	89		56	56	62	
	TCAR	Mean	13.5%***	11.1%**	5.8%*	-7.7%*	20.6%***	17.9%**	8.7%*	-12.0%*
		Median	6.7%*	7.3%*	-0.2%		12.6%**	16.2%**	2.5%	
		N	25	16	18		16	8	13	
(2)	A MTB	Mean	0.65	1.45	4.08	3.43***	0.60	1.57	4.39	3.79***
		Median	0.60	1.43	1.98		0.46	0.92	2.46	
		N	42	45	42		27	33	27	
	ACAR	Mean	8.7%**	0.7%	-1.0%	-9.7%***	10.5%**	-0.9%	0.5%	-10.0%**
		Median	0.6%	0.3%	-0.8%		1.3%	-0.1%	-0.6%	
		N	40	44	42		26	32	27	
	TCAR	Mean	-	8.9%**	0.6%	-	-	9.0%	12.0%	-
		Median	-	7.1%*	0.6%		-	9.0%	12.0%	
		N	-	5	1		-	1	2	
(3)	A MTB	Mean	1.05	3.80	7.65	6.60***	1.92	2.40	9.74	7.83**
		Median	1.14	1.80	2.93		1.16	1.90	3.38	
		N	18	20	18		13	8	13	
	ACAR	Mean	0.8%	2.3%*	1.7%	0.9%	3.4%**	4.8%	-0.2%	-3.5%*
		Median	2.3%**	0.0%	0.3%		1.3%	3.9%	-1.1%	
		N	17	20	17		12	8	13	
	TCAR	Mean	15.3%	0.2%	0.0%	-15.3%	-	2.8%	-0.6%	-
		Median	9.0%	0.2%	-0.6%		-	2.8%	-0.6%	
		N	3	1	3		-	1	1	
(4)	A MTB	Mean	1.33	3.26	10.48	9.15***	1.38	4.51	11.73	10.35***
		Median	1.04	2.52	5.88		1.38	2.94	6.57	
		N	79	87	79		57	63	57	
	ACAR	Mean	2.2%**	0.8%	2.0%*	-0.1%	2.3%**	0.6%	2.6%*	0.4%
		Median	0.9%	0.6%	0.3%		0.5%	0.2%	1.0%	
		N	69	81	79		53	60	57	
	TCAR	Mean	6.8%	10.3%	4.4%	-2.4%	-	17.3%*	-	-
		Median	6.8%	8.7%	4.4%		-	13.6%	-	
		N	1	8	1		-	3	-	
(5)	A MTB	Mean	1.44	3.42	2.69	1.25**	1.07	3.25	2.65	1.57
		Median	1.13	2.65	2.72		1.07	2.68	2.65	
		N	5	7	5		1	8	1	
	ACAR	Mean	0.1%	2.5%*	-5.3%	-5.5%	18.3%	-1.8%	2.2%	-16.1%
		Median	-8.5%	1.9%*	-5.3%		18.3%	0.1%	2.2%	
		N	3	6	2		1	6	1	
	TCAR	Mean	-3.0%	29.5%	-2.4%	0.7%	-	-2.9%	-	-
		Median	-3.0%	29.5%	-2.4%		-	-2.9%	-	
		N	1	2	1		-	1	-	
(6)	A MTB	Mean	1.20	3.49	7.28	6.08***	1.20	3.44	7.84	6.64**
		Median	0.78	1.85	4.17		0.71	1.85	4.17	
		N	20	19	20		14	17	14	
	ACAR	Mean	5.5%**	4.4%**	3.2%	-2.3%	5.0%**	3.3%**	7.6%**	2.6%
		Median	3.0%*	3.3%	0.4%		1.1%	3.7%**	1.6%	
		N	20	18	20		14	16	14	
	TCAR	Mean	0.6%	8.3%	-	-	-	0.6%	-	-
		Median	0.6%	8.3%	-		-	0.6%	-	

		N	1	2	-		-	1	-	
(7)	A MTB	Mean	1.01	1.97	5.24	4.23***	1.24	2.70	4.72	3.48***
		Median	0.83	1.70	3.65		0.98	1.71	3.55	
		N	29	33	29		16	20	16	
	ACAR	Mean	0.8%	2.6%	5.0%***	4.2%**	3.1%*	6.9%**	5.4%**	2.4%
		Median	-0.4%	-0.2%	2.7%*		0.0%	1.5%	2.4%	
		N	28	32	27		16	20	14	
	TCAR	Mean	-2.8%	1.1%	11.9%	14.6%	-2.4%	3.0%	-	-
		Median	-3.2%	0.1%	18.5%		-2.4%	3.0%	-	
		N	10	11	3		2	2	-	
(8)	A MTB	Mean	1.23	1.38	7.01	5.78***	0.64	1.64	5.46	4.83***
		Median	0.56	1.34	4.47		0.47	1.34	5.46	
		N	29	28	29		17	20	17	
	ACAR	Mean	-1.0%	0.8%	-0.7%	0.4%	-0.7%	3.0%***	-0.5%	0.2%
		Median	0.2%	1.9%	-0.6%		0.3%	3.1%***	0.0%	
		N	26	27	25		15	18	15	
	TCAR	Mean	55.2%	4.4%	1.4%	-53.7%	-	29.8%	-	-
		Median	55.2%	4.4%	0.0%		-	29.8%	-	
		N	1	1	3		-	2	-	

G. CARs and Acquirer Size by Transaction Type (Full)

ACAR (TCAR) is the five-day cumulative abnormal return to acquirer (target) calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorized at the top and bottom 1% levels. A Size is the market capitalisations of the acquirer four weeks prior to the transaction announcement. In each year A Sizes are ranked into terciles with Small being the lowest tercile. The left-hand side reports statistics for all deals, while the right-hand side reports those for the M&C subsample consisting of deals with post-announcement target ownership over 50%. (Large - Small) indicates mean difference in CAR between top and bottom terciles. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Transaction Type			All Sample				M&C Sample			
			Small	Median	Large	(Large - Small)	Small	Median	Large	(Large - Small)
(1)	A Size	Mean	107.42	547.07	4679.20	4571.78***	124.16	481.79	5034.46	4910.30***
		Median	57.94	468.98	2762.53		51.68	414.15	2566.58	
		N	86	88	86		59	58	59	
	ACAR	Mean	4.4%***	1.8%**	0.7%	-3.7%***	4.3%***	2.4%**	1.2%	-3.2%**
		Median	3.5%***	0.3%	0.4%		4.0%***	1.5%	0.3%	
		N	79	80	75		55	54	50	
	TCAR	Mean	4.7%	9.7%**	15.4%***	10.8%**	6.2%	21.1%**	18.9%***	12.8%**
		Median	2.5%	4.1%	12.2%***		2.5%	13.2%	13.0%***	
		N	10	19	29		6	6	25	
(2)	A Size	Mean	159.26	982.41	5280.85	5121.59***	124.83	778.69	4639.25	4514.42***
		Median	67.60	302.43	2243.97		92.86	292.11	1340.79	
		N	41	38	41		26	29	26	
	ACAR	Mean	6.7%**	2.9%	-1.4%*	-8.1%***	9.4%**	1.7%	-1.4%	-10.9%***
		Median	2.3%	-0.3%	-0.3%		2.3%	-0.2%	-0.7%	
		N	39	36	41		26	27	26	
	TCAR	Mean	2.4%	8.0%**	8.6%	6.2%	-	9.0%	12.0%	-
		Median	2.4%	8.0%**	1.8%		-	9.0%	12.0%	
		N	2	2	3		-	1	2	
(3)	A Size	Mean	158.60	832.50	5940.99	5782.39***	214.55	742.99	1516.79	1302.25**
		Median	65.07	303.04	2201.10		91.04	140.34	1154.16	
		N	19	20	19		12	12	12	
	ACAR	Mean	0.7%	2.2%*	1.1%	0.4%	0.2%	4.3%*	1.6%	1.4%
		Median	-0.9%	2.3%**	-0.1%		-0.9%	2.4%	0.3%	
		N	17	18	18		11	10	11	
	TCAR	Mean	2.8%	12.4%	-1.6%	-4.3%	2.8%	-	-0.6%	-3.4%
		Median	2.8%	0.2%	-1.6%		2.8%	-	-0.6%	
		N	1	3	2		1	-	1	
(4)	A Size	Mean	124.84	949.35	7995.21	7870.36***	164.36	891.25	8166.56	8002.21***
		Median	64.71	712.88	4462.06		67.47	680.16	4244.46	
		N	74	79	74		53	63	53	
	ACAR	Mean	2.3%**	2.2%**	1.5%*	-0.8%	2.9%**	2.9%**	0.9%	-2.0%
		Median	1.1%	1.0%	0.3%		0.6%	0.9%	0.3%	
		N	66	78	67		50	62	47	
	TCAR	Mean	-	6.6%**	16.4%*	-	-	10.1%	31.7%	-
		Median	-	4.3%*	10.9%		-	10.1%	31.7%	
		N	-	5	3		-	2	1	

(5)	A Size	Mean	420.49	4176.59	7861.20	7440.71	120.10	3813.52	25940.88	25820.78
		Median	342.28	224.13	2737.03		120.10	387.13	25940.88	
		N	4	7	4		1	8	1	
	ACAR	Mean	3.2%	-5.2%	5.2%	2.0%	-8.5%	3.1%	2.2%	10.7%
		Median	1.5%	-5.2%	2.8%		-8.5%	1.7%	2.2%	
		N	4	4	3		1	6	1	
	TCAR	Mean	-	-2.9%**	61.9%	-	-	-2.9%	-	-
		Median	-	-2.9%**	61.9%		-	-2.9%	-	
		N	-	2	1		-	1	-	
(6)	A Size	Mean	144.07	1068.29	3563.26	3419.19***	151.15	1089.88	4447.18	4296.03**
		Median	22.34	459.90	1456.31		15.55	346.34	1456.31	
		N	17	16	17		11	17	11	
	ACAR	Mean	8.0%**	3.3%	2.7%	-5.4%*	11.3%**	3.6%**	3.3%	-8.0%*
		Median	6.0%*	1.4%	-0.3%		9.9%**	3.4%**	-0.3%	
		N	17	15	17		11	16	11	
	TCAR	Mean	-6.6%	12.0%	-	-	-	0.6%	-	-
		Median	-6.6%	12.0%	-		-	0.6%	-	
		N	1	2	-		-	1	-	
(7)	A Size	Mean	130.17	1466.35	13584.29	13454.12**	47.51	1458.10	4683.53	4636.02**
		Median	47.54	299.86	3976.54		31.11	117.49	798.70	
		N	29	34	29		18	20	18	
	ACAR	Mean	5.8%**	2.6%*	0.3%	-5.5%*	5.6%*	7.5%**	2.7%	-2.9%
		Median	1.5%	0.8%	-0.5%		1.5%	1.5%	-0.7%	
		N	26	31	26		17	17	15	
	TCAR	Mean	6.0%	-0.1%	2.5%	-3.5%	5.0%	-	-4.5%	-9.6%
		Median	7.9%*	2.0%	-0.7%		5.0%	-	-4.5%	
		N	3	12	8		2	-	2	
(8)	A Size	Mean	571.55	2571.59	13597.79	13026.24***	910.13	2439.55	11079.54	10169.42***
		Median	136.04	789.73	6844.11		136.04	627.19	5018.54	
		N	26	31	26		18	18	18	
	ACAR	Mean	0.5%	-0.7%	0.0%	-0.4%	-0.4%	0.5%	1.7%**	2.1%**
		Median	1.5%	0.3%	0.9%		0.3%	1.9%	1.9%**	
		N	23	27	25		16	15	18	
	TCAR	Mean	-	27.6%	2.9%	-	-	55.2%	4.4%	-
		Median	-	27.6%	4.4%		-	55.2%	4.4%	
		N	-	2	3		-	1	1	

H. CARs and Acquirer Asset by Transaction Type (Full)

ACAR (TCAR) is the five-day cumulative abnormal return to acquirer (target) calculated by adding the market-adjusted return for days t-2 to t+2, where t is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorized at the top and bottom 1% levels. A Asset is the total asset of acquirer at the year-end prior to the deal announcement. In each year A Assets are ranked into terciles with Small being the lowest tercile. The left-hand side reports statistics for all deals, while the right-hand side reports those for the M&C subsample consisting of deals with post-announcement target ownership over 50%. (Large - Small) indicates mean difference in CAR between top and bottom terciles. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Transaction Type			All Sample				M&C Sample			
			Small	Median	Large	(Large - Small)	Small	Median	Large	(Large - Small)
(1)	A Asset	Mean	324.63	1246.65	9576.64	9252.01***	295.99	1122.90	8995.09	8699.10***
		Median	161.17	878.80	5108.87		138.31	879.23	4671.92	
		N	148	153	148		96	97	96	
	ACAR	Mean	2.9%***	0.3%	1.4%**	-1.5%*	3.6%***	0.3%	2.4%***	-1.2%
		Median	0.5%	-0.3%	1.9%***		2.4%**	-0.3%	2.1%***	
		N	130	118	122		86	79	77	
	TCAR	Mean	-0.8%	13.2%***	10.3%***	11.1%***	-0.5%	18.4%***	16.8%***	17.3%*
		Median	0.5%	8.4%**	6.7%**		1.4%	13.3%**	13.0%***	
		N	24	35	43		8	18	28	
(2)	A Asset	Mean	252.45	2072.27	9165.27	8912.81***	372.79	2903.64	6832.33	6459.54***
		Median	147.76	1064.46	8007.61		171.87	1112.34	5120.38	
		N	57	64	57		38	40	38	
	ACAR	Mean	4.6%***	4.6%**	-1.7%**	-6.3%***	7.5%***	2.3%	-1.8%**	-9.4%***
		Median	1.9%	0.1%	-0.9%		3.7%*	-0.6%	-1.2%	
		N	53	51	55		35	33	37	
	TCAR	Mean	9.0%	1.5%	7.3%*	-1.7%	-	9.0%	12.0%	-
		Median	9.0%	-0.3%	3.4%		-	9.0%	12.0%	
		N	1	3	5		-	1	2	
(3)	A Asset	Mean	735.37	2995.81	7414.44	6679.07***	1102.89	3584.81	3662.52	2559.64**
		Median	249.04	935.42	5705.65		182.15	976.14	1717.17	
		N	30	25	30		16	16	16	
	ACAR	Mean	3.0%**	-0.1%	0.7%	-2.3%	2.6%*	0.4%	2.2%	-0.4%
		Median	1.3%	-0.7%	0.5%		0.7%	-0.2%	0.3%	
		N	28	23	27		16	14	15	
	TCAR	Mean	11.4%	7.7%	1.9%	-9.5%	-	8.4%	-0.6%	-
		Median	6.9%	9.0%*	-0.6%		-	8.4%	-0.6%	
		N	4	3	5		-	2	1	
(4)	A Asset	Mean	170.88	872.23	10442.76	10271.88***	174.77	819.80	9488.76	9313.99***
		Median	121.27	724.03	3530.23		121.27	599.87	2817.68	
		N	119	122	119		89	88	89	
	ACAR	Mean	2.7%**	1.6%**	0.0%	-2.7%**	2.9%**	1.2%	0.6%	-2.4%*
		Median	0.1%	0.9%	0.0%		-0.1%	0.0%	0.5%	
		N	102	116	98		80	87	71	
	TCAR	Mean	10.9%	1.7%	17.9%***	7.0%	12.3%	6.6%	31.6%**	19.3%
		Median	10.2%	2.0%	10.9%**		13.6%	6.6%	31.7%**	
		N	4	4	11		3	1	5	

(5)	A Asset	Mean	555.80	4678.97	6744.92	6189.11*	361.23	4847.24	9490.40	9129.17
		Median	91.30	588.44	3286.53		97.70	441.71	734.14	
		N	10	12	10		5	11	5	
	ACAR	Mean	13.2%	-1.1%	0.1%	-13.1%	7.1%	4.3%	3.2%	-3.9%
		Median	5.6%	-0.4%	2.2%		5.6%	-0.4%	2.2%	
		N	6	11	5		4	9	3	
	TCAR	Mean	8.1%	3.6%	19.6%	11.4%	18.6%	2.9%	-	-
		Median	8.1%	2.1%	-0.1%		18.6%	-0.1%	-	
		N	2	3	3		1	3	-	
(6)	A Asset	Mean	331.93	806.89	2759.78	2427.85***	386.45	753.80	3006.00	2619.55***
		Median	61.40	450.03	2380.44		104.34	399.10	2900.95	
		N	22	31	22		16	22	16	
	ACAR	Mean	8.3%***	1.4%	0.7%	-7.6%***	8.3%**	2.3%**	3.7%*	-4.7%
		Median	4.6%*	1.2%	0.2%		4.5%	1.3%	1.3%	
		N	22	28	20		15	22	14	
	TCAR	Mean	-6.6%	7.6%	-	-	-	0.6%	-	-
		Median	-6.6%	0.6%	-		-	0.6%	-	
		N	1	3	-		-	1	-	
(7)	A Asset	Mean	485.63	5701.24	84946.35	84460.72***	232.68	1806.51	32293.28	32060.61**
		Median	87.71	1554.53	18964.60		55.51	286.39	4935.47	
		N	45	44	45		23	26	23	
	ACAR	Mean	1.7%	2.7%**	1.9%*	0.2%	6.4%**	4.1%**	1.8%	-4.6%
		Median	0.6%	0.8%	1.5%		1.6%	0.4%	1.3%	
		N	37	39	40		20	26	19	
	TCAR	Mean	8.8%*	0.6%	2.3%	-6.5%	5.0%	-	-3.8%	-8.9%
		Median	4.7%	0.1%	2.7%		5.0%	-	-2.4%	
		N	11	11	15		2	-	3	
(8)	A Asset	Mean	923.90	5949.31	51140.59	50216.68***	1232.48	2442.75	50932.68	49700.20***
		Median	306.96	2286.62	14615.90		263.57	1276.03	12500.39	
		N	38	41	39		21	26	21	
	ACAR	Mean	1.5%	-0.3%	-0.9%	-2.4%	0.9%	0.1%	1.9%**	1.1%
		Median	1.6%*	0.7%	0.1%		1.5%	0.5%	2.5%***	
		N	28	33	34		15	22	18	
	TCAR	Mean	14.4%	-0.4%	20.2%	5.8%	55.2%	-	4.4%	-50.7%
		Median	-1.8%	-0.4%	9.4%		55.2%	-	4.4%	
		N	3	1	4		1	-	1	

I. CARs and Deal Value by Transaction Type (Full)

ACAR (TCAR) is the five-day cumulative abnormal return to acquirer (target) calculated by adding the market-adjusted return for days t-2 to t+2, where t is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorized at the top and bottom 1% levels. Deal Val. is the transaction value. In each year Deal Vals are ranked into terciles with Small being the lowest tercile. The left-hand side reports statistics for all deals, while the right-hand side reports those for the M&C subsample consisting of deals with post-announcement target ownership over 50%. (Large - Small) indicates mean difference in CAR between top and bottom terciles. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Transaction Type			All Sample				M&C Sample			
			Small	Median	Large	(Large - Small)	Small	Median	Large	(Large - Small)
(1)	Deal Val.	Mean	9.66	74.88	669.51	659.86***	23.12	138.86	992.61	969.50***
		Median	5.28	52.04	316.80		12.69	96.94	546.99	
		N	145	143	145		84	85	84	
	ACAR	Mean	2.1%**	0.5%	1.9%***	-0.2%	3.0%***	1.6%*	2.6%***	-0.4%
		Median	0.3%	0.7%	1.2%*		2.3%**	0.5%	1.2%*	
		N	82	80	105		56	54	61	
	TCAR	Mean	7.0%***	8.5%***	15.0%***	8.0%***	8.8%**	11.3%***	20.8%***	12.0%***
		Median	2.6%	2.5%	11.0%***		3.5%	12.9%***	14.5%***	
		N	56	55	66		24	28	37	
(2)	Deal Val.	Mean	4.14	24.24	156.15	152.01***	8.12	26.12	203.72	195.61***
		Median	1.17	10.69	78.27		1.25	15.21	114.00	
		N	38	42	39		23	23	23	
	ACAR	Mean	1.8%	3.5%*	-0.1%	-1.9%	5.6%*	0.6%	-0.6%	-6.2%*
		Median	0.3%	-0.4%	-0.4%		-0.6%	-0.7%	0.3%	
		N	32	33	34		20	18	22	
	TCAR	Mean	7.1%	4.3%	9.8%	2.7%	-	0.6%	16.2%	-
		Median	7.1%	1.3%	9.0%		-	0.6%	16.2%	
		N	1	5	3		-	1	2	
(3)	Deal Val.	Mean	6.58	22.54	164.16	157.57***	7.50	44.81	175.60	168.10**
		Median	3.47	11.00	87.18		3.60	12.01	35.15	
		N	26	29	26		11	16	11	
	ACAR	Mean	1.8%	0.4%	4.5%*	2.8%	3.1%	2.0%*	2.0%	-1.0%
		Median	0.5%	0.4%	1.4%		1.7%	0.5%	-1.2%	
		N	19	17	17		9	8	8	
	TCAR	Mean	-5.7%**	13.7%*	9.7%**	15.4%***	-1.7%	20.2%*	22.5%**	24.3%*
		Median	-5.8%**	9.6%	6.3%*		-1.7%	19.0%*	22.5%**	
		N	5	5	14		2	4	2	
(4)	Deal Val.	Mean	5.48	31.36	539.59	534.11***	7.23	36.22	693.60	686.37***
		Median	3.55	17.53	147.10		4.30	18.31	245.32	
		N	86	86	86		58	63	58	
	ACAR	Mean	2.9%**	1.9%**	-0.1%	-3.0%*	2.0%*	3.9%**	0.0%	-1.9%
		Median	0.2%	0.6%	0.3%		0.2%	1.3%	0.8%	
		N	58	66	68		45	52	44	
	TCAR	Mean	12.4%**	9.2%**	13.7%**	1.3%	31.3%**	20.4%**	15.4%**	-15.9%**
		Median	5.0%	4.2%	6.8%*		26.7%**	18.4%**	6.7%	
		N	10	17	15		4	6	12	

(5)	Deal Val.	Mean	15.74	89.90	292.77	277.03***	11.78	133.05	398.83	387.06**
		Median	7.98	45.38	149.52		8.85	105.99	154.13	
		N	12	12	12		7	10	7	
	ACAR	Mean	4.7%	-4.0%**	-1.7%	-6.4%	9.3%	-4.8%**	-0.6%	-9.9%
		Median	4.8%	-3.4%**	-0.4%		10.5%	-2.7%	0.3%	
		N	4	6	8		3	7	5	
	TCAR	Mean	8.0%	6.7%*	14.9%	6.8%	13.3%	8.9%**	9.2%	-4.0%
		Median	2.8%	8.6%**	-0.1%		13.3%	11.6%**	9.2%	
		N	4	7	5		2	5	2	
(6)	Deal Val.	Mean	6.36	32.60	238.38	232.03**	61.24	40.20	244.43	183.19*
		Median	1.47	17.42	102.85		3.97	29.60	94.63	
		N	20	22	20		15	17	14	
	ACAR	Mean	2.7%*	-0.6%	8.3%**	5.6%*	3.6%	5.5%***	7.1%*	3.5%
		Median	0.5%	0.1%	4.1%		-0.1%	3.7%**	3.3%	
		N	17	17	18		13	12	13	
	TCAR	Mean	14.8%	0.2%	4.7%	-10.1%	38.8%	-1.9%	-	-
		Median	12.0%	0.4%	0.6%		38.8%	0.5%	-	
		N	3	3	3		1	4	-	
(7)	Deal Val.	Mean	7.40	51.97	385.23	377.83***	17.38	119.92	494.66	477.29***
		Median	3.94	30.07	175.06		7.64	72.23	336.70	
		N	86	76	86		33	32	34	
	ACAR	Mean	1.7%	2.4%*	3.7%**	2.0%	3.1%	8.9%***	4.5%	1.4%
		Median	0.8%	0.8%	1.7%		-0.6%	3.1%	0.8%	
		N	36	24	28		21	13	11	
	TCAR	Mean	2.9%	7.6%***	8.4%***	5.6%*	16.2%	10.8%**	9.9%**	-6.3%
		Median	0.2%	1.8%	4.8%**		13.4%	6.2%	4.5%	
		N	41	49	55		8	12	20	
(8)	Deal Val.	Mean	6.49	43.19	569.81	563.31***	21.31	425.18	796.98	775.67**
		Median	3.63	15.97	153.23		8.87	79.86	354.83	
		N	44	40	44		18	22	18	
	ACAR	Mean	-1.2%	2.2%**	0.7%	1.9%	0.4%	2.4%*	-1.6%	-2.0%
		Median	-1.3%	2.1%**	0.3%		-0.8%	1.5%	0.7%	
		N	18	23	15		10	13	7	
	TCAR	Mean	9.6%**	18.1%***	15.2%***	5.6%	26.7%	24.8%**	13.2%	-13.5%
		Median	2.9%	9.9%*	10.8%**		17.1%	10.8%	5.3%	
		N	16	15	19		3	9	5	

J. CARs and Target Asset by Transaction Type (Full)

ACAR (TCAR) is the five-day cumulative abnormal return to acquirer (target) calculated by adding the market-adjusted return for days *t*-2 to *t*+2, where *t* is the acquisition announcement day. In order to calculate the daily return, the corresponding country's Datastream value-weighted market index returns are used. Abnormal returns are winsorized at the top and bottom 1% levels. T Size is the market capitalisations of the target four weeks prior to the transaction announcement. In each year T Sizes are ranked into terciles with Small being the lowest tercile. The left-hand side reports statistics for all deals, while the right-hand side reports those for the M&C subsample consisting of deals with post-announcement target ownership over 50%. (Large - Small) indicates mean difference in CAR between top and bottom terciles. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Transaction Type			All Sample				M&C Sample			
			Small	Median	Large	(Large - Small)	Small	Median	Large	(Large - Small)
(1)	T Size	Mean	94.58	342.23	1124.94	1030.36***	107.77	368.85	1198.75	1090.98***
		Median	44.80	172.73	859.25		41.64	204.69	869.00	
		N	60	64	60		31	35	31	
	ACAR	Mean	0.8%	0.7%	0.9%	0.0%	2.0%	4.7%*	2.2%	0.2%
		Median	0.7%	-0.9%	1.3%		1.0%	0.6%	2.2%	
		N	22	19	34		17	12	18	
	TCAR	Mean	13.1%***	13.0%***	9.3%***	-3.8%	15.8%***	16.0%***	15.6%***	-0.1%
		Median	7.3%***	9.7%***	5.7%***		11.7%**	14.2%***	6.7%*	
		N	48	53	53		22	29	27	
(2)	T Size	Mean	113.94	387.69	539.05	425.11	-	150.88	-	-
		Median	113.94	227.07	539.05		-	153.34	-	
		N	2	6	2		-	4	-	
	ACAR	Mean	1.2%	-3.6%	-0.2%	-1.3%	-	-2.6%	-	-
		Median	1.2%	-3.6%	-0.2%		-	-0.7%	-	
		N	2	2	2		-	3	-	
	TCAR	Mean	2.0%	10.8%**	4.5%	2.5%	-	11.0%	-	-
		Median	2.0%	9.0%*	4.5%		-	9.0%	-	
		N	2	5	2		-	3	-	
(3)	T Size	Mean	225.81	176.26	1917.62	1691.81*	-	233.83	-	-
		Median	80.71	85.89	1100.10		-	83.10	-	
		N	6	12	6		-	7	-	
	ACAR	Mean	4.9%	4.2%	2.1%	-2.7%	-	3.7%	-	-
		Median	4.9%	4.2%	1.2%		-	3.7%	-	
		N	2	2	4		-	2	-	
	TCAR	Mean	18.7%*	5.5%*	6.0%	-12.8%	23.9%	6.2%	23.9%	0.0%
		Median	16.4%*	3.6%	-0.6%		23.9%	2.8%	23.9%	
		N	4	9	5		1	5	1	
(4)	T Size	Mean	121.76	114.67	1076.11	954.35**	326.98	264.32	1836.68	1509.70*
		Median	55.62	36.02	463.21		55.62	107.29	654.40	
		N	19	12	17		7	8	7	
	ACAR	Mean	0.9%	-3.5%	-1.6%	-2.5%	-0.7%	0.0%	-8.8%	-8.1%
		Median	-0.7%	-5.2%*	-0.7%		-0.7%	0.0%	-8.8%	
		N	3	3	4		2	2	1	
	TCAR	Mean	10.9%**	10.4%**	12.3%**	1.3%	16.8%**	20.7%**	19.0%**	2.2%
		Median	4.4%	6.2%	4.8%		13.6%*	23.2%**	17.6%**	
		N	17	10	14		7	7	6	

(5)	T Size	Mean	64.34	344.45	1111.38	1047.04	40.57	111.94	219.82	179.25
		Median	64.34	84.47	1111.38		40.57	108.23	219.82	
		N	2	8	2		1	4	1	
	ACAR	Mean	-0.1%	-4.0%	-	-	0.8%	-5.3%	-	-
		Median	-0.1%	-2.7%	-		0.8%	-2.7%	-	
		N	2	3	-		1	3	-	
	TCAR	Mean	7.9%	15.4%*	-3.5%	-11.4%	18.6%	9.1%	-0.1%	-18.7%
		Median	7.9%	8.6%	-3.5%		18.6%	11.6%	-0.1%	
		N	2	7	2		1	3	1	
(6)	T Size	Mean	62.55	1100.52	73.45	10.90	-	31.81	-	-
		Median	62.55	40.02	73.45		-	28.10	-	
		N	1	10	1		-	6	-	
	ACAR	Mean	2.7%	-0.5%	0.1%	-2.6%	-	2.7%	-	-
		Median	2.7%	-0.5%	0.1%		-	2.7%	-	
		N	1	2	1		-	1	-	
	TCAR	Mean	0.6%	6.3%	23.3%	22.7%	-	7.7%	-	-
		Median	0.6%	7.2%	23.3%		-	7.6%	-	
		N	1	6	1		-	4	-	
(7)	T Size	Mean	66.58	263.06	1642.56	1575.98***	66.08	240.17	675.29	609.21***
		Median	43.70	164.81	804.97		56.28	175.10	533.59	
		N	58	58	58		17	18	17	
	ACAR	Mean	-0.7%	-3.8%	2.4%	3.1%	3.1%	-11.4%	15.8%	12.7%
		Median	-0.1%	-1.8%	2.0%		-0.7%	-11.4%	15.8%	
		N	15	6	10		3	1	1	
	TCAR	Mean	4.8%*	3.4%*	6.0%***	1.1%	11.1%*	5.2%	7.6%*	-3.4%
		Median	3.0%	0.6%	5.1%***		8.7%	4.6%	2.6%	
		N	48	50	51		11	16	17	
(8)	T Size	Mean	59.90	170.24	1013.07	953.17***	647.09	204.46	1211.19	564.10
		Median	38.80	122.31	636.10		110.56	117.48	362.77	
		N	23	29	23		7	11	7	
	ACAR	Mean	5.0%	1.5%	0.9%	-4.2%	5.0%	5.0%	0.9%	-4.2%
		Median	5.0%	2.9%*	0.9%		5.0%	5.0%	0.9%	
		N	1	5	1		1	1	1	
	TCAR	Mean	14.1%**	19.3%***	6.3%**	-7.8%*	19.0%*	29.3%**	8.9%	-10.1%
		Median	1.6%	5.3%	4.7%**		11.7%	28.5%**	3.6%	
		N	20	23	18		5	7	6	

K. List of Abbreviation

Abbreviation	Full Name	Abbreviation	Full Name
AHP	Analytic Hierarchy Process	IPO	Initial Public Offering
ANN	Artificial Neural Network	IRR	Internal Rate of Return
ARIMA	Autoregressive Integrated Moving Average	KAGB	Kapitalanlagegesetzbuch
ARR	Accounting Rate of Return	KG	Kommanditgesellschaft
BDI	Baltic Dry Index	KS	Kommandittselskap
BDTI	Baltic Dirty Tanker Index	LIFFEX	London International Financial Futures Exchange
BFI	Baltic Freight Index	LTV	Loan-To-Value
BHARs	Buy-and-Hold Abnormal Returns	M&C Sample	Majority and Control Sample
BIFFEX	Baltic International Freight Futures Exchange	MCDM	Multi-Criteria Decision Making
CAPEX	Capital Expenditures	MRS	Markov Regime Switching
CAPM	Capital Asset Pricing Model	MTB	Market-to-Book ratio
CARs	Cumulative Abnormal Returns	NPV	Net Present Value
CDFs	Contracts-for-Difference	NYMEX	New York Mercantile Exchange
DCF	Discounted Cash-Flows	OECD	Organization for Economic Co-operation Development
DEA	Differential Evolution Algorithm	OSRA	Ocean Shipping Reform Act
DJCA	Dow Jones Composite Average	OTC	Over-The-Counter
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortisation	PCA	Principal Component Analysis
ECA	Export Credit Agency	PE	Private Equity
ERR	Economic Rate of Return	PIPE	Private Investment in Public Equity
ES	Expected Shortfall	ROA	Real Options Analysis
FFAs	Forward Freight Agreements	RV	Relative Valuation
GA	Genetic Algorithm	S&P	Sales and Purchase
GARCH	Generalized Autoregressive Conditional Heteroscedasticity	SCM	Supply Chain Management
GDP	Gross Domestic Product	SEO	Seasoned Equity Offering
GED	Generalized Error Distribution	SIC	Standard Industrial Classification
GISC	Global Services Cyclical Index	TEU	Twenty-foot Equivalent Unit
GTO	Global Terminal Operator	UTADIS	Utilities Additives Discriminants
HHI	Herfindahl-Hirschman Index	VaR	Value-at-Risk
IMAREX	International Maritime Exchange	VLCC	Very Large Crude Carrier
IPE	International Petroleum Exchange	WACC	Weighted Average of Cost of Capital