# ESSAYS ON SUSTAINABILITY ISSUES IN TRANSPORTATION MANAGEMENT

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# Essays on sustainability issues in transportation management

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CERTIFICATE OF ORIGINALITY

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Markus Vejvar (Name of student)

# Essays on sustainability issues in transportation management

## Abstract

Global transportation has profoundly affected and shaped our modern-day world. However, the transportation of cargo and passengers produces massive global negative externalities on both the environment and societies that need to be addressed. As commercial transportation companies are inherently focused on profitability goals, they tend to disregard environmental and social issues in their operations by implementing sustainability practices in accordance with the legally-mandated minimum or by paying lip service to the demands of stakeholders. Consequently, and keeping in mind the international nature of the transportation business, efficient ways to regulate and govern these externalities in a global context need to be identified, while paying special attention to not compromising the economic viability of transportation firms.

This thesis explores holistic sustainability as a tridimensional construct encompassing economic, environmental, and social goals in the transportation industry. It consists of five independent empirical studies that jointly discuss how the sustainability discourse diffuses through the industry, which factors are antecedents of the adoption of sustainability practices, and how sustainability practice adoption affects the operational performance of transportation firms. We employ a mix of qualitative and quantitative methods on different data sets from both the maritime and air transportation sectors to show that external institutional pressures play a dominant role in a transportation firm's sustainability performance, and that the implementation of said practices incurs hidden costs and benefits for companies that need to be regarded by executives.

Consequently, this thesis contributes to the current discussion of sustainability in transportation in both theory and practice. From a theoretical perspective, we provide additional evidence on how practices and discourse diffuse through an industry and contribute new measurements of sustainability and methodical approaches to the general discourse on holistic sustainability. Our practical contributions include further insights on the intricate links between corporate performance and sustainability, and also highlight profound implications for policymakers on how and why firms adopt (or do not adopt) sustainable practices, which can help to improve the effectiveness of future policy and regulations.

# Preface

This dissertation consists of five individual but related studies on sustainability issues in transportation management. While the studies jointly add to the literature and address the research gap of how sustainability discourse and practices diffuse through the transportation industry, they are separate entities and are thus published (or are in the process of being published) separately.

The original research work of all the studies, i.e., the conceptualization of theory and models, data collection and cleaning, statistical analyses and write-ups of the discussion and conclusion, was done by me, Markus Vejvar, under the close supervision of Prof. K. H. Lai and Dr. C. K. Y. Lo who provided feedback, ideas, and criticism. In the study *"Strategic responses to institutional forces pressuring sustainability practice adoption: Case-based evidence from inland port operations"* Dr. E.W.M. Fürst provided additional insights into the Austrian transportation market, ideas, feedback, and the contact information of key decision-makers in ports.

Next follows an overview of publications emerging from this dissertation, including authors, title, (planned) academic outlet, publication status, and conference presentation information. Except for the aforementioned study on sustainability in inland port operations that was funded by the Ernst Mach Grant awarded by the Euro-Pacific Uninet, all studies were conceived and funded during the course of my International Scholarship for PhD students at The Hong Kong Polytechnic University.

The language of this dissertation is American English, as this is the usual publishing standard in transportation journals.

## Overview of publications from this dissertation:

### *Published:*

Vejvar, M., K. H. Lai, C. K. Y. Lo. 2016. An institutional perspective on the diffusion of social sustainability and its discourse in liner shipping operations. *The Journal of Sustainable Mobility*, 3(2), 14–41; presented at the "CSR in maritime shipping" workshop hosted by the Copenhagen Business School in May 2016

Vejvar, M., K. H. Lai, C. K. Y. Lo, E. W. M. Fürst. 2017. Strategic responses to institutional forces pressuring sustainability practice adoption: Case-based evidence from inland port operations. *Transportation Research Part D: Transport and Environment*, 61 (Part B), 274–288, http://dx.doi.org/10.1016/j.trd.2017.08.014; joint project with the Vienna University of Economics and Business, funded through the Ernst Mach Grant from the Euro-Pacific Uninet (EPU) and scheduled for January to April 2017

### *Under Review:*

Vejvar, M., K. H. Lai, C. K. Y. Lo. 2018. Sustainability in liner shipping operations: A literature survey and citation network analysis; currently under second round of review in *Maritime Policy and Management*

Vejvar, M., K. H. Lai, C. K. Y. Lo. 2018. Talking about doing good together? Firm-internal corporate social responsibility communication levels and alliance membership; presented at the SMS 2018 special conference "Strategizing New Growth Avenues in an Evolving Global Context" in Sao Paulo in March 2018

Vejvar, M., K. H. Lai, C. K. Y. Lo. 2018. Pay well or look good? The moderating roles of corporate social responsibility and employee wages on flight delays during layoff; presented at the 7th POMS-HK conference in January 2018, and currently under review at *Management Science*

# Acknowledgements

Even though it is my name that is at the top of this dissertation, it would be naïve to assume that I would have been able to finish this thesis without the significant help and support from my supervisors, peers, friends, and family. As a result, I have accrued many debts to many people, and the least I can do is acknowledge these people and their contributions to my thesis here.

First of all, I would like to thank my supervisors Prof. Kee-hung Mike Lai and Dr. Chris Kwan Yu Lo for their support in my research. Their expertise and insights have helped to improve both the scientific rigor and the contributions of my work tremendously. Without Prof. Lai's astute observations of the transportation industry and the current state of the transportation management research field and Dr. Lo's extensive knowledge of the appropriate statistical methodology, none of the studies in this dissertation would have come to be of the quality that we were able to deliver, and for that I would like to thank them deeply.

Apart from my supervisors, I would like to thank a number of other academics that have supported me during my studies. I would like to extend my gratitude to Dr. Elmar W. M. Fürst and Prof. Sebastian Kummer for hosting me during my research project at the Vienna University of Economics and Business that resulted in the third study of this dissertation. In this regard, I also want to thank Dr. Hans-Joachim Schramm and Dr. Wolfram Groschopf for their support and their helpful insights over the course of that project. My gratitude also goes to all the port managers and policymakers that took time out of their busy schedules to discuss sustainability in inland port operations with me during that project and to the EPU Uninet committee that awarded me with the Ernst Mach Grant which provided the funding to make this project possible.

I would also like to thank all the lecturers and professors at The Hong Kong Polytechnic University that have helped to equip me with the tools and critical thinking required for academic research, in particular Prof. Jason Shaw and Dr. Yi Tang from the Department of Management and Marketing who went out of their way to share their knowledge about strategic management. Further thanks go to Dr. Alex Kin Yau Wong from the Department of Applied Mathematics who has continuously supported the quantitative studies of this thesis with his extensive statistical knowledge, and who has significantly contributed to the statistical rigor of these studies.

Further thanks go to my student peers at PolyU who have shared their knowledge, ideas, and feedback and often helped me with any administrative hurdles and cultural barriers that I was confronted with. In this regard, I would also like to thank the hard-working administrative staff of the general office of the Department of Logistics and Maritime Studies that never tired of reminding my oblivious self of important deadlines and paperwork, and that put up with my numerous questions.

I also extend my sincere gratitude to XY Sum, Bao Wu, Eppie Ng, and Miyuki Cheng for providing research support in the arduous task of collecting the data for the fourth study. I apologize for putting you through this most boring of works and am truly thankful for your patience and persistence.

I would also like to thank Jennifer Rontganger who helped with the final proofreading of this thesis for improving the flow of the language and correcting the last remaining mistakes and typos.

Outside of the academic world, there are countless people I would need to thank for their support and guidance during my studies – in fact, there are too many to list here. Consequently, I will just name the most important ones: I would like to thank my parents and my siblings (and, of course, their spouses) for their emotional support during my studies and for putting up with the fact that I was so far away from home for countless months, missing many important events (both good and bad) back at home. I would also like to thank my friends, both the ones in Hong Kong and the people back at home that stayed in touch thanks to modern technology. They provided stress relief and emotional support in the toughest times.

I am sure that there are many more people that have impacted me and my studies in the last three years – how could it be any different? – but they are too many to mention here. As a result, I would like to extend a “Thank you!” from the bottom of my heart to anyone who is not listed here that has supported me in one way or another in the past few years. Those addressed will know who I mean.

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# List of abbreviations

| | |
|---|---|
| ABBB | Aviation Benefits Beyond Borders |
| AEO | Authorized Economic Operator |
| BTF | Behavioral Theory of the Firm |
| CCWG | Clean Cargo Working Group |
| CNA | Citation Network Analysis |
| $CO_2$ | Carbon Dioxide |
| CORSIA | Carbon Offsetting and Reduction Scheme for International Aviation |
| CSR | Corporate Social Responsibility |
| DEA | Data Envelopment Analysis |
| e.g. | *exempli gratia*, for example |
| EPU | Euro-Pacific Uninet |
| EU | European Union |
| GDP | Good Distribution Practice |
| GMP | Good Manufacturing Practice |
| GRI | Global Reporting Initiative |
| IATA | International Air Transport Association |
| ICAO | International Civil Aviation Organization |
| i.e. | *id est*, that is |
| ILO | International Labor Organization |
| IMO | International Maritime Organization |
| ISO | International Organization for Standardization |
| LDA | Latent Dirichlet Allocation |
| MACN | Maritime Anti-Corruption Network |
| MALLET | Machine Learning for Language Toolkit |
| MARPOL | International Convention for the Prevention of Pollution from Ships |
| MCL | Markov Cluster Algorithm |
| MLC | Maritime Labor Convention |
| MPA | Main Path Analysis |
| $NO_x$ | Nitrogen Oxides |
| OECD | Organization for Economic Cooperation and Development |
| OHSAS | Occupational Health and Safety Standards |
| ROA | Return on Assets |
| SCM | Supply Chain Management |
| SOLAS | International Convention on Safety of Life at Sea |

| | |
|---|---|
| SQAS | Safety and Quality Assessment System |
| SSCI | Social Science Citation Index |
| STCW | International Convention on Standards of Training, Certification and Watchkeeping for Seafarers |
| $SO_x$ | Sulpuhr Oxides |
| TEN-T | Trans-European Transport Network |
| TEU | Twenty-foot Equivalent Unit |
| UN | United Nations |
| UNCTAD | United Nations Conference on Trade and Development |

# Chapter 1 – Introduction

Globalization has had a profound role in shaping the world as we know it today. However, apart from the generation of wealth and its contribution to economic development, globalization has also exacerbated global issues. Global supply chains have significantly increased both the global transportation volume and the average transportation distance, and in turn, has boosted the emission of pollutants and accelerated environmental degradation (Cavallaro et al. 2018, Chaabane et al. 2012, Lemos and Agrawal 2006). Firms that have outsourced their manufacturing processes to developing countries also show a record of human rights violations (Blanton and Blanton 2016, Cottier et al. 2005, Mosley 2010), and the increased mobility of assets has increased unemployment as well as social inequalities in both developing and developed countries (Goldberg and Pavcnik 2007, OECD 2011). Focusing on the negative externalities of globalization, there are calls for a gradual reversal of its effects, and indeed, recent political developments highlight an increasing protectionist sentiment.

Transportation is a key function in a globalized economy. Transportation be it via rail, road, air or sea, not only includes the transportation of finished goods to end consumers and the transportation of raw materials from suppliers to manufacturers, it also encompasses the transportation of semi-finished goods between plants, raw materials between warehouses, and finished products from wholesalers to retailers (Bowersox et al. 2013). It is not surprising that transportation management and research have received a high degree of attention from academics and practitioners alike. However, unsurprising for an industry marked by extreme competitive pressures, the majority of research on transportation issues focuses on cost reductions and efficiency gains to increase the economic viability of transportation. The negative external effects of transportation, including emissions (Lee et al. 2016), climate change (Chapman 2007), pollution (Bailey and Solomon 2004), safety and security (Bailey 2006, Hetherington et al. 2006), and employee welfare (Sampson and Ellis 2015) receive comparatively less attention (Campbell 2006, Geurs et al. 2009, Janic 2006). Transporting goods to generate profits is the core business of the transportation industry, and transportation firms generally cannot be expected to implement environmental or social initiatives by themselves, particularly when it could negatively affect their economic viability (Psaraftis and Kontovas 2010).

As a result, national governing bodies try to regulate their transportation industries to reduce negative externalities. However, global issues like climate change or growing social

injustice cannot be solved appropriately in a national context. Indeed, globalization has arguably led to reduced national sovereignty and has diminished the function of the state in governing global problems (Wijen et al. 2005). As a result, international governance bodies have bolstered their role in shaping the global discourse and have stepped up to provide global frameworks that address global issues (Campbell 2007, Hicks 2011). Prominent examples of these international bodies in the transportation context include the International Labor Organization (ILO), the International Maritime Organization (IMO) or the International Air Transport Association (IATA). While some of these organizations have preceded the advent of globalization, their role in governing and navigating global issues as environmental degradation, social exploitation or sustainable development has gradually increased over the years. These global institutions provide regulatory frameworks for their members to follow, yet many rely on national governments for the monitoring and execution of these regulations (Drezner 2007).

The recent resurgence of protectionist sentiments has led to a backlash against the idea of global governance, and many nation states are trying to address global problems on a national level in the best case or completely ignore them in the worst case. Following a mercantilist logic, governments are incentivized to pull out of global governance structures or gradually try to erode them, both for political reasons and in hopes of providing an economic advantage for domestic firms (Lazzarini 2015, Wajda-Lichy 2014). For instance, the public discourse about climate change has gradually shifted from a scientific debate to a political discussion, motivated by economic considerations. In an attempt to safeguard domestic industries from foreign firms with potential competitive advantages, and often fueled by political goals, we can see an increasing number of nation states struggling to regain their sovereignty by emancipating themselves from supranational bodies; the most prominent example of this development is the recent decision of the United Kingdom to leave the European Union.

Naturally, geopolitical developments on this scale have massive implications for transportation firms. Apart from political effects like market entry barriers that can have adverse effects on business, an increased granularity of legislative bodies can enable transportation companies to maneuver around national regulations. Transportation companies are relatively “footloose” when it comes to national regulation, as they have options to relocate part of their operations to evade specific laws and policies (Yliskylä-Peuralahti and Gritsenko 2014), and an erosion of the agency of international governance bodies could have a negative impact on their social and environmental performance.

Thus, ways need to be found to govern the negative externalities of transportation without compromising their economic viability. Regulations in the transportation industry always carry the risk of under- or overregulating the industry; while under-regulation leads to severe negative impacts on society not being appropriately addressed, over-regulation can severely increase the cost of transportation, which could render the transportation industry non-competitive and could cause drastic ripple effects for an economy, like bankruptcies, unemployment, transportation companies moving to less regulated environments, and a negative impact on the gross domestic product.

Without doubt, holistic sustainability in transportation management poses an intricate conundrum for practitioners, policymakers, and researchers alike. Alternative ways to promote sustainability in the transportation industry need to be found, for example, by identifying ways to strengthen international regulatory bodies or by incentivizing transportation companies to effectively self-regulate their negative externalities. However, to adequately design and promote these measures, we first need to expand our knowledge of the current status quo of sustainability in transportation, its major challenges and antecedents, and how sustainability discourse and practices have evolved and diffused in the industry in recent years. This thesis aims to shed light on how the sustainability discourse diffuses through the transportation industry, which antecedents affect sustainable practice adoption, and how sustainability adoption affects operational and financial performance in the transportation sector. After an introductory discussion of key concepts, we present the specific problem statement and related research questions and objectives that will then be addressed in five independent but connected studies. We conclude with a synthesis of our findings and their significance for academia, executives, and regulative bodies.

## Conceptual background: Sustainability, sustainable development, and corporate social responsibility

Even though the discussion on sustainable business began earlier, the most common definition of sustainability can be found in the 1987 report of the World Commission on Environment and Development, known as the Brundtland report, and defines it as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 1987). Building on this definition, Elkington (1998) proposed a triple bottom line approach that distinguishes *people, profit,* and *planet,* which refer to the social,

economic, and ecological dimensions of sustainability, respectively. He follows the rationale that businesses need to be not only socially just and environmentally-friendly, but also economically profitable to be truly sustainable. Initially devised as an accounting framework, this triple bottom line approach quickly became a prominent holistic management approach, and the three pillars of sustainability were rooted in the United Nation's commitment to sustainable development (United Nations 2005). Optimally, corporate sustainability should implement initiatives that benefit all three dimensions to generate long-term competitive advantages, but more often than not, trade-off scenarios occur (see Figure 1).

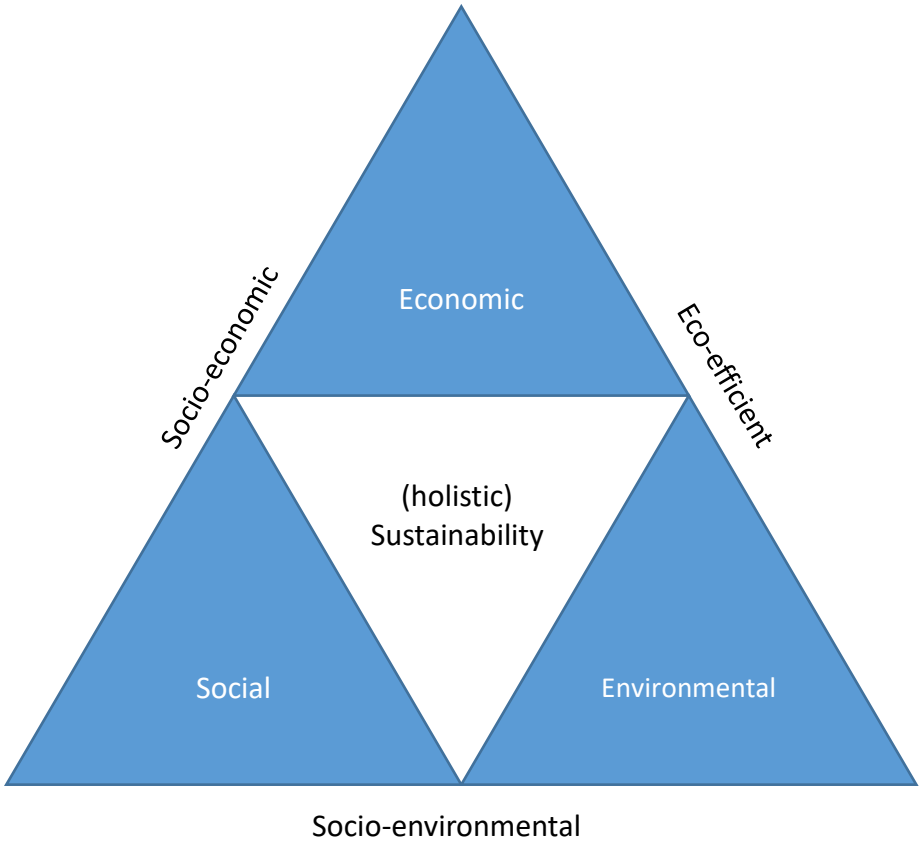


*Figure 1: Dimensions of sustainability, adopted from Elkington (1998)*

There are a multitude of frameworks and certificates to help firms implement sustainability in their operations. For example, the International Organization for Standardization (ISO) has issued several certificates that are relevant for the sustainability discussion. The ISO 9000 on quality management provides tools to ensure service or product quality and customer satisfaction, thus supporting the economic and social dimension of sustainability (International Organization for Standardization 2015). The ISO 14000 on environmental management supports companies in setting and reaching their environmental goals, thus reducing negative externalities on the environment (International Organization for

Standardization 2015). The ISO 45001 offers best practices in occupational health and safety management, thus reducing accidents and improving employee health and safety in the social dimension of sustainability (International Organization for Standardization 2015). The uncertified ISO 26000 on social responsibility offers a broader framework for firms to engage in corporate social responsibility and implement sustainability in a more holistic way (International Organization for Standardization 2010), including the sustainability aspects of labor practices, the environment, human rights, organizational governance, fair operating practices, development of community and society, and consumer issues. Other regulating bodies like the United Nations (UN), the European Union (EU) or the International Labor Organization (ILO) also issue regulations to support firms in their sustainability efforts (European Environment Agency 2015, ILO 2006, United Nations 2005). Further international bodies of governance as well as non-profit organizations like the IMO/IACO (which are part of the UN), IATA, Clean Cargo Working Group (CCWG) or the Aviation Benefits Beyond Borders (ABBB) provide further policies and regulation.

At a company level, sustainability efforts refer to business activities that include social and environmental concerns in operations, which exceed the legally mandated minimum and usually show a higher degree of interactions with stakeholders (van Marrewijk 2003). These efforts are often manifested and described as corporate social responsibility (CSR). Rooting in a discussion of responsible practices for businessmen in the 1950s, the CSR discourse has proliferated and matured in recent decades, and has gained recognition at all levels of management research (Carroll 1999), in part due to the increasing awareness of accelerating environmental and societal externalities generated by corporate activities (Jenkins 2005, Lim and Tsutsui 2012).

CSR postulates that companies have a societal responsibility that exceeds shareholder value and relations with direct stakeholders (Wang et al. 2016). Due to the overall vagueness of the CSR construct and a multitude of diverging definitions, CSR efforts can be interpreted differently between different environmental contexts and even between corporations (Doh and Guay 2006, Freeman and Hasnaoui 2011, Husted et al. 2016), which makes it difficult to clearly identify whether a corporate action should be seen as CSR or not. One way to differentiate CSR is by categorizing it into explicit and implicit CSR (Matten and Moon 2008). While implicit CSR constitutes the values and norms deeply ingrained within a firm that define the firm's informal and formal position within the broader societal context, explicit CSR describes the actual salient policies, programs, and initiatives undertaken by a firm to support the greater societal good.

CSR has been analyzed from a multitude of different theoretical lenses (Garriga and Mele 2004). Porter and Kramer (2006) look at corporate sustainability as a focal point between firms and society, and identify it a source of competitive advantage. Steurer et al. (2005) explore stakeholder relationship management as a driver of the sustainable development of companies. Other authors discuss sustainability from a more general strategic perspective (Dyllick and Hockerts 2002, McWilliams and Siegel 2001). In strategic management research on CSR, authors focus on defining and analyzing the link between social and financial performance (Lee 2008, Waddock and Graves 1997). Prior findings in the research of CSR have led to contradicting conclusions about the nature of this connection (Orlitzky et al. 2003), but early CSR research often struggled with measurement issues (Wood and Jones 1995) and model misspecifications (Margolis and Walsh 2003). Indeed, more recent research has concluded that there is indeed a positive link between a firm's social and financial performance (Barnett and Salomon 2006). However, there is no consensus yet that this relationship is causal, and the literature provides evidence of several contingency factors like industry or culture (Chih et al. 2010, Saeidi et al. 2015). In the supply chain and operations management literature, CSR is also a popular topic (Ahi and Searcy 2013, Seuring and Müller 2008, Zhu et al. 2015), as researchers aim to lessen the negative externalities of operations while improving relations with key stakeholders along the supply chain. While transportation is a crucial element in supply chain management, the discussion of CSR has not yet fully extended to the transportation discourse, and both CSR and sustainability are only discussed to a varying degree in the different modes of transportation (Sampson and Ellis 2015).

## Sustainable development in different modes of transportation

The sustainability discourse has increasingly gained importance in the transportation management literature (Carter and Easton 2011), which stems from the high negative externalities that are usually attributed to these functions (Seuring and Müller 2008). Authors in this field particularly discuss the effect of environmental practices on firm performance (Fahimnia et al. 2015, Rao and Holt 2005, Zhu et al. 2012), as well as ways to lessen the negative environmental impact of supply chains (Lee 2008, Shi et al. 2012). Social issues have been comparatively less discussed (Hutchins and Sutherland 2008, Seuring 2008). However, it is highly desirable to view sustainability as a holistic management approach rather than focusing on a single performance dimension. The eco-friendliest technology is unlikely to be adopted by the industry if the implementation is not profitable; similarly, a highly profitable enterprise will not be able to sustain its competitive

advantage without caring for its stakeholders and the environment (Dyllick and Hockerts 2002).

All modes of transportation have received due research attention, and studies look for options to make road freight (Cavallaro et al. 2018, Fürst et al. 2013, Santos et al. 2010), maritime transportation (Adland et al. 2017, Cariou 2011, Lam and Lim 2016, Psaraftis and Kontovas 2010), rail cargo and intermodal freight (Bauer et al. 2010, Limbourg and Jourqin 2009), and air transportation (Akerman 2005, Gössling and Peeters 2007) more sustainable. Authors have also discussed sustainability in major hubs like airports or seaports and provided frameworks on how to reduce the negative externalities of hub operations (Acciaro et al. 2014, Chang and Wang 2012, Lam et al. 2013, Upham et al. 2003). While the sustainability discussions of all modes have their own extensive body of literature that could be discussed, we will only provide an introduction to sustainability in maritime transportation and aviation in this thesis. Out of all modes, maritime transportation and aviation are the most globalized, providing links between countries and continents, and as a result, they were chosen as target industries for the studies in this thesis.

## Sustainability in maritime transportation

Maritime transportation is a crucial link in many globalized supply chains (Fransoo and Lee 2013, Midoro et al. 2005). Thus, it is not only highly dependent on global trade volume, but it is also one of the main drivers of the ongoing globalization (Lun and Browne 2009). Due to decreasing transportation costs and increasing demands for transportation services, driven by global supply chains with geographically dispersed manufacturing sites and markets, the global maritime transportation volume has reached an all-time high after recent economic downturns and continues to grow in conjunction with global trade (UNCTAD 2015). In light of these considerations, it is not surprising that sea transportation constitutes by far the biggest share of the global freight transportation modal split, both in volume and in terms of ton-miles (Benamara et al. 2011). The global shipping market is characterized by a long-term financial investment in ships, a high degree of shipping demand volatility, a high concentration of companies, and low average returns on capital investment (Luo et al. 2009, Stopford 2009). Prices in the market are set by the freight rate, which is determined by supply and demand in the transportation market. Transportation supply is determined by the overall capacity that exists in the market, which in turn is dictated by new orders of vessels, the scrapping of old vessels, and operational measures like vessel speed and loading factors. Demand, on the other hand, is derived from

international trade – the higher the international (seaborne) trade volume, the higher the demand for maritime transportation services (Lun et al. 2010, Luo et al. 2009).

Similar to other transportation-related literature, the focus of the shipping literature on sustainability is mainly confined to economic and environmental issues (Lam 2015, Sampson and Ellis 2015). Due to volatility in demand and the competitive nature of the maritime transportation business (Stopford 2009), the most discussed dimension is undoubtedly economic sustainability. Within this dimension, researchers focus on ship routing (Christiansen et al. 2004, Meng et al. 2014), operational efficiency and cost reduction (Clark et al. 2004, Kozan 2000), and strategic and quality management (Bang et al. 2012, Bichou et al. 2007). The increase in the public awareness of environmental practices over the past decades has also spurred academic and industry interests in environmentally-friendly maritime transportation. Research in the environmental dimension mostly focuses on environmental protection, resource conservation, and waste reduction (Psaraftis and Kontovas 2010, Zhu et al. 2012). Another stream of research in maritime transportation focuses on the reduction of emissions caused by maritime transportation through the speed reductions or regulations (Cariou and Cheaitou 2012, Corbett et al. 2009). Lai et al. (2011) conceptualize green shipping practices, which include company police and procedure, shipping documentation, shipping equipment, shipper cooperation, shipping materials and shipping design, and compliance in measuring a shipping company's impact on the environment.

A prime example of the pursuit of achieving lower environmental impacts in maritime transportation is the International Convention for the Prevention of Pollution from Ships (MARPOL), issued by the International Maritime Organization (IMO). MARPOL is the main global convention aimed at reducing pollution and other environmental damages caused by maritime transportation (IMO 1974). Other non-profit organizations like the clean cargo working group (CCWG), which focuses on improving the environmental impact of maritime cargo movements (CCWG 2015), or the Trident alliance which advocates the strict enforcement of Sulphur emissions regulations by shippers (Trident Alliance 2016) indicate the willingness of certain shipping companies to proactively address environmental issues beyond the legally-mandated regulative framework. Furthermore, several green certifications (e.g., ISO 14001) have gained in importance for shipping companies and further stress the practical relevance of ecological sustainability for maritime transportation.

Many publications of social sustainability in liner shipping focus on labor practices, including health and safety management (Bailey 2006, Ellis et al. 2010). However, there are discussions on broader social issues including seafarers' welfare (Ellis 2010), training and education (Sampson et al. 2011), and regulatory compliance (Bloor et al. 2013). Overall, the social discussion is quite diverse: Yliskylä-Peuralahti and Gritsenko (2014) explore CSR as a form of voluntary self-regulation within the industry rather than through binding rules and regulatory frameworks, while Shinohara (2005) studies the incentives for shipping firms to improve their shipping service quality. Fafaliou et al. (2006) examine the issues of job satisfaction, social welfare, and social accountability in the context of the Greek shipping industry. Lu et al. (2009) analyze the effect of community involvement and environment, disclosure, and employee and consumer interests on financial and non-financial performance in Taiwanese companies and find a positive effect on both financial and non-financial performance. A major regulative body governing social issues in liner shipping operations is the International Labor Organization (ILO), which issued the Maritime Labor Convention (MLC), a set of standards for working conditions for seafarers (ILO 2006).

## Sustainability in aviation

While the aviation industry is similar to maritime transportation in that it is a global industry dependent on efficient networks spanning multiple countries, there are two significant differences between aviation and maritime transportation that profoundly impact the sustainability discourse in aviation. Firstly, contrary to maritime transportation, the most important business segment for aviation is not cargo but passenger transportation (Lan et al. 2006). Consequently, air transportation companies are much more focused on business-to-consumer business, rather than business-to-business interactions, and their (sustainability) actions are consequently much more salient and observable by the public (Hagmann et al. 2015, Mayer et al. 2012, Prince and Simon 2015). Secondly, while maritime transportation is one of the biggest contributors to transportation-related emissions, this is due to the sheer volume transported, as emissions per transported unit of cargo are comparatively low (UNCTAD 2016); however, for aviation, the exact opposite is the case: Overall, contribution to transportation emissions is low, but emissions per unit transported are very high (Gössling and Peeters 2007, Hooper and Greenall 2005). However, given the past and projected growth rates of the aviation industry (Abeyratne 2003) and the high impact of individual flights, negative externalities of aviation are expected to increase drastically in the coming years.

Given the high prevalence of passenger transportation in aviation, this thesis and the corresponding studies on sustainability will focus on commercial passenger airlines. Like in other modes of transportation, economic considerations of commercial airlines are the most regarded in the extant literature. Key research topics on the economic viability of passenger airlines are cost control (Martín and Román 2011), revenue management (McGill and Van Ryzin 1999), flight schedules (Barnhart and Cohn 2004, Luo and Yu 1997), airport management (Barrett 2004, Hergott 1997), alliance formation (Oum et al. 2000), and the impact of delays (Deshpande and Arikan 2012, Nicolae et al. 2017). Other important factors for the economic viability of airlines that can also be considered as part of the social dimension of sustainability are service quality (Suzuki 2000), customer satisfaction (Steven et al. 2012), and safety management (Squalli and Saad 2006). Considering the importance of customer satisfaction, safety, and service quality for the economic success of an airline, and the scrutiny which airlines come under from passengers (Prince and Simon 2015), it is unsurprising that research on the social dimension of air transportation sustainability seems more developed than in maritime or road transportation. Other important aspects of social sustainability include employee satisfaction (Kim and Back 2012, Kucukusta et al. 2016) and health (Chen and Kao 2011), and to a lesser degree, community involvement and diversity (Cowper-Smith and de Grosbois 2011). Airline emissions and their impact on climate change are at the center of the environmental discussion in aviation due to the significant emissions of flights (Abeyratne 2003). Apart from contributing to global greenhouse gas emissions, airline transportation also has a significant local impact on air quality and noise levels near airports through flights, maintenance and handling operations, and feeder transports (Daley et al. 2008). Indeed, several studies agree that the current practices to address the environmental impacts of aviation are not sufficient (Gössling and Cohen 2014, Preston et al. 2012). Consequently, a significant number of studies discuss solutions on how to regulate the environmental impact of airlines, including carbon pricing, emissions trading schemes, alternative fuels, demand shifts, and efficiency improvements (Scheelhaase et al. 2010, Sgouridis et al. 2011).

In contrast to maritime transportation, the overall sustainability discourse in aviation is much more focused on CSR rather than the more general term of sustainability, which could be caused by the close proximity to end consumers. Even though the overall CSR discourse is still in its infancy (Abeyratne 2003, Cowper-Smith and de Grosbois 2011, Vourvachis et al. 2016), a trend toward stronger CSR disclosure can be observed in a multitude of markets (Lynes and Andrachuk 2008, Mak et al. 2007). This is a significant

development, as international regulation on sustainability in aviation is much weaker when compared to maritime transportation. For example, emissions of the international airline industry were exempted from regulation through the Kyoto protocol (Preston et al. 2012). Furthermore, the International Civil Aviation Organization (ICAO), the aviation equivalent of the IMO at the UN, has not yet been able to produce a framework to regulate emissions that has as profound and far-reaching impacts as IMO's MARPOL. While it has recently introduced the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) to regulate international emissions, these changes will only take full effect from 2027 onward and have already been criticized for not being far-reaching enough (ICAO 2016). Thus, similar to maritime transportation, the global aviation industry is suffering from a lack of holistic sustainability concepts that address all three dimensions of sustainability to a sufficient degree.

## Problem statement and research questions

While the different dimensions of sustainability in the transportation industry seem to be discussed to a varying degree within the literature, there seems to be a distinctive lack of research discussing sustainability from a holistic point of view. The overall goal of this thesis is to utilize different methods in empirical studies to advance the discussion of holistic sustainability in transportation management. With increased demands for sustainability, transportation companies and policymakers alike might face uncertainty about the implementation of sustainability in their business practices, particularly due to a lack of well-developed frameworks. For policymakers, a good understanding of the sustainability discourse and its diffusion through an industry is key to designing effective and suitable legal frameworks to facilitate implementation without negatively affecting the competitiveness of companies and economic areas. Companies, on the other hand, need to find ways to implement sustainable practices that meet the requirements of policymakers and the demands of customers without adverse effects on operational or financial performance. This dissertation aims to fill the gap in the current literature by holistically discussing the diffusion of sustainability discourse and practices in the transportation industry, thus providing relevant insights for sustainability scholars, managers, and policymakers alike. It is guided by three major research questions that refer to the nature of the current discourse, the mechanisms of diffusion of practice, and the impact of practice adoption in the industry:

- **RQ 1:** How does sustainability discourse diffuse through the transportation industry?
- **RQ 2:** What are the antecedents and mechanisms of sustainability practice diffusion in the transportation industry?
- **RQ 3:** What are the effects of sustainability practice adoption on operational performance in the transportation industry?

## Research objectives

To answer these research questions, we pursue the following research objectives in several related essays that are cumulatively collected in this dissertation:

- Review the state of sustainability in the liner shipping literature using a citation network analysis (CNA) approach
- Examine the diffusion of the sustainability discourse in liner shipping operations through qualitative content analysis
- Study the role of inland ports in support of sustainability development through a multiple case study approach
- Discuss how transportation firms set sustainability communication levels and how they update them based on their external environment, with a particular focus on alliance formation
- Evaluate the effect of corporate social responsibility on operational performance in commercial aviation

In achieving these research objectives, we hope to deepen the understanding of how the sustainability discourse diffuses through both the academic community and the industry, and highlight which measures can be taken by governing institutions to facilitate the implementation of sustainable practices and reduce the negative externalties of transportation. Subsequently, we further explore the link between practice implementation and the performance of a company to generate managerial insights into effective implementation and to put the postulated win-win scenarios under scrutiny.

## Methodology, data, and research scope

This thesis consists of five independent but interrelated studies, which are summarized below. Figure 2 provides an overview of the structure of this thesis, and how the chapters relate to our research objectives. After the introduction that includes a problem statement,

research questions, and research objectives, we employ a mix of different methods and data sources to generate insights into the diffusion of sustainability discourse in academia (Essay I) and practice (Essay II), followed by a qualitative (Essay III) and quantitative (Essay IV) assessment of how sustainable (communication) practices diffuse through the industry. The final study discusses the effects of practice adoption on operational performance (Essay V). The concluding chapter 5 summarizes our contributions to academia and practice while discussing the limitations of this dissertation and further potential research venues.

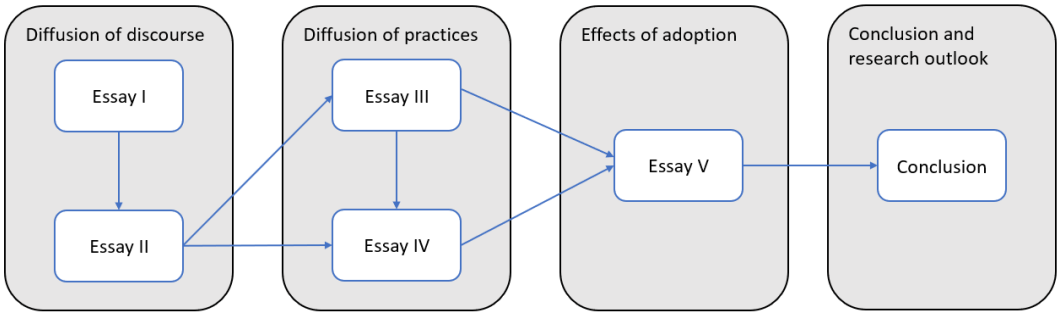


*Figure 2: Thesis structure*

The first study (Essay I) is based on a quantitative citation network analysis and identifies further areas of research for the subsequent studies, based on a data set of 253 paper from the transportation management literature.

The second study (Essay II) employs institutional theory to conduct a content analysis of the sustainability reporting of the top 10 biggest liner shipping companies in terms of fleet size, and discusses isomorphic pressures and their effect on the sustainability discourse in the liner shipping industry.

Building on the elaborations of the second study and trying to tackle the concern of limited agency in institutional studies, the third study (Essay III) employs institutional theory enriched with resource-dependency tenents in a case study approach to assess the logistics and sustainability performance of the five biggest inland harbors in Austria, with a particular focus on how these ports deal with external sustainability pressures.

Building on the insight that firms indeed have a set of diverse strategies to deal with external sustainability pressures, the fourth study (Essay IV) employs the novel behavioral theory of institutionalization on panel data from commercial aviation over 25 years to analyze how sustainable communication practices diffuse through the industry and how firms gradually adopt external pressures in their internal CSR communication goals.

The final, fifth study (Essay V) employs a set of econometric methods to study the impact of layoffs, wages, and corporate social responsibility on operational performance in the airline sector, based on a set of approximately 7.7 million flight records.

In the conclusion, we present the aggregate findings from our five studies and their implications for academia and practice. We also address any remaining limitations that this thesis is subject to that were not discussed in the specific studies.

# Chapter 2 – Citation network analysis

# Essay 1: Sustainability in liner shipping management: A literature survey and citation network analysis

## Chapter summary

Based on an analysis of 253 related papers drawn from the Web of Science database, this chapter examines holistic sustainability research in the liner shipping management literature using a citation network analysis (CNA) approach followed by a qualitative analysis of findings. We identify four major research domains, namely shipping performance, port selection and management, shipping markets, and environment, as well as related subdomains of shipping performance. We discuss the current research trends and focal issues in these domains with a focus on their implications for policy development. Our results indicate that while the sustainability discourse in the literature has developed and matured significantly in the last decade, generating valuable insights for practitioners and regulators alike, it still struggles with blurry terminology and a lack of holistic frameworks jointly addressing the different aspects of sustainability: Economic considerations of liner shipping are still the main concern, while environmental and social issues are held in lower regard in the academic discourse. Furthermore, we identify a dearth of studies rooted in managerial or economic theory. In this regard, this chapter provides insights on the scope of the holistic sustainability discourse in liner shipping management, its contributions to theory and practice, and its implications for the further development of policies addressing sustainability in liner shipping management. We advocate further construct development for sustainability in liner shipping, as well as empirical tests of the antecedents of sustainability practice adoption in the industry for future research.

## Introduction

In recent years, there has been growing managerial attention paid to the sustainability aspect of shipping, given the immense cargo volume handled and the remarkable externalities caused by maritime transportation activities. Indeed, future scenarios see a massive increase in the negative impacts on the environment caused by the maritime industry (IMO 2015). While firms are looking for ways to reduce costs and improve service quality to enhance their competitiveness, governments and policymakers have a vested interest in reducing the negative externalities caused by shipping activities; as a result, an

extensive academic discussion has been started on how to reduce the environmental damages caused by maritime transportation without compromising its economic viability (Lai et al. 2011, Lam and Notteboom 2014, Lister 2015, Psaraftis and Kontovas 2010).

Yet, it is not sufficient for sustainability efforts to balance economic viability and environmental sustainability. According to the triple bottom line approach advocated by Elkington (1998), a business striving for sustainability needs to embrace it as a holistic management approach. This includes integrating environmental and social sustainability aspects into its economic operations (Dyllick and Hockerts 2002). Consequently, a sustainable shipping firm needs a certain minimum performance in economic, environmental, and social aspects (Seuring and Müller 2008).

Even though the World Shipping Council (WSC), comprised of representatives of the major shipping companies in the world, stresses the importance of environmental efficiency and social viability (World Shipping Council 2017), and some liner shipping firms organize in voluntary groups like the Clean Cargo Working Group (CCWG) or the Trident Alliance to address the negative externalities of shipping (CCWG 2015, Trident Alliance 2016), there is still a void of comprehensive frameworks addressing sustainability in maritime shipping (Sampson and Ellis 2015). Indeed, the International Maritime Organization (IMO) recently emphasized the importance of developing a holistic framework of corporate social responsibility in maritime shipping (IMO 2012).

Several authors have reviewed the economic performance (Christiansen et al. 2013, Lau et al. 2013, Meng et al. 2014, Panayides and Song 2013) of liner shipping and related port operations (Athanasios et al. 2010, Woo et al. 2012), including to a certain extent the environmental (Lam and Gu 2013) and social (Yang et al. 2013) implications of sustainability in liner shipping management; however, there seems to be a dearth of research that systematically analyzes the evolution of sustainability efforts in the liner shipping industry. Furthermore, it appears that most studies on liner shipping sustainability are confined to one or two dimensions, focusing only on specific aspects of sustainability rather than discussing it from a holistic perspective.

However, it is highly desirable to assess whether the literature is moving toward an inclusive understanding of sustainability and whether the discourse on sustainability is developing and maturing. Doing so can provide insights and tools required for policymakers to regulate the social and environmental impact of the industry without hampering its economic competitiveness. Consequently, this paper employs a citation network analysis

(CNA) to survey the literature on sustainability in liner shipping, including both shipping companies and on-shore supply chain partners of liner shipping companies (e.g., ports and container terminals, due to their connecting role in facilitating liner shipping operations and impacts on sustainability performance in liner shipping networks (Lam and Notteboom 2014). This study is guided by the following research questions:

- What is the current status quo of sustainability research in liner shipping management?
- What are the contributions of the current body of the literature on sustainability in liner shipping management to theory and practice, and what implications do they hold for future regulatory policies to govern liner shipping operations?
- What are the main focal issues and upcoming trends currently discussed in liner shipping management regarding sustainability?

## Conceptual development

Sustainability and related concepts like corporate sustainability, corporate social responsibility, and sustainability development are widely discussed in multiple bodies of literature. Yet, there is no universal definition of sustainability, and the measurement of related constructs is largely dependent on the specific manifestation of the concept and the field of research it is applied to (Montiel and Delgado-Ceballos 2014, van Marrewijk 2003). While most of these concepts are rooted in the Brundtland report that postulates the long-term orientation of sustainability through "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 1987), specific manifestations of sustainability show nuanced differences. For example, the sustainability development literature studies the links between environmental problems and socio-economic issues and their role in the development of societies and humanity as a whole (Hopwood et al. 2005). In contrast, corporate sustainability and corporate social responsibility focus on a firm's responsibility to manage its external impacts on the environment and society, with a view to not compromising its economic viability (Montiel and Delgado-Ceballos 2014). While conceptually very close, a major difference between corporate sustainability and corporate social responsibility is their different focus. While corporate sustainability emphasizes an ecocentric perspective (Montiel 2008), corporate social responsibility has a stronger relation to the utility of sustainability for firms by

highlighting a positive link to firm performance (Matten and Moon 2008, Waddock and Graves 1997), although this postulated positive link is contested in the literature and seems to be contingent on several factors (Surroca et al. 2010).

Given the different perspectives and definitions of (corporate) sustainability, it is unsurprising that a multitude of theoretical lenses have been applied to explore the impact, motivations, and goals of sustainability in business. Institutional scholars have explored sustainability as externally-imposed demands that affect firms via norms, rules, regulations, and organizational mimicry (Brammer et al. 2012, Campbell 2006, Vejvar et al. 2016), and that firms acquiesce to in order to attain legitimacy (DiMaggio and Powell 1983, Scott 2014). In contrast to institutional theory, the stakeholder theory attributes a higher degree of agency to firms. While also adopting an external view of sustainability by postulating that firms need to engage in sustainability (often in the form of corporate social responsibility) to manage the demands of various stakeholder groups (Hillman and Keim 2001, Jamali 2008), stakeholder theory argues that investments in sustainability enable firms to generate resources like goodwill and stakeholder support (Godfrey et al. 2009). Similarly, resource-dependence theory conceptualizes sustainability investment as a way for firms to gain and maintain access to critical resources (Denktas-Sakar and Karatas-Cetin 2012, Vejvar et al. 2017). Theories adopting an internal perspective of sustainability include the resource-based view that considers sustainability as a firm-internal capability to generate sustained competitive advantage (Shi et al. 2012, Yang et al. 2016), and Upper Echelon theory, which sees a firm's sustainability efforts deeply linked to the firm's top management (Lewis et al. 2014, McGuire et al. 2003). Similarly to the literature on ethical decision-making (Craft 2013, O'Fallon and Butterfield 2005), this highlights the impact of the individual characteristics and personalities of executives on the sustainability efforts of firms.

While some streams of literature focus on single- or two-dimensional manifestations of sustainability (e.g., environmental management (Bansal and Roth 2000) or corporate social performance (Orlitzky et al. 2003)), all established definitions of sustainability share the notion of three interconnected dimensions, i.e., economic, environmental/ecological, and social, and acknowledge interactions between these three dimensions. Elkington (1998) advocates the triple bottom line approach that focuses on profit, people, and the planet, indicating these three dimensions of sustainability. Dyllick and Hockerts (2002) framed these three dimensions as actionable managerial cases: the business case (economic), the natural case (environmental), and the societal case (social). While there is a variety of

definitions for sustainability in the extant (maritime) transportation literature (Seuring and Müller 2008), there is a consensus that sustainability in shipping includes a certain minimum economic, environmental, and social performance that could enable firms to improve their long-term competitiveness (Carter and Rogers 2008). We thus consistently define sustainability in liner shipping as a long-term orientation that holistically addresses issues from the economic, environmental, and social dimensions, which we will further elaborate in the specific liner shipping context below. Our adopted definition of sustainability is intentionally broad, as this will allow us to canvas and analyze different approaches and streams of research within the extant liner shipping literature (Montiel and Delgado-Ceballos 2014).

In practice, sustainability in the liner shipping industry is governed by a plethora of national and regional rules and regulations to address the sustainability aspects of liner shipping. However, international conventions are arguably the most important tool to regulate the liner shipping industry: liner shipping companies are relatively "footloose" in their operations and are thus able to evade national regulations (Kostova et al. 2008, Yliskylä-Peuralahti and Gritsenko 2014). Hence, the most important frameworks for regulating sustainability in liner shipping are issued by supranational bodies like the International Maritime Organization (IMO), which issued the International Convention for the Prevention of Pollution from Ships (MARPOL) in 1974 and has since been updated by six annexes. The IMO also developed both the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) to regulate training needs, and the International Convention for the Safety of Life at Sea (SOLAS) that focuses on safety management (IMO 1974, IMO 1974, IMO 1978). The Maritime Labor Convention (MLC), issued by the International Labor Organization (ILO) in 2006, provides a standard for seafarers' working conditions, including working hours, salary, minimum safety requirements, and training (ILO 2006).

### *Economic dimension*

Transporting goods is the core business of the commercial, profit-oriented maritime transportation industry. Consequently, there is a stream of research discussing the economic aspects of liner shipping from strategic (Bang et al. 2012) and operational (Christiansen et al. 2013) perspectives, while other authors explore port operations (Clark et al. 2004, Sánchez et al. 2003). Other issues include liner shipping network design (Frémont 2010) and shipping finance (Drobetz et al. 2010). In sum, the economic dimension

of sustainability in liner shipping receives ongoing research attention (Lau et al. 2013) that contributes to the already well-developed discussion of productivity aspects in liner shipping (Cullinane 2010, Cullinane 2011).

### *Environmental dimension*

Environmental issues in liner shipping management include vessel and port emissions ($CO_2$, NOx, SOx, etc.), dredging, the handling of waste and waste water, marine pollution, invasive species, habitat loss, and the disposal of physical shipping assets (Lirn et al. 2014, Lister 2015). The high ecological impact of liner shipping is exacerbated by an increase in the number of liner shipping routes and an over-concentration of traffic flows in maritime port regions (Ducruet 2017), which can lead to significant environmental deterioration among routes and in hub areas. Unsurprisingly, this has caused a growing demand for environmentally-friendly solutions in maritime transportation and, as a result, the environmental dimension of sustainability in liner shipping has received growing research attention. For example, Lai et al. (2011) focus on the managerial aspect of liner shipping and define green shipping practices that include company policies and procedures, shipping documentation, shipping equipment, shipper cooperation, shipping materials, and shipping design and compliance. From an operational perspective, many methods to reduce the environmental damages caused by shipping have been explored, and some of these methods have been found to lead to cost reductions. For example, slow steaming, i.e., lowering vessel speed to reduce emissions and bunkering costs, has been thoroughly discussed in the literature (Ferrari et al. 2015, Woo and Moon 2014, Yin et al. 2014). However, managing the trade-off between environmental and economic performance in liner shipping is not a straightforward issue and is much discussed in the extant literature (Mansouri et al. 2015, Psaraftis and Kontovas 2010). Other authors discuss environmental governance in maritime shipping (Lister 2015, Roe 2009) or focus on ports by discussing the greening of port operations (Lam and Notteboom 2014, Lun 2011) and hinterland connections (Lam and Gu 2013).

### *Social dimension*

The social sustainability aspects of liner shipping include safety and security management (Alyami et al. 2014, Hetherington et al. 2006, Thai 2009), health issues, and seafarers' welfare (i.e., stress and fatigue levels, social isolation, quality of accommodation and working conditions (Doyle et al. 2016, Exarchopoulos et al. 2018, Thomas et al. 2003), maritime education and training standards, impact on society and local communities, and

regulatory compliance (Sampson and Ellis 2015). While there is extensive research on safety management and accident prevention (Trucco et al. 2008, Yip 2008), these papers focus predominantly on the economic implications of maritime accidents (i.e., supply chain disruptions, reparation costs, loss of vessels, etc.). Similarly, the question of a vessel's flag is mostly discussed based on economic implications, but bears significant social implications (i.e., manning costs, taxation, regulations in effect, etc. (Kavussanos and Tsekrekos 2011)). However, more and more authors have started to explore the social aspects related to liner shipping operations. Fafaliou et al. (2006) discuss social welfare and job satisfaction in the Greek maritime transportation industry, while Lu et al. (2009) find a positive correlation between financial performance and community involvement in the Taiwanese shipping industry. In terms of port operations, Acciaro (2015) looks at corporate social responsibility implementation and how it can help to improve value creation in seaports. Indeed, seaports are important cargo hubs for entire economic areas and are thus inextricably linked to the development of their immediate regions and their corresponding hinterland (Talley 2009). Consequently, the extended body of literature offers perspectives on the social impact of liner shipping activities and related economic ripple effects. For example, Ducruet and Itoh (2016) conduct an extensive quantitative analysis to show that port characteristics and specializations have a significant impact on the socio-economic development of their respective hinterland areas.

### *Holistic sustainability*

In order to attain "real" sustainability, the three dimensions of sustainability need to be considered collectively. Policies and management practices affecting one or two dimensions of sustainability will indubitably affect the remaining dimensions; for example, additional security screenings of cargo in ports could lead to an increase in port time, which has been associated with an increase in both costs and emissions (Moon and Woo 2014). Similarly, the observed ongoing increase in container ship size to improve scale economy can improve both environmental and financial performance, but could also increase the vulnerabilities of shipping routes (Xu and Xia 2017) to external shocks, and has potential social and economic ripple effects due to the consolidation of cargo flows in fewer main hubs (Ducruet et al. 2015).

Conversely, ongoing developments in liner shipping sustainability are contingent on exogeneous factors. For example, the recent proliferation of slow steaming practices is not rooted in the industry's efforts to reduce emissions, but is the result of high bunkering

costs, overcapacity in the market, and low freight rates. Should freight rates increase suddenly (e.g., by a sudden surge in demand or by capacity leaving the market), or should bunkering costs decrease drastically, liner shipping firms would have a strong economic incentive to revert back to full speed (Cariou 2011, Ferrari et al. 2015). Furthermore, due to the international context of the liner shipping industry and its footloose nature, policies and regulations aimed at governing its externalities need to be designed in such a way that firms are unable to evade them (Yliskylä-Peuralahti and Gritsenko 2014). Indeed, studies show that multinational enterprises have the option to engage in different levels of sustainability efforts in different institutional contexts (Weber et al. 2009), and in some cases even transfer irresponsible and unsustainable practices to foreign subsidiaries (Surroca et al. 2013).

Consequently, any research on sustainability in the liner shipping industry should be as holistic and pervasive as possible. While there seems to be a nascent emphasis on a holistic, i.e., tridimensional, discussion of sustainability in the shipping literature (Acciaro 2015, Lam 2015), it is not clear whether these efforts are sufficient to supply policy and practice with the insights required to drive the development of sustainability in the industry appropriately. Consequently, this study applies CNA, followed by a qualitative discussion of the extant literature as a more objective approach to analyze major research domains and patterns in the research field of holistic liner shipping sustainability.

## Method and data

One viable research approach to evaluate the evolution of a given research field and to identify gaps of knowledge and future research possibilities is through a literature review (Tranfield et al. 2003). Although many authors employ a structured approach to capturing a research field as objectively as possible, their selection of reviewed papers, leading to biased discussions (Colicchia and Strozzi 2012). To identify an objective starting point to review (holistic) sustainability in liner shipping management, this study employs a structured bibliometric approach (i.e., citation network analysis (CNA)). The CNA approach assumes that citation networks depict the systematic proliferation of knowledge over time (Hummon and Doreian 1989) and analysis of the structures of these networks allow for a more objective evaluation compared to traditional reviews. CNA is considered a powerful analytical tool to identify established areas and emerging issues (Fahimnia et al. 2015). Recently, CNA has been increasingly applied to literature in the related fields of operations and supply chain management (Fahimnia et al. 2015, Fan et al. 2014).

In a first step, a data sample of research articles relevant to sustainability in liner shipping was collected from Web of Science (WoS), the knowledge database administered by Thomson Reuters. The aim was to employ a collection of liner shipping-specific keywords that would be matched with keywords from one or multiple of the three respective sustainability dimensions. This would allow us to capture articles employing single-, two- and tridimensional concepts of sustainability, without confining ourselves to one specific definition of the sustainability construct. Due to the ambiguity of certain liner shipping search terms, the search type chosen was "topical" (including title, abstract, and keywords), rather than "full text." We started with a set of keywords that were based on our own experience and the abstracts and keywords of prolific articles on sustainability in liner shipping, followed by an iterative process in which we analyzed the keywords in the preliminary data sample: We used the bibliographic software HistCite to rank the most frequently-used keywords in the sample, and analyzed these findings to update the search string several times. This approach allowed us to exclude keywords that would not increase the number of results, include keywords that were impactful and frequently-used in the sample, and remove keywords that would create false positives due to ambiguity (e.g., "vessel," "container"). This iterative approach for reviewing keywords within the literature has been successfully applied in management research before (Pittaway et al. 2004). Some keywords that would net few hits were retained for the sake of completeness (e.g., "health"), while other keywords were deliberately excluded to prevent false positives ("cruise"); an asterisk was used to account for differences in spelling (e.g., "lab*r" for "labor" and "labor"). The final search string that was achieved after several iterations is included in Appendix A.

Next, we filtered our search results. Searching for English SSCI-indexed articles from 1900 to 2016, we ended up with 719 results in the Web of Science core collection. We confined our literature sample to SSCI-indexed articles due to their academic relevancy for identifying research trends in the liner shipping literature. By limiting our search to the "transportation" category, the results were reduced from 719 to 376 papers. We then excluded all papers that were marked as "conference proceedings" and papers that were also listed in non-transportation categories (e.g., civil engineering, marine biology) to maintain our focus on the liner shipping management literature. This filtering procedure left us with 253 papers for analysis, which we deemed to be an appropriate size for our data set. To maintain objectivity and facilitate reproduction of our results, we refrained from further manually filtering the data sample. The data sample is included in Appendix B.

To proceed with the CNA, we employed several different analytical tools. HistCite is a powerful bibliometric tool that can directly integrate bibliographic records from WoS. It was mostly used for descriptive statistics (HistCite 2016). To identify the main research domains, and for the remaining visualization and clustering purposes, the software package Gephi was chosen due to its (visualization) flexibility and clustering capability (Gephi 2016).

## Results

### *Descriptive results*

A visualization of the publication years of the articles within our sample shows the development of liner shipping literature over the years (see Figure 3). This development can be categorized into three stages that are roughly based on the past three decades. In the pre-2000 era, sustainability in liner shipping operations was barely discussed. In the early 2000s, though, research interest in the sustainability of liner shipping management increased. From 2001 to 2010, our sample captured 66 articles on this issue, constituting roughly 26% of all articles captured. After maintaining the same publication trend in the early 2010s, the sustainability discourse massively gained in popularity: 129 articles (so approximately half of the data set) were published in the years 2013, 2014, and 2015 alone. 2016 exhibits a similarly strong trend.

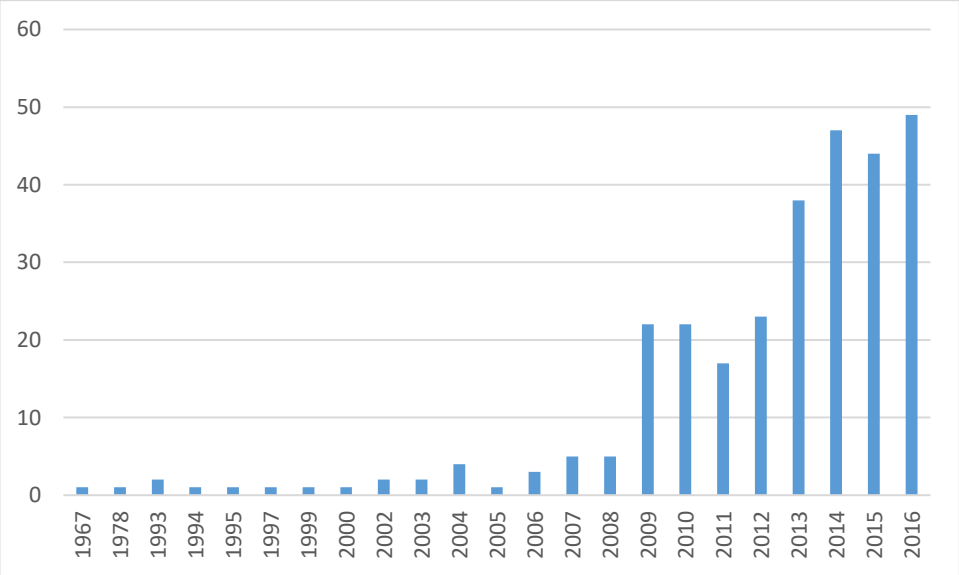


*Figure 3: Publication year of articles (Sample only includes data until February 2016, i.e., nine articles from 2016)*

Table 1 gives an overview of prominent authors within our sample that have been able to consistently publish on the topic in SSCI-indexed journals (see Table 1). Furthermore, our search yielded results from 16 different scholarly journals (see Table 2).

*Table 1: Most productive authors within the sample*

| Author | Articles in sample |
|---|---|
| Lun, YHV | 9 |
| Lee, PTW | 8 |
| Lam, JSL | 7 |
| Luo, MF | 7 |
| Cheng, TCE | 5 |
| Fan, LX | 5 |
| Lai, KH | 5 |
| Ng, AKY | 5 |
| Parola, F | 5 |
| Song, DP | 5 |

*Table 2: Source journals of articles*

| Journal | Articles in sample |
|---|---|
| Maritime Policy & Management | 73 |
| International Journal of Shipping and Transport Logistics | 36 |
| Maritime Economics & Logistics | 36 |
| Transportation Science | 22 |
| Transportation Research Part D – Transport and Environment | 19 |
| Transportation Research Part A – Policy and Practice | 15 |
| Transport Reviews | 12 |
| Transport Policy | 9 |
| Transportation Journal | 9 |
| International Journal of Transport Economics | 8 |

Table 3 gives an overview of the authors' affiliations (see Table 3). Many of the researchers in liner shipping management within our sample are located in Asia, which could be explained through the significance of the industry for the economic development of this geographical area. Other universities that are located near major global shipping hubs (e.g., Rotterdam, Antwerp) also show a high concentration of research in liner shipping management.

*Table 3: Authors' affiliations*

| University | Articles in sample |
|---|---|
| The Hong Kong Polytechnic University | 26 |
| National Taiwan Ocean University | 10 |
| Nanyang Technological University | 9 |
| Norwegian University of Science & Technology | 9 |
| National University Singapore | 8 |
| University Antwerp | 8 |
| University Genoa | 8 |
| University Plymouth | 8 |
| Edinburgh Napier University | 7 |
| Erasmus University Rotterdam | 6 |

### *Citation network analysis*

We applied the force atlas sorting algorithm in the visualization software Gephi to model our data set as a network graph. Force atlas is a simple approach in which disconnected nodes repulse each other, while connected nodes attract. This results in more influential and prolific articles moving into the center, whereas less-cited articles move to the outer edges of the network. To show the development of the literature over time, we have modeled the network within our sample at three points in time (see Figure 4) in accordance with the three stages of literature development identified in Figure 3. We can see a strong increase of publications and interconnectedness, particularly from 2010 to 2016.

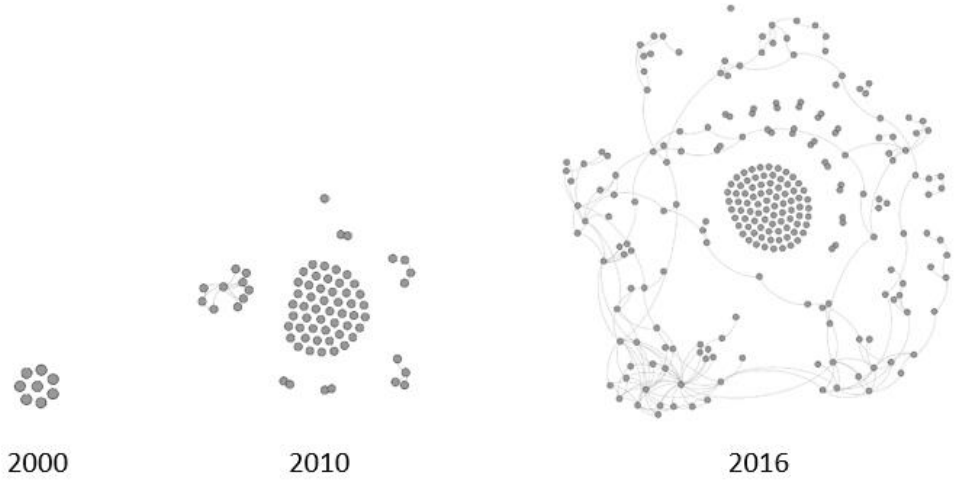


*Figure 4: Development of literature over time*

At the third stage, our sample consists of 253 papers with a local citation score of 221; as a result, we obtain a network of 253 nodes (i.e., papers) and 221 edges (i.e., citations). The network is composed of 84 unconnected nodes, 14 two-node networks, two three-node networks, and a major network of 135 nodes and 202 edges. For our further clustering efforts, we classified the minor networks (i.e., less than three nodes) and disconnected nodes as "scattered clusters" and removed them from the cluster analysis to focus on the major network only. To identify emerging research domains within this network, we employed the Markov Cluster Algorithm (MCL) to the 135-node network. MCL is an algorithm that clusters networks by simulating a flow within the network, following the rationale that flows are stronger within the center of a cluster and weaker at the edges. MCL was deemed appropriate as it is fast and makes no assumptions about the number of clusters within the network (van Dongen 2000). While not widely used in the business context, MCL has been successfully applied in other fields of research, such as bioinformatics (Satuluri et al. 2010) and network security (Ahmed and Abulaish 2012). Other clustering algorithms also considered by this study include Girvan-Newman, which employs the concept of "edge betweenness" to focus on edges that are most likely connecting clusters (Girvan and Newman 2002), and approaches that employ modularity, i.e., the number of edges falling within a group minus the number of expected edges if they were distributed randomly (Newman 2006). Ultimately, MCL was chosen due to its focus on node centrality, which we deemed as a better fit with our subsequent Main Path Analyses (MPA) to identify the most influential studies within the domain. Lastly, MCL was used because of its excellent implementation with our employed bibliometric tools (i.e., Gephi).

The MCL approach resulted in the six-cluster solution as shown in Figure 5. We analyzed the papers in every cluster thoroughly to find common topics and characteristics and assigned labels to each cluster. We labeled these literature clusters based on their most salient characteristics as “shipping performance,” “port selection and management,” “shipping markets,” “environmental,” “data envelopment analysis” and “shipping network” (see Figure 5). To improve the quality and validity of our findings, we made improvements to the initial cluster algorithm output in the following ways. We manually merged the smaller shipping network with the shipping performance cluster, and we merged the data envelopment analysis cluster, which focuses on port literature, with the port selection and management cluster to generate four distinct research domains. Due to the size of the shipping performance domain (89 papers), we ran a second iteration of our clustering process within the research domain to generate subdomains. The three resulting subdomains were labeled “shipping strategy and network,” “scheduling and optimization,” and “multiple objective management” (see Figure 6). These clusters are the three primary research streams within the current economic discourse: While not distinctive enough to be identified as clusters of their own within the wider sustainability discourse, they form stable clusters (i.e., developed topics) when within the boundaries of the economic cluster.

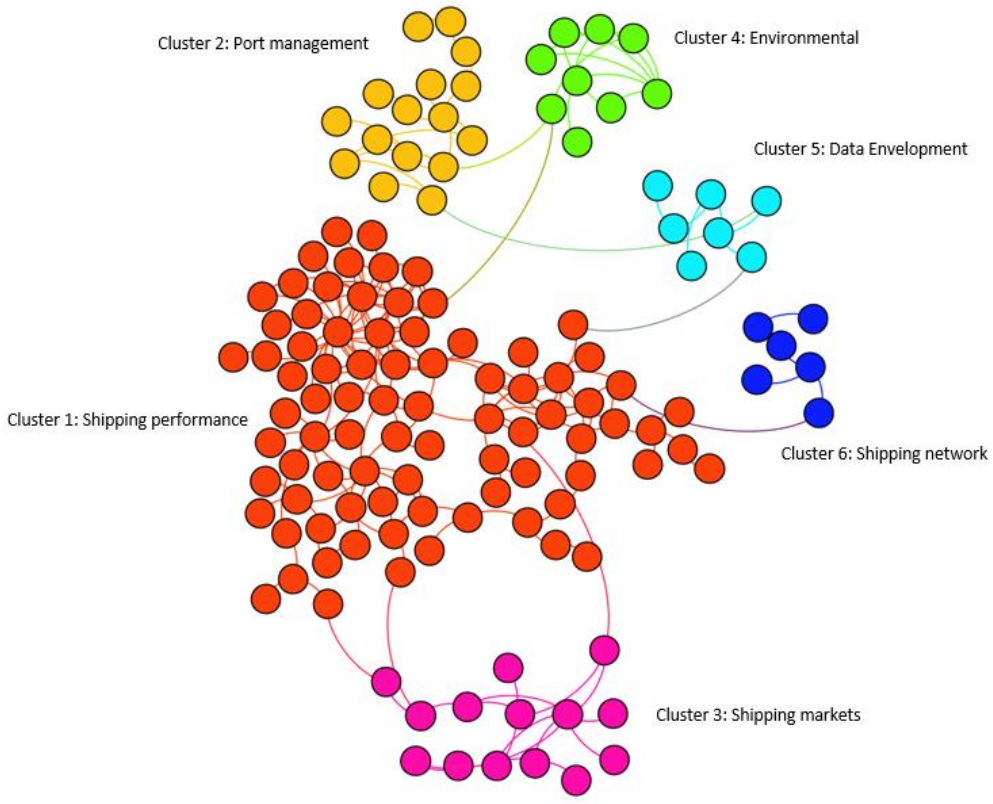


*Figure 5: Citation network and clusters*

To proceed with the analysis of the research domains, we used the software Pajek to conduct MPA. MPA identifies the main contributing papers within a domain by modeling the networks within the domains as acyclical (chronological) networks, and simulating flows between the papers that do not cite other sources within the domain (source nodes) and articles that are not cited themselves (sink nodes) (de Nooy et al. 2011). In line with former research (Colicchia and Strozzi 2012, Fan et al. 2014), we employed the Search Path Count (SPC) method, which focuses on nodes that are more frequently used in paths by calculating traversal weights, which is the ratio of available paths in a node to the total number of paths (de Nooy et al. 2011). This helped us to identify the most influential articles in each research domain, which we used as a starting point to discuss the domain's sustainability insights. The result of our MPA per cluster can be found in Appendix C. The following discussion elaborates the main issues, as well as the practice and policy implications of each research domain, by highlighting these central publications from our literature sample in relation to the extant literature.

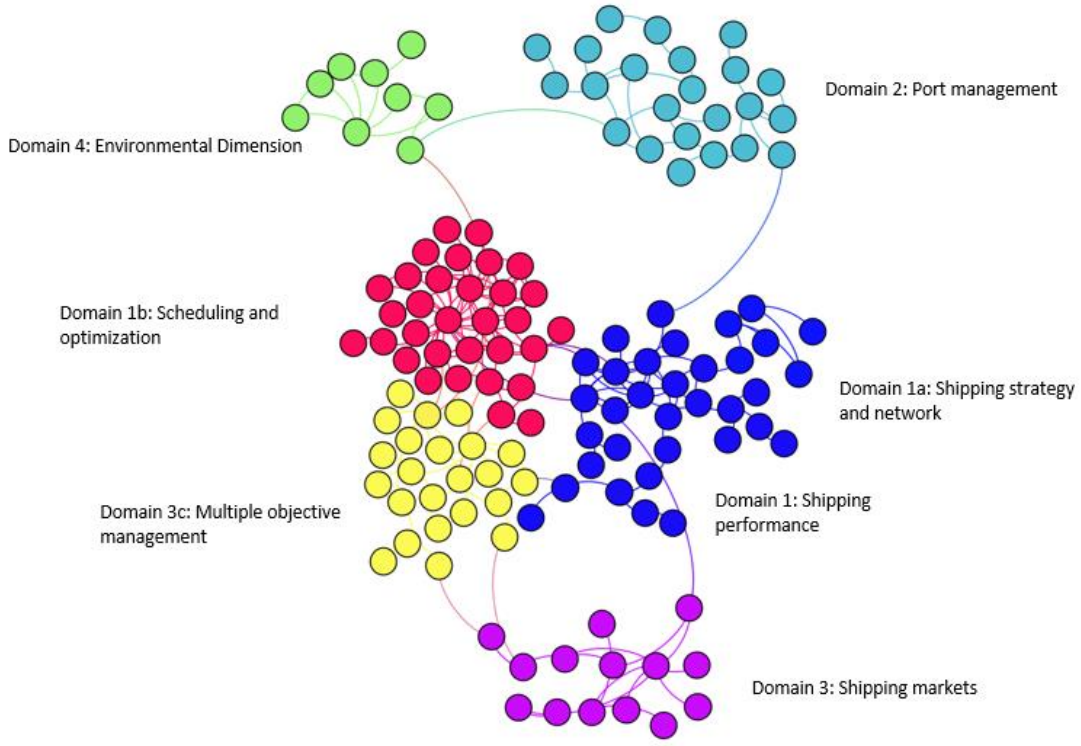


*Figure 6: Research domains*

## Discussion of research domains

### *Research domain 1a – Shipping strategy and network*

Central to this subdomain are strategic considerations by liner shipping companies, particularly when it comes to their network organization. While authors like Lam (2013) and Seo et al. (2015) discuss how liner shipping operations can be implemented in the broader supply chain context, other authors discuss the fleet mix (Lun and Browne 2009), corporate strategies (Parola et al. 2015), key resources (Lu 2007), and service quality (Huang et al. 2015). A prominent topic in this domain that can clearly be attributed to both economic and environmental issues is container repositioning, which is caused by trade imbalances between areas with different economic developments. Empty containers erode shipping companies' profits, by generating costs without contributing to revenue. Similarly, inefficient repositioning generates excess container movements that result in unnecessary negative externalities (Song and Dong 2015, Song and Zhang 2011). Within our sample, there are several recent publications that address this issue, most notably by Song (e.g., (Gonzalez-Torre et al. 2013, Song et al. 2010, Song and Xu 2012)). This trend can also be observed in the extant literature (Braekers et al. 2011). Shintani et al. (2007) present an algorithm that simultaneously addresses the issue of deploying ships and containers and show that their heuristic provides a better solution for the issues compared to when they are solved one at a time. Meng and Wang (2011) devise a mixed-integer linear programming model to solve the issue of empty container repositioning in a combined hub-and-spoke and multi-port calling system and find evidence of high cost saving potentials. Recent studies assess the potential for empty container exchange between liner carriers to realize cost savings (Zheng et al. 2015), and investigate empty container handling in port hinterland operations in conjunction with the option for repair operations (Hjortnaes et al. 2017).

### *Research domain 1b – Scheduling and optimization*

Within our sample, scheduling and optimization papers can be regarded as the most representative, as they are at the core of the shipping performance cluster; this might stem from the competitive nature of the liner shipping industry. Christiansen et al. (2004) is one of the most central publications in both the shipping performance domain and the scheduling and optimization subcategory. The authors of this prolific publication conducted a systematic literature review of the routing and scheduling of liner shipping services. They identified increased collaboration, supply chain integration, computational efforts, and increased focus on optimization and strategic planning as emerging trends and potential

future research areas in liner shipping operations. Following up on these recommendations, Agarwal and Ergun (2008) devised a mathematical mixed integer model that heuristically solves the ship scheduling and cargo routing problem, while Alvarez (2009) presented an algorithm that addresses the joint routing and ship deployment problem.

Meng et al. (2014) revisited the liner shipping scheduling and routing literature in a systematic review and acknowledged significant advancements in terms of development. Furthermore, they identified six future research perspectives with practical relevance: intermodal container transportation network design, joint planning between shippers and port operators, reliability and vulnerabilities in shipping networks, green shipping, improvement of benchmarking and modeling efforts, and practical applications. These research perspectives have been further discussed in the extant literature. Hoff et al. (2010) discuss fleet optimization and routing aspects with a focus on industrial aspects and connectivity with road freight transportation and call for a better grounding in practical, real-world problems. Wang and Meng (2012) approach the issue of the negative effects of uncertain container handling and port congestion times on service reliability stochastically and devise a heuristic that helps to improve scheduling. In another instalment of their prolific review, Christiansen et al. (2013) revisited the ship routing and scheduling literature and conclude that many of the old issues still need to be addressed. They encouraged researchers to investigate liner shipping network problems, the development of applicable benchmarks, and how to deal with the increasing uncertainty in liner shipping.

### *Research domain 1c - Multiple objective management*

As observed in both previous subdomains, there are attempts to address two or three dimensions of sustainability with a single strategy through multi-objective optimization. In this stream of research, economic considerations are distinctly discussed with due consideration of the other two pillars of sustainability (Mansouri et al. 2015), emphasizing win-win situations. For example, Psaraftis and Kontovas (2010) discuss technical, market-based and operational strategies to balance environmental and economic performance in maritime transportation. One of the main operational strategies discussed is slow steaming, that is, the decrease of container vessel speeds in order to lower fuel consumption and emissions, and several authors in this subdomain discuss the effects of this strategy on both environmental and economic performance (e.g., (Ferrari et al. 2015, Lindstad et al. 2016, Yin et al. 2014, Zis et al. 2014)). While there is a general consensus that

slow steaming can simultaneously lower the bunkering costs and emissions of container ships, these findings need to be taken with a grain of salt, as slow steaming lowers service speed and, in turn, schedule reliability and the revenue generated (Corbett et al. 2009). Cariou (2011) argues that an economic incentive for shipping lines is only given as long as bunkering costs are high (and/or freight rates low), and that powerful market-based mechanisms (e.g., levies) need to be implemented to sustain the benefits of slow steaming in changing market conditions – this highlights the importance of effective policies to regulate the sustainability efforts of the industry. However, regulators need to be careful not to overregulate the industry, as a decrease in cargo velocity might incentivize shippers to move their cargo from container vessels to faster solutions like road freight or rail, which would increase overall transportation emissions and be detrimental to the competitiveness of liner shipping companies (Psaraftis and Kontovas 2010, Psaraftis and Kontovas 2013).

In sum, our results show that the shipping performance domain is well-developed. Research papers in this domain focus on operational efficiency and cost reductions, reflecting the highly competitive business environment of the liner shipping industry. However, researchers are branching out to address economic issues with implications for environmental and, to a lesser extent, social aspects, as reflected in research focusing on empty container repositioning, slow steaming, and multi-objective management; this research is of particular interest to lawmakers, as it highlights the intricate interplay between the industry's requirement of economic viability with society's need to govern and limit externalities.

### *Research domain 2 – Port selection and management*

The second largest research domain focuses on port selection and management. This is expected as our study is not confined only to liner shipping companies but also includes its on-shore supply chain partners.

A popular approach to empirically assess the performance of ports and terminals is the Data Envelopment Analysis (DEA) approach. DEA is a non-parametric approach based on linear programming that is mostly used in performance evaluation (De Oliveira and Cariou 2015) and has been applied in the maritime sector for over a decade (Cullinane et al. 2005, Wang and Cullinane 2006). In particular, the accessibility of historical and economic data from container ports seems to prompt researchers to employ DEA as an analytical approach. Indeed, DEA is used by several authors in our sample (Bichou 2011, Rios and de Sousa 2014, Wu et al. 2010) for the performance evaluation of ports in different

geographical contexts, a trend that we can also witness in recent literature outside of our data sample (e.g., (Omrani 2016, Yu and Chen 2016)).

The research domain of port management and selection is generally focused on economic issues. Similar to the shipping performance domain, authors focus on operational performance and cost aspects. Yoon et al. (2015), however, suggest including environmental performance as a characteristic in future considerations, while Onut et al. (2011) discuss the option of considering the ecological and social impacts of ports. Indeed, the extant literature offers additional insights in particular into the greening of ports. Dimwoodie et al. (2012) offer a framework to include environmental management considerations in port operations, while other authors develop green performance indicators (Lirn et al. 2013) and port sustainability rankings (Asgari et al. 2015).

The literature shows a strong focus on green and environmental policy (e.g., (Chang and Wang 2012, Ng and Song 2010)) and the management of the potential trade-off between operational efficiency and environmental impacts (Chin and Low 2010). However, some authors also pursue a more holistic idea of port management that also includes social factors. For instance, (Denktas-Sakar and Karatas-Cetin 2012) employ resource dependence theory to draft a conceptual framework that considers the organizational relationships between port and supply chain stakeholders, while (Acciaro 2014) discusses the concept of corporate social responsibility in the port sector. Research in the focal area of ports as connecting nodes in supply chains (and their corresponding effect on the sustainability of transportation chains) highlights the importance of ports as economic centers with wider implications for entire economic areas and their serviced hinterland (Ducruet et al. 2015). While policies might target the sustainability performance of ports, as they are not as flexible as liner shipping firms and are unable to evade regulations, there might be unexpected cascading societal and economic effects, if not implemented carefully.

### *Research domain 3 – Shipping markets*

Research domain 3 is loosely connected to the shipping performance domain, and primarily discusses shipping markets. It highlights a growing awareness of the interplay between markets and societies in the liner shipping context. Several papers within our data sample make connections between economic performance and social issues such as quality, safety and security (Bichou et al. 2007), piracy (Fu et al. 2010), and global social development as a whole (Lau et al. 2013). This matches a trend that can also be observed in the extant literature. While some authors focus on discussing the structural (Luo et al. 2014,

Panayides and Wiedmer 2011) and geographical (Lam and Yap 2011, Liu et al. 2016) aspects of shipping markets, social issues are prominent in the discussion of seaborne trade. Safety (Hetherington et al. 2006), security (Chao and Lin 2009, Thai 2009), and quality management (Mitroussi 2004, Shinohara 2005) have strong implications for the success of the entire liner shipping industry and receive continuous research attention. Other more market-related aspects like maritime piracy have recently moved from being a comparatively niche topic (Birnie 1987) to attaining wider recognition in the academic discourse (e.g., (Hallwood and Miceli 2013, Kondaker et al. 2013, Wong and Yip 2012)), probably due to the increasing number of piracy incidents and their stronger impact on liner shipping (Fu et al. 2010). Other niche issues like maritime education (Emad and Roth 2008, Lau and Ng 2015) and the impact of liner shipping practices on local communities (Sonak et al. 2008) are less prominently discussed. Overall, however, this is the research domain in which the social sustainability dimension receives the most research attention. The interdependencies of liner shipping with global economic development and its impact on society in an increasingly globalized context are certainly worthy of further investigation, particularly when it comes to the development of future policies. For instance, making sustainability in liner shipping a requirement in maritime education could help to raise awareness of sustainability concerns in the long term and might help to improve the industry's readiness to adopt further practices. Likewise, building on research into the social and economic impacts of liner shipping operations on local communities could help to devise policies that address the sustainable long-term development of specific geographical or economic areas.

### *Research domain 4 – Environmental dimension*

While topically close to issues like slow steaming and empty container repositioning, which are predominantly discussed in the shipping performance domain, the papers in this cluster are dedicated to researching the environmental dimension of shipping and related carbon dioxide ($CO_2$) emissions, mostly via policy-based instruments such as speed limits or emission taxes. This focus is distinctive enough to emancipate the articles from the bigger shipping performance domain to which it is loosely connected. Most of the papers within this cluster have been recently published. This might indicate an increased effort to discuss environmental sustainability in liner shipping as a major policy-based issue rather than as a side topic in economic considerations.

Cariou and Cheaitou (2012) discuss the effectiveness of speed limits and international bunker levies in maritime transportation for reducing $CO_2$ emissions. Based on their model, they argue that a speed limit is not only far less effective than an international bunker levy for reducing emissions, but also comes at a far higher cost. Following this discussion, Lee et al. (2013) model the effect of an international carbon tax on maritime transportation and test it in various scenarios. They argue that as long as the carbon tax is not excessively high there is little impact on global economies, and they propose a comparison between an emission trading scheme and a differentiated carbon tax as a potential future research venue. Woo and Moon (2014) use a model to simulate the effect of reduced vessel speed on $CO_2$ emissions and operational costs and find no evidence of the postulated win-win situation of lower costs and emissions. The same authors also consider the trade-off between environmental and economic goals in port operations by applying simulation modeling, and conclude that the key to reducing both ship-side costs and emissions is an increase in the efficiency of port operations and the resulting reduction of port time (Moon and Woo 2014).

In connection with our findings in the shipping performance domain, it becomes evident that the liner shipping sustainability literature is characterized by identifying ways to balance environmental impacts and operational efficiency, and there is strong evidence that a postulated win-win of reducing both emissions and costs through increased efficiency cannot always be supported. Apart from the operational practices like slow steaming and empty container repositioning discussed in the prior research domain, and the articles mostly focused on $CO_2$ emissions and carbon taxes in this domain, the extant literature discusses some additional topics, including Sulphur emissions (Jiang et al. 2014, Yang et al. 2012) and port-related emissions (Berechman and Tseng 2012, McArthur and Osland 2013). Lai et al. (2011) conceptualize green shipping practices and discuss their implementation (Lai et al. 2013). From a policy perspective, little research has been done on the issue of invasive species, even though shipping is recognized as one of the major means of introducing bioinvaders (Molnar et al. 2008). The introduction of invasive species via ballast water and the consequent threat to biodiversity can have severe implications on both the environmental and social development of communities (e.g., by affecting fisheries or aquatic farms), and a thorough economic assessment of this externality would be in order to assess cross-industry impacts and devise policies to safeguard especially food-producing industries from unexpected negative externalities.

While anchored in an environmental perspective, the articles in this research domain all

show a strong focus on operational efficiency. Even though a strong body of research on environmental issues in shipping is required, and the academic discourse seems to put a stronger focus on the issue, the question remains: which dimension of sustainability is preferred in practice when there are no mutual gains to be generated and environmental and economic objectives are diametrically opposed? While there is a normative desire for "greener" liner shipping transportation, we need to keep in mind that liner shipping is a very competitive industry, and generating profits is the sine qua non of liner shipping companies. Thus, changes in market conditions and resource prices might incentivize companies to move away from environmentally-friendly transportation. In that case, it seems like effective policies might be needed to support the implementation of environmental and social measures. Consequently, research on efficient policies to regulate the environmental impacts of the shipping industry constitutes a potential future research area.

# Conclusion

## *Academic discussion*

Our results show that scope of sustainability research in the liner shipping literature has gradually increased in recent decades. A sharp increase in publications on sustainability issues can be particularly observed at the beginning of this decade. While most of these publications study only a single dimension of sustainability, there is an increasing emphasis on two-dimensional research on sustainability issues, as evidenced by prolific topics like slow steaming or empty container repositioning. Some authors have also started to embrace a more holistic perspective of sustainability, addressing all the intricate interactions between all three dimensions of sustainability. However, a uniform definition of sustainability is yet to be found; while some authors discuss sustainability, others adapt the terminology of corporate social responsibility or environmental management. Further conceptual research is needed to provide a distinct, unified definition of sustainability in liner shipping.

Overall, the scope and scale of sustainability research in the liner shipping literature has made good advancements in recent years. New research domains have emancipated themselves from a predominantly economic discussion to study different aspects of liner shipping, and while operational efficiency and financial performance are focal issues, researcher have started to explore strategies that regard externalities and trade-offs in shipping. The questions remain, however, how much of this discussion is normative and

driven by wishful thinking, and how do shipping firms manage diverging objectives between sustainability dimensions in practice? Is the industry really steering toward more sustainable operations for the future, or is the industry only interested in embracing sustainability if it supports profit considerations? Will the dynamics of the business environment (e.g., fluctuations in oil prices, socio-economic development, and volatile shipping markets) change the long-term strategies and sustainability agendas of shipping companies, as expected in the cases of slow steaming (Cariou 2011) or cargo flow concentration (Ducruet and Itoh 2016)? Further empirical studies can help to better understand the managerial logic of liner shipping companies and the externalities of the liner shipping industry in supporting sustainability.

While our focus in this chapter was the current status quo of sustainability in liner shipping, and not the theoretical lenses applied to explain sustainability adoption, the lack of a distinct theoretical cluster is a worthy finding. Indeed, looking at all the articles in the data sample, it seems like the current discourse on sustainability in liner shipping is surprisingly lacking when in the application of theoretical perspectives. While some articles employ resource-dependence theory (Denktas-Sakar and Karatas-Cetin 2012) or a resource-based view terminology by discussing the resources and capabilities of liner shipping firms (e.g., (Lu 2007)), other prolific economic theories often associated with sustainability (e.g., stakeholder view or institutional theory) are not represented. Articles in our sample are concerned with the effects of sustainability practices (Kontovas 2014, Lirn et al. 2014), or how to improve specific sustainability performance (Lee et al. 2016, Ugurlu et al. 2016); the questions of how and why firms adopt sustainability appear to be considerably less regarded. It is hard to conclude whether this situation is attributable to the comparative infancy of the sustainability discourse in liner shipping research or the strong competitive pressures in the industry that necessitate research on economic viability. Further research on the motives and antecedents of sustainability adoption in the industry can advance our understanding of sustainability in this context considerably and help to devise more effective regulations. Established economic and business theories can further help to improve our understanding of sustainability processes and drivers. For example, adopting an institutional (Scott 2014) or stakeholder (Freeman 1984) perspective to conceptualize sustainability as an external demand can help to identify the strongest sustainability pressures encountered by liner shipping firms. Alternatively, by employing upper echelon theory (Hambrick and Mason 1984) or a resource based view (Barney 1991), we can explore sustainability as a firm-level construct driven by firm-internal processes.

Topically, we have identified an emerging research domain of environmental-based liner shipping literature that has emancipated itself from core economic discussion. This area of research is of particular interest for regulators and policymakers, as it explores the regulation of sustainability issues in liner shipping through external governance bodies. It is worthwhile following the development of this new research domain and observing whether it can manage to establish itself as an independent entity. Social issues, however, still seem to be very much embedded in economic considerations. As a result, efforts should be undertaken to shape the field of social liner shipping research in future works, particularly when it comes to the impact of the liner shipping industry on society and local communities in a globalized setting, and to infuse the discussion of economic and environmental issues in liner shipping with social considerations in order to promote a holistic approach to sustainability research.

Within this emerging discussion, however, it is vital to depart from the hopeful, normative discussion of win-win situations and pay attention to situations where a unification of profit-maximizing and sustainable objectives is difficult or thoroughly impossible – how do shipping companies manage this mismatch? And is it possible to employ policies and regulations to incentivize shipping companies to sacrifice profit for the sake of a stronger investment in sustainability without hurting the industry's competitiveness? Without doubt, it would take considerable time and effort until all aspects of sustainability are regarded equally both within the literature and in practice, and, given the competitive nature of the business, it is unlikely that this equilibrium will ever be reached – if, indeed, it can be reached at all.

### *Practical insights and policy discussion*

Our findings hold important implications for policymakers: Our results indicate that the current literature is focused on efficiency and win-win situations as a result of cost pressures and strong competition. Indeed, our findings further suggest that multi-objective management is moving increasingly into the focus of practitioners and researchers alike. Consequently, policymakers should consider the extended effect of specific policies on all three dimensions of sustainability thoroughly (e.g., slow steaming, container repositioning, etc.). Consequently, any policy (national policy in particular) addressing sustainability in shipping should aim to balance the economic viability and external impacts of shipping, possibly by exploring incentives that aim to offset the associated costs.

These policies need to be devised with a good understanding of global sustainability development, as liner shipping companies might try to evade or decouple policies that negatively affect their bottom line, as evidenced by other multinational enterprises (Weber et al. 2009). This might lead to unintended ripple effects in the socio-economic development of entire regions (Ducruet 2017), as liner shipping companies might move from overregulated hubs to areas with less intrusive regulations (Kavussanos and Tsekrekos 2011), and shippers might look toward other, less-regulated modes of transportation. However, our research shows that the ports as connecting elements in liner shipping could play an important role in enhancing the industry's sustainability performance. Ports are more easily affected by national policy, as unlike liner shipping firms, they do not have the ability to evade national regulation.

Indeed, research on sustainability issues in liner shipping management has increased substantially in recent years, and particularly the notion that some of this research is focusing on the interplay between liner shipping and societal development holds further significant implications for policymakers. On the one hand, any type of policy imposed on the liner shipping industry needs to carefully assess the further impact on other industries; due to the prevalent role of liner shipping in international trade, any barriers or obstacles imposed on this connecting industry might have unexpected effects on other industries and might entail an aftermath of unintentional economic, environmental, and societal effects – for instance, if imposing a $CO_2$ levy on container vessels increased the cost of transportation, it would also cause more shippers to choose alternative modes of transportation (such as road freight) and could result in an even higher output of emissions at higher economic cost. On the other hand, the increase in academic interest indicates an increasing awareness of sustainability in the liner shipping community that policymakers can capitalize on. Improving public awareness and getting a buy-in on the issues of sustainability in liner shipping, for example, by paying special attention to the voluntary measures of the shipping industry (e.g., WSC, CCWG), can help to start a dialogue between firms and lawmakers that could potentially facilitate the development of suitable regulations and lessen implementation pains.

In terms of managerial implications, the common body of literature currently offers a detailed discussion on cost reduction, optimization, and efficiency gains in the liner shipping industry. In-depth discussions about scheduling, speed management, liner shipping network configuration, and multiple objective management can be particularly interesting for practitioners who can apply these concepts in practice. However, we see a

lack of integrative frameworks that supports practitioners to approach the topic of sustainability holistically, as most research focuses on singular or two-dimensional implementation. We hope to provide some guidance for practitioners in understanding the importance of holistic tridimensional sustainability by advancing the discussion on topics and providing more insights into different manifestations and definitions of sustainability. The current literature also includes a call by some authors to find a better connection with shipping practice, and to devise more practical applications of sustainability in our research (Christiansen et al. 2013, Meng et al. 2014). We strongly support this argument: not only can the liner shipping practice benefit significantly from increased research efforts on sustainability frameworks and implementation; a closer collaboration with practice and a stronger focus on the applicability of the results might help us better understand the intricacies of the liner shipping market and increase the quality of our research in this important research area in maritime studies.

### *Limitations*

There are several limitations to this literature review that influence the interpretation of our findings. First, some of the decisions on filtering the data set are arguably subjective (e.g., choice of data base, limiting the scope to SSCI-indexed papers, excluding certain non-transportation categories). What is more, repeating the search with a different or expanded selection of keywords will undeniably affect the results. Even though much effort was put into the keyword selection, and they were refined in a process with multiple iterations, we cannot rule out the possibility that not all relevant keywords were captured. We also acknowledge the lack of an exhaustive overview of the entirety of maritime transportation literature (e.g., engineering, geography, marine biology) due to our focus on providing insights into current trends and research interests solely from a managerial and policy perspective. Furthermore, we are aware that some publications within the field were not captured in our data sample due to the aforementioned limitations. This limits our results as certain “missing links” that were not captured by our search string could affect connectivity within and between research domains or give additional insights into geographical proliferation. However, we address this issue by comparing and contrasting our objective results with prominent and proliferate publications in the extant literature. Furthermore, our intention was to capture the trends in the field rather than to identify the most prolific authors and publications, and even if a prominent article was not captured in our dataset, its impact would be mirrored in the articles that are based on it and the transcending discussion in the respective domain. In this regard, the labeling of the

research domain can be seen as another limitation: While the methodological approach suggested the structure of the clusters, the labeling of the domains was done by the authors and could thus be subjective. While we are confident that our discussion of the research domains provides a good argument for our choice of labels, it is necessary to mention that the labels were decided upon by the authors. Lastly, our results are also affected by the choice of clustering algorithm: While our results show a high degree of robustness, contrasting different clustering approaches could help to further improve the methodological rigor of our work. However, in order not to dilute our focus on sustainability with excessive methodological discussions, we purposely employed a singular clustering approach (i.e., MCL).

# Chapter 3 – Qualitative research

# Essay 2: An institutional perspective on the diffusion of social sustainability and its discourse in liner shipping operations

## Chapter summary

Even though sustainability in maritime transportation is increasingly emphasized by researchers and practitioners, social sustainability remains under-explored. Based on neo-institutional theory, we formulate three propositions to conjecture how coercive, normative, and mimetic isomorphic pressures affect the social sustainability discourse in the liner shipping operations context by applying a qualitative content analysis approach to the sustainability communication of the top 10 biggest companies in terms of fleet size in the liner shipping industry. We conclude that while normative pressures generated through shared expectations and social obligations and coercive pressures stemming from laws and regulations certainly shape the social sustainability discussion within the industry, there were no distinctive results on the effect of mimetic pressures on the social sustainability discourse. Based on these results, we also point to potential future research fields.

## Introduction

While maritime transportation is highly dependent on the global trade volume for prosperity, it also contributes to the ongoing globalization of market and production activities. Due to lower transportation costs and growing demands for transportation services in managing the global supply chains with geographically dispersed manufacturing sites and markets, the global maritime transportation volume maintains an upward trend in spite of recent economic downturns and continues to flourish in conjunction with global trade, albeit at different growth rates (UNCTAD 2015). Indeed, maritime transportation constitutes by far the largest share of the global freight transportation modal split (Benamara et al. 2011, Stopford 2009). Within the maritime transportation industry, containerized cargo (i.e., liner shipping) is the fastest growing segment (UNCTAD 2015).

Due to its high cargo volume handled and immense importance supporting global trade activities, researchers and practitioners alike are keen on finding solutions to mitigate the externalities caused by liner shipping operations. Similar to other transportation-related literature, though, the focus of the shipping literature is mainly confined to green issues (Lam 2015, Sampson and Ellis 2015). While environmental protection is certainly a prominent issue in liner shipping, it is highly desirable to view sustainability as a holistic

management approach rather than focusing on a single dimension. The eco-friendliest technology is not adopted by the industry if the implementation is not profitable; similarly, a profitable enterprise will not be able to sustain its competitive advantage without caring for stakeholders and the environment (Dyllick and Hockerts 2002).

Building on the Brundtland report of the World Commission on Environment and Development, which defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 1987 p. 41), Elkington (1998) proposed the triple bottom line approach, specifically a holistic management approach that categorizes the sustainable development of enterprises into an ecological, economic, and social dimension. All three dimensions of sustainability have been discussed to a varying degree within the context of liner shipping (Lam 2015). Due to the volatile and competitive nature of the liner shipping business, the most discussed dimension is apparently economic sustainability, as it is an intrinsic goal of shipping firms to become profitable. Within this dimension, researchers discuss such issues as ship routing (Christiansen et al. 2004), operational efficiency and cost reduction (Clark et al. 2004, Kozan 2000, Sánchez et al. 2003), strategic and quality management (Bang et al. 2012, Bichou et al. 2007, Midoro et al. 2005), and supply chain integration (Lam and Van de Voorde 2011).

The increase in the public awareness of environmental management practices in recent decades has spurred both academic and industry interest for environmentally-friendly liner shipping operations. Research in the ecological dimension tends to focus on environmental protection, resource conservation, and waste reduction (Psaraftis and Kontovas 2010, Zhu et al. 2012). Lai et al. (2011) conceptualize green shipping practices as encompassing several implementation dimensions, including company policies and procedures, shipping documentation, shipping equipment, shipper cooperation, shipping materials, and shipping design and compliance for evaluating a shipping company's operations and the damages caused to the environment. Several green certifications for shipping companies (e.g., ISO 14001) have gained in importance and have shown the practical relevance of ecological sustainability for liner shipping. A prime example of the pursuit of lower environmental impacts in maritime transportation in general is the International Convention for the Prevention of Pollution from Ships (MARPOL), issued by the International Maritime Organization (IMO). Adopted in 1973 and updated and expanded by six annexes since then, MARPOL is the main global convention aimed at reducing pollution and other environmental damages caused by maritime transportation (IMO 1974).

The third, social dimension of sustainability has also been explored to some extent (Lam 2015, Sampson and Ellis 2015, Yliskylä-Peuralahti and Gritsenko 2014). Even though corporate social responsibility (CSR) is becoming a popular topic in the supply chain management (SCM) literature (Zhu et al. 2015), this trend has not been fully extended to the field of maritime transportation (Sampson and Ellis 2015). Many publications of social sustainability in liner shipping focus on labor practices, health or safety management (Bailey 2006, Ellis et al. 2010), and seafarers' welfare (Ellis 2010), which includes perceived stress and fatigue levels, social isolation, quality of accommodation and working conditions, and shore leave arrangements (Doyle et al. 2016). However, there are discussions on broader social issues including training and education (Sampson et al. 2011) and regulatory compliance (Bloor et al. 2013). Fafaliou et al. (2006) examine the issues of job satisfaction, social welfare, and social accountability in the context of the Greek shipping industry. Lu et al. (2009) analyze the effect of community involvement and environment, disclosure, and employee and consumer interests in the financial and non-financial performance of Taiwanese companies and find a positive effect on both financial and non-financial performance. Yliskylä-Peuralahti and Gritsenko (2014) explore CSR as voluntary, private self-regulation within the industry rather than through binding rules and regulatory frameworks, while Shinohara (2005) probes the incentives to improve the quality of shipping services. The main regulative body governing social issues in liner shipping operations is the International Labor Organization (ILO), which issued the Maritime Labor Convention (MLC), a set of standards for working conditions for seafarers (ILO 2006). The recently released guidelines for the voluntary self-certification of ISO 26000 discuss social issues in the broader scope of CSR by focusing on labor practices, the environment, human rights, organizational governance, fair operating practices, development of community and society, and consumer issues (International Organization for Standardization 2010).

Apparently, different dimensions of sustainability are discussed to a varying degree in the liner shipping context. The aim of this paper is to assess how sustainability is communicated in the liner shipping industry with a particular focus on social sustainability in accordance with the ISO 26000 framework, and how the social sustainability discourse diffuses through the industry. In the scope of this chapter, we define diffusion as the process in which an innovation or practice is communicated to members of a social system (in this case, to companies in the liner shipping industry) over time (Rogers 2003). Thus, this chapter is guided by two research questions:

- How is social sustainability communicated in the liner shipping industry, and how does this social sustainability discourse diffuse through the industry?
- What forces affect shipping companies in their decision to adopt (or to not adopt) sustainability practices?

In the extant literature, these questions have been discussed mostly within a broader supply chain management (SCM) framework (Carter and Easton 2011, Carter and Rogers 2008, Svensson 2007). We seek to examine the social sustainability discourse from the neo-institutional theoretical perspective and demonstrate that institutional isomorphic pressures provide an apt theoretical framework to analyze the discourse and diffusion of social sustainability practices in liner shipping operations. We begin with a discussion on neo-institutional theory and isomorphic pressures. Using this theory, we explain the social sustainability practices diffusion in the liner shipping industry based on the institutional isomorphism arguments by DiMaggio and Powell (1983). We employ qualitative content analysis to assess social sustainability communication from the 10 biggest container shipping companies in the world based on fleet size, which represent around 62% of the globally operated liner shipping fleet (Alphaliner 2016, UNCTAD 2015). After this introduction, we provide an overview of institutional theory and elaborate how it has been applied in the maritime transportation literature before. Based on our theoretical discussion, we formulate propositions that guide our research and help us to discuss the implications of neo-institutional theory on the social sustainability practices diffusion in the liner shipping industry. After specifiying the data and method used in our qualitative analysis, we present the results and subsequently discuss them with respect to the three types of isomorphic pressure. We conclude with a summary of our findings, a discussion of the limitations of this study, and an overview of potential further research venues.

## Institutional theory

The new institutionalism expands on classic institutional views by moving away from pure rational actor models and discussing organizations in the context of their environment (Abell 1995). Institutions are based on three pillars for their operations, namely regulative, normative, and cultural-cognitive, from which they generate legitimacy and stability. In institutional theory, legitimacy describes the acceptance of an institution by its external environment (Meyer and Rowan 1977). The cultural-cognitive dimension is a particular novelty to the classic institutional perspective, as it allows the analysis of cultural factors and “the shared conceptions that constitute the nature of social reality” (Scott 2014 p. 57).

Naturally, due to the proliferation of new institutionalism through different fields like economics, political science, sociology, and organizational theory, and the resulting richness of views and perspectives, a common definition for new institutionalism or even the term "institutions," is hard to come by (Scott 2014). Some authors see institutions as bundles of formal rules and unwritten codes of conduct that impose penalties on non-compliance, thus stressing the regulative foundation (North 1989), while others focus on the normative dimension by seeing institutional legitimacy anchored in routines, values, and norms (March and Olsen 1984). Authors like Powell and DiMaggio (1991) or Scott (2014), however, emphasize the cultural-cognitive pillar by focusing on the semiotic features of culture and the interactions between symbols and the meanings attributed to them. While regulative institutions are legally sanctioned and normative institutions are morally governed, cultural-cognitive institutions are recognizable and culturally supported. However, it is important to maintain a holistic view of these institutional dimensions, as institutions achieve legitimacy by combining some or all of these different elements (Scott 2014).

DiMaggio and Powell (1983) employ new institutional theory to enquire why organizations become more homogeneous over time, a tendency that has sped up even more in the course of globalization (Campbell 2004). They argue that all companies face similar pressures that they need to subjugate to in order to obtain legitimacy and political power, and empirical studies have found supporting evidence for the link between these institutional pressures and legitimacy (Deephouse 1996). As a result, organizations subject to similar pressures tend to become more homogeneous over time, but not necessarily more efficient (Kauppi 2013). These pressures are labeled isomorphisms and are categorized into coercive, normative, and mimetic pressures, which were later attributed to the respective institutional pillars as shown in Table 4 (Scott 2014).

*Table 4: Overview of institutional pillars and isomorphisms*

*Adopted from DiMaggio and Powell (1983) and Scott (2014)*

| **Institutional pillar** | **Normative** | **Regulative** | **Cultural-cognitive** |
|---|---|---|---|
| **Source of legitimacy** | Routines, values, norms | Rules and regulations | Semiotic features |
| **Basis of order** | Binding expectations | Regulative rules | Constitutive schema |
| **Isomorphic pressure** | Normative | Coercive | Mimetic |

Coercive pressures correspond to the regulative pillar and describe the pressures on organizations exerted by other organizations. This includes formal pressures from national or international legislative bodies, as well as informal pressures through other institutions that the organizations are dependent on. Organizations like the International Maritime Organization (IMO), International Labor Organization (ILO), or the European Union (EU) issue regulations and directives governing maritime transportation with the aim to lessen its negative externalities. The ILO has set several international labor standards for shipping companies – most notably the Maritime Labor Convention (MLC), which was adopted in 2006 and enacted in 2013. The MLC regulates seafarers' working and on-board living conditions (e.g., accommodation, food, and recreation facilities), minimum health standards and rest hours, and wages. It also includes minimum manning levels, training and education requirements, and social security standards. In short, the MLC is the most comprehensive framework to govern work, safety, and health issues in maritime shipping (ILO 2006). However, it focuses primarily on the well-being of seafarers without discussing other social issues like community development, corruption, or the welfare of other stakeholders (e.g., local communities, cargo owners' and freight forwarders' employees, governments).

In the case of the IMO, these regulations focus mostly on the environmental impact of transportation (IMO 1974), with notable exceptions being the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), and the International Convention for the Safety of Life at Sea (SOLAS), that focus on maritime educational standards and health and safety management, respectively (IMO 1974, IMO 1978). These conventions include minimal reporting standards and manuals on safety management, accident prevention and security procedures that are legally required on board every ship (IMO 2013). In the literature, regulations are generally considered the most important source of coercive pressures, as non-compliance can lead to penalties and legal actions, thus inflicting economic damage and also decreasing the legitimacy of an organization (Zhu and Sarkis 2007). However, informal pressures could be generated by the suppliers or customers that a company is dependent on, or within conglomerate corporations, in which standard operating practices are imposed on subsidiaries (DiMaggio and Powell 1983).

Normative pressures coincide with the normative pillar and stem mostly from a concept that is regarded as professionalization by DiMaggio and Powell (1983). They argue that education and the common body of literature are subject to the same isomorphic

pressures as institutions themselves, which results in a consensus in the norms and values of decision-makers in organizations. This development is fostered by the growth of international professional networks on the one hand, and the concentration of formal education and legitimation in the cognitive base produced by specialists on the other (e.g., the STCW or maritime academies sponsored by liner shipping companies). While theoretically similar to coercive pressures, it is important to note the main differences between coercive and normative pressures – while coercive pressures are imposed with a varying degree of subtlety and can lead to penalties, normative changes are based on social obligation and binding expectations (DiMaggio and Powell 1983, Scott and Christensen 1995).

Mimetic pressures are a reaction to uncertainty, and Scott (2014) attributes them to the cultural-cognitive pillar. Organizations that face ambiguous goals, poorly-understood organizational technologies, or an environment that creates symbolic uncertainty will start to imitate other organizations which they deem more successful or legitimate and that are subject to similar pressures. This so-called modeling is a strategy to deal with uncertainty at little economic cost, and might also happen through other factors like employee transfer, consulting firms, or trade organizations (DiMaggio and Powell 1983).

Institutional views and isomorphic pressures have been widely used to explain how innovations and green practices diffuse through an industry (Butler 2011, Campbell 2006, Clemens and Douglas 2006, Delmas and Toffel 2004, Husted and Allen 2006). In liner shipping, the institutional theory has been applied to explain competitiveness (Cho and Kim 2015) and the diffusion of innovation (Lebbadi 2015). Shinohara (2005) employed institutional views to discuss how quality in shipping can be improved. Research on the diffusion of social sustainability practices through institutional isomorphisms is less prevalent in the literature. Recent publications include Acciaro (2015), who conducted an institutional theory-based multiple case study about corporate social responsibility in port management, and Yliskylä-Peuralahti and Gritsenko (2014), who employed institutional theory, that is, a conceptual framework of CSR proposed for shipping operations. Table 5 gives an overview of articles that bring institutional views and maritime transportation literature together (see Table 5).

*Table 5: Institutional theory in maritime transportation literature*

| Author | Field | Focus | Type |
|---|---|---|---|
| **Shinohara (2005)** | Maritime transportation | Shipping Quality | Conceptual Article |
| **Yliskylä-Peuralahti and Gritsenko (2014)** | Maritime transportation | Adoption of CSR in shipping | Conceptual Article |
| **Acciaro (2015)** | Maritime transportation | Adoption of CSR at ports | Empirical Study |
| **Cho and Kim (2015)** | Maritime transportation | Competitiveness | Empirical Study |
| **Lebbadi (2015)** | Maritime transportation | Diffusion of innovation | Empirical Study |

Overall, studies have shown that the new institutional theory has a predictive power that is appropriate for examining the diffusion of innovations and practices and the struggle for legitimacy in a supply chain context (Kauppi 2013). Legitimacy is particularly important for liner shipping companies, as they operate in the business-to-business (B2B) sector with institutional customers and suppliers. In their role as transportation service providers, liner shipping firms need to be perceived as professional, legitimate entities, as they need to coordinate both upstream and downstream supply chain partners in order to service the supply chain efficiently (Lun et al. 2010).

Based on our second research question that aims to analyze the pressures that bring liner shipping companies to adopt (or not adopt) social sustainability practices, we formulate propositions based on the three types of isomorphic pressures liner shipping companies face in their struggle to obtain political power and legitimacy. We will subsequently discuss these propositions based on our empirical results. Coercive pressure stem primarily from regulations; however, except for the Maritime Labor Convention (MLC) that focuses on working conditions only, there is no comprehensive legislative body or standard governing social sustainability in liner shipping operations. Accordingly, the coercive pressures prompting social initiatives might be exerted to a higher degree through different channels, including supply chain partners (e.g., partners in liner shipping alliances, port authorities, forwarding agents organizing hinterland transports) and shippers, as is increasingly the case with the demand for more environmentally-friendly cargo transportation (Poulsen et al. 2016). Therefore, we conjecture that:

*Proposition I: For social sustainability practices discourse in liner shipping operations, coercive pressures are stronger through supply chain networks and relationships with shippers than from regulations.*

Normative pressures, on the other hand, concentrate on the expectations and norms of how business should be conducted. As customers of liner shipping services are corporate clients rather than individuals, professionalism might be a crucial issue for maintaining business ties. Thus, we anticipate that

*Proposition II: The normative isomorphisms generated through public expectations and social obligations in terms of social sustainability performance will enhance social sustainability discourse in liner shipping operations.*

Mimetic pressures affect companies confronted with organizational uncertainty. The adoption of social sustainability practices is an organizational transformation process that includes costs and risks that are difficult to anticipate. When faced with social sustainability in the liner shipping context, shipping companies might look toward market leaders and international standards (e.g., ISO 26000) for guidance on how to deal with their implementation. Accordingly, we expect that

*Proposition III: There is homogeneity in social sustainability discourse in liner shipping operations with the market leaders' approach mimicked by their smaller counterparts.*

## Method and data

To explore the effect of isomorphic pressures on the diffusion of social sustainability practices in liner shipping operations, we employ a qualitative content analysis approach. Content analysis can be defined as a systematic and objective analysis of message characteristics (Neuendorf 2002) to identify the intention of the communication (Weber 1985). While many authors view content analysis as a quantitative approach that makes inferences from the numerical frequencies of variables within a sample only (Neuendorf 2002), others argue that frequency does not necessarily imply importance, and that a single appearance or omission might hold more significance than relative frequencies (Holsti 1969). It can be argued that qualitative in-depth analyses of a limited number of communications can yield better insights into the attitudes and intentions of actors than standardized, frequency-based techniques (George 1959).

Content analysis is a suitable approach for this study for a variety of reasons. First of all, content analysis is appropriate when data availability is limited (Holsti 1969). Indeed, data on social sustainability implementation is widely documented and publicly accessible, but social sustainability communication is readily available in the form of annual and

sustainability reports, mission statements, code of conducts, and other external company communication. Secondly, content analysis can be used to reflect cultural patterns in groups or institutions, as well as to reveal the focus of institutional or societal attention (Weber 1985). This approach can be used to analyze study objects in the context of their environment rather than in an artificial setting (Holsti 1969), which is a good fit to the institutional perspective of this chapter. Lastly, content analysis can also identify trends in communication contents (Weber 1985), which provides additional insights on the diffusion of social sustainability practices in liner shipping operations.

Following the suggestion of George (1959) to conduct more qualitative research on a limited number of cases, we analyze social sustainability discourse with data gathered from the world's 10 biggest container shipping companies based on fleet, namely A.P. Moller-Maersk (Maersk Line), Mediterranean Shipping Company (MSC), CMA CGM Group, Evergreen Line, Hapag-Lloyd, COSCO Container Line, China Shipping Container Lines (CSCL[1]), Hamburg Süd Group, Hanjin Shipping, and Orient Overseas Container Line (OOCL) (as of February 2016). The combined capacity of these companies is about 12,681,000 20-foot equivalent units (TEUs), representing about 62% of the globally operated fleet (Alphaliner 2016). All companies within our data set have been major players in the industry for the entire investigated time period, and most of them have been consistently placed in the top 10 in terms of fleet size (Alphaliner 2016). The data collected from these sample companies includes annual and sustainability reports, code of ethics/conduct, certifications, mission and vision statements, awards, and web pages from 2005 to February 2016. It was gathered as part of our desk research in January and February 2016.

Our approach followed the prevalent suggestions to conducting content analysis in the literature (Krippendorff 2013). In a first step, the data was inspected and coded by paragraph by the first author. Subsequently, the content categories were defined. We decided to code the paragraphs according to the ISO 26000 framework for corporate social responsibility, given that it is currently one of the most comprehensive frameworks of corporate social responsibility. The ISO 26000 is based on seven principles – accountability, transparency, ethical behavior, respect for stakeholder interest, respect for the rule of law, respect for international norms of behavior, and respect for human rights – and deals with seven core subjects: labor practices, the environment, human rights, organizational governance, fair operating practices, development of community and society, and

[1] At the time of data collection, CSCL was in merger negotiations with COSCO Container Line. This merger took place after the data collection phase of this chapter had been finished.

consumer issues (International Organization for Standardization 2010). Our data was tabulated according to these categories and aggregated on a company level. We paid close attention to the three types of reliability in content analysis, namely stability, reproducibility, and accuracy (Krippendorff 2004, Krippendorff 2013, Neuendorf 2002). The contents were coded more than once by the same coder (stability) and were checked by the other authors (reproducibility) (Krippendorff 2004, Weber 1985). Accuracy determines how close the classification of the communication corresponds to an established standard or norm (Krippendorff 2013).

### *Results*

Table 6 provides an overview of the companies' sustainability foundation, when their reporting started, and what they define as sustainability (taken from their vision/mission statements; see Table 6). Half of the largest liner shipping companies are based in Asia, while the other half is headquartered in Europe. Out of the 10 companies, four do not issue a dedicated sustainability report. Evergreen Lines bases its sustainability discourse on its *Internal Safety, Quality and Environmental Policy*, and does some sustainability reporting via its annual report (Evergreen Line 2014). Hapag-Lloyd has published a sustainability policy, but does not disclose any further information in a dedicated report (Hapag-Lloyd 2014). Neither the MSC nor CMA CGM group, numbers two and three in our sample with respect to fleet size, disclose any sustainability information, except for their respective code of conducts/code of ethics (CMA CMG 2016, Mediterranean Shipping Company 2016).

Within our sample, Maersk is a noticeable leader in terms of social sustainability communication. Maersk does provide quarterly sustainability reports and appoints an internal sustainability council to monitor sustainability targets and advise the executive board on improvement actions. They issue regular benchmarks to track developments, and put a particular focus on human rights, development of communities, diversity, and improvement of trade conditions (AP Moller - Maersk 2014). Apart from Maersk, only a few other companies communicate that they embrace sustainability as a holistic management approach, most notably Hamburg Süd (Hamburg Süd 2013).

The earliest available reports for each company were also collected to further analyze how the social sustainability discourse has diffused throughout the industry. Some of the companies, most notably Hamburg Süd, COSCO, Hanjin and Maersk started reporting almost a decade ago. Hamburg Süd has in fact been issuing environmental reports for 15 years. Interestingly, many of these earlier reports were not designated sustainability

reports but were instead labeled as environmental reports. Over the years, however, the reporting changed in scale and scope. Not only did the reports become longer and more detailed, but they also started branching out to embrace social issues. As other companies in the sample followed suit and started reporting of their own, more and more of these reports became designated "sustainability reports."

*Table 6: Overview of companies and vision statements*

| Company | Foundation | Reporting started | Vision |
|---|---|---|---|
| **Maersk** | Sustainability Council (AP Moller - Maersk 2014) | 2007 (Environmental report; Health, safety & environment report)<br>2009 (Sustainability report) | "Sustainability to support both society and business activities" |
| **MSC** | Code of Conduct (Mediterranean Shipping Company 2016) | Do not report | "Future health of our planet, its people – as well as our business." |
| **CMA CGM Group** | Code of Ethics (CMA CMG 2016) | Do not report | "As a leading worldwide shipping Group CMA CGM's guiding principle places the protection of the environment at the heart of its sustainability policy." |
| **Evergreen Lines** | Internal Safety, Quality and Environmental Policy (Evergreen Line 2014); Annual Report (Evergreen Line 2015) | 2005 (Annual report) | "We will not wait for legislation to be introduced. We will use the latest technology as soon as it is available so as to minimize the impact of container shipping operations both on marine life, on port communities and on humanity worldwide." |
| **Hapag-Lloyd** | Sustainability Policy (Hapag-Lloyd 2014) | Do not report | "Our Sustainability Policy expresses our current and future commitment to protect the environment, provide the highest service quality, and care for employees' health and safety." |
| **COSCO** | Sustainability Report (COSCO 2014) | 2005 (sustainability report) | "We promote the green development of shipping industry, cope with major challenges of the globe, and try to contribute to the sustainable future of human society." |
| | | | |

| Company | Foundation | Reporting started | Vision |
|---|---|---|---|
| **CSCL** | Social Liability Report (CSCL 2013) | 2009 (social liability report) | "Responsibility: Maintaining corporate responsibility is the belief through which to create corporate value, health, fast-paced development, accountability for shareholders, employees, and the society." (translated from Chinese by the authors) |
| **Hamburg Süd** | Sustainability report (Hamburg Süd 2015) | 2000 (environmental report)<br>2013 (responsibility report)<br>2014/15 (sustainability report) | "Hamburg Süd relies on a business development that adopts a comprehensive view of three key areas: ecology, society, and economics." |
| **Hanjin** | Sustainability Report (Hanjin Shipping 2013) | 2005 (environmental report)<br>2006 (sustainability report) | "We will play a leading role in the world shipping community through our excellence in Operations, Service and Innovation. This role must be formed on an uncompromising commitment to safety, security, quality, environment, and health." |
| **OOCL** | Sustainability Report (OOCL 2014) | 2011 (sustainability report) | "We take important measures to improve our sustainability performance, which include implementing an open stakeholder engagement process and combining our approaches to environmental management, economic development, and social responsibility into a more coherent structure to help us better understand and identify the focus areas toward our long-term Sustainability Strategy. " |

In their current reports (and, if not available, in their respective codes of conduct), all of the companies communicate a strong commitment to environmental issues and sound labor practices, with a particular focus on health and safety management. The reporting style and terminology used in the reports indicates that most companies are at least familiar with ISO 26000 on corporate social responsibility. However, contrary to other ISO standards, the ISO 26000 framework is a self-reporting standard. Instead of following a strict set of rules verified by official audits, the ISO 26000 provides companies with guidelines to follow in order to improve their social impact.

Further evidence of the companies' willingness to implement sustainability is summarized in Table 7. It provides an overview of the ISO 14000 (environmental management, (International Organization for Standardization 2015)), OHSAS 18001 (occupational health and safety (OHSAS 18001 2015), and the ISO 9000 (quality management, (International Organization for Standardization 2015)) certifications, as well as the membership of certain voluntary sustainability groups, such as the Clean Cargo Working Group (CCWG 2015), the Trident alliance focusing on stringent enforcement of Sulphur emission regulations in maritime transportation (Trident Alliance 2016), and the Maritime Anti-Corruption Network (MACN 2015). Appendix D also shows the different social and environmental awards and nominations won by the liner shipping companies in the last five years. This list is not exhaustive and is affected by the disposition of the respective companies to share awards and nominations publicly; however, the inclination to communicate these awards in itself is already an indication of a company's involvement in the social sustainability discussion.

*Table 7: Certificates and voluntary group memberships*

*(compiled by authors from (CCWG 2015), (MACN 2015), (Trident Alliance 2016) as well as the companies' webpages and sustainability/annual reports)*

| | **ISO 14000** | **ISO 9000** | **OHSAS 18001** | **CCWG** | **MACN** | **Trident** |
|---|---|---|---|---|---|---|
| **Maersk** | x | x | x | x | x | x |
| **MSC** | x | x | x | x | | |
| **CMA CGM Group** | x | x | x | x | x | |
| **Evergreen Lines** | x | x | x | x | | |
| **Hapag-Lloyd** | x | x | x | x | | x |
| **COSCO** | x | x | x | x | | |
| **CSCL** | | x | | | | |
| **Hamburg Süd** | x | x | x | x | x | x |
| **Hanjin** | x | x | x | x | | |
| **OOCL** | x | x | | x | | |

While some companies communicate a strong commitment to social issues (Maersk, Hamburg Süd), others focus on environmental issues (COSCO, CSCL, Hanjin, OOCL) or refrain from dedicated sustainability reporting at all (MSC, CMA CGM group, Hapag-Lloyd, Evergreen Lines). However, regarding our first research question about how social sustainability discourse diffuses through the liner shipping industry, there is evidence that indicates that social sustainability communication has increased in both detail and scope in the last 10 years, at least for the 10 biggest companies within the market. This

development is accompanied by the issue of improved standards and frameworks for social sustainability in liner shipping, most notably the MLC and ISO 26000. The next section will discuss the three types of isomorphic pressures that accompany these developments influencing the decision of liner shipping companies on whether to adopt social sustainability discourse.

## Discussion

### *Coercion*

DiMaggio and Powell (1983) hypothesize that the extent to which organizations transact with agencies of the state affects the strength of coercive pressures. It can be argued, however, that coercive pressures in liner shipping operations stem mostly from supranational legislative bodies, given the international nature of the liner shipping business. All liner shipping companies in the data sample are multinational, and might thus be able to evade coercive pressure through national legislative bodies to a certain extent, or even attempt to shape legislation in their favor (Kostova et al. 2008, Yliskylä-Peuralahti and Gritsenko 2014).

Apart from the MLC, there is little in terms of supranational regulations to govern social sustainability in liner shipping. Multi-national bodies like the European Union seem to lag behind when it comes to the social impact of maritime transportation (Skovgaard 2011). The IMO has recently started to emphasize social sustainability in shipping, stressing the importance of a holistic impact and the interdependence of the three sustainability dimensions (IMO 2012). In the current state, however, the lack of a dedicated, supranational governing body for social issues in liner shipping transportation might indicate that coercive pressures through regulations are not strong enough to bring all shipping companies to address social issues.

However, regulations are not the only source for coercive pressures. Shipping companies provide cargo transportation services to shippers with the obligation to satisfy shippers' service requirements for repeated business. This corresponds to the view that organizations become more homogeneous to other organizations that they depend on. In terms of sustainability, it could be that shippers who face customer requests for more sustainable consumer products would impose these pressures on their transportation service partners in an attempt to lessen the negative externalities of their supply chain, as is currently happening with environmental performance (Poulsen et al. 2016).

The liner shipping sector is highly competitive and cost-driven, and as a result, is highly dependent on operational efficiency. Cost-effective operational management of cargo handling and interfaces with supply chain partners are crucial for the success of a shipping company. It is common for liner shipping companies to establish liner shipping networks with other organizations (both vertically and horizontally in the shipping chain) in order to reap greater performance gains (Lun et al. 2010). Through close collaboration with other actors like intermodal service or terminal operators (e.g., on-shore supply chain partners like container terminals and ports, or freight forwarders that integrate liner shipping operations with hinterland transportation), shipping companies are pressurized to accept and adopt their sustainability practices (e.g., safety and health standards, mandatory training exercises, diversity programmes, etc.) in order to stay in business, particularly with the increasing popularity of intermodal transports.

All companies in our data set emphasize a strong commitment to respect the rule of law. The companies are keen on communicating compliance with relevant international and the respective national regulations. From an institutional perspective, they seem to be able to attain legitimacy by complying with the rule of law while avoiding penalties. However, due to a lack of a comprehensive international social sustainability framework, companies might have an incentive to circumvent more inconvenient regulations by moving their operations to countries with less stringent requirements.

Coercive isomorphism in informal networks, i.e., customers and supply chain partners, seems to be weaker than we conjectured, however. Similarly, to demand more environmentally friendly transports, coercive pressures for social sustainability in liner shipping operations seem to stem from laws and regulations rather than being buyer-driven. In our sample, we observe that companies communicate meeting laws and regulations on social sustainability, rather than focusing on requests by supply chain partners (e.g., terminal or port operators, members of liner shipping alliances). A peculiar finding is that companies who are committed to social sustainability reporting (e.g., Maersk) share capacity with companies that exhibit a lack of commitment (CMA CGM group, MSC). This implies that in contrast to our proposition that operative and informal networks are an important factor for social sustainability diffusion in liner shipping, coercive pressures exerted by laws and regulations might still be the most important factor.

### *Norms*

Normative pressures are generated through professionalization and common perspectives on how companies should operate professionally. Professionalization coincides with norms and expectations of "how things should be done" that are propagated by educational institutions or professional networks. Liner shipping is a highly complex and volatile field that includes a high number of different parties and requires a diverse set of management skills (e.g., coordination and routing, technical, financial and legal knowledge, optimization, forecasting, etc.). It can be argued that the professionalization of the field, the demand for highly skilled managers and specialists, and the resulting institutional isomorphism in the industry are high. This argument is corroborated by the fact that leading shipping companies actively invest in maritime education and sponsor maritime academies (AP Moller - Maersk 2014, Evergreen Line 2014). The presence of liner shipping networks and associations for maritime transportation professionals (e.g., IMO, MACN, Trident alliance, CCWG) contributes to this professionalization.

Accordingly, all major liner shipping companies issue a "code of conduct" or "code of ethics," that specifies how the company operates and that brings employees in line with the company's way of conducting business to achieve a higher degree of legitimacy. Within these codes, the companies specify other cornerstones of their efforts to improve their social impact. Apart from a strong communication of stakeholder interests, they are against discrimination and corruption, while stressing human rights in the course of their operations ((AP Moller - Maersk 2014, CMA CMG 2016, Mediterranean Shipping Company 2016)). However, simply formulating a code of conducts is not a guarantee to improve social performance, particularly in different cultural settings (Lund-Thomsen 2008).

Within our sample, the social sustainability discourse is quite homogeneous in terms of style and topics. Companies stress labor rights, anti-corruption policies, respect for the rule of law and human rights, ethical behavior, and accountability. However, there are significant differences in the scale of the social sustainability report – while some companies undertake a continuous effort to issue reports and communicate social sustainability issues (e.g., Maersk, Hamburg Süd), others base their external communication on single, rather short codes (e.g., CMA CMG group, MSC).

### *Mimesis*

Organizations model themselves after other organizations that they perceive as being successful, particularly when confronted with (organizational) uncertainty. Liner shipping

companies conduct business within a volatile operations environment characterized by high uncertainty and long-term investments (Stopford 2009). Sustainability in general and social sustainability in particular are concepts that are relatively new to the liner shipping industry; liner shipping firms might still be uncertain about whether investments in social initiatives are profitable in the long term. This uncertainty is reinforced by the view that liner shipping companies face both the pressure to reduce costs for better ability to compete, and the pressure to lessen their negative externalities. The resulting ambiguous goals could increase the power of mimetic isomorphisms within the industry.

Consequently, liner shipping companies might look to other, conceived as successful, companies in their field for guidance, following the rationale that the greater the extent to which (organizational) management practices are uncertain, the stronger the mimetic pressures on companies. Decision-makers within companies might also be influenced by the success stories of other companies that have implemented certain standards and managed to improve their profitability (Lo et al. 2014), or even the compensation of decision-makers (Lo et al. 2011, Yeung et al. 2011). The mimetic argument includes competitive considerations – for example, shipping firms that are not able to offer 'green' transports at competitive prices might not be able to compete within the industry. Besides, failure to implement threshold safety and security practices will put shippers' cargo at risk and consequently make a shipping company less attractive when compared to the competition.

Horizontal supply chain partners, i.e., other liner shipping companies that operate in the same liner shipping alliance and thus share transportation capacities, might be willing to share their experiences with social sustainability, while the ISO 26000 framework provides exhaustive guidelines on how to implement social sustainability and corporate social responsibility. Apart from the ISO 26000 guidelines, there are not many alternative holistic frameworks on how to organize (social) sustainability within the field, thus fostering homogeneity in social sustainability discussion and practice implementation for liner shipping operations.

However, our data sample indicates that this is not yet the case. Even though a certain homogeneity can be observed in our sample, the scale and communication commitment by the companies varies strongly. If the market leaders are not unanimous in their social sustainability discourse and sustainability leaders are sharing capacities with laggards (e.g., Maersk and MSC), smaller shipping companies are unlikely to resolve their uncertainty by

looking to the market leaders for guidance. However, we anticipate an ongoing diffusion of social sustainability discourse through the major liner shipping companies considering that the ISO 26000 has only recently been released. It might be that the industry is moving toward increased homogeneity but that the social sustainability discourse is not yet mature enough to influence their smaller counterparts.

## Conclusion and outlook

This chapter discusses how neo-institutional theory can be applied to explain the diffusion of social sustainability practices in liner shipping operations. The institutional forces influencing social sustainability adoption in the liner shipping industry are discussed through three guiding propositions, using qualitative data from a content analysis of the top 10 biggest liner shipping companies' sustainability discourse.

Even though efforts are made by both researchers and practitioners to lessen the negative externalities of liner shipping operations, the sector still seems to lag behind, particularly when it comes to the social sustainability discourse. Our data indicates that social sustainability is communicated less by major liner shipping companies than by economic and environmental topics. However, analysis of our data sample show that the social sustainability discourse is maturing and continually diffusing through the industry.

By understanding how social sustainability practices spread through the industry and why they are adopted (or, even more interestingly, why they are not adopted), new social initiatives and regulations can be modeled with greater efficiency. We have formulated propositions to predict how isomorphic pressures might affect social sustainability adoption in the liner shipping industry. Due to a lack of a comprehensive regulatory framework on social issues, we argue that coercive pressures are exerted through supply chain partners rather than regulatory bodies. However, this does not seem to be the case. While many liner shipping companies tend to be indifferent to the social sustainability performance of their supply chain partners, regulations are an effective tool to mandate liner shipping companies to implement social sustainability practices. Accordingly, we strongly suggest that regulators and policymakers should work on a more comprehensive framework of social sustainability in liner shipping.

Furthermore, we conjecture that social sustainability discourse and practices adoption is fostered by an environment of high public expectations and social obligations. Looking at the social sustainability communication of the 10 biggest liner shipping companies, this

seems to be the case. All companies are aware of the necessity to address these issues; however, the commitment to communicating the sustainability practices appears to vary greatly. For mimetic pressures, we argued that smaller companies might model themselves after the market leaders to overcome uncertainty, due to a lack of guidelines and supportive frameworks. However, given the current state of the heterogeneity of social sustainability reporting among market leaders, it is unlikely that smaller companies would be able to resolve any uncertainties through following the paths of their larger counterparts. Table 8 summarizes our findings.

*Table 8: Overview of propositions*

| **Proposition** | **Supported by data?** |
|---|---|
| Proposition 1 (coercive): *For social sustainability practices discourse in liner shipping operations, coercive pressures are stronger through supply chain networks and relationships with shippers than from regulations.* | No; opposite result |
| Proposition 2 (normative): *The normative isomorphisms generated through public expectations and social obligations in terms of social sustainability performance will enhance social sustainability discourse in liner shipping operations.* | Yes |
| Proposition 3 (mimetic): *There is homogeneity in social sustainability discourse in liner shipping operations with the market leaders' approach mimicked by their smaller counterparts.* | No |

Based on our propositions, we encourage further research on all three sources of isomorphic pressures regarding the diffusion of social sustainability in liner shipping operations. For coercive isomorphisms, we recommend research on how to design a comprehensive regulative framework for social sustainability in liner shipping operations, and how it might affect the current modus operandi of liner shipping companies. Furthermore, it would be interesting to explore whether the isomorphic pressures generated by shippers and supply chain partners influence social sustainability practice adoption as well. For normative isomorphism, given that they are generated by expectations and social obligations, we suggest further research on how these expectations affect the adoption of social sustainability practices, and how they differ between geographical or cultural contexts. For mimetic isomorphism, a promising venue for extending this chapter is to evaluate the degree of homogeneity between smaller liner shipping companies and market leaders in terms of social sustainability practices adoption and to assess whether smaller companies are employing modeling techniques to resolve uncertainty. It is also worthwhile monitoring the further diffusion of social sustainability discourse in the industry, particularly between market leaders and smaller companies, and

the rate at which liner shipping companies adopt social sustainability in their operations. Furthermore, we strongly encourage research on the actual impact of CSR policies in liner shipping, to move research focus from discourse to actual practice implementation. An alternative venue for further research would be to analyze social sustainability discourse in other segments of maritime transportation (e.g., tanker, dry bulk).

## Limitations

We are aware of several limitations that apply to our research. First of all, there are some issues connected with our chosen research approach. Content analysis is an approach that is mostly used quantitatively. However, in this chapter, we follow the tenets of qualitative content analysis. While backed by some authors ((George 1959, Holsti 1969), we are aware that this is certainly the less-developed approach of content analysis. Still, we have paid close attention to the validity and reliability of our approach, and have aimed for the highest possible degree of scientific rigor. Secondly, our data set is limited in two regards. On the one hand, the sample is not chosen randomly, but has been limited to the 10 biggest companies in the liner shipping industry. While this gives us the advantage of covering the bulk of the liner shipping market, it also limits us from drawing any conclusion for smaller companies. Big companies are undeniably under greater public scrutiny than small and medium enterprises and have more organizational slack, which will certainly affect the way the companies communicate sustainability issues. On the other hand, our data is limited to publicly available, secondary data. While suitable for our goal to discuss the social sustainability discourse, we have to keep in mind that without primary data, we are unable to draw any meaningful conclusions about the companies' actual commitment toward sustainability issues, let alone the actual implementation of sustainability practices.

# Essay 3: Strategic responses to institutional forces pressuring sustainability practice adoption: Case-based evidence from inland port operations

## Chapter summary

This chapter investigates the strategic responses of inland ports to institutional forces pressuring their adoption of sustainability practices. We postulate that even though inland port operators strive for economic viability, there are growing pressures from various stakeholders for the continuous enhancement of their environmental and social sustainability practices. We apply institutional theory to classify the effects of these forces based on five institutional antecedents – *cause, constituents, content, control, and context* – and further expand our theoretical framework with resource dependence tenets to discuss the spectrum of strategic responses available to inland ports to deal with institutional forces. We examine our theoretical arguments with empirical evidence collected from four inland ports using a case study-based approach. We conclude that while inland ports have a strong disposition toward social sustainability, economic considerations are still most emphasized, and environmental issues are mostly regarded in compliance with the legally mandated minimum. The most important sources of institutional pressure are identified as *cause*, *constituents*, and *control*. In a further step, we present evidence of the inland ports' potential strategic responses. The study also provides insights for managers and policymakers on strategic options as appropriate organizational responses to proliferating institutional pressures for sustainability practices adoption.

## Introduction

The transportation of cargo is instrumental in promoting worldwide economic development and growth. However, the transportation of goods and people causes damage to society and the environment (Ahi and Searcy 2013). This includes emissions, noise, congestion, accidents, habitat loss, pollution, and deterioration of the infrastructure (Santos et al. 2010). There is growing attention from academia and practitioners to find new solutions in the hope of balancing transportation-caused damage with its economic viability for a more sustainable transportation development (Demir et al. 2015, Lee et al. 2016).

In this context, sustainability can be understood as a holistic concept comprising three unique aspects, namely economic, environmental, and social sustainability (Elkington

1998). While economic sustainability concerns itself with the profitability of an enterprise and is usually intrinsic to the strategy of any for-profit firm, environmental sustainability aims to lessen the damage caused by a firm's operations to the environment, for example, by reducing emissions, cutting waste, or recycling (Carter and Easton 2011, Janic 2006). Social sustainability focuses on balanced and sustained relations with all of a firm's stakeholders, be it customers, suppliers, employees or local communities (Steurer et al. 2005). For sustainable development, a firm needs to exhibit a minimum performance in these three dimensions (Seuring and Müller 2008). However, win-win situations are rare, and compromises are often necessary as investments into one dimension of sustainability can offset performance in the other two dimensions (Dyllick and Hockerts 2002).

Researchers have tried to find ways to make road freight (Fürst et al. 2013, Santos et al. 2010), maritime transportation (Adland et al. 2017, Cariou 2011, Lam and Lim 2016, Psaraftis and Kontovas 2010), rail cargo (Bauer et al. 2010), and air transportation (Akerman 2005) more sustainable in their operations. Authors have also explored sustainability concepts in transhipment operations in major hubs like airports or seaports (Acciaro et al. 2014, Chang and Wang 2012, Lam et al. 2013, Upham et al. 2003). However, only little research is available on the sustainability efforts and strategies of inland ports. Inland ports are significant nodes in international transportation networks and often fill an important role for the transhipment and handling of cargo flows (Rodrigue et al. 2010). Thus, inland ports contribute significantly to the efficiency of hinterland connections of seaports and other major transportation nodes (Van Den Berg and De Langen 2015). They are, though, by no means "smaller seaports further inland," and need to deal with a unique set of challenges and issues (Witte et al. 2014), particularly when it comes to sustainability efforts (Dooms et al. 2013, Haezendonck et al. 2006).

In contrast to current research on seaports, there are few insights offered into how inland ports deal with sustainability issues. Lättilä et al. (2013) investigate the impact of dry port usage on the $CO_2$ emissions of seaports, and conclude that an increase in inland port usage could help to lower the environmental damage caused by transportation. Iannone (2012) discusses social cost in hinterland container transportation. Similarly, Roso (2013) and Bergqvist et al. (2015) investigate the importance of inland ports for sustainable intermodal transportation, though without focusing on inland port operations. So far, there is currently no publication that discusses sustainability in inland port operations from a holistic perspective. This research void leads us to examine the awareness of inland ports on sustainability. With the lack of prior research, our first research question is

**RQ 1:** What is the current status quo of sustainability development in inland port operations?

After assessing sustainability development in inland port operations, we aim to investigate the drivers of sustainability practice adoption. Inland ports are subject to diverse institutional forces of varying strength in their adoption of sustainability practices – they have to follow regulations to avoid penalties, cater to customers' requests to attract and retain business, and fulfill the operational and sustainability requirements of transportation and logistics partners. Following the tenets of institutional theory, we analyze the pressures exerted by governmental institutions, customers, and local stakeholders on the ports to assess their effect on inland port sustainability efforts. Thus, we aim to answer the question

**RQ 2:** What institutional forces influence the adoption of sustainability practices in inland ports?

Subsequently, we explore the potential strategic responses of inland ports to institutional forces on a spectrum from passive acceptance to active resistance. Based on a resource-dependence theory perspective, we examine inland ports' agency and acknowledge their ability to actively shape their business environment through strategic actions in response to institutional processes, thus seeking to answer the following question.

**RQ 3:** What strategies do inland ports elect in response to institutional forces calling for increased sustainability practices adoption?

## Literature review

### *Inland port operations*

Inland or dry ports are defined by the United Nations Conference on Trade and Development (UNCTAD) as "a common user facility with public authority status, equipped with fixed installations and offering services for handling and temporary storage of any kind of goods (including containers) (…)" (UNCTAD 1991, p. 2). Inland ports are important nodes in the hinterland of seaports and contribute to their competitiveness by facilitating cargo flows and alleviating congestions (Roso et al. 2008). They fulfill four primary functions: transfer of cargo, assembly of cargo in preparation for transfer, storage of cargo, and logistical control of cargo flows (Roso and Lumsden 2010, Slack 1999). In this role, they are also the main facilitators of multimodal transports, as they conduct the modal shift between truck, rail, and barge (Notteboom and Rodrigue 2005). As a result, inland ports

are strong economic drivers for their respective regions (Cullinane et al. 2012). However, they need to attract sufficient volume to establish economies of scale and manage to achieve transportation costs low enough to compete with alternative modes of transportation (Rahimi and Harrison 2008).

Inland ports can be connected via road, rail, and inland waterway transportation, and offer the transshipment of container and/or bulk cargo, customs and security checks, storage, communication, and documentation of cargo. Basic inland port infrastructure includes (container) handling equipment, customs control and clearance, temporary storage areas, security facilities, offices for shipping agents and operators, and communication facilities (UNCTAD 1991). However, inland ports usually offer varying degrees of value-added services, including (but not limited to) labeling, container repair, commissioning of goods, repackaging, long-term storage (including goods with special requirements, e.g., hazardous goods, cold goods), and even assembly (Jaržemskis and Vasiliauskas 2007, Roso and Lumsden 2010, Roso et al. 2008).

Compared to research on seaports, inland ports are relatively less regarded; however, recent years have shown increasing academic interest in inland port operations, and case-based research in particular is employed to study the development of dry ports (Qiu et al. 2015, Roso and Lumsden 2010). The operational efficiency of inland ports has been most discussed in the extant literature, focusing on issues like berth allocation planning (Arango et al. 2011), freight distribution planning (Crainic et al. 2015), operational disruptions (Pant et al. 2011), storage pricing (Qiu et al. 2015), and the desired attributes of inland ports for carriers and shippers (Walter and Poist 2003). Other topics discussed include inland port governance (Ng and Gujar 2009, Witte et al. 2014), inland port locations (Limbourg and Jourqin 2009), and their importance for intermodal transportation in international logistics networks (Bergqvist and Tornberg 2008).

### *Sustainability in inland ports*

The sustainability discourse has significantly matured in both transportation research and practice (Carter and Easton 2011, Vejvar et al. 2016). While there is a variety of definitions for sustainability practices available in the transportation literature (Seuring and Müller 2008), there is a consensus that sustainable development includes a minimum economic, environmental, and social performance (Carter and Rogers 2008, Linton et al. 2007). Due to the intrinsic aim of for-profit companies to turn a profit, the economic dimension of sustainability is usually at the center of any port's strategy. In this regard, ports in general

tend to focus on operational efficiency (Clark et al. 2004, Cullinane et al. 2005, Tongzon 2001).

Environmental issues in transportation literature include emissions, habitat loss, water quality, pollution, dredging, and to a lesser degree, invasive species (Lam and Notteboom 2014, Yang and Wong 2016). Strategies offered by the literature to reduce the environmental impact of general port operations include recycling and reuse policies, waste and waste water management, energy saving programs, eco-design, alternative fuels, renewable energy, and cleaner or more efficient physical assets (Bailey and Solomon 2004, Dinwoodie et al. 2012, Lirn et al. 2013). Social aspects of sustainability in general port operations encompass security (Bichou 2011), safety and health management (Yip 2008), employee satisfaction and customer relations (Shin and Thai 2016), exchange with local stakeholders and authorities (Ferrari et al. 2010), as well as education and training (Lau and Ng 2015). While win-win situations between multiple dimensions of sustainability are possible (Chin and Low 2010), it is necessary to balance the different dimensions due to trade-off situations. In particular, industries characterized by strong competition and cost pressures often find it difficult to justify investments that have no tangible or immediate payoff or utility. However, there is evidence that sustainability pressures from regulatory bodies and end consumers are increasing, particularly in developed countries (Chang and Wang 2012, Kotowska 2016, Poulsen et al. 2016). As a result, we conjecture that

**Proposition 1:** Inland ports have a strong need for efficiency and focus on economic sustainability; however, a holistic approach to sustainable development is needed due to external pressure.

### *Institutional forces and isomorphism*

Following the implicit assumption of our first proposition that there are external pressures affecting inland ports in developing their sustainability efforts, we employ institutional theory to explain how these forces are exerted. Institutional theory discusses organizations in the context of their environment (Abell 1995), and argues that they are striving for legitimacy and stability, which can be attained by conforming to regulative, normative, and cultural-cognitive pressures (Deephouse 1996, Scott 2014). DiMaggio and Powell (1983) label these forces as isomorphism. Coercive isomorphisms are exerted by other organizations, and non-compliance is usually met with penalties. Usual examples include pressures exerted by authorities and the legal framework, but coercive pressures can also stem from other organizations (e.g., customers, partners, suppliers). Normative

isomorphisms refer to the consensus of norms and values and include a certain expectation of "how business should be done." Normative pressures are diffused via educational norms, professional networks, consulting companies, or certification standards. While similar to a certain degree to coercive pressures, normative isomorphisms are not imposed and penalized like that of coercive pressures, but refer to social expectations and moral obligations (Scott 2014). Mimetic pressures are exerted by the competition and are an organizational response to (organizational) uncertainty. Companies facing ambiguous goals, uncertain environments or unclear objectives often look to firms they perceive as successful to model themselves after them (DiMaggio and Powell 1983).

Institutional theory has only sparingly applied to the port operations sector. Wong et al. (2009) discussed information technology management and the respective institutional pressures in a seaport-based case study. Acciaro (2015) employed an institutional theory framework to discuss the corporate social responsibility strategies of 10 seaports. Santos et al. (2016) applied institutional theory to explain the communication of 186 seaports on sustainability issues and conclude there is evidence that sustainability practices are diffusing through the industry. However, inland ports face a vastly different geographical (e.g., proximity to urban centers, accessibility of labor, available infrastructure) and organizational environment (e.g., relevant stakeholders, applicable regulations, number of parties involved in intermodal transportation) compared to seaports, and hence we expect different isomorphic pressures to influence their operations. To the authors' knowledge, there are currently no studies investigating how institutional isomorphisms influence the sustainability practice adoption decisions of inland ports. An important step in answering this research inquiry is to analyze the antecedents of institutional forces and how they affect inland ports on sustainability practices adoption. As a result, we turn to the prolific framework of institutional antecedents (see Table 9) devised by Oliver (1991) and propose:

**Proposition 2:** Inland ports are affected by isomorphic forces that can be classified based on five institutional antecedents: *cause, constituents, content, control,* and *context*; these antecedents affect the strength of pressures exerted on inland ports and the inland ports' adoption of sustainability practices.

*Table 9: Antecedents of institutional processes based on Oliver (1991)*

| Institutional antecedents | Explanation |
|---|---|
| **Cause** | **Organizational fit with intended objectives of pressure:** |
| Legitimacy | Conformity to pressure enhances social fitness |
| Efficiency | Conformity to pressure improves economic fitness |
| **Constituents** | **Multiplicity of and dependence on external stakeholders:** |
| Multiplicity | Conformity to pressure lower for multiple constituents |
| Dependence | Pressures stronger from organizations highly dependent on |
| **Content** | **Effect on internal goals and decision-making capabilities of forces:** |
| Consistency | Pressures consistent with internal goals |
| Constraint | Degree of restriction for firm by conforming to pressures |
| **Control** | **Strength of coercive and normative institutional forces:** |
| Coercion | Gravity of legal pressures on non-conformity |
| Diffusion | Voluntary acceptance and diffusion of pressures |
| **Context** | **Environmental context of practice diffusion:** |
| Uncertainty | Degree of uncertainty in environmental context |
| Interconnectedness | Density of interorganizational relations |

### *Strategic responses to institutional isomorphism*

However, institutional theory has often been criticized for a lack of organizations' agency and their ability to act in self-interest (DiMaggio 1988). Indeed, organizations do not always placatingly comply with isomorphic forces, but have the active choice to dismiss or challenge them, albeit at the risk of losing legitimacy (Scott 2014). Thus, Oliver (1991) suggests a synthesis of institutional theory and resource dependence theory to make organizational strategic choices more actionable. Resource dependence theorists argue that organizations are unable to generate all the necessary organizational resources internally, and thus need to interact with their environment to gain access to specific resources (Pfeffer and Salancik 2003). This necessarily leads to power imbalances and dependence in cases where the desired external resources are scarce (Hillman et al. 2009). Thus, resource dependence theory follows the notion that organizations have a strong need to actively shape their organizational environment to strengthen their access to scarce resources, thereby reducing uncertainty and external control. The only application of this theory in general port sustainability literature is by Denktas-Sakar and Karatas-Cetin (2012), who conceptualize seaport sustainability using a resource dependence theory framework.

Although some underlying concepts and mechanisms are divergent, Oliver (1991) has shown that the core assumptions of both institutional and resource dependence theory are

convergent, and that a synthesis creates a spectrum of organizational strategic responses to external pressures, ranging from passive acceptance to active resistance. Based on these considerations, we argue that inland ports have a variety of potential responses to external sustainability pressures:

**Proposition 3**: Inland ports employ varying sets of strategies to cope with institutional forces for increased sustainability practices adoption that range from passive conformity to active resistance.

The spectrum of strategic responses offered by Oliver (1991) includes a range from a subconscious "taken-for-grantedness" to active resistance. These strategies can be roughly classified as "Acquiesce," "Compromise," "Avoid," "Defy," and "Manipulate." To further diversify strategic options, three tactical responses for each respective strategy are introduced. Table 10 offers an overview of the five strategies and the corresponding tactics in order from least to most resistance to institutional forces. We will provide further insights on these strategies during the discussion of our findings.

*Table 10: Strategic responses to institutional forces based on Oliver (1991)*

| Strategy | Tactic | Explanation |
|---|---|---|
| **Acquiesce** | Habit | Following norms, "taken-for-grantedness" |
| | Imitate | Mimicking institutional models, "modeling" |
| | Comply | Obeying rules and conforming to pressures |
| **Compromise** | Balance | Balancing pressures exerted by multiple sources |
| | Pacify | Accommodating institutional elements, "lip service" |
| | Bargain | Negotiation with sources of institutional pressure |
| **Avoid** | Conceal | Disguising nonconformity |
| | Buffer | Loosening institutional attachments |
| | Escape | Adapting or changing organizational goals to avoid pressures |
| **Defy** | Dismiss | Ignoring expectations |
| | Challenge | Contesting rules and regulations |
| | Attack | Actively undermining the source of pressure |
| **Manipulate** | Co-opt | Including influential constituents in decision-making |
| | Influence | Attempt to actively shape framework |
| | Control | Attempt to dominate the source of pressure |

## Method and data

We use case-based evidence to empirically examine our propositions. A case study is a qualitative enquiry that investigates a body of research within its context. Thus, a case-based approach is a suitable way to analyze a small number of cases without losing individual information about single cases. It allows investigation at a high level of

complexity and grants an in-depth understanding of decision-making processes (Eisenhardt 1989, Gerring 2007, Yin 2013), and is thus well-suited for explorative studies that aim to answer the "how" or "why" of a specific phenomenon (Ellram 1996). A case study can employ flexible research methods and is able to take contextual factors into account (Eisenhardt 1989, Voss et al. 2002). Because of these characteristics, case-based evidence is suitable for studying sustainability development issues (Lun 2011, Seuring 2008). The literature suggests analyzing a sample of four to 12 cases to increase generalizability and return more robust results. Furthermore, case data should include primary data supported by secondary data to increase data validity (Eisenhardt 1989, Yin 2013), as otherwise results might be biased or not generalizable (Seuring 2008).

For our case selection, we chose the four largest public Danube ports[2] in Austria. The Danube is part of the Rhine-Danube core network within the European Union and a major axis in the European transportation network (European Commission 2014). These inland ports process the majority of water-side cargo and serve as important transhipment hubs in the Austrian transportation network with good rail and inland waterway connections to the North Sea and the Black Sea (Statistik Austria 2015).The collection, preparation, and analysis of the data have followed guidelines from case study research methodology literature (Yin 2016). In order to minimize variations in the institutional environment of our sampled cases, all ports were chosen from the same country. In contrast to calls for polar case selection in the literature (Eisenhardt 1989), we follow the tenets of literal reproduction, i.e., trying to reconstruct organizational logic and strategic responses from a sample of similar cases (Yin 2013). This allows us to better focus on variations regarding how ports react to similar institutional pressures, rather than studying differences in institutional pressures. Primary data was collected via on-site observations and interviews with managing directors and key decision-makers and were supplemented with secondary data.[3]

In a first step, the extant literature was thoroughly analyzed to draft an initial interview questionnaire. Next, this questionnaire was refined and adapted in a series of talks with experts from academia, practice, and the government. During these reiterations, we also finalized the case selection for our study. The finalized questionnaire was structured in

[2] From here on, "port" will refer to inland ports in general to avoid unnecessary word repetitions. We will use "seaports" to specifically refer to coastal ports that conduct ocean transportation.
[3] Anonymity was a prerequisite by the ports to participate in our study; as a result, we are required to omit information that is too specific, and will refer to the ports as "Port A," "Port B," "Port C," and "Port D."

three parts according to the three dimensions of sustainability, included roughly 50 questions, and a translated version can be found in Appendix E. Subsequently, we contacted the ports to schedule interview meetings with managing directors, or, if not available, key decision-makers knowledgeable in the field (e.g., head of operations, head of strategic development). Upon confirmation, the interview partners were sent the questionnaire (written in German) and an enclosed letter explaining the scope and aims of the project, as well as providing definitions to key concepts like sustainability, at least a week prior to the scheduled interviews. The interviews were conducted in German, following the tenets of qualitative interviewing (Rubin and Rubin 2012), and recorded for later use. In total, nine interviews were conducted: three with practitioners (from which two were working for a government agency, and one was the managing director of a logistics company focused on Danube transportation) and two with researchers on Austrian transportation management to prepare the questionnaire, and an interview with either the managing director or the head of strategic management in the respective ports. The interviews were subsequently translated into English by the authors.

The last step of the data collection phase included the gathering of secondary data. For this purpose, we searched the news database Factiva for any news articles relevant to any of our four ports in the period from 2007 to 2017. The resulting 300 articles were read, and coded based on port, year, press outlet, topic, and sustainability dimension. We also extracted financial data including balance sheets and profit and loss statements for all ports in the same period from the commercial register. Other secondary data collected includes certificates (e.g., ISO certification), information from the ports' web pages and other online sources (e.g., danubeports.info), folders and project reports issued by ports, the Austrian government, or the European Union, and other relevant news bulletins and publications.

We subsequently analyzed the respective cases to find answers to our research questions and associated propositions. To increase the validity and robustness of our findings while enhancing generalizability, a cross-case analysis was conducted. Investigating the similarities and differences between the singular cases helped to deepen our understanding of related processes (Miles et al. 2014). Furthermore, comparing the results of the single cases and analyzing the similarities and differences between them, can help to increase the transferability of our findings to other contexts (Gerring 2007, Miles et al. 2014).

## Cross-case analysis

The four inland ports in the data set are located along the Danube river in Austria. They are important nodes in the European transportation network particularly as hinterland hubs for the Northern Sea ports, and to a lesser extent, for the Black Sea ports. The ports are all tri-modal, being connected to the road, rail, and inland waterway transportation network; however, water-sided transportation contributes only a minor fraction to the transportation volume due to low velocity and navigation issues on the Danube river. As a result, it is only used for bulk transportation, and to a lesser degree, empty container repositioning. Import goods include mostly containers, cars, and liquid bulk (crude oil). Due to the strong service-focus of the Austrian industry, exports are comparatively low and include agricultural goods, chemicals, and steel. Table 11 and Figure 7 provide general information about the ports, while Table 12 provides an overview of their respective strategies.

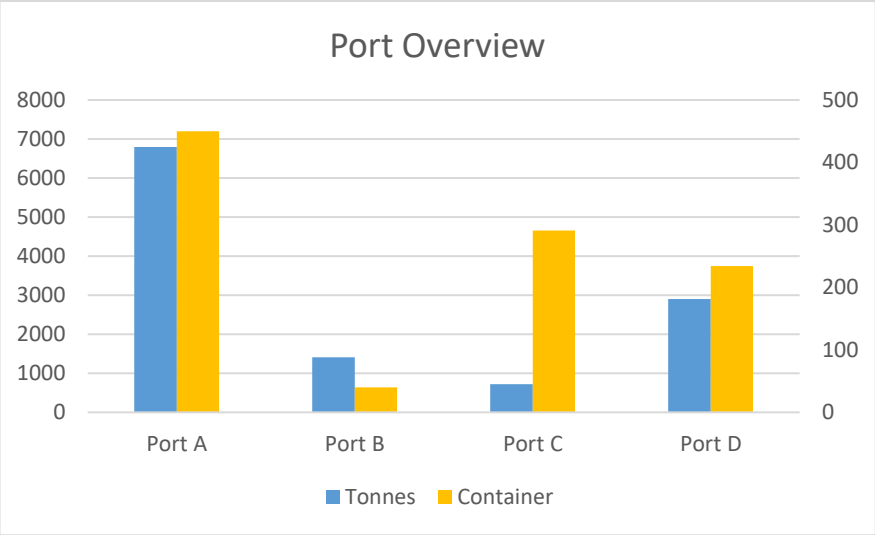


*Figure 7: Yearly throughput in tons (primary axis) and TEU (secondary axis) per port (data from 2015)*

*Table 11: Case overview*

| General info | Port A | Port B | Port C | Port D |
|---|---|---|---|---|
| Type | Public service | Tool port | Landlord port | Public service |
| Area in m² | 3.000.000 | 483.581 | 3.530.000 | 1.350.000 |
| Location | Urban | Rural | Rural | Urban |
| Revenue 2015 | €48 million | €4.9 million | n/a | €35 million |
| Certifications | ISO 9001<br>ISO 14001<br>GMP (Good Manufacturing Practice) | ISO 9001<br>ISO 14001<br>GMP | None (landlord) | ISO 9001<br>ISO 14001<br>AEO (Authorized Economic Operator)<br>SQAS (Safety and Quality Assessment System)<br>GDP (Good Distribution Practice) |
| Goods | Dry bulk<br>Container<br>Liquid Bulk<br>Break Bulk<br>High & Heavy<br>Car terminal | Dry bulk<br>Container<br>Break Bulk<br>High & Heavy | Dry Bulk<br>Container<br>Liquid Bulk<br>Break Bulk<br>High & Heavy | Dry bulk<br>Container<br>Liquid Bulk<br>Break Bulk |
| Sustainability strategy | Yes, since 2013 | No | No | No |

From our four ports in the data set, only one employs a formalized sustainability strategy that has quantifiable, monitored goals. While the other ports agree that there is a certain need for sustainability in port operations, they tend to address issues reactively on a point-by-point basis.

Unsurprisingly, all ports focus on the economic viability of their operations. While they have all recovered from the financial crisis of 2009 and the resulting slump in the transportation market, the ports uniformly state that they are under extreme cost and competitive pressures. As a result, they aim to achieve cost reductions and economies of scale, particularly in the land-sided container business, and all ports are pursuing improvements in operational efficiency and planning in add-on capacity and storage areas. Additional logistics services are generally offered, but only Port B and Port D show a strong commitment to offering a wide array of value-added services like commissioning, labeling, repackaging, or assembly of goods.

Our findings show a certain homogeneity of measures to lessen the environmental impacts of port operations. All ports have energy savings and waste reduction initiatives in place; other common measures include recycling, reuse, and resource conservation. While Port A does not monitor emissions, Port B and D have invested in clean port equipment including hybrid cranes and electric cars to reduce air pollution. Investment in renewable energy sources has been considered in all ports, and while Port B has dismissed the investment as not economically feasible, Port A and Port D have followed through and now use solar panels to power their warehousing operations. The environmental impact on water quality is only seen as a minor issue, and Port B seems to disregard it completely. As a landlord port, Port C does not conduct operations on its own account and focuses on a monitoring role rather than actively shaping sustainability efforts; however, environmental issues seem to be of lower priority in their administrative role. As a matter of fact, the ports unanimously state that investment in environmental strategies needs to be economically feasible (i.e., win-win solutions), due to immense cost-pressures and the unwillingness of customers to pay extra for "green" services.

Interestingly enough, all ports seem to have a strong dedication to the social aspect of sustainability issues. All ports invest heavily in accident prevention, safety and security management, and employee health and well-being. Job satisfaction is an important topic, and all ports conduct regular employee satisfaction surveys and invest in human capital. The rural ports especially see a strong need for investments in training and education to address the scarcity of skilled personnel in rural areas. Port D even made it a policy to refrain from letting employees go during times of economic downturn so as to provide job security and increase staff morale. Furthermore, there is an ongoing exchange with local stakeholders to proactively address any port-related issues that might affect local communities. Port C has set up a council with important local stakeholders to discuss the port's impact in regular meetings, while the other ports have good institutional ties to local authorities and government representatives. In terms of customer focus, the ports show different approaches. Port A and D employ standardized surveys to evaluate their service quality, with Port A also conducting regular in-depth personal feedback discussions with key customers. While Port B does not have a standardized approach to customer satisfaction evaluation, they aim to establish regular contact and to excel in terms of services offered, stating that they would do "everything that is technically and legally possible" for their customers.

*Table 12: Port sustainability strategies*

| Port | Economic strategy | Environmental strategy | Social strategy |
|---|---|---|---|
| **Port A** | Logistics provider with minor landlord activities and focus on land-sided transshipments | • reduction of waste and energy consumption<br>• resource conservation<br>• renewable energy<br>• recycling<br>• Minor focus on water quality | • Customer focus<br>• Investment in training and education<br>• Safety and security management<br>• Accident prevention<br>• Focus on job satisfaction |
| **Port B** | Strong customer focus; offers one-stop logistics solutions including freight forwarding and additional services | • reduction of waste and energy consumption<br>• resource conservation<br>• recycling<br>• No investment in renewable energy<br>• Water quality not monitored | • Customer focus<br>• Good exchange with local stakeholders<br>• Investment in training and education<br>• Safety and security management<br>• Accident prevention<br>• Focus on job satisfaction |
| **Port C** | Focus on landlord activities; mostly accommodating companies handling agricultural goods | • Monitors accommodated firms in their environmental efforts<br>• Low priority | • Excellent exchange with local stakeholders<br>• Investment in training and education<br>• Safety and security management<br>• Accident prevention |
| **Port D** | Focus on transhipment and storage of dangerous goods (chemical, pharmaceutical) | • Heavy investment in low emission assets<br>• reduction of waste and energy consumption<br>• resource conservation<br>• renewable energy<br>• recycling<br>• minor focus on water quality | • Investment in training and education<br>• Safety and security management<br>• Accident prevention<br>• Strong focus on job satisfaction |

Overall, our findings suggest that there is evidence to support the proposition that inland ports face a business environment with strong competition and cost pressures. Particularly when it comes to environmental sustainability, ports do not seem to be ready to invest in initiatives without immediate cost-savings. However, our data shows a strong tendency to over-fulfill legal requirements in terms of social sustainability. Aside from investments in safety, security, health, and accident prevention that have strong economic implications for ports, we observe a strong commitment to local communities in all four cases, even though there can be no immediate economic gain associated with some of these measures.

## Discussion of institutional antecedents

Oliver (1991) proposes that there are five institutional antecedents – *cause, constituents, content*, *control,* and *context* – that affect the intensity of institutional pressures and the likelihood for companies to subdue to or revolt against them (see Table 9). Applying these institutional antecedents to study inland ports helps us understand the nature and intensity of isomorphic forces influencing the industry on sustainability practices adoption.

*Cause* refers to the intended objective of the institutional forces. If the intended aim of an institutional pressure is a good fit with the internal goals of a firm and an increase in economic efficiency or social legitimacy, firms have a high incentive to conform. Indeed, we observe that all ports have conformed to sustainability pressures in fields where they are able to realize win-win situations toward achieving their internal goal of profitability. All ports in the sample have implemented energy saving programs and waste reduction initiatives, recycle, and have invested in health, safety, and security measures to prevent accidents. Other measures with less obvious or promising returns including habitat loss, eco-design, and the monitoring of water quality, however, have received significantly less regard. While most ports have invested in renewable energy due to a good fit with their strategy, Port B has assessed the option and has disregarded it on purpose, stating that there is not enough economic incentive for the investment. Based on these findings, there is evidence that efficiency, i.e., the economic gain attributed to an institutional pressure, has a positive impact on adoption. Accordingly, the degree of social legitimacy attained from conformity has also been found to be positively correlated to adoption. Interview partners stated several times that they went beyond the scope of legal compliance for investments in health management, safety, and accident prevention because they care for the well-being of their employees, and that “this is what is expected from [them].”

*Constituents* refer to the nature and number of external institutions influencing the operations of a firm. This generally includes all types of stakeholders, from customers, employees, and local communities to state authorities and the general public. While a higher multiplicity of constituents (or stronger ambiguity of constituents' demands) could lead to a higher propensity of ports to resist institutional pressures due to conflicting interests, a high dependence on certain constituents should lead to the inverse effect. Even though the number of constituents is arguably lower for ports compared to other organizations under the stronger scrutiny of the public, demands by different constituents, particularly when it comes to sustainability efforts, might be conflicting. While local stakeholders might pressure a port to invest in emission or noise reduction, customers would demand sustained low prices; as a result, ports might choose to ignore the demands of one group in order to conform to the pressures of another. Indeed, our data suggests that inland ports are heavily dependent on their clients for sustained cargo volume, and that they put a strong focus on customer retention. In particular, certifications that are beyond the scope of legal compliance are strong evidence that ports need to conform to certain demands of their customers. As a matter of fact, all ports that are moving cargo on their own account (i.e., all ports excluding Port C) are certified to ISO 9001 and ISO 14001, while also having certifications relevant to the cargo transshipped (e.g., GMP for animal feed, GDP for cooling logistics). Ports invest in and attain these certifications to conform to normative expectations in general, and pressures from customers in particular. Following this logic, we argue that high dependence does indeed lead to a higher likelihood of conformity.

*Content* signifies the alignment of institutional pressures with internal goals. The assumptions here are that a lower degree of consistency and a higher degree of constraints imposed on the organization by following isomorphic forces will lead to more active resistance. In terms of consistency with internal goals, sustainability pressures have an ambiguous effect on ports. While some investments for enhanced sustainability have been found to be consistent with the internal goal of profitability (e.g., more advanced physical equipment lowers not only emissions, but also costs), and others are even necessary to attain internal goals (e.g., investments in education and training to guarantee a good supply of skilled personnel), investments that are not considered to be economically feasible are usually disregarded. Interestingly enough, even though an increase of constraints imposed by institutional pressure should have the same theoretical effect on ports as low internal consistency, our evidence suggests that the ports rather accept these

constraints, particularly when they are exerted as coercive pressures from customers. This is consistent with our findings of how the dependence on constituents shapes the intensity of institutional pressures on a port.

Institutional *control* describes the coercive and normative pressures exerted on firms. Generally, it can be expected that the lower the coercive pressures (i.e., legal coercion in the form of regulatory frameworks and penalties) and the lower the normative pressures (i.e., voluntary diffusion based on norms and practices), the higher the propensity of firms to actively resist institutional forces. For ports, there is a plethora of laws and regulations they need to adhere to, particularly when it comes to social and environmental issues. Due to not being in direct contact with end consumers, and thus arguably under less public scrutiny, ports might choose to resist some of these pressures in order to decrease costs. However, all ports show a high inclination to follow the law, due to penalties and image loss on non-compliance, and most ports state that they do not even consider the monetary and organizational efforts needed to fulfill the legal compliance, as it is seen as a minimum requirement of their operations. This implies a high degree of "taken for grantedness," i.e., strong evidence that the connected institutional pressures are ingrained in the organizational culture of the ports (Scott 2014). Voluntary proliferation of standards is much subtler. A high certification rate of ISO and similar standards implies that normative diffusion is also strong, particularly when ports are required to meet customer expectations. These channels are fortified by a loose partnership of the ports for marketing and lobbying purpose that facilitates the exchange of ideas and knowledge between ports.

The last institutional antecedent is *context*. *Context* refers to the general institutional environment of a firm; the lower uncertainty in the environment, and the lower the degree of interconnectedness and institutional ties, the higher the likelihood that firms will actively resist pressures. This follows the rationale that a high degree of uncertainty will coerce firms to follow institutional rules and norms, in lieu of better strategies to cope with uncertainty; likewise, a high degree of interconnectedness implies stronger institutional channels for the diffusion of institutional pressures. Referring back to DiMaggio and Powell (1983), a high degree of uncertainty and interconnectedness will lead to a higher degree of modeling within the industry. Even though ports face a high degree of uncertainty in demand due to external shocks, the uncertainty of the further development of sustainability demands is comparatively low. Granted, technological innovations and the accompanying regulatory changes are a significant source of uncertainty, particularly for an industry with high capital investments, but institutional and political change is usually slow,

and the pressures exerted are lower when compared to other antecedents. Conversely, interconnectedness in transportation is fairly high, making it easier for practices to diffuse through the industry.

Overall, our evidence suggests that the strongest antecedents of sustainability development in port operations are *cause, control,* and *constituents.* If demands for sustainability also increase efficiency or social legitimacy, or are imposed by important constituents like major customers, ports tend to comply and invest. In this regard, diffusion is supported by the high degree of interconnectedness of the industry. Furthermore, pressures exerted through institutional *control* are also accommodated, but with a lesser effect – our data suggests that while ports are ready to accept constraints imposed by alignment with institutional *content*, they do so only reactively, rather than proactively aligning their internal goals with institutional pressures. Similarly, the effects of *context* are low due to long investment horizons in physical assets, and the slow pace of political change, which make it easier for ports to resist and postpone investments. Data also suggests that possible constraints imposed by demands are accepted if they are found to be consistent with the port's general strategy, or required by specific constituents (e.g., through certification). Less influential stakeholders (e.g., local communities) seem to need the support of (coercive) institutional control to be able to affect ports' sustainability efforts.

## Discussion of strategic responses

A common criticism of institutional theory is that it underestimates the ability or propensity of organizations to actively shape and resist pressures (DiMaggio 1988). Indeed, ports might not always conform to isomorphic forces. Particularly when institutional demands are not consistent with internal goals, or demands from constituents are opposed to either the port's objectives or to demands made by other (more influential) constituents, ports might decide to resist institutional pressures. Oliver (1991) offers a set of five strategic responses – acquiescence, compromise, avoidance, defiance, and manipulation – with three respective tactics to classify a firm's potential reaction when confronted with institutional pressures.

Acquiescence is the most passive form of response and includes the tactics of habit, imitate, or comply. Habit tactics correspond to a certain "taken for grantedness" exhibited by the ports. They refer to institutionalized norms and expectations about sustainability efforts. For example, all ports pay fair wages, have a strict policy to prevent littering, and

closely monitor economic benchmarks. While there might be legal restrictions that constrain what the ports could do, they have institutionalized these norms by virtue of habit and thus do not challenge them. Imitation refers to the conscious or unconscious mimicry of organizational strategy, and is similar to what is called “modeling” by DiMaggio and Powell (1983). Firms imitate by following paragon organizations that are seen as successful, by following consulting or expert advice, or by following certain voluntary frameworks for certification. The last part is particularly evident – all ports with operations on their own account have ISO certifications, thus replicating organizational technology, and becoming increasingly homogeneous. Port C as a landlord port is not ISO certified, but the majority of the local operators are. Lastly, compliance denotes the conscious decision to follow regulations and the law. All ports in our sample stress a strong commitment to legal compliance when it comes to environmental and social regulations, in particular as non-conformity is connected with penalties and image loss (Gunningham et al. 2004). Even though they are operating in a business-to-business environment which could indicate less dependence on good public relations, our data suggests that all ports in the sample have internalized the goal to maintain a favorable public image, and as a result, do not question their role as the regional economic driver and employer.

Compromise and its tactics balance, pacify, and bargain signify the first efforts of a firm to lessen the impact of institutional forces. Given a certain multiplicity of constituents with often diverging or ambiguous goals, most firms see the necessity to balance institutional pressures. While our data shows that ports feel a need to be more sustainable, they are also subject to immense cost pressures exerted by their customers, who are unwilling to pay for more sustainable services. As a result, ports try to balance the pressures by identifying investment potentials to address both issues. This includes improved scheduling of trucks (better operational efficiency and fewer (noise) emissions), more efficient assets (better fuel efficiency and lower emissions), energy saving initiatives and, to a certain degree, investment in renewable energy. Naturally, these win-win situations are limited in number, and while the inland ports do their best to identify them and realize the potentials, social or environmental sustainability efforts are often disregarded in favor of improved economic viability to cater to cost pressures from clients. In these cases, ports often use pacification tactics to weaken demand for additional sustainability efforts. Calls by local stakeholders for noise mitigation, for example, are often met with reactive investments in noise barriers, rather than trying to reduce the noise itself; for the ports, it is entirely irrelevant whether these barriers are suitable for noise mitigation – they are built

simply to pacify demands. Similarly, ports engage in bargaining tactics, particularly with comparatively weaker local authorities; before committing to sustainability investments that are not perceived to be economically feasible, ports often try to get concessions from the source of institutional pressure – in the example of demands for noise mitigation, this could include resettlement, rededication of the area as an industrial zone, or public subsidies for the noise barrier.

Avoidance denotes the active decision to find ways of forgoing the necessity of conformity, or to shroud nonconformity from the sources of institutional forces. Respective tactics are concealment, buffering, and escape. Firms might choose to consciously conceal their nonconformity to institutional pressures, knowing full well the potential (social) penalties that might be imposed on the firm if caught. We found little evidence of concealment tactics in the ports. Ironically, due to the nature of concealment, this might not mean that this is not an employed tactic – it might also just indicate that inland ports are good at hiding their non-conformity to sustainability norms. One indication of this is that none of the ports in the sample – contrary to many of their bigger seaport counterparts – issue a sustainability report or any type of annual report that might disclose sustainability information. This also helps them to employ the tactic of buffering, which is the attempt to reduce the degree of external inspection a firm is subject to. By not issuing reports, the ports are essentially buffering sustainability pressures by making the data costlier to obtain by constituents and harder to compare with similar ports. Furthermore, inland ports operate exclusively in a business-to-business setting and are more or less invisible to the end consumer. As a result, they are able to buffer pressures that do not come from close constituents like authorities, customers, or local communities. Ports in our sample also exhibit the tactic of escape. Escape tactics are used by firms to completely withdraw from a field with institutional pressures they do not want to conform to. In our data sample, we have multiple examples of ports deliberately not engaging in the transportation or transhipment of certain goods due to the complexity of their operations and the high level of environmental and social standards to meet. Indeed, only Port D has decided to cover the niche of transshipping and transporting chemical and pharmaceutical goods due to very high safety and environmental requirements. Similar considerations hold true for the handling of crude oil – ports B and C refrain from offering crude oil transhipment due to high operational and legal requirements.

Companies that employ a defiance strategy exhibit a high degree of resistance to institutional processes, and their potential set of actions include dismissal, challenge, or

attack tactics. By actively dismissing institutional pressures, firms aim to salvage their own legitimacy by lowering the legitimacy of the forces affecting them. A major example of this is the port's unwillingness to develop formalized sustainability concepts rather than reactively addressing issues. Managers have stated several times that sustainability concepts are "just not needed" or "would not improve the port's performance." Some have also mentioned that they do not really understand the new sustainability discourse, as they feel like the discussion is just trying to address what they have already been doing for decades and is missing the point. Through dismissing sustainability pressures as over-formalized, the ports attempt to shape the discourse in a way that reduces uncertainty and the potential need for further investments in their future. Ports also challenge the positive impact of some sustainability initiatives, stating that the economic investment would particularly not be feasible, or trying to understate the negative impact of their operations. For example, Port B has tested investment in renewable energy and made the conscious decision not to follow through with it, as the economic incentives were not high enough. Furthermore, all ports also challenge the notion that their operations are having an impact on ecology and the natural habitat of wildlife, stating that "the port is a dedicated industrial zone"; Port A even stated that they do not produce any noteworthy emissions in their operations at all. The most active way of defiance, though, is the direct attack on institutional norms. Ports justify their lack of investment in sustainability with the customers' unwillingness to pay higher fees or a premium, thus making investments not feasible in their eyes. Their rationale is that as long as customers are not willing to pay, the general demand is not strong enough to justify investments.

The highest degree of active resistance can be observed in manipulation strategies that try to proactively shape institutional pressures in favor of a firm. Companies can choose to co-opt, influence, or control pressures to generate a more favorable institutional environment. Co-opting a source of institutional pressure can not only enable a firm to affect the nature of this pressure but can also improve legitimacy through institutional ties. The ports employ this strategy to a limited degree; they all invest in logistics education and training outside the boundary of their firms, some of them by entering academic partnerships with secondary and tertiary educational institutions (universities, universities of applied science, vocational schools). This helps them to generate legitimacy and goodwill, while also being able to affect the base understanding of graduates (and future experts) of how business is conducted (and should be conducted) in the industry. Influence tactics are a more general variation of co-optation; influence does not try to affect pressures by building institutional

ties to a source, but by changing general beliefs and norms. Ports actively engage in influence tactics through joint lobbying efforts and partnerships. Through a coordinated effort they are able to promote their business, attract potential customers to Austria, affect new laws and regulations, and shape the public's general expectations about their operations. The last manipulation tactic is control, denoting the attempt of a firm to completely seize and manipulate the source of an institutional pressure. The literature suggests that this is normally the case with pressures originating from small constituents, e.g., local stakeholders. In our study, we were unable to find any evidence of the ports actively trying to control forces to this degree; this might be due to the fact that the ports do not have enough power to effectively do so, or because pressures from local stakeholders tend to be relatively weak.

In sum, all major strategic responses to institutional pressures have been identified within our data sample (see Table 13 and Table 14). While inland ports readily conform to some sustainability pressures, they try to avoid or defy others. The reason for different strategic responses to similar pressures can be found in the differing antecedents: if constituents are ambivalent, internal consistency is low, or penalties are not high enough, inland ports will increase their active resistance to pressures. In other words, it is safe to assume that the antecedents of a particular pressure have a significant effect on a port's strategic response to it.

*Table 13: Overview of observed strategic responses to institutional forces*

| **Strategy** | **Tactic** | **Port example** |
|---|---|---|
| **Acquiesce** | Habit | No littering, fair employee compensation |
| | Imitate | Use of KPIs, ISO-certifications |
| | Comply | Legal compliance |
| **Compromise** | Balance | Some additional investments in sustainability (if win-win) |
| | Pacify | Reactive investments to "resolve" issues; only minor improvements |
| | Bargain | Try to get concessions from local stakeholders |
| **Avoid** | Conceal | Not observed in sample |
| | Buffer | Little to no external sustainability reporting |
| | Escape | Portfolio decisions (e.g., no liquid bulk; no chemicals, etc.) |
| **Defy** | Dismiss | Dismiss necessity for e.g., sustainability KPIs, monitoring |
| | Challenge | Question (economic) viability of investment in sustainability |
| | Attack | Explain lack of investment with customers' unwillingness to pay |
| **Manipulate** | Co-opt | Investment in logistics education, academic partnerships |
| | Influence | Joint lobbying efforts, partnerships |
| | Control | Not observed in sample |

*Table 14: Observed strategic responses on port level*

| Strategy | Tactic | Port A | Port B | Port C | Port D |
|---|---|---|---|---|---|
| **Acquiesce** | Habit | Yes | Yes | Yes | Yes |
| | Imitate | Yes | Yes | Partly | Yes |
| | Comply | Yes | Yes | Yes | Yes |
| **Compromise** | Balance | Partly | Partly | Partly | Partly |
| | Pacify | Yes | Yes | Yes | Yes |
| | Bargain | Yes | Yes | Yes | Yes |
| **Avoid** | Conceal | No | No | No | No |
| | Buffer | Partly | Partly | Partly | Partly |
| | Escape | No | Yes | Yes | No |
| **Defy** | Dismiss | Yes | Yes | Partly | Partly |
| | Challenge | Partly | Yes | Partly | Partly |
| | Attack | Yes | Yes | Yes | Yes |
| **Manipulate** | Co-opt | Yes | No | Yes | No |
| | Influence | Yes | Yes | Yes | Yes |
| | Control | No | No | No | No |

## Conclusion

This chapter explores the adoption of sustainability practice in inland port operations. We postulated that while inland ports have an intrinsic need for economic viability in their operations, they are increasingly regarding the environmental and social impact of their business. Indeed, there is evidence that profitability and operational efficiency are focal issues of inland ports, and all ports in our data sample show an above average commitment to social sustainability. Ports seem to be aware of their roles as employers, regional suppliers and economic drivers, and seek good relations and regular exchanges with stakeholders as part of their core business strategy. However, our results suggest that while ports are certainly aware of environmental initiatives, they are only realized when they are deemed economically feasible in the short term and have no negative implications for operational efficiency. Our findings suggest that this issue is exacerbated by immense cost pressures and customers' unwillingness to pay for environmental protection in port operations and holds important implications for the implementation of green transportation and logistics practices in (inland) ports – without customer demand, subsidies or other incentives, environmental practice adoption will likely always be constricted by economic and operational considerations.

Furthermore, this study explores the antecedents of and strategic responses to sustainability pressures in inland port operations. We address several gaps in the literature:

Firstly, we contribute to the ongoing discussion of sustainability in transportation management research with a focus on antecedents of sustainability development. Secondly, we discuss inland port operations; while inland port operations are comparatively less regarded in the current academic discussion on port operations, they are certainly important nodes in many international transportation networks and contribute significantly to hinterland, transhipment, and intermodal transportation efficiency. Thirdly, we introduce two theories – institutional theory and resource dependence theory – to the discourse of sustainability practice adoption in general port operations that have only scarcely been applied before and show that they are both suitable lenses for investigating sustainability practice adoption in port operations.

Our data suggests that *cause, constituents*, and *control* are the most important antecedents of institutional change in inland port operations. While all five antecedents defined by Oliver (1991) have a certain degree of influence, ports will adopt practices that are consistent with their internal goals, requested by important stakeholders, or required by law with the highest probability. This is mirrored in our finding that ports tend to implement sustainability practices that lower costs, increase efficiency, ensure business and cargo flows, or avoid penalties, but hesitate to invest in initiatives that show no immediate payoff. This has a major effect on how inland ports react strategically: for example, if internal consistency or institutional control is high, they are more likely to acquiesce to pressures; if constituents' demands are divergent, they will try to balance or avoid certain pressures; and if institutional pressures are perceived to be inconsistent with internal aims, ports are likely to actively resist them. Similarly, low uncertainty in the institutional *context* of sustainability development, contingent on slow political change and long asset life cycles, as well as a low willingness to align internal goals with the intended purpose of institutional *content* lead to comparatively fewer incentives for inland ports to develop or adopt sustainability practices.

Apart from our academic contributions, the results have implications for inland port managers and policymakers. We discuss the current status quo of sustainability efforts in inland port operations in developed countries; furthermore, we exemplify strategies that could be utilized to actively resist or shape institutional pressures: By understanding the antecedents of sustainability demands, managers might be able to make better-informed decisions on how to react appropriately. For example, if a local community is requesting additional investment in noise mitigating infrastructure, a port manager can assess the consistency with the port's strategy (*cause*), the importance and power of the stakeholder

(*constituents*), and the legal framework as well as the social expectations (*control*) of the investment. The manager can then subsequently decide to conform to the demand (*acquiesce*), try to reduce the extent of the investment or get subsidies for it (*compromise*), attempt to reorganize operations to lower noise levels or restrict noisy works to limited time windows (*avoid*), or try to prove that noise levels are within acceptable bounds (*defy*).

In addition, we sketch some potentials for win-win situations between two, or even all, dimensions of sustainability in inland port operations – for example, the majority of ports in our sample have invested in solar panels to power their warehouse and storage operations, which have decreased dependence on fossil fuels and energy costs particularly for ports that operate storage facilities with a high-energy consumption (e.g., cold storage). Policymakers could benefit from a better understanding of how institutional pressures diffuse through an industry and how they can be exerted in an efficient manner. Furthermore, our ideas might contribute to an assessment of the effectiveness of the current regulative framework, help to improve sustainability efforts in ports, and provide insights into how to shape regulations to come.

However, there are certain limitations to our research. First of all, there are pitfalls connected to our chosen research method and its qualitative nature. Case studies are perceived as more subjective than quantitative approaches and are thus more often subject to objections (Seuring 2008). To address this issue, we aimed for a high degree of transparency in our documentation and explanation of our approach – from the selection of cases to data collection and analysis. Furthermore, due to a certain desirability bias of interview partners (Podsakoff et al. 2003), researchers need to be cautious in interpreting any conclusions drawn from primary data. Thus, we only considered our results as valid when our findings from interviews were corroborated by secondary data (Yin 2013). Apart from issues connected to the chosen research method, our study may lack external validity. Even though we employed a cross-case analysis to improve the generalizability of our results, we tried to minimize variation of institutional pressures, and as a result, the study is still limited to the context of a small, developed country. Thus, we encourage researchers to investigate institutional sustainability pressures in different institutional contexts. Lastly, we use the term “sustainability pressure” broadly. Indeed, pressures for sustainability are by no means homogeneous, and it might very well be that, e.g., pressures for lower emissions follow a completely different institutional logic than pressures for increased accident prevention. However, due to the comparatively low development of the sustainability discourse in inland port operations, we deemed it necessary to establish a

starting point and lead with a more general discussion. Investigating the respective pressures in greater depth and comparing the different diffusion mechanisms and strategic responses is a promising direction.

# Chapter 4 – Quantitative research

# Essay 4: Talking about doing good together? Firm-internal corporate social responsibility communication levels and alliance membership

## Chapter summary

We employ behavioral and institutional tenets to analyze how institutional pressures enter the goal-selection process of firms and how these pressures are gradually internalized as firm goals. Employing the behavioral theory of institutionalization, we hypothesize that goal-selection processes and internal aspiration levels for external goals are affected by institutional pressures. Based on longitudinal data of the Corporate Social Responsibility (CSR) communication efforts of 38 global airlines, we show that firms are affected by institutional pressures in their goal selection. Our evidence suggests that particularly social comparison and mimetic isomorphism within strategic alliances play a role in the diffusion of CSR communication efforts and practices. To conclude, we provide insights on the diffusion of (CSR) communication efforts, practices and innovations within alliances, and empirical evidence to support the behavioral theory of institutionalization.

## Introduction

Corporate social responsibility (CSR) as a collective term for firms' efforts toward societal and environmental needs has been an influential topic in management research in recent decades. The common body of literature analyzes the interplay between financial performance and CSR (Waddock and Graves 1997, Wang et al. 2016), the effects of CSR on firm and shareholder value (Flammer 2013, Godfrey et al. 2009), as well as the antecedents and the efficacy of CSR practices (Doh and Guay 2006). Some researchers make a strong case that CSR is externally imposed on firms (Chih et al. 2010), however, this neither explains why some firms in similar institutional contexts exhibit a divergence of CSR efforts (Vejvar et al. 2016), nor does it provide insights into how firms decide on their level of external CSR communication to acquiesce to pressures. In other words, while the "why" and "what" have received ample attention in the literature, the "how" of CSR communication, i.e., the specific firm-internal process that decides on an adequate level of CSR communication efforts, has drawn comparatively less attention.

This study aims to increase our understanding of firm-internal decision-making processes when it comes to CSR communication efforts. Ingrained in a behavioral theory of the firm

(BTF), we postulate that firms see the need for CSR communication as an externally-imposed, secondary goal and define an internal aspiration level to select and update their CSR communication goals, based on their historical performance and the observed communication intensity of peer firms they perceive to be similar to themselves. Due to the vague notion of CSR and the correlated organizational uncertainty (Schwartz and Tilling 2009), we expect institutional pressures to be a major impact factor influencing the internal CSR communications goal-setting processes of firms. While traditional BTF research accounts for externally-imposed demands, they are usually seen as necessary side payments (Cyert and March 1992) and receive comparably less research attention than primary goals like profitability (Greve 2003, Lant 1992). To answer the guiding research question of this study of "How do firms decide on their external CSR communications, and what factors affect their decisions?", we seek to account for how institutional pressures shape internal goal-finding processes for CSR communication efforts.

We see two independent, yet connected theories: the behavioral theory of the firm that provides insights on internal goal selection processes with a lower regard for external pressures on goal selection, and the institutional theory that focuses on the external pressures on firms with less concern about agency and firms' option to actively resist external pressures (DiMaggio 1988, Greve and Teh 2018, Oliver 1991). Following the behavioral theory of institutionalization proposed by Greve and Teh (2018), we show that the synthesis of institutional and behavioral tenets provides an appropriate theoretical lens to analyze how firms choose and update their internal level of CSR communication efforts based on external institutional pressures. While conceptually not the same, the main drivers of historical and social aspiration levels in the BTF can be seen as related to two of the main drivers of homogenization in institutional theory, i.e., normative and mimetic isomorphism (DiMaggio and Powell 1983). Consequently, based on the behavioral theory of institutionalization and supported by a longitudinal data sample from the global aviation industry, this study analyzes how firms set and update their CSR communication efforts, with a particular focus on the role of alliances for the social comparison mechanisms innate in both BTF and institutional theory.

## Conceptual development and hypotheses

### *Corporate social responsibility*

CSR follows the notion that firms have a societal responsibility that exceeds shareholder value and relations with direct stakeholders (Wang et al. 2016). Indeed, CSR, both as a form

of voluntary self-governance and as a social imperative of “giving back” to society (Matten and Moon 2008), has gained significant traction throughout recent decades, in part due to the increasing awareness of accelerating environmental and societal externalities generated by globalization (Jenkins 2005, Lim and Tsutsui 2012). While CSR policies are usually clearly defined and easily identifiable as CSR (Matten and Moon 2008), their manifestation and implementation are often much vaguer, and it is not always clear whether a corporation is implementing a CSR practice for the societal good or due to expected personal gains. Thus, the interpretation, implementation, and regulation of CSR can be different between different environmental contexts and even between corporations (Doh and Guay 2006, Freeman and Hasnaoui 2011, Husted et al. 2016), making a clear definition of CSR practice hard to come by. One way to differentiate CSR is by categorizing it into explicit and implicit CSR (Matten and Moon 2008). While implicit CSR denotes the values and norms deeply ingrained within a firm that define the firm’s informal and formal position within the broader societal context, explicit CSR describes the actual salient policies, programs, and initiatives undertaken by a firm to support the greater societal good.

CSR has been analyzed from a multitude of different theoretical lenses (Garriga and Mele 2004) and strategic management research on CSR has put a strong focus on defining and analyzing the link between social and financial performance (Lee 2008, Waddock and Graves 1997). Prior findings in the research on CSR have led to contradicting conclusions about the nature of this connection (Orlitzky et al. 2003), but early CSR research often struggled with measurement issues (Wood and Jones 1995) and model misspecifications (Margolis and Walsh 2003). Indeed, more recent research supports the positive link between a firm’s social and financial performance (Barnett and Salomon 2006). However, there is no consensus yet that this relationship is causal (Chih et al. 2010); Surroca et al. (2010), for example, propose that the relationship of social and financial performance is contingent on a firm’s intangible resources, like reputation, human capital, and culture.

Prominent research streams in CSR research employ institutional theory (Brammer et al. 2012, Campbell 2007) to explain the diffusion and adoption of CSR practices or employ stakeholder theory to treat CSR as an invaluable tool in stakeholder relation management to ensure support of critical stakeholder groups (Jamali 2008, Mitchell et al. 1997, Steurer et al. 2005). In this regard, CSR has also been discussed as a form of self-governance in a globalized context (Scherer and Palazzo 2011). Both from a stakeholder theory and an institutional perspective, CSR is seen as a more or less given external pressure imposed on

firms that the firms succumb to in order to attain legitimacy from an institutional perspective (Doh et al. 2010, Marquis and Qian 2014) or to improve their relations with stakeholders (Steurer et al. 2005). However, while the motivations of firms to engage in CSR activities and the effect of CSR on a firm's performance and environment are well discussed from diverse theoretical backgrounds, the question as to how firms set, monitor, and adjust both their CSR performance and how they externally communicate CSR have been significantly less researched (Wang et al. 2016). Indeed, many of the prominent theoretical perspectives applied to CSR – like institutional theory – lack the firm-level introspection to explain how firms react to these external pressures in their own goal-finding and performance-setting processes; consequently, we employ BTF to understand how firms decide and update their CSR communication goals.

### *Behavioral theory of the firm*

Established by Cyert and March (1992), a behavioral theory of the firm views performance feedback at the core of the organizational goal-finding process. In BTF, a dominant coalition of decision-makers first sets an organizational goal based on aspiration levels and later evaluates whether the goal has been fulfilled or not (Argote and Greve 2007). If the goal is fulfilled, decision-makers turn their attention to other matters and decrease their risk tolerance; if it is not, they start looking for solutions and increase their overall risk tolerance (Cyert and March 1992, Greve 1998). Thus, the internal goal-setting process, the performance-feedback loop, and the effect of under- and overachieving goals on organizational risk-taking are at the center of BTF (Cyert and March 1992, Fiegenbaum and Thomas 1988). The theory assumes that the dominant coalition of decision-makers acts according to bounded rationality, which emphasizes rational behavior limited by the actors' knowledge, rather than assuming complete information (Simon 1952). Consequently, this implies that set goals are not necessarily the "optimal" goals for the firm, and in some cases, goals might even be arbitrarily established.

Aspiration levels are a guiding factor of the dominant coalition's goal-setting process. They are a method to monitor performance with respect to organizational goals, and consequently function as governing mechanisms of organizational efforts (Greve 2003). Goals can be based on a natural aspiration level (i.e., a level that seems logical or "given" to decision-makers), historical aspiration levels (i.e., a level in line with the historical performance of the organization), or social aspiration levels (i.e., a level established through social comparison with similar firms), and in practice, all of these aspiration levels

will be factored in the organizational goal to a certain degree. If a firm's performance is exceeding its aspiration level, BTF suggests that it will not increase its efforts, as organizational goals have already been met. Cyert and March (1992) call this process "satisficing." Decision-makers are content with the performance and focus their limited attention on other issues at hand, following a sequential attention to goals. However, if a firm fails to meet its performance goals, it will engage in a problemistic search to identify issues and potential solutions. The literature suggests that, subject to the idea of social comparison, firms start a problemistic search within their immediate environment and, if unsuccessful, expand their search patterns further out to identify solutions. This implies that a firm's performance in relation to its aspiration level has a direct effect on the intensity of problemistic search and, in turn, propensity to organizational change (Cyert and March 1992, Greve 2003).

Organizational goals can be formulated either as numerical goals or as mission statements, but the majority of empirical BTF literature has focused on numerical goals due to their quantifiability. The most prominent goal discussed in the extant literature is financial performance (Uotila et al. 2009). However, the theory has been extended to other organizational concepts, such as firm size and growth (Audia and Greve 2006, Greve 2003), stock price returns (Mishina et al. 2010), and in a non-business context, sports team scores (Lehman and Hahn 2013).

When it comes to non-financial, secondary goals, the current body of literature does not offer much insight into how these goals are addressed from a BTF perspective. In the CSR-specific case, it seems that firms feel a need to address CSR issues as they are presented to them, but they might be significantly less interested in the actual efficacy of the solutions found and make "side payments" to acquiesce stakeholders rather than proactively tackling the issue (Crilly et al. 2012). However, to the authors' knowledge, no empirical study has investigated the aspiration levels of a firm's external CSR communication, or whether CSR communication goals are governed by processes following a BTF logic. Operationalizing CSR reporting efforts and aspiration levels in organizations is a difficult task due to a lack of objective measurements and the general breadth of the concept (Carroll 1999). Pressures for CSR practice implementation and reporting are usually exerted by an external source (Campbell 2007, Chih et al. 2010), and CSR goals are usually secondary to profit considerations for any commercial firm (Carroll and Shabana 2010). Consequently, we conceptualize CSR communication goals as a secondary external goal within a firm that enters the goal selection process either as a side payment to important stakeholders, or

through supportive members within the dominant coalition. We expect organizational CSR communication goals to be significantly less formalized than traditional performance goals – like return on sales or return on assets (ROA) – that have traditionally been at the center of BTF and expect them to only have limited support within the dominant coalition.

It is unsurprising that so far, CSR goals and CSR aspiration levels have not been discussed from a BTF perspective. Indeed, "traditional" BTF might not even be a suitable lens to discuss CSR goals and aspiration levels within a firm due to their external nature and BTF's lack of focus on the effect of external, institutional pressures on firm goals – even though recent studies have highlighted the moderating effect of the external environment on the performance feedback mechanism in firms (Rowley et al. 2016, Shipilov et al. 2010, Wezel and Saka-Helmhout 2006). By further expanding on BTF by enriching it with institutional tenets to attain a "behavioral theory of institutionalization" (Greve and Teh 2018), we can maintain the focus on firm-internal goal-finding processes while accounting for external institutional influence.

### *Institutional theory*

In contrast to BTF, institutional theory focuses on firms within the context of their environment (Abell 1995). A key concept in institutional theory is the struggle for legitimacy and stability, which can be achieved by conforming to regulative, normative, and cultural-cognitive pressures (Deephouse 1996, Scott 2014). Consequently, institutional theory adopts a more passive understanding of firms. Rather than actively shaping their goals by themselves, firms are seen as being strongly affected by greater institutional forces that they need to attain to, and which they – in the case of latent norms and values – even subconsciously follow. DiMaggio and Powell (1983) call these institutional pressures isomorphisms and see them as the main driver of increasing homogenization between organizations. The three isomorphisms conceptualized are coercive isomorphisms, i.e., the pressures exerted by other organizations that are penalized on non-compliance, often referring to regulative frameworks and contractual obligations; normative isomorphisms, which encompass the normative expectations and social obligations of how organizations should act (Scott 2014), and mimetic isomorphism, which is a response of firms confronted with organizational uncertainty. Companies facing ambiguous goals or unclear objectives often look to firms perceived as more successful to mimic and "model" themselves after them (DiMaggio and Powell 1983).

From an institutional perspective, CSR can be conceptualized as an acquiescence to coercive pressures exerted by suppliers, customers, alliance partners or the general public (Husted et al. 2016), implementation of "taken-for-granted" norms and values about how firms should interact with their environment (Campbell 2007), or firms following the trail of market leaders due to the general organizational uncertainty connected with the implementation of CSR practices (Vejvar et al. 2016). CSR from an institutional perspective has been associated with an improved reputation (Doh et al. 2010), increased social support (McDonnell and King 2013), and an "insurance-like" goodwill with shareholders in case of negative events (Godfrey et al. 2009) for a firm. However, evidence suggests that the institutional context itself might be a significant contingency factor when it comes to the reasons and (financial) impacts of CSR practice adoption (Doh and Guay 2006, Freeman and Hasnaoui 2011, Julian and Ofori-Dankwa 2013).

A key concept to regard when analyzing CSR practice adoption through an institutional lens is decoupling. Decoupling denotes the ceremonial adoption of a practice that is distinctly de-connected from the adopted practice's purpose. Rather than fully adopting CSR practices, firms pay lip-service ("white-washing" in practical terms) by declaring the adoption of a practice without following through, or by adopting a practice without paying attention to whether the adopted practice fulfills the declared aim (Marquis and Qian 2014, Meyer and Rowan 1977); consequently, firms might be more interested in communicating CSR, rather than actually implementing it. Decoupling can occur when organizations feel forced to react to institutional pressures, but either lack resources, understanding, or the will to follow through with actual practice adoption (Lim and Tsutsui 2012). Established organizations like major corporations that operate in different institutional environments with ambiguous and conflicting pressures have been found to be particularly prone to decoupling (Weber et al. 2009).

### *Aspiration levels and institutional pressures*

We see ourselves confronted with an interesting conundrum: while BTF as a process-based theory focuses on internal goal selection, it lacks consideration of how these goals are affected by external, institutional forces. Meanwhile, institutional theory as an outcome-based theory puts a strong emphasis on the external influence on firms but is regularly criticized due to the lack of agency it attributes to organizations. Greve and Teh (2018) argue that while the differences between these theoretical lenses are distinct, they share sufficient common ground to be connected in a more holistic theory that enables

researchers to conceptualize both how goals are set internally, and how these goals are affected by (and affecting) institutional pressures. For instance, bounded rationality and social comparison are concepts at the core of BTF that are applied in institutional theory. Furthermore, decoupling from institutional pressures can be interpreted as a form of satisficing when done as side payments to acquiesce external demand, as firms "settle" on practice adoption, but not at reaching the implemented practice's intended outcome. What was coined as "mimetic isomorphism" by DiMaggio and Powell (1983), i.e., modeling organizational processes based on firms perceived as successful in the organizational environment as a reaction to uncertainty can be interpreted as a form of problemistic search based on social comparison from a BTF perspective, and seen as a driver of organizational change toward homogenization. It seems that while the theories are conceptually distinct, they resemble different perspectives of overlapping organizational and external processes that affect organizational CSR communication goals in similar ways. We will subsequently discuss the impact of historical and social aspiration levels as well as the corresponding institutional pressures on a firm's external CSR communication efforts and hypothesize about the expected impacts (see Figure 8).

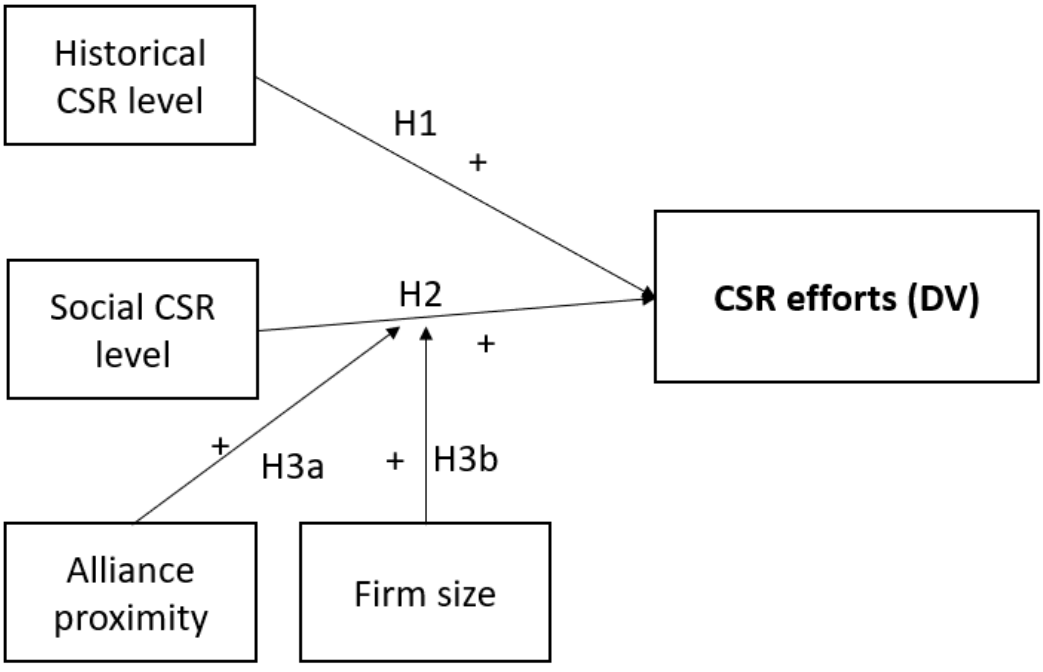


*Figure 8: Conceptual model and hypotheses*

*Historical aspiration level and normative isomorphism.* Normative isomorphisms refer to the general "taken-for-grantedness" of a practice (Scott 2014). They are shaped over time

as both the firm and society get used to certain practices or approaches because "it has always been like that." As such, norms and values that have already been fully internalized by the dominant coalition cannot be used in any theory that analyzes goal selection, as there is per definition no "choice" in practice adoption (Zucker 1977); as a result, we need to analyze norms and values that are currently in the process of being institutionalized but have not yet fully permeated the dominant coalition. These institutionalizing processes are expected to challenge the status quo of a firm and influence the goal-selection process, as aspirations levels are updated from what the firm is "used to" in terms of efforts to be more in line with current external pressures. Similarly, historical aspiration levels have a significant impact on a firm's goal selection process due to benchmarking historical data to assess what level is seen as "appropriate" (Lant 1992). Firms might be reluctant to perform below historic levels of effort as they might feel that prior performance is what stakeholders have come to "expect" from them. Furthermore, in a business environment that puts normative pressure on firms toward "more" CSR communication, firms might feel additional pressure to build upon their historical performance. Consequently, we expect that

***H1:*** *A firm's current CSR communication efforts are positively affected by higher historical communication efforts*

*Social aspiration level and mimetic isomorphism.* Mimetic isomorphism describes the practice of firms "modeling" themselves after firms they perceive as successful (often market leaders) when confronted with organizational uncertainty. Similarly, BTF suggests that firms model their goals after similar firms via social comparison. In the case of CSR that is marked by a very diverse discourse on its potential costs and benefits (Wang et al. 2016) that is bound to increase organizational uncertainty, we expect social comparison and mimetic isomorphism to be a very strong influence factor on a firm's level of CSR communication. As a result, we conjecture that

***H2:*** *A firm's CSR communication efforts are positively affected by higher overall CSR communication of other firms in the industry*

### *Alliance formation*

Strategic alliances are interorganizational networks that can either be horizontally or vertically aligned, and firms join these networks in order to gain access to critical resources

(Barringer and Harrison 2000, Gulati and Garguilo 1999). These resources include market access, technology, and organizational knowledge (Grant and Baden-Fuller 2004). The nature of interorganizational networks has been intensively studied to explore the foundation, evolution, governance and performance of alliances, as well as their effect on members' performance (Gulati 1998). Alliances are means for firms to acquire market access, particularly when other options like mergers, acquisitions, or relocations are not viable or are legally not possible, and firms have also been found to join alliances to attain access to knowledge and expertise (Oum et al. 2000, Wassmer and Dussauge 2012). Indeed, strategic alliances have been found to drive product innovation (Kotabe and Scott Swan 1995) and the diffusion of practices (Boisot and Child 1999, Nooteboom 1999); however, in the case of CSR research, strategic alliances as drivers of CSR practice diffusion have received comparatively less research attention. Recent case-based research has focused on the cooperation between firms and non-governmental organizations to drive CSR initiatives in "social alliances" (Jamali and Keshishian 2009, Jamali et al. 2011, Sakarya et al. 2012, Utting and Zammit 2009), but does not offer insights on how CSR efforts diffuse between for-profit firms in strategic alliances.

Both BTF and institutional theory suggest that firms compare themselves to organizations they perceive as being similar. BTF postulates that firms failing to achieve their aspiration level will engage in problemistic search and look toward peers in their business environment to identify solutions (Cyert and March 1992), while institutional theory suggests that firms look to organizations confronted with similar institutional forces when confronted with organizational uncertainty (DiMaggio and Powell 1983). Consequently, due to the increased organizational proximity to alliance members, we expect a firm's social aspiration levels to be affected by the general level of CSR communication within the alliances, as a focal firm will look to other alliance members to resolve organizational uncertainty.

***H3a:*** *Due to closer proximity, the overall CSR communication efforts of alliance members will have a stronger effect on a focal firm's CSR communication than the efforts of non-alliance members*

Institutional theory also states that firms confronted with organizational uncertainty benchmark market leaders to resolve ambiguity. Furthermore, strategic alliances are an excellent environment for normative, mimetic, and coercive diffusion of practices. We expect that firms will prioritize alliance members in their problemistic search that are

perceived as being more successful – similar to what DiMaggio and Powell (1983) refer to as "modeling" – as a response to organizational uncertainty. Consequently, we propose that

***H3b:*** *The higher the CSR communication of alliance market leaders is, the higher the CSR communication efforts of other alliance members*

## Data and method

### *Data*

We test our hypotheses on a data sample from global commercial aviation. Transportation firms, particularly firms engaging in international transportation like liner shipping companies or airlines, are relatively "footloose" and can evade national or regional regulations to a certain extent; consequently, alternative approaches to regulation, like voluntary self-governance in the form of CSR, need to be explored (Yliskylä-Peuralahti and Gritsenko 2014). Furthermore, the transportation industry is notorious for its massive negative externalities, including greenhouse gas emissions and poor working conditions, as well as its comparative low investment in CSR (Cowper-Smith and de Grosbois 2011, Demir et al. 2015, Sampson and Ellis 2015). Passenger airlines were chosen as the study context because of their high propensity to join strategic alliances due to their reliance on market access to build competitive networks and their high (and increasing) environmental and social impacts. Furthermore, the formation of airline alliances has been extensively studied and has been found to be mainly governed by economic drivers like financial (Fu et al. 2010, Oum et al. 2000) and operational performance (Lazzarini 2007), thus minimizing the risk of reverse causality (i.e., alliances forming due to similar CSR preferences). What is more, airline alliances are also very stable, and carriers usually do not leave alliances after joining. This characteristic makes the industry suitable for a longitudinal analysis without too much interference through changes in alliance structure. Indeed, airline alliances also include a year of "probation" for new airlines before officially joining the alliance (Zhang et al. 2011), which could mark the start of alliance-based institutional pressures affecting new joiners. Thus, we expect to see the effects of any alliance-based isomorphisms on new airlines from the first year of joining.

Our initial data sample included every airline that is currently a member of one of the three major airline alliances (Skyteam, Oneworld, StarAlliance), and included 61 full alliance members in total. To analyze changes in alliance membership over time, we track the

openly communicated CSR coverage of all firms over the course of 25 years, starting in 1993. Twenty-five years was chosen as a time horizon for our study as the first airline alliance was founded in 1997. This allows us to track historical CSR communication aspirations level of founding members before alliance formation and generate insights into how they were affected by alliance foundation.

To enable social comparison, any data that we employ must be observable and publicly available to airlines without a significant time lag. Thus, we analyze the intensity (i.e., quantity) of firms' openly communicated explicit CSR efforts. From an institutional perspective, firms have a very high incentive to openly communicate their efforts to the general public to appease external demands and show that they are actively engaging in CSR (Bartley and Child 2014, King 2008). Furthermore, only openly communicated CSR efforts enable social comparison processes between firms.

The data were collected via the news data base Factiva based on a string of CSR-related keywords. However, there is only a limited consensus on what the most pressing CSR issues in aviation are, and not all airlines actively engage in the CSR discourse (Cowper-Smith and de Grosbois 2011). Consequently, to identify the most pertinent CSR issues in aviation, and to derive the highest possible objectivity in our keyword-based search, both CSR topics and related keywords were determined via topic modeling, a machine learning frequency-based approach for text mining ingrained in latent Dirichlet allocation (LDA) that is able to determine main themes and topics based on large and unstructured samples of text (Blei 2012). Our text sample for LDA consisted of roughly 115 documents (around 2 million words) of prolific sustainability and CSR publications from governmental, non-governmental and academic sources over the past 30 years to account for changes in CSR report language over time (Wang and McCallum 2006). Firms' CSR reports were not included to avoid endogeneity in the results.

It is important to acknowledge that this search string is limited to the English language only. We have taken several steps to test for this language bias (see below) and found no significant impact. To run our topic model, we employ the open source software package MALLET (Machine Learning for Language Toolkit) due to its well-tested and established approach, its user-friendliness and adaptability, and its availability (McCallum 2002). Table 15 provides an overview of the four distinct labels and associated keywords provided by the algorithm (see Table 15). A more in-depth discussion of the steps to establish these topics and the underlying algorithm can be found in Appendix F.

*Table 15: Overview of aviation CSR keywords*

| Label | Search string |
|---|---|
| **Disclosure** | sustainability report* OR environmental report* OR sustainability disclosure OR csr report* OR corporate social responsibility report* OR sustainability report* |
| **Safety** | safety management OR safety training OR safety record OR security training OR security management OR accident* OR fatalit* OR unruly passengers |
| **Environment** | emission* OR sustainable fuel OR climate change OR environmental OR noise OR carbon OR ghg OR greenhouse gases |
| **Social** | social policy OR social impact OR social responsibility OR sustainable policy OR responsible enterprise OR human right* OR community involvement OR community development OR health OR stakeholder* OR social management |

Using these search strings in connection with our 61 airlines in the news database Factiva (on passenger airlines, in English, and based on full text) yielded 60,000 distinct reports over the past 25 years that needed to be checked manually due to multiple airlines being named in a single report, false positives due to ambiguous search terms (e.g., "health" referring to financial health, or "environment" referring to business environment), and to ensure that the reports were indeed providing positive coverage. The reports were checked by a team of research assistants following a clearly formulated manual that can be found in Appendix G.

Financial data was collected from Bloomberg. We paid special attention to changes in the market over time. For example, when Lufthansa acquired Swiss Airlines in 2010 and Austrian Airlines in 2011, we made sure that any coverage of these airlines was attributed to Lufthansa post-acquisition. A similar approach was employed for the merger of Air France and KLM. However, some smaller airlines (e.g., EgyptAir, Copa Airlines, etc.) are not publicly traded, and availability of financial data was poor. Rather than trying to supplement our Bloomberg data with secondary sources and risk introducing bias through different reporting standards, we decided to drop these privately-held airlines. For some carriers, only select years were available; in these cases, we collected as many years as possible. Furthermore, we dropped several smaller airlines (e.g., Avianca, Shenzhen Airlines, Brussels Airlines) that had fewer than 25 CSR reports in the entire 25-year reporting period, as their CSR communications efforts are clearly not yet developed enough to be a well-established secondary goal in the sense of BTF. This resulted in a data sample of 38 airlines with 928 firm-year observations for CSR communication, and due to missing observations particularly in the pre-2000 era, 684 firm-year observations for financial data.

### *Measurements*

*Dependent variable.* As stated above, we define the sum of all CSR media coverage (self-reported and third-party media coverage) per firm per year as our dependent variable. No specific assumptions about source or content were made; all media outlets and all types of CSR coverage were treated equally. Every instance of positive coverage of CSR for an airline by a distinct source on a distinct day was coded as an observation; multiple reports by the same source on the same day were regarded as duplicate. Our final data sample yielded 9,698 distinct instances of positive coverage. Table 16 provides an overview of the results.

*Table 16: Overview of airlines in data sample*

| | Alliance | Joined | Country | CSR reports | Average number of employees |
|---|---|---|---|---|---|
| **Aeroflot** | Skyteam | 2006 | Russia | 38 | 16,127 |
| **Aeromexico** | Skyteam | 2000 | Mexico | 29 | 13,307 |
| **Air Berlin** | Oneworld | 2012 | Germany | 92 | 6,553 |
| **Air Canada** | StarAlliance | 1997 | Canada | 238 | 24,458 |
| **Air China** | StarAlliance | 2007 | China | 53 | 32,170 |
| **Air France KLM** | Skyteam | 2000 | France | 471 | 74,831 |
| **Air India** | StarAlliance | 2014 | India | 223 | 21,000 |
| **Air New Zealand** | StarAlliance | 1999 | New Zealand | 539 | 10,242 |
| **All Nippon Airways** | StarAlliance | 1999 | Japan | 263 | 32,099 |
| **American Airlines** | Oneworld | 1999 | United States | 625 | 99,933 |
| **Asiana Airlines** | StarAlliance | 2003 | Korea | 39 | 10,380 |
| **Austrian Airlines** | StarAlliance | 2000 | Austria | 41 | 6,632 |
| **British Airways** | Oneworld | 1999 | United Kingdom | 723 | 50,626 |
| **Cathay Pacific** | Oneworld | 1999 | Hong Kong SAR | 572 | 21,554 |
| **China Airlines** | Skyteam | 2011 | China | 29 | 14,710 |
| **Delta Air Lines** | Skyteam | 2000 | United States | 551 | 78,539 |
| **Ethiopian Airlines** | StarAlliance | 2011 | Ethiopia | 65 | 6,266 |
| **EVA Air** | StarAlliance | 2013 | Taiwan | 112 | 11,919 |
| **Finnair** | Oneworld | 1999 | Finland | 110 | 8,569 |
| **Garuda Indonesia** | Skyteam | 2014 | Indonesia | 96 | 11,263 |
| **Japan Airlines** | Oneworld | 1999 | Japan | 113 | 42,611 |
| **Kenya Airways** | Skyteam | 2007 | Kenya | 30 | 3,541 |

| | Alliance | Joined | Country | CSR reports | Average number of employees |
|---|---|---|---|---|---|
| **KLM** | Skyteam | 2004 | Netherlands | 33 | 31,029 |
| **Korean Air** | Skyteam | 2000 | Korea | 231 | 20,300 |
| **Lufthansa** | StarAlliance | 1997 | Germany | 1059 | 94,735 |
| **Malaysia Airlines** | Oneworld | 2013 | Malaysia | 42 | 17,225 |
| **Qantas** | Oneworld | 1999 | Australia | 1188 | 31,055 |
| **Qatar Airways** | Oneworld | 2013 | Qatar | 363 | 24,000 |
| **Scandinavian Airlines** | StarAlliance | 1997 | Sweden | 106 | 21,893 |
| **Singapore Airlines** | StarAlliance | 2000 | Singapore | 309 | 26,675 |
| **South African Airways** | StarAlliance | 2006 | South Africa | 160 | 9,662 |
| **SriLankan Airlines** | Skyteam | 2014 | Sri Lanka | 26 | 6,561 |
| **Swiss International Air Lines** | StarAlliance | 2006 | Switzerland | 9 | 5,174 |
| **TAP Portugal** | StarAlliance | 2005 | Portugal | 44 | 11,376 |
| **Thai Airways International** | StarAlliance | 1997 | Thailand | 217 | 23,375 |
| **Turkish Airlines** | StarAlliance | 2008 | Turkey | 108 | 15,363 |
| **United Airlines** | StarAlliance | 1997 | United States | 616 | 88,000 |
| **Vietnam Airlines** | Skyteam | 2011 | Vietnam | 135 | 17,287 |

*Normative pressures and historical performance.* Historical aspiration levels are measured based on a firm's prior CSR efforts (H1). We measure prior efforts by lagging the CSR efforts of a specific firm in period *t* by one to three years. Rather than weighting prior observations, as can be done to consider more recent observations to a higher degree (or vice versa) (Greve 2003), we consider all periods equally to be able to observe the different strength of coefficients.

*Mimetic pressures and alliance membership.* Social aspirations levels are established by the efforts of the firms that a focal firm compares itself with (Cyert and March 1992). While it would be optimal to know each firm's reference framework and attribute weights of importance to account for the fact that different firms will have different impacts on a focal firm (Greve 2003), these preferences are unknown and hard to evaluate, particularly as they might be latent even to the firms themselves. Consequently, we follow other empirical

works and use the sample-wide unweighted average (H2) (Fiegenbaum and Thomas 1988, Greve 1998). This average is computed without accounting for the focal firm to avoid endogeneity and is lagged in the same way as historical performance to account for a reaction lag of other firms. In a next step, we further test our alliance-based hypotheses by testing the strength of social comparison within and outside of alliances (H3a) and how the size of other firms affects social comparison within and outside of alliances (H3b). Alliance-based mimetic pressures were calculated as the unweighted average of CSR coverage within an alliance in period *t* (without considering the impact of the focal firm) in the variable *InAlliance* and also lagged for one period in the variable *Inlag* to account for a time lag of diffusion. To compare mimetic pressures within alliances to industry-wide mimetic pressures, the average CSR efforts outside of a given alliance (i.e., average of all other firms in different alliances or no alliance at all) was calculated in the variable *OutAlliance* and lagged correspondingly. To generate data for the years before the alliance foundation, "no alliance" was considered as a type of alliance for these variables. In other words, all firms start in the "no alliance" bracket and gradually move into one of the three alliances over time. For H3b, size was measured in number of employees, and was coded according to three size categories: small, medium, and large. Our sample of firms was strongly skewed to the left in terms of size, meaning that we had much more smaller firms than medium and large firms. As this is to be expected, we designed the cut-off value for the size categories at 25,000 employees for small airlines (e.g., Asiana, Air Berlin), 50,000 employees for medium-sized airlines (e.g., All Nippon Airlines, Cathay Pacific), and over 75,000 employees for large airlines (e.g., American Airlines, Lufthansa). Airlines were allowed to change size category over time if their number of employees changed accordingly.

*Control variables.* We gathered multiple control variables. Most importantly, all airlines were coded in accordance to whether English is an official language in their country of incorporation to account for a possible language bias. Furthermore, the airlines were coded according to their country of incorporation, and we also added "time" and "time in alliance" dummy variables to account for general CSR trends over time. We also collected financial performance data to control for the potential impact of good or poor financial performance on a firm's CSR communications. Please see Table 17 and Table 18 for an overview of descriptive statistics and correlations.

*Table 17: Descriptive statistics of data*

| Variable | Obs | Mean | Std. Dev | Min | Max | Description |
|---|---|---|---|---|---|---|
| **CSRtotal** | 928 | 10.45043 | 19.09675 | 0 | 142 | Sum of CSR coverage in *t* |
| **CSRlag1** | 890 | 9.980899 | 18.77421 | 0 | 142 | Sum of CSR coverage in *t-1* |
| **CSRlag2** | 852 | 9.589202 | 18.57693 | 0 | 142 | Sum of CSR coverage in *t-2* |
| **CSRlag3** | 814 | 9.0086 | 17.75517 | 0 | 136 | Sum of CSR coverage in *t-3* |
| **AverageCSR** | 928 | 9.395219 | 7.746085 | 0 | 23.44737 | Average of other firms in *t* |
| **Avglag1** | 890 | 8.942608 | 7.582936 | 0 | 23.44737 | Average of other firms in *t-1* |
| **InAlliance** | 928 | 10.45043 | 10.71368 | 0 | 50.5 | Average within alliance in *t* |
| **OutAlliance** | 928 | 10.10857 | 8.066709 | 0 | 28.07143 | Average outside of alliance in *t* |
| **Inlag** | 890 | 9.922681 | 10.53025 | 0 | 50.5 | Average within alliance in *t-1* |
| **Outlag** | 890 | 9.697353 | 7.961769 | 0 | 28.07143 | Average outside of alliance in *t-1* |
| **SizeCat** | 927 | | | 1 | 3 | Size category based on employees in *t* |
| **Profit** | 708 | 5,986.713 | 161,929.4 | -1,942,784 | 2,370,501 | Profit in *t* |
| **Language** | 928 | | | | | Binary indicator for English as official language |
| **Country** | 928 | | | | | Country of incorporation |
| **Time** | 928 | | | | | Time dummy for period of panel |
| **Alliancetime** | 928 | | | | | Time dummy for time of firm within alliance |

*Table 18: Pairwise correlation matrix*

*Correlations with p<0.05 are starred*

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. |
|---|---|---|---|---|---|---|---|---|---|
| **1. CSRtotal** | 1 | | | | | | | | |
| **2. CSRlag1** | 0.84* | 1 | | | | | | | |
| **3. CSRlag2** | 0.76* | 0.84* | 1 | | | | | | |
| **4- CSRlag3** | 0.69* | 0.76* | 0.83* | 1 | | | | | |
| **5. AverageCSR** | 0.40* | 0.36* | 0.36* | 0.31* | 1 | | | | |
| **6. Avglag** | 0.35* | 0.40* | 0.36* | 0.36* | 0.89* | 1 | | | |
| **7. InAlliance** | 0.56* | 0.51* | 0.49* | 0.44* | 0.89* | 0.70* | 1 | | |
| **8. OutAlliance** | 0.35* | 0.31* | 0.31* | 0.25* | 0.96* | 0.84* | 0.63* | 1 | |
| **9. Inlag** | 0.51* | 0.56* | 0.51* | 0.5* | 0.70* | 0.78* | 0.9* | 0.55* | 1 |
| **10. Outlag** | 0.31* | 0.35* | 0.31* | 0.3* | 0.86* | 0.96* | 0.56* | 0.88* | 0.62* |
| **11. SizeCat** | 0.46* | 0.46* | 0.46* | 0.45* | 0.07* | 0.06 | 0.24* | 0.02 | 0.24* |
| **12. Profit** | 0.01 | 0.01 | 0.01 | -0.01 | 0.04 | 0.06 | -0.01 | 0.05 | 0.02 |
| **13. Language** | 0.01 | -0.01 | -0.04 | -0.03 | 0.06 | 0.05 | 0.03 | 0.05 | 0.02 |
| **14. Country** | 0.03 | 0.04 | 0.04 | 0.04 | -0.01 | 0.01 | -0.05 | 0.04 | -0.04 |
| **15. Time** | 0.06 | 0.06 | 0.07* | 0.04 | 0.03 | 0.02 | 0.06 | 0.02 | 0.06 |
| **16. AllianceTime** | -0.01 | -0.02 | 0.01 | -0.02 | 0.01 | 0.01 | 0.02 | -0.01 | 0.02 |

| | 10. | 11. | 12. | 13. | 14. | 15. | 16. |
|---|---|---|---|---|---|---|---|
| **10. Outlag** | 1 | | | | | | |
| **11. SizeCat** | 0.01 | 1 | | | | | |
| **12. Profit** | 0.07 | -0.01 | 1 | | | | |
| **13. Language** | 0.05 | -0.09* | 0.04 | 1 | | | |
| **14. Country** | 0.04 | 0.07* | 0.13* | -0.1* | 1 | | |
| **15. Time** | 0.01 | 0.03 | 0.04 | 0.01 | 0.02 | 1 | |
| **16. AllianceTime** | -0.01 | -0.06 | 0.07 | 0.28* | -0.05 | 0.72* | 1 |

## Results

We test our hypotheses using an instrumented-variable regression on panel data. Due to sequential attention to goals, a firm's CSR communication might be limited by its financial performance. As a secondary goal, we expect CSR to attain more attention if primary organizational goals (i.e., financial performance) are met. This seems logical – if key decision-makers satisfactorily resolve primary issues, they have more resources and time available to focus on and improve secondary goals. Additionally, an increase in resources can improve organizational slack, thus enabling the organization to further improve CSR communications. Consequently, we use the lagged financial performance of a firm, measured as yearly profit, as an instrument for CSR coverage to account for this effect.

To assess how CSR communication goals are influenced by external pressures and internal aspiration levels, we specified three interrelated models (see Table 19). Each model

includes tests for the hypotheses related to historical (H1) and social (H2) aspiration levels, as well as associated control variables. Model 1 is specified as

$$Model\ 1: CSRtotal = b0 + b1 * CSRlag1 + b2 * CSRlag2 + b3 * CSRlag3 + b4 * AverageCSR + b5 * Avglag + b6 * SizeCat + b7 * Language + b8 * Country + b9 * Time + b10 * AllianceTime$$

$$Instruments\ for\ CSRlag1, CSRlag2, CSRlag3 = ProfitLag\ 1, ProfitLag2, ProfitLag3, Profitlag4$$

and already shows a good fit with the data. Significant impact factors on a firm's CSR communication efforts are their historical efforts in a *t-1*, the average efforts within the industry, the average efforts within the industry in *t-1*, and its size. Interestingly enough, while historical efforts, average efforts and size increase the efforts positively, the prior average efforts within the industry show a negative effect. To gain further insights into how alliances in particular affect CSR efforts, we exchange the industry averages with within-alliance and outside-alliance averages. For the calculation of these averages, "no alliance" was considered to be an alliance of itself to create data for 1993–1997, when no airline alliances existed yet. The model is specified as

$$Model\ 2: CSRtotal = b0 + b1 * CSRlag1 + b2 * CSRlag2 + b3 * CSRlag3 + b4 * InAlliance + b5 * Inlag + b6 * OutAlliance + b7 * Outlag + b8 * SizeCat + b9 * Language + b10 * Country + b11 * Time + b12 * AllianceTime$$

$$Instruments\ for\ CSRlag1, CSRlag2, CSRlag3 = ProfitLag\ 1, ProfitLag2, ProfitLag3, Profitlag4$$

and exhibits a better fit than our first model in terms of $R^2$. In terms of significance, we see that the same factors significantly affect CSR communication efforts. The major difference, however, is that the pressures attributed to general industry pressures in Model 1 are now clearly associated with alliance pressures; not only are social pressures from outside the alliances not significant, but the pressures inside alliances also exhibit a similar coefficient (i.e., effect strength) as the industry effects in Model 1. Yet again, the lagged within-alliance

effect shows a negative effect. To test whether the interaction of size and alliance pressures is significant, we insert firm size (SizeCat) as an interaction term for inside alliance pressures in Model 3:

$$Model\ 3: CSRtotal = b0 + b1 * CSRlag1 + b2 * CSRlag2 + b3 * CSRlag3 + b4 * InAlliance + b5 * InAlliance * SizeCat + b6 * Inlag + b7 * Inlag * SizeCat + b8 * OutAlliance + b9 * Outlag + b10 * Language + b11 * Country + b12 * Time + b13 * AllianceTime$$

$$Instruments\ for\ CSRlag1, CSRlag2, CSRlag3 = ProfitLag\ 1, ProfitLag2, ProfitLag3, Profitlag4$$

While historical CSR communication is still a significant impact on current CSR communication efforts in Model 3, the situation within alliances is now more complicated. The data shows that the biggest firms have the strongest influence on an alliance's overall CSR efforts. Interestingly enough, the efforts of large firms in other alliances seem to have a negative impact on the efforts of a focal firm. Furthermore, prior within-alliance efforts seem to paradoxically lower current CSR communication efforts again.

*Table 19: Overview of models (significance levels in brackets; coefficients with p<0.05 are starred)*

| | **Model 1** | **Model 2** | **Model 3** |
|---|---|---|---|
| **R squared** | 0.7130 | 0.7419 | 0.7335 |
| **N** | 553 | 553 | 553 |
| | | | |
| **CSRlag1** | 0.5908121* (0.000) | 0.5939027* (0.000) | 0.5546036* (0.000) |
| **CSRlag2** | 0.0045095 (0.970) | -0.0178838 (0.493) | -0.0565735 (0.591) |
| **CSRlag3** | 0.0516724 (0.624) | 0.0668674 (0.878) | 0.080357 (0.344) |
| **AverageCSR** | 0.8914824* (0.000) | | |
| **Avglag1** | -0.4240419* (0.002) | | |
| **InAlliance** | | 0.784665* (0.000) | |
| **InLag** | | -0.4862106* (0.001) | |
| **OutAlliance** | | 0.2727968 (0.109) | 0.2928711 (0.060) |
| **OutLag** | | -0.0900907 (0.506) | -0.1060131 (0.391) |
| **InAlliance*SizeCat** | | | 1: 0.4118159* (0.007)<br>2: 0.8555108* (0.000)<br>3: 2.115334* (0.000) |
| **InLag*SizeCat** | | | 1: -.247914 (0.050)<br>2: -0.4933067* (0.001)<br>3: -0.872787* (0.050) |
| **SizeCat** | 1: -5.640089 (0.226)<br>2: -2.00182 (0.3653)<br>3: 5.416912* (0.002) | 1: -6.609342 (0.153)<br>2: -2.995856 (0.487)<br>3: 4.285638* (0.025) | 1: -1.609451 (0.819)<br>2: -1.74002 (0.762)<br>3: -7.583417* (0.011) |
| **Language** *(dummy)* | | | |
| **Country** *(dummy)* | | | |
| **Time** *(dummy)* | | | |
| **AllianceTime** *(dummy)* | | | |

### *Robustness of results*

In our analysis, the statistical software Stata 15.1 was used due to its high customization and computing power (Pevalin and Robson 2009). We estimated our model specification in a Hausman test and concluded that a fixed effects model was the best fit ($\chi^2$ = 186.43, prob > $\chi^2$ = 0.000) (Hausman 1978). All regressions were run with the Stata command "robust" to control for possible multicollinearity, heteroskedasticity, and endogeneity concerns (Rabe-Hesketh and Everitt 2004). We also conducted further robustness tests on our measurements. An ANOVA showed that there are significant differences in CSR coverage between the alliances (F=78.47, p=0.00). Furthermore, a two-tailed t-test showed that there are no significant differences in CSR reporting between English- and non-English-speaking airlines (t(926)=-0.0999, p=0.9204). We further tested the robustness of the measurements for within- and outside-alliance pressures, as it might be the case that firms would try to bring their CSR efforts in line with alliance efforts before aspiring to join to signal compatibility, even if an airline alliance foundation was found to be driven by operational and economic reasons (Fu et al. 2010, Oum et al. 2000). Changing the firms alliance status "as if" they had joined alliances one to three years earlier (to simulate aspirations to bring their CSR communications efforts in line with the alliances) gradually decreases the model fit, significance level, and coefficient of in-alliance pressures compared to Model 3, to an extent that in a model with a three-year change, in-alliance pressures start to be not a significant factor any more (see Table 20). Outside-alliance pressures, however, become increasingly stronger as they contain more observations from when firms are already in an alliance. This provides some evidence of causal order of the effects of our hypotheses: Firms do not change their CSR communication to join alliances, they join first and then gradually adapt their communication level through mimetic isomorphism and in social comparison.

*Table 20: Robustness check (significance levels in brackets; coefficients with p<0.05 are starred)*

| | **Model 4** |
|---|---|
| **R squared** | 0.7298 |
| **N** | 553 |
| | |
| **CSRlag1** | 0.514771*<br>(0.000) |
| **CSRlag2** | -0.0439943<br>(0.688) |
| **CSRlag3** | 0.1065423<br>(0.240) |
| **AverageCSR** | |
| **Avglag1** | |
| **InAlliance** | |
| **InLag** | |
| **OutAlliance** | .5606435*<br>(0.001) |
| **OutLag** | -0.4425885 *<br>(0.000) |
| **InAlliance*SizeCat** | 1: 0.1428238<br>(0.141)<br>2: 0.4133233*<br>(0.000)<br>3:1.800502*<br>(0.000) |
| **InLag*SizeCat** | 1: 0.0524201<br>(0.385)<br>2: 0.0440408<br>(0.592)<br>3: -0.5816098<br>(0.077) |
| **SizeCat** | 1: -1.312022<br>(0.840)<br>2: -2.576956<br>(0.627)<br>3: -7.461172<br>(0.077) |
| **Language** *(dummy)* | |
| **Country** *(dummy)* | |
| **Time** *(dummy)* | |
| **AllianceTime** *(dummy)* | |

Furthermore, more sophisticated econometric methods were applied to the data set and found to produce consistent results. For example, we applied a system generalized method of moments (GMM) to our data, an econometric method that accounts for endogeneity,

i.e., the correlation of endogenous variables with the error term, by using exogeneous instrumental variables (Semadeni et al. 2014). As it is difficult to completely identify exogenous incremental variables, system GMM uses the lagged independent variables to construct these exogeneous instruments (Roodman 2009). The results of this more robust method are consistent with our regression model, which indicates a high degree of robustness and statistical conclusion validity of our findings.

## Discussion

Our results provide empirical evidence of how external pressures enter firms, and how they become internalized as secondary goals. In the case of historical aspiration levels and normative pressures, our results support the intuitive notion that a firm's past communication level has a significant impact on its current aspiration level, even when accounting for trend effects over time. While BTF suggests that firms might take multiple prior periods into account when making these decisions (Greve 2003), we observe that the most impactful (and only statistical significant) factor is the communication in the most recent period. We see multiple reasons for this. First of all, there is a certain "rolling average" effect when looking into prior periods, as the realized efforts in *t-1* were already significantly affected by aspiration levels set based on efforts in periods prior to *t-1*. Secondly, firms might see their most recent communication efforts as a bar against which their future efforts can be measured internally, similar to the rationale that firms are content to model their secondary goals based on the status quo. Thirdly, from an external perspective, it might be detrimental to a firm's reputation to produce communication levels that are significantly below the normative expectations of its stakeholders that have been established in recent periods (Crilly et al. 2012, Godfrey et al. 2009).

We have also found strong evidence that there is a high tendency for social comparison and mimicry. Even though a general, industry-wide normative pressure for "more CSR communication" might be a confounding factor, we suggest that due to the global nature of the data sample and the according difference in institutional environments, the social component of diffusion is prevalent. In other words, while some firms are indubitably pressured by their specific configuration of institutional environment (Husted et al. 2016, Julian and Ofori-Dankwa 2013) in their goal selection process to improve CSR communications, the main factor of diffusion through the industry seems to be other firms mimicking these early adopters. These findings become much more salient when turning to Model 2 to study the effects of alliance membership on CSR communication efforts. In line

with the idea that firms turn to other firms in their near proximity for social comparison (Cyert and March 1992), our results support hypothesis 3a, that social comparison processes are more prevalent within alliances compared to between alliances. In other words, a focal firm will look toward its strategic partners to decide on the intensity of accommodating or acquiescing external pressures. This results in an increasing homogenization of alliance-wide communication intensity over time, which has some important implications for self-governance within alliances and policymaking. Even more importantly, we see that the social comparison process within alliances follows a mimetic institutional logic (DiMaggio and Powell 1983). Firms model themselves after alliance leaders in their CSR communication efforts, with the biggest firms showing the strongest effect strength, which are thus clearly dictating the within-alliance CSR discourse. Interestingly enough, pressures from outside the alliance (i.e., by non-partner airlines) are not significant. While this is consistent with our hypotheses and the theoretical lens of the behavioral theory of institutionalization, it provides an interesting CSR-specific counterpoint to prior research that showed due to strategic rivalry, airline alliances are very well aware of their competitors' strategic choices (Zhang and Zhang 2006).

Not only do current alliance averages in our sample significantly influence CSR coverage, but firms are also significantly impacted by overall alliance communication in prior periods. Here, however, we are confronted with a paradox – even though current alliance averages are a significant positive influence, efforts in prior periods seem to have a contrasting effect in all three models and social comparison hypotheses. Industry and alliance averages of CSR communication in prior years have been found to significantly decrease the current efforts of a focal firm. A possible explanation for this paradox phenomenon can be found in the satisficing process: dominant coalitions within firms might take notice of the general increase of their CSR communication level in prior periods and attempt to reduce their coverage to check whether they are already in line with external demands, thus trying to minimize the costs of side payments.

## Conclusion

Building on the behavioral theory of institutionalization (Greve and Teh 2018), we propose that firms can reshape external institutional pressures into internal goals that are affected by the performance-feedback loop of BTF. Using external CSR communication as an externally-imposed secondary goal and a data sample of 38 airlines over 25 years, we show that historical performance and alliance averages are the main drivers of deciding on

appropriate CSR communication efforts within the airline industry. We identify clear mimetic isomorphic tendencies that govern this process of social comparison. Firms look toward market leaders within their own alliance to decide on the adequate level of CSR coverage but engage in satisficing when they feel that their side payments have acquiesced reporting demands.

Our findings hold significant theoretical and practical implications. From a theoretical perspective, our study is one of the first empirical tests of the behavioral theory of institutionalization, and thus gives more insights on how firms can internalize and update external goals while accounting for institutional pressures. In this regard, we are able to generate some insights into how external goals enter the organization, how firms form and update their aspiration levels for external goals, how they decide on the satisficing level in their side payments, and how alliance membership leads to a certain homogenization of internal goals throughout alliances. However, many questions are left unanswered, and we hope to inspire further research in this novel field of study. For example, while we found evidence of firms observing and mimicking each other's behavior in terms of CSR communication, we know very little about how the actual organizational learning process takes place, so drawing on tenets of learning theory might help us to further enrich our theoretical lens (Levitt and March 1988). Similarly, we assume in our study that firms will eventually succumb to institutional pressures and either adopt or decouple from them; however, research suggests that firms might have a more diverse set of strategies available to evade or actively fight institutional pressures (Oliver 1991, Vejvar et al. 2017) – research on what happens when some firms choose different strategic responses to institutional pressures might help to further explore and understand the underlying mechanisms. Alternatively, conceptualizing alliances as important stakeholders for firms rather than sources of institutional pressures would enable researchers to further analyze the active efforts of firms to shape alliance expectations and their environment (Mitchell et al. 1997). As this study focuses on external CSR communication level only, it would be very interesting to explore whether our logic holds when it comes to the actual implementation of CSR practices: Do firms learn from other firms, particularly alliance partners and leaders, in their CSR practice implementation? And if yes, do they follow the same organizational logic and institutional processes as with external CSR reporting levels? Further research on these questions promises to be fruitful and interesting.

This chapter also provides interesting insights for practitioners. Our findings strongly suggest that the CSR discourse diffuses from alliance champions to smaller alliance

members. This implies that policymakers should target major companies in alliances when providing incentives for CSR or sustainability investment, as these practices might have the potential to also diffuse from larger firms to smaller ones over time. Moreover, regulators could incentivize alliance formation in traditional hard-to-regulate industries, and then use these alliances as a tool to speed up CSR discourse diffusion and improve industry awareness of critical issues. Furthermore, the mechanisms and processes outlined in this paper can be extended beyond the scope of CSR discourse diffusion. Indeed, we expect the discourses discussing occupational safety and health standards, security management, or administrative practices like accounting standards to follow a similar organizational logic, particularly when firms are facing a high degree of uncertainty and ambiguity in their input-outcome transformation. From a managerial perspective, knowing the mechanisms of external goal internalization and social comparison within alliances can help to resolve organizational uncertainty. A dominant coalition that is unsure about how to deal with ambiguity can specifically look to the next biggest member within their strategic network to shorten their problemistic search process and come up with better results. Similarly, executives can improve support for their heralded external communication goal within a dominant coalition by making the case that external goal internalization (even over the extent of satisficing) can create goodwill with stakeholders and increase the legitimacy of the organization.

### *Limitations*

As with all studies that go into uncharted territories, there are several limitations that apply to our findings. As both the adopted theoretical lens and the means of data acquisition are novel, they are the main causal factors for these limitations, and as such, we want to group our limitations accordingly. Firstly, this is one of the first studies to empirically test the behavioral theory of institutionalization proposed by (Greve and Teh 2018). As such, it was a daunting – if not impossible – task to adequately cover both BTF and institutional theory in their intricacies, and still be able to undertake empirical testing. Thus, we had to make some simplifications in our discussion of the theories and the accompanying assumptions. For example, we look at firms in general, and not at the dominant coalitions within firms. While this level of abstraction enables us to track the aspirations of multiple firms over time, we lose an additional layer of insight when it comes to the goal finding process. What is more, we underplay the importance of organizational risk and non-problemistic search in BTF, as we focus on goal-finding processes and aspiration levels much more than on the performance feedback loop deeply ingrained in the theory. Due to the global nature of our

data sample, we also disregard coercive isomorphism and natural aspiration levels. Even though we control for regional difference, we still need to assume that airlines are significantly affected by the institutional pressures of their home environments – a study that is able to capture these coercive isomorphisms and test their effects on goal-setting processes in multiple institutional environments would thus be a useful extension to our study.

In terms of data, we understand that our machine learning approach can be seen as unorthodox, as the output provided by the algorithm greatly depends on the data sample initially provided. However, we made sure to select a diverse set of documents from different organizations and publication years to derive the highest possible validity of findings. There is also the possibility that a bias was introduced into the data by having the coding of articles conducted by a team that might have different understandings of what denotes "CSR." We tried to alleviate this potential bias by providing a thorough and detailed manual for coding news reports (found in Appendix G) to all team members, maintaining close communication during the arduous task of checking thousands of reports, and discussing borderline cases together as a team. However, even so, there is still a bias in terms of CSR definition, language, and media coverage that we need to acknowledge due to the nature of this study. Lastly, we also did not assess the quality or intensity of the CSR reports (or their sources) in any way, but only looked at the overall quantity – weighting the reports based on their expected impact or the impact factor of the publishing source could affect our results significantly.

# Essay 5: Pay well or look good? The moderating roles of corporate social responsibility and employee wages on flight delays during layoffs

## Chapter summary

Airline operations are characterized by volatile demand and immense cost pressures. Consequently, decisions to adjust capacity to market demands are important for an airline's success. While decisions to reduce capacity are usually viewed as a means for cost control to improve financial performance, we argue that there may be subtle ramifications of capacity reductions on operational performance, which may erode financial outcomes. Particularly layoffs may lead to unintended understaffing, the increased fatigue and exhaustion of employees, and a decrease in morale and loyalty to the company. Considering the service-oriented nature of the passenger airline industry, we consequently argue that layoffs undermine airlines' on-time performance. However, we expect firms with a strong commitment to incorporate social responsibility and higher average employee compensation to be able to absorb some of these negative effects due to a better standing with stakeholders. We empirically test our hypotheses based on the panel data of approximately 8 million flight records over 65 months from the US domestic airline market. Our findings highlight the complex relationship between on-time performance, corporate social responsibility efforts, and employee compensation, while also advancing knowledge on sustainability in operations management and providing managerial insights into capacity management and hiring strategies in service-based industry sectors.

## Introduction

The passenger airline industry has exhibited tremendous growth in recent decades and continues to link countries and continents as a major driver of tourism and cultural exchange. However, commercial air travel is highly cyclical and characterized with an alternating pattern of booms and downturns. In fact, the aggregate net average profit of the airline industry over the past four decades is close to zero (Cronrath 2017). The cyclical nature of commercial air travel is contingent on several factors. Demand is volatile and highly dependent on the global financial outlook (Bender and Stephenson 1998) and political climate, while costs are adversely affected by fluctuations in the fuel market (Bhadra 2009). Furthermore, external shocks (like the terrorist attacks of the 9/11 incident that undermined the passengers' subjective safety perception) are unpredictable and can

have devastating, long-lasting effects on the industry's performance (Gittell et al. 2006). Thus, the industry has experienced numerous booms and busts, with the latter often leading to airline bankruptcies. To increase their chances of survival in times of economic downturn, airlines often attempt layoffs to adjust capacity to demand proactive cost control (Martín and Román 2011). Currently, the industry is estimated to support more than 60 million jobs worldwide (IATA 2017).

The commercial airline industry is characterized by strong competitive pressures, as airlines compete on price (Gerardi and Shapiro 2009) and service quality (Mazzeo 2003, O'Connell and Williams 2005). One of the most salient criteria of airline service quality is their on-time performance: Delays not only cause a major annoyance to passengers, but also incur massive costs. An increase in delay frequency and delay times will have a significant effect on airlines' service quality and customer satisfaction (Gursoy et al. 2005, Prince and Simon 2015). There are also more profound effects due to propagated delays (Arikan et al. 2013). According to an estimation by the Federal Aviation Association, delay costs for US airlines and passengers amount to approximately US $27.2 billion per year (Ball et al. 2010). While this study accounted for industry-wide lost demand due to passengers opting for alternative, less delay-prone modes of transportation, it does not account for the loss of passengers from individual airlines to competing airlines, or the additional negative externalities to an increase in emissions and pollutants caused by delays (Zhang and Czerny 2012). Consequently, the actual overall social costs of delays are expected to be even higher.

The antecedents of delays are adequately examined in the literature. However, most studies investigate operational impacts like flight schedules (Deshpande and Arikan 2012), airline policy (Nicolae et al. 2017), weather effects (Rupp and Holmes 2006), and hub and network congestion (Mayer and Sinai 2003) to explain delays and cancellations. Considering that the managerial aspect on airline delay lacks due research attention, this study specifically examines how top-level management decisions—in this case layoffs, employee compensation, and external corporate social responsibility investment—affect delay frequency and durations on an operational level in commercial aviation. We postulate that major layoffs have the potential to severely disrupt operational processes (Chadwick et al. 2004, Hobbs and Williamson 2003), either by understaffing, increased fatigue, or by lowering the morale of employees (Brockner 1992, Latorella and Prabhu 2000), which will materialize in a decrease in on-time performance for airlines. Furthermore, we argue that airlines that emphasize corporate social responsibility (CSR)

and higher employee compensation exhibit stronger commitment to their stakeholders and thus command a better ability to absorb the negative effects of layoffs on delay propensity and duration due to increased organizational support (Kucukusta et al. 2016), employee motivation (Chen and Kao 2011, Lazear 2000), and stakeholder goodwill through a better reputation (Godfrey et al. 2009).

We test our hypotheses in a longitudinal study of a data sample of roughly 8 million flights over 65 months (August 2010 to December 2016) from the three main US network carriers, namely American Airlines, United Airlines, and Delta Airlines. We employ a series of probit and instrumental-variable regressions on panel data to show that there is a long-term "hidden cost" associated with layoffs, as they increase both the frequency and duration of delays. We conclude by discussing the implications of the operational and financial impacts of layoffs on airline delays with a particular focus of the moderating role of their CSR investment and wage levels.

## Literature review

### *Airline operations management and delays*

Due to the volatility of airline passenger demand and high competitiveness in the market, airlines require a strong focus on capacity and revenue management if they are to survive (Luo and Yu 1997, Martín and Román 2011, McGill and Van Ryzin 1999). As a result, the extant literature on airline operations management has a strong focus on yield management (Jerath et al. 2010, Subramanian et al. 1999) and cost control. In terms of operational performance, both service quality and productivity have been found to affect the profitability of airlines (Tsikriktsis 2007). Productivity is concerned with a firm's ability to combine a variety of inputs and efficiently transform them into a set of outputs. Service quality, on the other hand, measures the degree to which perceived service quality is in line with customer expectations (Voss et al. 2005, Zeithaml et al. 1996). One of the major dimensions of airline service quality is indubitably on-time performance (Gursoy et al. 2005), and delays have been found to negatively affect perceived service quality and, consequently, passenger satisfaction (Prince and Simon 2015). Apart from the further implications like reduced passenger satisfaction, customer retention, and loss of reputation, delays also incur massive costs due to increased handling costs, airport fees, and disruptions of further flight schedules via propagated delays. In fact, delay costs for US airlines and their passengers are estimated at US $27.2 billion per year, even without accounting for further negative externalities (Zhang and Czerny 2012).

Given the massive financial and operational implications of delays, there is plentiful research discussing airline delays. The extant literature studies the propagation of delays (Deshpande and Arikan 2012, Luo and Yu 1997), optimization of flight schedules (Lan et al. 2006), cost implications (Cook et al. 2009), and schedule reliability measures (Barnhart and Cohn 2004, Carey 1999). Recent research also looks into operational management practices that affect delays; for instance, Nicolae et al. (2017) analyze the effect of an airline's baggage policy on delay times and find a correlation between reduced check-in luggage and overall lower delay times. On the flip side, Parast and Fini (2010) have analyzed the effects of on-time performance on profitability in the US airline industry and found a significant negative relation. They argue that due to the inverse relationship between safety procedures and on-time performance, customers favor high safety over on-time arrival. Consequently, better on-time performance would jeopardize safety and negatively affect profitability. However, this study is subject to several limitations. Firstly, the authors studied the aggregated industry rather than single airlines, thus they are not able to study individual airlines' performance even though there is evidence that low on-time performance has a negative effect on a carrier's market share, as passengers tend to switch carriers after experiencing bad service quality (Suzuki 2000). Furthermore, the authors employed monthly aggregate delay data rather than more specific delay data, resulting in a low sample size. Secondly, they did not distinguish between different types of delays (e.g., weather-based delays, carrier delays, propagated delays, etc.). Thirdly, due to the aggregate nature of the study, the authors were not able to model any airline-based control variables (e.g., aircraft size, aircraft number, number of employees). Thus, the study results should be interpreted with caution, particularly as they are at odds with results in the extant literature.

### *Layoffs and effects on on-time performance*

In line with the operational cost control methods discussed above, airlines need to make sure to continuously adapt their capacity to volatile market demands. Apparently, unused capacity is expensive for airlines and will erode their profitability immensely (Coelli et al. 2002). In practice, airlines have the option to undertake operational adjustments to capacity, e.g., by overbooking flights (Wangenheim and Bayón 2007), offering last-minute seats (Jerath et al. 2010), or by reducing flight frequencies or employing smaller aircraft (McCartney 2007). However, lower flight frequency reduces asset utilization which can degrade the return on assets and financial performance. Simply put, it is costly for airlines to operate with excessive capacity (Dana Jr. 1999). Consequently, airlines have a strong

motivation to anticipate changes in airline passenger demand and "right-size" accordingly by reducing capacity in the long term.

While the capacity of physical assets (e.g., aircraft) is comparably slow to adjust, airlines have a higher degree of flexibility when it comes to cabin and ground crew staffing decisions. Indeed, the cost of labor in the US airline industry has decreased drastically in the last few years (Tsoukalas et al. 2008). This development is not unexpected, as the practice of employee downsizing has become a common strategy in a multitude of industries and is usually interpreted as a means to improve a firm's efficiency and reduce costs (Datta et al. 2010). In the spirit of "lean service," the airline industry is no exception to this trend (Suárez-Barraza et al. 2012). The overall positive effects of downsizing are disputed, though, as the practice may worsen the financial performance of a company (De Meuse et al. 1994). Possible explanations for this adverse effect are that layoff events can also be interpreted by investors as an emergency response and a sign of financial distress (Lee 1997), that downsizing significantly tarnishes a firm's reputation (Love and Kraatz 2009), and that it leads to a loss of knowledge and employee loyalty (Guthrie and Datta 2008, Klehe et al. 2011).

Thus, airlines need to tackle the trade-off between efficiency and service quality in their staffing decisions. While layoffs might lead to short-term productivity gains, cost reduction and increased profitability, the literature suggests that downsizing will affect customer satisfaction negatively in the long term, particularly for services (Andersson et al. 1997, Sirdeshmukh et al. 2002).

Layoffs can have severe consequences, as empirical studies have found a significant negative impact of stress on job performance in aviation (Chen and Kao 2011). Layoffs increase stress and decrease productivity if improperly handled (Brockner 1992). Apart from a decreased service quality for passengers, the increased stress and pressure might increase the propensity for human error in operations (Chadwick et al. 2004, Hobbs and Williamson 2003), thus increasing the odds of incidents and accompanying delays that further worsen customer satisfaction. Not accounting for external impacts like weather or hub congestion, an airline's service quality and on-time performance depends to a high extent on their employees' ability to professionally juggle a wide range of demands from customers and react appropriately to different stressful and challenging situations – skills that take time to be taught (Wilder et al. 2014), and also improve with experience (Bolton and Boyd 2003). Even though airlines rely heavily on checklists and standardized processes

to reduce errors (Hales and Pronovost 2006), increased stress and fatigue have been associated with an increase in human errors and accidents (Dinges 1995). Prior studies on safety management in aviation have linked fatigue to memory lapses and stress to an increased propensity of rule violation in aircraft maintenance, thus significantly increasing error and accident likelihood (Hobbs and Williamson 2003, Latorella and Prabhu 2000). Indeed, empirical findings show that a majority of accidents in aviation are caused by the human errors of airline employees (Helmrech 1997), and consequently, frameworks to reduce both the probability and the impact of human errors have been developed (e.g., crew resource management trainings (Helmreich et al. 1999), governmental safety programs (McFadden and Hosmane 2001), or fatigue risk management systems (Gander et al. 2011)). It is plausible that flight delays follow a similar logic: fatigued, stressed airline employees are more prone to human error, more likely to violate rules, and less motivated to meet operational goals, thus significantly increasing both the frequency of flight delays and the overall delay duration. Thus, we expect that

- ***Hypothesis 1a:*** *Layoffs by passenger airlines lead to more frequent delays as employees are more prone to human error that cause delays*
- ***Hypothesis 1b:*** *Layoffs by passenger airlines lead to longer delay times as employees are more prone to human error that cause delays*

### *Corporate social responsibility and its effects on operational performance*

The notion that firms need to proactively support and develop their stakeholders in general and employees in particular is widely discussed in different research streams and coined social management practices (Huq et al. 2016), corporate social responsibility (CSR) (Wang et al. 2016), or social sustainability (Vejvar et al. 2016). CSR has been discussed from a variety of different theoretical perspectives (e.g., stakeholder theory (Jamali 2008, Mitchell et al. 1997), institutional theory (Campbell 2007, Doh et al. 2010) or resource-based view (Yang et al. 2016)) in diverse cultural and geographical contexts (Julian and Ofori-Dankwa 2013, McDonnell and King 2013). The general consensus of the CSR literature is that there is an overall positive link between social and financial performance (Waddock and Graves 1997), albeit several contingencies like culture or industry are proposed to moderate its effectiveness (Surroca et al. 2010).

A key distinction of CSR practices is between explicit and implicit CSR. While explicit CSR describes the specific voluntary actions of a firm to engage in actions beyond the legally

mandated minimum to address societal issues, implicit CSR embodies the less tangible values and norms ingrained in a firm's way to interact with the wider society, both formally and informally (Matten and Moon 2008). Even though the definitions of explicit and implicit CSR seem to vary based on cultural contexts (Blindheim 2015), it seems that the general notion of "giving back to society" overall enables firms to generate intangible resources and general goodwill to bolster their financial performance (Godfrey et al. 2009).

The aviation industry is producing massive negative externalities like emissions, pollution, noise, and accidents (Gössling and Peeters 2007) and has increasingly been under scrutiny to regulate its impact on the environment and society (Hooper and Greenall 2005, Scheelhaase et al. 2010). Apart from the required regulation of the industry, there is an increasing trend for airlines to self-regulate their negative impact by engaging in CSR (Hooper and Greenall 2005, Philipps 2006), particularly as they aim to promote a green image for their passengers (Becken 2007, Hagmann et al. 2015, Mayer et al. 2012). However, the benchmarks employed and data reported vary heavily between airlines and geographical contexts, which makes a comparison of performance and investment particularly difficult (Lynes and Andrachuk 2008, Mak et al. 2007). The most prolific issues discussed in the extant literature are airline emissions and their impact on climate change (Abeyratne 2003, Cowper-Smith and de Grosbois 2011). Apart from contributing to global greenhouse gas emissions, airline transportation also has a significant local impact on air quality and noise levels near airports through flights, maintenance and handling operations, and feeder transports (Daley et al. 2008). The literature also discusses social issues, particularly employee satisfaction (Kim and Back 2012, Kucukusta et al. 2016) and service quality. Other social issues like community involvement or diversity are comparatively niche (Cowper-Smith and de Grosbois 2011). Overall, there is a trend for increasing CSR reporting and governance in the industry, but the development of the CSR discourse is still in its infancy and needs substantial development to address the increasing negative externalities of air transportation.

From an economic perspective, studies have found a positive link between CSR and financial performance in the airline industry (Lee and Park 2010). Indeed, CSR practices have been found to have a positive effect on financial performance in service industries through customer satisfaction as a mediator (Saeidi et al. 2015), and a recent study in the airline industry shows CSR practices are suitable for improving employees' affective commitment to a firm (Kucukusta et al. 2016). Similarly, another study in the tourism and hospitality industry has found a positive impact of customer satisfaction on several

financial indicators, including profit margin, return on equity, return on assets, and market value added (Sun and Kim 2013). Conversely, a lack of organizational support was found to cause a significant increase of stress and loss of job satisfaction among airline employees (Chen and Kao 2011). A relevant framework to link service quality and productivity to profitability is the service-profit chain proposed by Heskett et al. (1994). The authors postulate that profitability and revenue growth are contingent on customer loyalty, which is in turn driven by customer satisfaction. Customer satisfaction is affected by service quality, and service quality is influenced by employee satisfaction, employee retention, and employee productivity. Consequently, the framework argues that a strong organizational commitment to employee well-being can drive customer satisfaction and profitability, which is in line with prior research in the airline industry (Kucukusta et al. 2016).

Following this logic, we expect airlines with a higher dedication to CSR to have a higher organizational commitment to their employees, resulting in higher intrinsic motivation (Kucukusta et al. 2016), better retainment of task-specific knowledge, and lower error propensity during layoff events, which should reduce the duration and frequency of delays (Hobbs and Williamson 2003, Latorella and Prabhu 2000). Furthermore, we argue that a high degree of CSR can help an airline to build up goodwill with its employees that can be used to buffer the negative emotions and stress accompanying layoffs (Godfrey et al. 2009, Klehe et al. 2011). As layoffs might be interpreted by employees as a decrease in organizational support, which is considered as a major driver of job satisfaction, and in turn employees' organizational commitment (Heskett et al. 1994, Kim and Back 2012), more CSR-invested airlines might have a better understanding of their stakeholders and consequently manage these processes more appropriately. Consequently, we hypothesize that

- ***Hypothesis 2a:*** *Firms with a higher dedication to corporate social responsibility can lower the impact of layoffs on delay frequency*
- ***Hypothesis 2b:*** *Firms with a higher dedication to corporate social responsibility can lower the impact of layoffs on delay times*

However, CSR practices are only one of the factors driving employee satisfaction (Kucukusta et al. 2016) – other factors like career opportunities (Campbell 2008, Kosteas 2011), compensation (Ederer and Manso 2013, Lazear 2000) or job strain and effort-reward imbalances (De Jonge et al. 2000) can also significantly affect employee satisfaction and in turn, productivity. Indeed, financial compensation has been found to be one of the main

drivers of job satisfaction in the transportation industry (Delery et al. 2000, Fisher and Yuan 1998, Li et al. 2014, Rodriguez et al. 2006). Furthermore, firms paying higher wages have a higher ability to retain skilled and knowledgeable employees (Ang and Slaughter 2004, Bewley 1998, Rodriguez et al. 2006), particularly as higher-than-average wages mean that employees cannot easily switch jobs without incurring losses to their salaries (Chiu et al. 2002). Thus, we expect airlines that pay higher wages to have higher overall employee motivation, a more skilled and loyal workforce, and a higher ability to retain more experienced employees. This should make it easier for these airlines to adequately deal with the operational and staffing challenges that come with layoffs.

> ***Hypothesis 3a:*** *Firms paying higher financial compensation to their employees can lower the impact of layoffs on delay frequency*
> ***Hypothesis 3b:*** *Firms paying higher financial compensation to their employees can lower the impact of layoffs on delay times*

## Data and method

### *Data sample and collection*

To test our hypotheses, we employ a longitudinal sample of domestic flights from US-American network carriers (United Airlines, American Airlines, Delta Airlines). Network carriers were chosen because they were found to be more susceptible to delays (Deshpande and Arikan 2012, Mayer and Sinai 2003) and because they have a stronger focus on service compared to no-frills airlines (O'Connell and Williams 2005). Our sample covers 7,740,440 flights in the period from August 2010 to December 2016. The data are provided by the Bureau of Transportation Statistics (BTS) of the United States Department of Transportation, are publicly available on their website (United States Department of Transportation 2017), and include detailed information for each flight, including carrier name, tail number, origin and destination airport, estimated flight time, delay time and cause of delay. We cross-referenced the tail number of each flight with the Federal Aviation Association Aircraft Registration master file and the Aircraft Reference file to retrieve detailed aircraft information for further data cleaning and control variables.

Similar delay data have been used for a variety of other studies before (e.g., (Arikan et al. 2013, Deshpande and Arikan 2012, Mayer and Sinai 2003, Nicolae et al. 2017, Prince and Simon 2015, Rupp and Holmes 2006)). We adopted the approach to data cleaning from Deshpande and Arikan (2012). This included deleting incomplete or erroneous data entries

(e.g., wrong aircraft classifications or physically impossible travel speeds), excluding outliers (e.g., excessive travel times that are likely based on data entry typos), and flights by aircraft with fewer than 10 seats.

### *Measurements*

*Carrier delay.* Carrier delay is our dependent variable. BTS has started to document "cause of delay" in August 2010, and possible delay reasons are carrier delay, weather delay, late aircraft delay (i.e., propagated delay), security delay, and national aviation systems delay. While prior studies have focused on national aviation systems delay (Mayer and Sinai 2003), weather delays and cancellation (Rupp and Holmes 2006), and late aircraft delays (Deshpande and Arikan 2012), we will only consider carrier delays in this study. Carrier delays are considered to be delays caused by anything within the responsibility of the carrier itself. This includes delays while boarding, refueling, luggage handling, or due to unexpected maintenance. A flight is marked as "delayed" when it arrives 15 minutes after scheduled arrival. For an overview of our data, please see Table 21.

*Table 21: Overview of flight data*

| | **All** | **American** | **Delta** | **United** |
|---|---|---|---|---|
| **#Flights** | 7,740,440 | 1,285,702 | 4,607,563 | 1,847,175 |
| **#Carrier delays** | 666,242 / 8.6% | 127,623 / 9.9% | 347,345 / 7.5% | 192,074 / 10.4% |
| **#Affected by layoffs** | 1,347,821 / 17.4% | 164,523 / 12.7% | 980,473 / 21.3% | 202,825 / 11.0% |
| **#major layoff events** | 26 | 9 | 10 | 7 |

*Layoff data.* We retrieved layoff event data between 2010 and 2017 from the online news database Factiva by employing a search string with the words most commonly associated with layoffs (e.g., layoff, laid off, fired, vacancies, etc.). Only major layoff events were considered to potentially have a significant impact on operations and morale; consequently, only layoffs with over 100 employees let go were taken into account. Twenty-six layoff events were identified. Layoffs are not distinct events, and the announcement of layoffs and the date on which employees are let go are often separate. Furthermore, layoffs are often accompanied by rumors and negotiations with union or employees' representatives (Kets de Vries and Balazs 1997). Thus, different time windows for layoff effects were tested on our initial data set, ranging from weekly to three-month periods. Our results indicate that a monthly to bi-monthly effect period has the highest significance and effect. Consequently, we defined layoffs to affect all flights within the same month of the layoff and include two weeks before and after the given month to even

out the time windows and provide a rolling measurement of layoffs. In short, each layoff event affected every flight by the respective carrier in the month it took place, plus every flight in the two weeks before and after that month to account for the effects of pre-layoff rumors and layoff aftershocks.

*CSR Score.* Measuring the CSR performance of a firm is a difficult task, as CSR is only vaguely defined and data is scarce, particularly in the aviation industry with comparatively low dedication to CSR reporting (Cowper-Smith and de Grosbois 2011). Many studies use KLD data, however, KLD data is subject to limitations of its own (Orlitzky et al. 2003, Wood and Jones 1995). Benchmarks and CSR reports issued by airlines often use different metrices, which makes comparison between airlines difficult (Hooper and Greenall 2005). Furthermore, other metrices like fuel consumption or customer satisfaction are too one-dimensional to adequately capture the multidimensionality of CSR (Wang et al. 2016). Consequently, we propose a compound measurement of CSR based on an airline's

- CSR reporting intensity
- Airline quality ranking
- Fuel consumption per passenger mile
- CSR media coverage

Each airline in our data set is scored based on these four criteria, and then the sum of their specific scores represent their overall CSR score per month. This approach has several benefits. First of all, it accounts for the multidimensionality of CSR by measuring social and environmental issues alike. Secondly, it mostly uses publicly available data and is thus more salient for the airlines' stakeholders. Thirdly, it uses a variety of different data types and sources, which helps to reduce bias when compared to data from single sources. For reporting intensity, we checked the airlines' CSR reporting quality. 0 points were awarded if no CSR report was issued in a period, 1 for bi-annual reports, 2 for yearly reports. The full score of 3 was awarded if the reports followed GRI reporting guidelines. Airline quality rankings are awarded by the BTS based on service quality, luggage handling, complaints, and on-time performance. We assigned points based on an airline's relative ranking. If an airline was ranked in the top quartile in a period, we awarded the full three points, with a point deduced for every quartile below that, and 0 points in the bottom quartile. While there are some endogeneity issues concerning the effect of on-time performance on this score, we are confident that its overall impact on CSR efforts is negligible, as it constitutes less than one-sixteenth of the CSR score.

Fuel consumption per passenger mile data was extracted from Bloomberg. We calculated the average consumption per month and awarded three points to firms that have a fuel consumption lower than average, and 2 points to firms that matched the average. For media coverage, we used topic modeling, a machine learning algorithm based on latent Dirichlet allocation, on a data sample of 115 documents of unstructured text to provide us with a set of keywords that capture the discourse of CSR in aviation. We used this search string in the news database Factiva and coded the results accordingly to identify the intensity of an airline's positive CSR coverage. We calculated the average reporting intensity of airlines per month. If an airline showed a higher than the average intensity, it was awarded 3 points. If its intensity matched the average, 2 points; and if the reporting intensity was below the average, it received one point. If an airline did not issue any CSR-specific communication in a month, 0 points were awarded. A more detailed explanation of the topic modeling algorithm and our coding process can be found in appendices F and G. Shapiro-Wilk and Shapiro-Francia tests for distribution were conducted in Stata 15.1 and showed that the composite score followed a normal distribution.

*Wages.* Wage data were collected from Bloomberg for all airlines. Only aggregate wage data were provided, i.e., no specific wage data per type of employee was available. Given that we consider layoffs to be aggregate as well, we deemed this data as appropriate. Data were available as three-monthly averages, which we also did not consider to be an issue, as wages are not adjusted as frequently.

*Control variables.* Control variables include financial (Net income/loss before tax, operational costs, net cashflow, net income) and operational (fleet size, average fleet age, types of different aircraft in fleet, average number of employees, average revenue passenger miles, average load factor) data collected from Bloomberg for each airline. Other variables were considered and tested (e.g., return on assets, load factor, revenue passenger miles, etc.) but were not found to contribute to the results. Most indicators were available on a three-month basis. Furthermore, we collected the number of seats, distance traveled in miles, and airtime in minutes on a flight level. An overview of explanations and descriptive statistics of all variables can be found in tables 22, 23, and 24.

*Table 22: Description of variables*

| Variable | Description |
|---|---|
| **CarrierDelay** | Delay of a flight in period *t* in minutes |
| **Layoff** | Number of people laid off in 2-month window |
| **CSRScore** | CSR performance in period *t* |
| **Wages** | Average wage paid by carrier in dollar |
| **Distance** | Distance in miles |
| **Seats** | Number of available seats on a flight |
| **ACTypes** | Number of different aircraft types operated by carrier |
| **Fleetsize** | Number of aircrafts operated by carrier |
| **Fleetage** | Average age of aircrafts operated by carrier in years |
| **Airtime** | Time from take-off to landing in minutes |
| **Employees** | Number of employees of carrier |
| **ROA** | Return on asset in percent |
| **Income** | Income in period *t* |
| **lagInc1** | Income in period *t-1* |
| **lagInc2** | Income in period *t-2* |
| **OPcosts** | Cost of operations in period *t* |
| **lagOPc1** | Cost of operations in period *t-1* |
| **lagOPc2** | Cost of operations in period *t-2* |
| **Cashflow** | Cashflow in period *t* |
| **lagCF1** | Cashflow in period *t-1* |
| **lagCF2** | Cashflow in period *t-2* |

*Table 23: Descriptive statistics*

| Variable | N | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| **CarrierDelay** | 7,740,440 | 3.44 | 23.67 | 0 | 2142 |
| **Layoff** | 7,740,440 | 126.71 | 507.77 | 0 | 8400 |
| **CSRScore** | 7,740,440 | 7.25 | 1.96 | 2 | 11 |
| **Wages** | 7,740,440 | 2054.14 | 324.18 | 1061 | 2869 |
| **Distance** | 7,740,440 | 954.80 | 660.35 | 67 | 4983 |
| **Seats** | 7,740,440 | 174.84 | 51.74 | 10 | 495 |
| **ACTypes** | 7,740,440 | 20.69 | 4.34 | 11 | 47 |
| **Fleetsize** | 7,740,440 | 1018.61 | 264.83 | 717 | 1550 |
| **Fleetage** | 7,740,440 | 14.52 | 1.99 | 11 | 17 |
| **Airtime** | 7,740,440 | 126.92 | 78.19 | 13 | 675 |
| **Employees** | 7,740,440 | 83424.04 | 11956.84 | 42700 | 122300 |
| **ROA** | 7,740,440 | 5.63 | 7.31 | -13.29 | 22.18 |
| **Income** | 7,740,440 | 736.77 | 1381.91 | -2000 | 8479 |
| **lagInc1** | 6,070,853 | 735.43 | 1388.73 | -2000 | 8479 |
| **lagInc2** | 4,850,537 | 774.88 | 1390.92 | -2000 | 8479 |
| **OPcosts** | 7,740,440 | 8379.49 | 1011.04 | 4720 | 10475 |
| **lagOPc1** | 6,070,853 | 8350.29 | 1017.89 | 4720 | 10475 |
| **lagOPc2** | 4,850,537 | 8340.26 | 1018.24 | 4720 | 10475 |
| **Cashflow** | 7,740,440 | 438.57 | 745.09 | -1926 | 2169 |
| **lagCF1** | 6,070,853 | 449.33 | 736.82 | -1926 | 2169 |
| **lagCF2** | 4,850,537 | 456.31 | 735.42 | -1926 | 2169 |

*Table 24: Pairwise correlation matrix*

*Correlations with p<0.05 are starred*

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. |
|---|---|---|---|---|---|---|---|---|---|
| **1. CarrierDelay** | 1 | | | | | | | | |
| **2. Layoff** | 0.0006 | 1 | | | | | | | |
| **3. CSRScore** | 0.0072* | -0.025* | 1 | | | | | | |
| **4. Distance** | 0.0138* | 0.0053* | -0.0478* | 1 | | | | | |
| **5. Seats** | 0.0090* | 0.0009* | -0.1376* | 0.3929* | 1 | | | | |
| **6. ACType** | -0.0030* | -0.0292* | 0.4079* | 0.0116* | -0.1004* | 1 | | | |
| **7. Fleetsize** | 0.0087* | -0.0093* | -0.4347* | 0.1427* | 0.2324* | -0.3497* | 1 | | |
| **8. Fleetage** | -0.0021* | -0.0127* | 0.5517* | -0.1792* | -0.2632* | 0.4030* | -0.7748* | 1 | |
| **9. Airtime** | 0.0160* | 0.0054* | -0.0487* | 0.9716* | 0.3741* | 0.0122* | 0.1451* | -0.1801* | 1 |
| **10. Employees** | 0.0092* | -0.0183* | -0.3153* | 0.0212* | 0.1476* | -0.4786* | 0.6584* | -0.4602* | 0.0255* |
| **11. Wages** | 0.0081* | -0.0501* | 0.2896* | 0.0264* | 0.0561* | 0.0737* | 0.3782* | -0.0580* | 0.0297* |
| **12. ROA** | 0.0011* | -0.0647* | 0.3875* | -0.0498* | 0.0005 | 0.0356* | 0.0237* | 0.1493* | -0.0486* |
| **13. Income** | 0.067* | -0.0491* | 0.1750* | -0.0397* | -0.0045* | 0.0367* | -0.0173* | 0.1879* | -0.0420* |
| **14. OPcosts** | -0.0002 | -0.0184* | 0.0270* | 0.0052* | -0.0168* | 0.2100* | 0.0099* | 0.1090* | 0.0065* |
| **15. Cashflow** | 0.0027* | -0.0505* | 0.3413* | -0.0572* | -0.0972* | 0.2680* | -0.2563* | 0.3883* | -0.0612* |

| | 10. | 11. | 12. | 13. | 14. | 15. |
|---|---|---|---|---|---|---|
| **10. Employees** | 1 | | | | | |
| **11. Wages** | 0.5721* | 1 | | | | |
| **12. ROA** | 0.1879* | 0.4848* | 1 | | | |
| **13.Income** | 0.0957* | 0.2596* | 0.5240* | 1 | | |
| **14. OPcosts** | 0.2469* | 0.3698* | 0.2491* | 0.0502* | 1 | |
| **15. Cashflow** | -0.2202* | 0.3008* | 0.3005* | 0.1422* | 0.0269* | 1 |

## *Method*

A variety of different methods have been applied to BTS data before. Deshpande and Arikan (2012) used a structural estimation approach to build a newsvendor model to measure the impact of flight schedules on delay times, and further built on the propagation of flight delays via stochastic modeling (Arikan et al. 2013). Rupp and Holmes (2006) employed a probit model to explore antecedents of flight cancellations, while Mayer and Sinai (2003) used an ordinary least squares regression to estimate the effect of networks and hub congestion on air travel time. Nicolae et al. (2017) adopted an event study methodology to test the effect of luggage policy on on-time performance. Intuitively, an event study approach seemed appropriate to test our hypotheses, as layoffs are major distinct events for any airline. However, we see the event study approach as unsuitable for two reasons. First of all, layoff time horizons are not clearly defined, with layoff announcements and negotiations often taking several weeks, if not months, in which they could possibly affect performance. Secondly, there is a multitude of confounding factors over these long time periods that could affect the results. For example, an airline in financial distress might consider layoffs to cut costs. At the same time, however, the same

firm might suffer from a lack of available cash flow, which might impede maintenance operations, and negatively effect on-time performance.

Consequently, we settled for a panel data approach, as we were looking for a method that is able to show the impact of layoffs on on-time performance while able to account for confounding factors and retain the longitudinal nature of the data set. We built our panel based on the airlines' weekly flight schedules (t=336). As a panel identifier, we had to uniquely identify each route and match flights with the same flights from other periods. The only way to do this was to define a flight by a specific airline from a specific airport on a specific weekday at a specific time as a unique route and match it between weeks. Thus, even if an airline offered a single flight multiple times per week, or made multiple turnarounds per day, these flights were seen as different routes in our model. This has the advantage of being able to account for specific time- or date-specific confounders in our results. Our final unbalanced panel contains 1,669,587 unique routes, with between 1 to 273 flights each.

To test our hypotheses, we looked toward different approaches for panel data. To test the frequency of airline delays, given that our dependent variable delay probability is a binary variable, we decided to employ a probit approach on panel data, similar to Rupp and Holmes (2006). To test our hypothesis of delay duration, we considered the application of a system generalized method of moments (GMM) to our data. GMM is an econometric method that has the advantage of being able to account for endogeneity (Semadeni et al. 2014) by using lagged independent variables to construct exogeneous instruments (Roodman 2009). However, GMM is designed for panels with "small t, large n" characteristics, and using it on our panel with 336 weekly periods would result in the generation of millions of instrumental variables, thus severely over-identifying the model and requiring unrealistic computational efforts. Consequently, we settled for a regression on panel data using instrumental variables to account for endogeneity. While not able to account for panel bias like a system GMM, we argue that at 336 periods, panel bias should be negligible, and considering the extreme computational requirements of GMM, we deem this to be the optimal method for our analysis.

## Results

Our first probit model calculates the probability of a single flight being delayed as

$$Model\ 1: Delay_{probability} = b0 + b1 * Layoff + b2 * CSRScore + b3 * Wages + b4 * Distance + b5 * Seats + b6 * ACTypes + b7 * Fleetsize + b8 * Fleetage + b9 * Airtime + b10 * Employees + b11 * Income + b12 * OPcosts + b23 * Cashflow$$

and supports our hypothesis that major layoffs will significantly increase the probability of delays (see Table 25). As probit regression have binary outcomes, coefficients cannot be directly interpreted. Consequently, we calculated the marginal impact that a change of a unit in an independent variable has on the probability of change in the dependent variable. Other significant impact factors are in line with intuition: for example, the longer the distance of a flight, the more time the aircraft has to make up for a delay; similarly, the longer the airtime, the more likely it is that it exceeds the planned airtime. Interestingly enough, while higher wages seem to decrease delay propensity, a high CSR score also seems to significantly increase the probability of delays, which is counterintuitive to our hypothesis that CSR efforts can alleviate the negative impact.

*Table 25: Model 1 (probit for delay probability, t-statistics in parentheses)*

*Coefficients with p<0.05 are starred*

| **N** | 7,740,440 | | |
|---|---|---|---|
| **groups** | 1,669,587 | | |
| | | | |
| **Variable** | **Coefficient** | **Significance** | **Marginal impact** |
| **Constant** | -2.1631* (-139.19) | 0.000 | |
| **Layoff** | 0.0000671* (49.42) | 0.000 | 0.0001 |
| **CSRScore** | 0.0361634* (63.78) | 0.000 | 0.0053977 |
| **Wages** | -0.0002271* (-49.07) | 0.000 | -0.000339 |
| **Distance** | -0.0006535*(-112.08) | 0.000 | -0.0000975 |
| **Seats** | 0.0001828* (11.37) | 0.000 | 0.0000273 |
| **ACTypes** | -0.0048462* (21.39) | 0.000 | 0.0007233 |
| **Fleetsize** | 0.0002556* (45.14) | 0.000 | 0.0000382 |
| **Fleetage** | -0.0157352* (-22.74) | 0.000 | -0.0023486 |
| **AirTime** | 0.0060715* (125.32) | 0.000 | 0.0009062 |
| **Employees** | 0.00000465* (36.26) | 0.000 | 0.000000693 |
| **Income** | 0.0000135* (24.98) | 0.000 | 0.00000202 |
| **OPcosts** | 0.0000227* (26.02) | 0.000 | 0.00000339 |
| **Cashflow** | 0.0000211* (17.34) | 0.000 | 0.00000315 |

Inserting the interaction effects between layoffs and CSR and layoffs and wages into our model nets even more interesting results (see Table 26). With both interaction effects, the direct impact of layoffs becomes non-significant. Wages have a significant negative effect on delay frequency, while CSR has a significant positive effect; the interaction effects of the two variables are inverted. This implies that while CSR practices increased delay probability, they still hold the potential to reduce the probability generated by layoffs. High wages, in contrast, exacerbate the negative impact of layoffs on delays. However, as marginal effects are calculated as how much a change of one unit in the independent variable affects the dependent variable, we cannot calculate the marginal effects for interaction terms, as continuous interaction terms consist of multiple independent variables (Williams 2012). Thus, we cannot provide additional insights into the exact strength of the effect.

$$Model\ 2: Delay_{probability} = b0 + b1 * Layoff + b2 * CSRScore + b3 * Layoff * CSRScore + b4 * Wages + b5 * Layoff * Wages + b6 * Distance + b7 * Seats + b8 * ACTypes + b9 * Fleetsize + b10 * Fleetage + b11 * Airtime + b12 * Employees + b13 * Income + b14 * OPcosts + b15 * Cashflow$$

*Table 26: Model 2 (probit for delay probability with interaction effects, t-statistics in parentheses)*

*Coefficients with p<0.05 are starred*

| **N** | 7,740,440 | | |
|---|---|---|---|
| **groups** | 1,669,587 | | |
| | | | |
| **Variable** | **Coefficient** | **Significance** | **Marginal impact** |
| **Constant** | -2.178006* (-139.53) | 0.000 | |
| **Layoff** | -0.00000733 (-0.42) | 0.672 | 0.000116 |
| **CSRScore** | 0.0377583* (64.76) | 0.000 | 0.0051995 |
| **Layoff*CSRScore** | -0.0000202 (-13.84) | 0.000 | |
| **Wages** | -0.0002328* (-50.13) | 0.000 | -0.000323 |
| **Layoff*Wages** | 0.00000112*(9.32) | 0.000 | |
| **Distance** | -0.0006535* (-112.13) | 0.000 | -0.0000875 |
| **Seats** | 0.0001843* (11.47) | 0.000 | 0.0000275 |
| **ACTypes** | 0.0046812 (20.46) | 0.000 | 0.0009058 |
| **Fleetsize** | 0.0002621* (46.10) | 0.000 | 0.0000391 |
| **Fleetage** | -0.0151444* (-21.79) | 0.000 | -0.0022601 |
| **AirTime** | 0.0060697* (125.31) | 0.000 | 0.0009058 |
| **Employees** | 0.00000467* (36.38) | 0.000 | 0.000000697 |
| **Income** | 0.0000135* (24.90) | 0.000 | 0.00000202 |
| **OPcosts** | 0.0000229* (26.11) | 0.000 | 0.00000341 |
| **Cashflow** | 0.0000212* (17.40) | 0.000 | 0.00000316 |

The probit model gives us some insight into the probability of delays, but not on how layoffs affect the average delay duration. To test our hypotheses on layoffs' effect on delay duration, we employ an instrumental-variable regression on panel data. This is required as, for example, an airline in financial distress might slash maintenance budgets and lay people off to reduce costs. While a simple regression would show us that there is a significant correlation between layoffs and delays, that might be the case because both are affected by the preceding poor financial health of the company. By using the lagged financial indicators of an airline as instruments, we can account for this endogeneity. Consequently, we use the following model to test the effect of layoffs on the duration of delays.

$$Model\ 3: Delay_{duration} = b0 + b1 * Layoff + b2 * CSRScore + b3 * Wages + b4 * Distance + b6 * Seats + b6 * ACTypes + b7 * Fleetsize + b8 * Fleetage + b9 * Airtime + b10 * Employee + b11 * Income + b12 * OPcosts + b13 * Cashflow, Instruments\ for\ Layoff = lagInc1\ lagInc2\ lagOPc1\ lagOPc2\ lagCF1\ lagCF2$$

*Table 27: Model 3 (instrumental-variable regression for delay duration, t-statistics in parentheses)*

*Instrumented: Layoff*
*Instruments: lagInc1 lagInc2 lagOPc1 lagOPc2 lagCF1 lagCF2*
*Coefficients with p<0.05 are starred*
*Reduced sample size due to lagged variables; only observations from t+2 onwards can be considered*

| **N** | 4,850,537 | |
|---|---|---|
| **groups** | 940,091 | |
| | | |
| **Variable** | **Coefficient** | **Significance** |
| **Constant** | -3.907885* (-7.14) | 0.000 |
| **Layoff** | 0.0002918* (10.38) | 0.000 |
| **CSRScore** | 0.1570068* (11.65) | 0.000 |
| **Wages** | -0.0009613* (-6.67) | 0.000 |
| **Distance** | -0.0017396* (-13.33) | 0.000 |
| **Seats** | -0.0002515 (-0.51) | 0.613 |
| **ACTypes** | 0.0381479* (4.88) | 0.000 |
| **Fleetsize** | -0.0007873* (-3.74) | 0.000 |
| **Fleetage** | 0.2830898* (10.21) | 0.000 |
| **AirTime** | 0.0178637* (32.54) | 0.000 |
| **Employees** | 0.0000317* (7.36) | 0.000 |
| **Income** | 0.0001357* (10.12) | 0.000 |
| **OPcosts** | 0.0000502 (1.95) | 0.051 |
| **Cashflow** | 0.000232* (7.24) | 0.000 |

The results are coherent with the results of our probit model 1. Even though our model indicates that there is a significant effect of layoffs on delay times, the effect is small (see Table 27). Again, CSR efforts seem to increase the durations of layoffs, while higher wages paid seem to reduce them. To further test the relationship between CSR efforts and layoffs we include the interaction terms in our model.

$$Model\ 4: Delay_{duration} = b0 + b1 * Layoff + b2 * CSRScore + b3 * Layoff * CSRScore + b4 * Wages + b5 * Layoff * Wages + b6 * Distance + b7 * Seats + b8 * ACTypes + b9 * Fleetsize + b10 * Fleetage + b11 * Airtime + b12 * Employees + b13 * Income + b14 * OPcosts + b15 * Cashflow, Instruments\ for\ Layoff = lagInc1\ lagInc2\ lagOPc1\ lagOPc2\ lagCF1\ lagCF2$$

*Table 28: Model 4 (instrumental-variable regression for delay duration with interaction effects, t-statistics in parentheses)*

*Instrumented: Layoff*
*Instruments: lagInc1 lagInc2 lagOPc1 lagOPc2 lagCF1 lagCF2*
*Coefficients with p<0.05 are starred*
*Reduced sample size due to lagged variables; only observations from t+2 onwards can be considered*

| **N** | 4,850,537 | |
|---|---|---|
| **groups** | 940,091 | |
| | | |
| **Variable** | **Coefficient** | **Significance** |
| **Constant** | -3.964945* (-7.24) | 0.000 |
| **Layoff** | 0.001046* (2.53) | 0.011 |
| **CSRScore** | 0.1716991* (11.26) | 0.000 |
| **Layoff*CSRScore** | 0.0000352 (1.11) | 0.266 |
| **Wages** | -0.0009386* (-6.50) | 0.000 |
| **Layoff*Wages** | -0.000000552 (-1.96) | 0.05 |
| **Distance** | -0.0017400 (-13.33) | 0.000 |
| **Seats** | -0.0002509 (-0.50) | 0.614 |
| **ACTypes** | 0.035238* (5.05) | 0.000 |
| **Fleetsize** | -0.0008704* (-4.00) | 0.000 |
| **Fleetage** | 0.2947040* (10.25) | 0.000 |
| **AirTime** | 0.0178665* (32.54) | 0.000 |
| **Employees** | 0.0000324* (7.48) | 0.000 |
| **Income** | 0.0001347* (10.02) | 0.000 |
| **OPcosts** | 0.0000501 (1.95) | 0.051 |
| **Cashflow** | 0.0002321* (7.24) | 0.000 |

While layoffs, wages, and CSR have a similar impact on delay duration as in our previous model, the interaction effect of layoff and CSR is non-significant (see Table 28). Unlike model 2, which suggests that airlines with a high CSR investment can indeed absorb part of the negative impact of layoffs on delay propensity, this does not hold true for delay duration. However, the interaction with wages is significant and negative, indicating that high-wage airlines going through layoffs can reduce the duration of delays. While some of these results seem counterintuitive and even contradictory, we will discuss them in greater detail after various robustness tests.

### *Robustness checks*

We also conducted a series of other tests to check the validity and robustness of our results. A Hausman test provided significant evidence that our instrumental-variable regressions are adequately specified as fixed effects models ($\chi^2 = 943.33$, prob > $\chi^2 = 0.000$) (Hausman 1978). A simple two-tailed t-test showed that there is a significant difference in carrier delay times between flights affected by layoffs and flights not affected by layoffs (t(7,740,439) = 2.7571, p=0.00). Furthermore, ANOVA showed that there is a significant difference in delay times between carriers (F=399.48, p=0.00), as well as a significant difference in layoffs between carriers (F=11202.89, p=0.00). All calculations were conducted using the Stata 15.1 software, and using the "robust" command (where applicable) to account for collinearity, heteroscedasticity, and endogeneity issues in the models (Pevalin and Robson 2009, Rabe-Hesketh and Everitt 2004). Also, different transformations and polynomial terms were considered for certain control variables to test for non-linear relations (e.g., quadratic terms for Seats, Wages and Employees to account for particularly strong effects at very high levels of the variable). However, their contribution to the models was minimal, and they were omitted for simplicity's sake.

We also considered the possibility that carriers with lower wages are more likely to lay off employees, which could result in multicollinearity. While the distribution of layoffs and wages (see Figure 9) is indeed slightly skewed to the left, indicating that lower wages could be correlated with layoffs, overall, our data shows an approximate normal distribution of layoffs between high and low wages. We deem this distribution of layoffs over wage brackets to be robust enough to draw conclusions from.

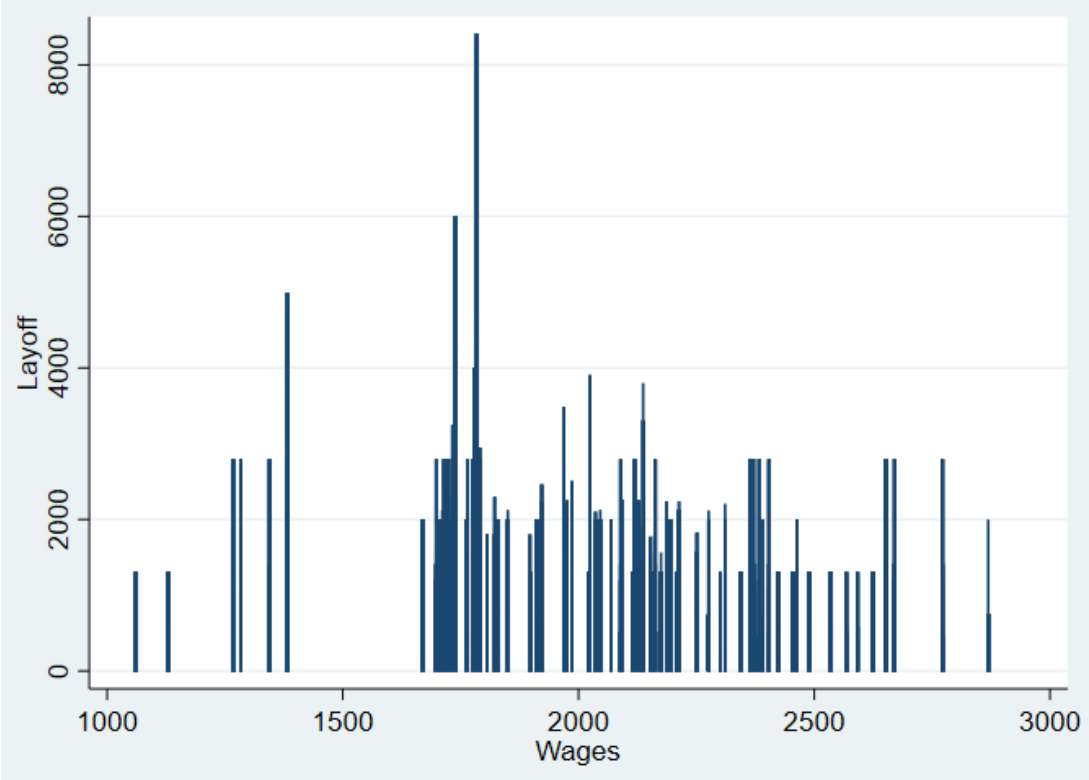


*Figure 9: Relation between layoffs and wages*

Furthermore, given that our models 3 and 4 calculate the duration of delays and are thus contingent on flights being delayed, which is only true for about 10% of the data sample, we considered running the same regression on delayed flights only. However, as flights do not tend to be consistently delayed, this severely impacts the panel structure of our data. A simple regression on all delayed flight provides consistent results with our prior findings but has comparatively less statistical conclusion validity as we cannot instrument variables or employ panel data. Lastly, we considered that our data sample does not include negative delays, i.e., data in cases when flights land early. Consequently, our dependent variable is left-censored, and we also tested a mixed-effect Tobit model with the dependent variable CarrierDelay censored at 0 to account for the effects of the possibility of negative delays (Tobin 1958, Woolridge 2013), which produced results that are overall consistent with Model 4.

## Discussion

Our results provide empirical evidence that layoffs lead to an increase in both delay probability and delay duration: we accept both hypotheses 1a and 1b. Although the coefficient of the effect of layoffs on delay probability seems small, we need to emphasize that this calculation is based on a single flight as the unit of observation, while layoffs were

modeled to have a two-month-long impact. Consequently, a layoff of 1,000 people would increase the probability of at least a 15-minute delay of every flight of that carrier for two months by 0.1 percent. Given the sheer amount of flights per month and carrier, the operational and financial consequences of layoffs might be quite high for airlines. For example, a layoff of 1,000 employees would mean an average of 14,000 delayed flights more over two months for Delta Airlines. Clearly, there is a "hidden cost" associated with layoffs that will negatively affect the long-term operational and financial performance of an airline, particularly when considering the high costs of delays. Given that passenger have both a preference for higher service quality and increasingly the tools and information at their disposal to make their decisions based on criteria like on-time performance (Prince and Simon 2015), airlines with frequent delays might lose customers to competing carriers (Suzuki 2000). Stressing the high importance of service quality and the comparatively low proportion of labor costs compared to total costs in commercial air travel (Tsoukalas et al. 2008), it could easily be that these "hidden costs" are substantially higher than the accompanying cost reductions. Thus, firms that try to consolidate their financial health in the short term via layoffs might suffer in the long term (De Meuse et al. 1994, Love and Kraatz 2009).

However, it is important to keep in mind that the overall impact of layoffs on delay duration is, while significant, very minor. Airline flight schedules and delay times are affected by a multitude of intricate and chaotic effects (Lan et al. 2006), so it is very difficult to accurately forecast which factors are strong antecedents of delay times. Furthermore, delays are not homogeneous, and there might be significant differences between delays. While a 20-minute delay on a long- or medium-haul flight might not be a major issue for passengers, it could be seen as a major annoyance when passengers need to make a transfer or in the case of a short-haul flight. The longer the delay, the more salient the negative effects probably are: Passengers that experience very long delays might be significantly more likely to switch carriers in the future. This implies that it is not sufficient for airlines to focus on delay prevention, they also need contingency plans in place to reduce the effect of disruptions on flight schedules.

Both wages and CSR seem to play a less straightforward and slightly more paradoxical role for delays than layoffs. While our intuition was that CSR should have a negative impact on delay times, the opposite is the case. Airlines with a high investment in CSR are both more likely to experience delays and suffer from longer delays than less-invested airlines. A possible explanation could be that airlines with high CSR investment have a better

understanding and knowledge of their internal processes and pay closer attention to safety, which might result in more frequent and longer delays due to higher standards. Alternatively, an explanation offered by the literature that cannot be verified by our data sample is given that network carriers have been found to be more prone to delays (Mayer and Sinai 2003), and also overall more invested in CSR reporting (Cowper-Smith and de Grosbois 2011), there might be an interaction of type of carrier and CSR investment that causes this effect.

Our findings only partly support hypothesis 2. While Model 2 indicates that firms with a high CSR investment can absorb the negative impact of layoffs on delay probability, the effect on delay duration in Model 4 is not significant. Thus, in the case of layoffs, our findings suggest that CSR can help to avert disruptions that lead to delays but does not provide any operational advantage when disruptions happen. This is in part at odds with the extant literature that shows that organizational support in aviation leads to more satisfied, productive, and intrinsically-motivated employees (Heskett et al. 1994, Kim and Back 2012, Kucukusta et al. 2016) that might be able to deal with delays or its operational antecedents more appropriately (Helmrech 1997, Hobbs and Williamson 2003).

Interestingly enough, all models consistently show that higher wages lead to a decrease in delay probability and duration. However, the interaction between wages and layoffs is considerably more complicated. High wages were found to reduce delay duration during layoffs but to increase delay frequency; while we can accept hypothesis 3b, we clearly need to reject hypothesis 3a. This effect is only paradoxical at first glance, as the literature offers a potential explanation. As higher wages have been associated with lower turnover and the retention of more skilled workers (Bewley 1998, Rodriguez et al. 2006), it would only make sense that, following a layoff, the remaining employees are more skilled and have more experience of how to deal with delays when they happen. However, given the higher average intrinsic value of employees, it could be that firms with higher wages suffer from additional disruptions when laying off people, because the average loss of skill and experience per employee is higher. It seems apparent that the intricacies between layoff, wages, motivation, and operational performance are not yet clearly understood. Consequently, further research on what the most motivating factors for employees are and how they affect operational performance in the aviation industry might be needed.

## Conclusion

Delays are a major cost driver in the airline industry (Ball et al. 2010) and have the potential to not only threaten an airline's margins, but also to negatively affect its long-term viability by reducing service quality and alienating passengers (Mazzeo 2003, Prince and Simon 2015). This study provides evidence of how the airlines' management practices, i.e., layoffs, wage levels, and corporate social responsibility efforts, affect airlines' delay probability and delay duration. This expands on the extant literature by focusing on carrier-caused delays in contrast to propagated delays (Deshpande and Arikan 2012), weather-caused delays (Rupp and Holmes 2006), and airport congestion delays (Mayer and Sinai 2003, Pels and Verhoef 2004, Zhang and Zhang 2006). Our findings based on a sample of 7.7 million flight records from the domestic aviation sector of the United States show that both layoffs and CSR efforts lead to more frequent and longer delays, while wages take a more complex role. These findings hold significant insights for theory and practice. Apart from showing a significant relationship between layoffs and delays, we also further the extant discourse on CSR in aviation, a crucial topic gradually growing in importance. Rather than relying on external scores or single sources, we devise a multi-source composite measurement of CSR that, if further expanded on and refined, could help to track the industries' CSR efforts and related effects without the reliance on second-hand data from rating agencies (Orlitzky et al. 2003) or the often-inconsistent airline-reported benchmarks (Hooper and Greenall 2005).

From a theoretical perspective, more research is needed on how employee morale and delays are related. While we postulate a mechanism based on higher human error propensity (Helmrech 1997) and lower motivation (Chen and Kao 2011) due to lower morale (Kucukusta et al. 2016) and understaffing, we cannot provide strong evidence for the inverse logic that higher CSR efforts ease the negative impact of layoffs. While high-CSR airlines are able to absorb some of the negative impact of layoffs on delay frequency, no such effect was found on delay duration. Moreover, firms with high CSR investment seem to suffer from more and longer delays in general. In contrast, high wages seem to enable firms to decrease both delay duration and frequency, at the cost of suffering additional delays during layoffs, probably due to the loss of key employees (Ang and Slaughter 2004, Ederer and Manso 2013). These findings hold some interesting implications for the broader CSR literature: While airlines that maintain a strong CSR-friendly image to the wider public seem to not benefit from it in their operations, airlines that treat their employees well by providing additional incentives are able to reap rewards in the form of better operational

performance. This is in line with findings on “green-washing” and firms that maintain CSR as a marketing tool (Walker and Wan 2012). Firms that have a higher discrepancy between their communicated CSR and their actual CSR performance showed a worse financial performance. Compared to other CSR-firm performance studies that are largely based on CSR as an aggregate construct, the external and internal proxies we used shed some light on the intricate link between different manifestations of CSR and firm performance. Thus, our findings not only contribute to a recent call for a more differentiated analysis of the impact of different dimensions of CSR (Wang et al. 2016), but also adds to the current discourse of how organizational support and employee satisfaction drive service quality and customer satisfaction in service-based industries (Saeidi et al. 2015, Sun and Kim 2013) by providing some evidence that employees are well-aware of gaps between an employer’s social image and its actual practices. Interesting further research questions would be whether other internal employee-friendly management practices (like trainings, promotion opportunities, or other benefits) have an effect similar to high wages, and whether specific external CSR investments can produce a positive internal response and lead to a higher motivation of employees.

The exact process of how these inputs affect delays also warrant further studies: further research on the major motivators of airline employees can especially help to further our understanding of how morale affects operational performance. Another thing to keep in mind is that we focus exclusively on carrier-caused delays in this study; however, it is completely possible that layoffs and CSR efforts will affect an airline’s ability to deal with delays caused by other sources and impede their ability to resolve these issues appropriately. Further research is needed to expand our understanding of the complexities of staffing decisions, morale, and delays. Furthermore, we highly encourage researchers to conduct similar studies with related management practices and policies. In line with this study and similar to Nicolae et al. (2017) who showed how an airline’s luggage policy affects its on-time performance, researchers could look to other firm-level policies, for example, relating to employees (training and benefits), passengers (boarding policy, carry-on allowance), or other stakeholders (airports, security practices, code-sharing agreements), to explain delay frequency and duration. Similarly, the role of airports for carrier-caused delays should be further explored. While there is an established stream in the transportation literature discussing airport congestion delays (Pels and Verhoef 2004, Zhang and Zhang 2006), it would be interesting to explore whether the airport choice also affects delays specifically attributed to the carriers, either due to the fact that different

people work in different teams at different airports, or due to interaction effects between carrier teams or processes and airport location.

This chapter also offers important insights for the management of airlines. While layoffs might be seen as a method to reduce capacity and match supply with market demands (Coelli et al. 2002), executives need to be aware that there are hidden long-term costs connected with layoffs. Re-hiring staff after a period of low demand (and associated layoffs) is not the same as maintaining staff, as implicit skills will be lost (Wilder et al. 2014) and morale will be lower (Chen and Kao 2011). Moreover, paying higher wages, while increasing salient costs in the airline's profit and loss statement, might help to reduce hidden costs, smoothen operational processes, and build human capital. Accordingly, executives should think twice about whether they want to jeopardize long-term sustainability in favor of short-term profits, and if they decide that layoffs are inevitable, they should make sure that they are properly handled (Brockner 1992, Klehe et al. 2011), lest they manifest negatively in their operational performance. However, we can only partly confirm the findings of another study on CSR in another context. We only found some evidence of CSR being able to build "insurance-like" goodwill with stakeholders (i.e., employees) that can be used to deal with negative events (Godfrey et al. 2009, Klehe et al. 2011), while wage levels were consistently identified to have a positive impact on operational performance. However, in this lies a major conundrum: Our results not only show that layoffs negatively affect on-time performance, they also reveal that increased CSR efforts themselves seem to be correlated with a deterioration of on-time performance – and even high wage levels can lead to more delays in times of layoffs. Executives need to tread lightly if they want to maneuver layoffs, wage levels, and CSR investment without jeopardizing their service quality – and further research is certainly warranted to provide guiding insights.

### *Limitations*

Given the nature of the data sample and the complexity of the concepts discussed, there are several limitations to our findings that we would like to highlight. Firstly, our assessment of flight delay and duration is based entirely on the BTS database, and we trust that the data provided (except for the obvious erroneous entries that were deleted during data cleaning) is correct. However, a study has shown that airline agents have a strong incentive to misreport their delay times for personal gain (Forbes et al. 2015). While this is certainly a concern for the validity of our results, we argue that it is relatively minor. On the

one hand, this behavior has been observed with every airline in the industry, and consequently, it should affect our results more or less equally. On the other hand, if this behavior was not an issue, there would be an increase in delay times and frequency, which would further strengthen the significance and coefficients of our regressors. Secondly, the composite CSR score perceived and introduced in this paper is novel and untested. We used several sources to avoid bias in our score and tried to use relative ratings (rather than absolute scores) to highlight differences between airlines. Furthermore, we ran several statistical tests on this measurement to test for validity and robustness. While there might be some bias retained in this score, we see it as a more appropriate measurement than scores from external rating agencies, particularly as it can be extended and applied to the entire US domestic airline industry, whereas CSR scores by rating agencies are unavailable for most of the smaller carriers. Thirdly, our analysis of layoffs and carrier delays does not directly account for geographical criteria: our layoff variable does not keep track of whether a specific route between two airports is affected by layoffs, as we focused on firm-wide effects and assumed that the negative impact affected all routes equally. We see the analysis of the regional effects of layoffs on delay times as a promising future study. In this regard, we also do not account for the type of personnel (cabin crews, maintenance staff, pilots, front-desk employees, etc.) being laid off, and neither do we account for different wage levels of different types of personnel. However, due to the nature of the industry and the rarity of carriers laying off flight crews, the majority of layoffs in our data sample are maintenance and front desk staff. Lastly, our data sample is based exclusively on network carriers in a single geographical context and excludes international flights; thus, it has limited generalizability. We encourage further studies on the difference between network and no-frills airlines, as well as replication in different geographical contexts.

# Chapter 5 – Conclusion

There is no question that ways need to be identified to address the negative externalities of transportation on communities and the environment. However, these impacts need to be regulated without negatively affecting transportation efficiency and costs in order to not produce unforeseen consequences. For example, if a port is pressured into adopting noise cancellation technology by neighboring communities, and the investment associated with this adoption is unreasonably high, it will hurt the competitiveness of the port and in turn weaken the performance and competitiveness of the wider economic area and probably have negative economic impacts on the neighboring communities that effected these investments. Similarly, over-regulating the maritime transportation industry to reduce emissions might lead to significant changes in cost and utility functions of transportation services, and shippers might move to alternative modes of transportation like road cargo that have even a worse impact on the environment. Indeed, it is crucial for transportation experts to see the bigger picture of the industry and how even minor changes can have far-reaching consequences. Thus, there is a need for researchers to study, analyze, and understand the intricacies of sustainability and how sustainable practices are adopted in the transportation industry.

This thesis discusses the diffusion of sustainability discourse and practices as well as the impact of sustainable practices adoption in the transportation industry in five connected but independent studies. A focus was put on maritime transportation and aviation in their role as connecting industries in increasingly-globalized economies. Institutional theory was adopted in the majority of the studies to analyze how external pressures affect sustainability adoption in transportation firms, and institutional tenets were enriched with other theoretical lenses to provide a more extensive and agency-based approach.

Both theory and practice exhibit a clear trend toward “more” sustainability discourse. Researchers aim to design more effective frameworks to address sustainability issues and try to identify win-win situations; however, we do not fully share the optimistic view that holistic sustainability can be attained without trade-offs, as more often than not, “money is king.” Economic considerations are usually a priority in the transportation industry (Psaraftis and Kontovas 2010). Similarly, it seems that transportation firms have an increasing tendency to invest in sustainability and CSR, and particularly improve their overall reporting standards and transparency. This, however, has to be taken with a grain of salt, as “white-washing” in the form of overselling achievements and understating issues

is a major issue in the industry, and it is anything but clear that the current efforts of transportation firms are sufficient to address their massive negative externalities. Furthermore, our evidence in essay 5 suggests that using CSR as a marketing tool could be detrimental to the performance of transportation companies, so firms should endeavor to properly invest in CSR and sustainability, rather than just paying lip-service.

In the following sections, we will recap the contributions of this thesis. We will start by discussing the academic contributions and sketching a potential research outlook for future studies. Subsequently, we will summarize our contributions, and discuss how managers and executives can utilize our findings to better understand the current sustainability discourse and how to improve their own firm's impact. We will close with the remaining limitations that this thesis is subject to which have not yet been adequately covered in the respective studies.

## Academic contributions and research outlook

Apart from the academic contributions of the individual studies, we would like to highlight the bigger picture of our findings in this section. Our first study shows a clear trend toward more sustainability research in transportation management. The current discourse is not only improving in quantity, but also in quality: Researchers improve their scientific rigor by adopting more sophisticated methods and making use of the increase in computational power in recent years to analyze bigger data sets. While this trend has not yet been fully embraced by the scientific community, we expect it to increasingly do so in future research (Christiansen et al. 2013, Meng et al. 2014). What is more, researchers are branching out to tackle an increasing number of niche topics relevant to sustainability in transportation management. There is also an increasing number of researchers that adopt a holistic perspective on sustainability issues (Cowper-Smith and de Grosbois 2011, Lam 2015), even though they are still a minority, as most studies focus on two or only one dimension of sustainability.

We provide clear evidence that a major contributor to a firm's sustainability efforts is its institutional environment. Efforts of transportation firms are shaped by their regulative environment (see essay 2, 3), their partners and alliances (see essay 4), and their customer base (see essay 3). Based on our findings, we argue that the current trend toward more sustainability in transportation is based on an increase in institutional pressures. Apart from the obvious coercive pressures exerted by regulators, there is a clear and ongoing shift in the public's perception of what the minimum sustainability performance of a

transportation company is. While airlines need to deal with these pressures more directly (Mayer et al. 2012), shipping companies are affected by these pressures via their downstream supply chain partners (Poulsen et al. 2016). Once pressures for the adoption of a particular practice have entered the industry and proven to be efficient, it will slowly but surely permeate it, as companies mimic each other to resolve any organizational uncertainty associated with sustainability. While our results provide a clear picture of smaller firms modeling themselves after big thought leaders in the aviation industry (see essay 4), our findings in the maritime industry are more ambiguous. While the biggest container shipping line Maersk has a strong dedication to sustainability, the runner-up firms only invest at the legally-mandated minimum (see essay 2). If anything, this could increase the organizational uncertainty related to sustainability in the liner shipping industry, and more research is needed to understand the complexities of the market.

Our third study suggests that as pressures for sustainability adoption increase, firms increasingly come up with new strategies to resist and reshape pressures. Consequently, even though we see more voluntary investment in sustainability, regulations are still an essential tool. While we provide insights on how practices can diffuse through the industry or through groups of firms within the industry (see essay 4), further studies are needed.

Apart from the further research outlooks identified in the respective studies, we see three promising topics for future studies. Firstly, while we provide clear evidence that CSR and sustainability reporting is on the rise in the industry, we cannot confirm that actual practice adoption is increasing accordingly, as firms might decouple formal practice adoption with actual practice implementation (Meyer and Rowan 1977) by “white-washing” their impact, which seems to have a negative impact on operations (see essay 5, (Walker and Wan 2012)). Thus, we highly encourage further research on actual practice implementation, or on the gap between communicated adoption and actual adoption. Secondly, we provide evidence in our fifth essay that sustainability can cause hidden costs and benefits for firms. While CSR and financial performance have been studied extensively in strategic management research (Wang et al. 2016), we encourage further research on the connection between sustainability/CSR and operational performance. While we provided evidence that there might be a connection, our paradoxical results indicate an intricate relationship with yet-indeterminate effects on long-term financial performance. Thirdly, even though we try to make a case for a holistic perspective of sustainability, we understand that sustainability and CSR are sophisticated constructs that are only vaguely-defined. Consequently, we not only need a stronger commitment to conceptual studies to

develop and bolster these concepts, but also more specific empirical studies to test the various facets of these multidimensional constructs. In situations where one aspect of CSR affects performance positively and one aspect of CSR affects performance negatively, an aggregate understanding of CSR can be misleading and provide imperfect results. A major limiting factor in this regard is data availability: Firms are reluctant to share their sustainability data, maybe in fear of being publicly ostracized, and third-party rating agencies provide data only for a few selected companies. As these issues seem exacerbated in the transportation industry, researchers on sustainability in transportation are forced to think outside the box and find additional data sources. Luckily, recent advancements in computing power, big data, and machine learning can help to come up with new ways to analyze and generate data, and we highly encourage researchers to explore novel approaches – like our topic modeling algorithm – in the analysis of sustainability issues.

## Managerial implications

Apart from the specific findings in the individual studies, we want to highlight how our aggregate insights can help policymakers design appropriate regulations and how they can support the industry in dealing with sustainability issues.

For executives, we provide food for thought about how their firms are affected by external sustainability pressures. We show that while pressures for more societal responsibility are usually generated outside of a firm, they can be internalized as a firm goal and continue to drive sustainable development. To resolve uncertainty in practice adoption, firms can look to market or alliance leaders to generate solutions or identify the optimal implementation strategy. Alternatively, strategic alliances or loose cooperation between firms can help to invigorate the discourse and facilitate a diffusion of practices. Understanding the drivers, antecedents, and trends of sustainability in the transportation industry can help managers to react appropriately to external demands and make better-informed decisions about sustainability investments. In this regard, this study also equips them with some alternative strategies to handle sustainability pressures (see essay 3) and provides insights into how the implementation of practices can affect their operational and financial performance (see essay 5). While there is ample research on the link between CSR and performance, the results of this thesis can provide an alternative perspective on this link, with a particular view toward some prior unconsidered costs and benefits. Our findings particularly highlight that executives should make sure that they are not just “talking the talk,” but rather “walking the walk,” i.e., following up on CSR statements with effective and practical CSR

implementation, otherwise, their CSR investment might lead to a decreased operational performance and may make it harder for firms to stay on a path toward sustainability.

For policymakers and regulators, our elaborations about the diffusion of discourse and practices can be helpful for understanding the obstacles and drivers of sustainability adoption. This can provide support in policy and regulation design and improve overall success rate. Apart from the more obvious findings, that firms look to realize win-win situations and that regulations are an essential part of internalizing some of the negative effects of the transportation sector where these win-win situations are not possible, our results also provide more profound insights. For example, essay 4 shows that the self-governance of firms can be incentivized via the harmonization of efforts through strategic alliances. This implies that regulations that are specifically tailored toward adoption by market and alliances leaders have a strong success rate, as smaller firms will gradually follow through with adoption. Furthermore, on the flip side to the aforementioned strategies for managers to handle external sustainability pressures, regulators can achieve a better understanding of the evasion strategies utilized by firms to combat regulations, and act accordingly. Lastly, we provide evidence that national regulation is not the optimal approach for governing the highly globalized transportation industry. To appropriately address global negative externalities, we need strong and international governance bodies with the adequate tools to penalize non-compliant firms and countries.

## Limitations

While all studies were conducted with the highest scientific rigor possible, there are some limitations associated with the theory, methods, and data that need to be addressed. Rather than reiterating the limitations of the individual studies, we would like to highlight some factors that limit the contributions of this thesis as a whole. First of all, we only conducted our studies in two transportation modes, and even then, we did not replicate the maritime studies in aviation or vice versa. While we see similar trends in both industries and interpret them as a good indication that our findings can be generalized toward the wider transportation industry, we acknowledge that this is a limitation to the external validity of our findings. Incidentally, we confined all our research to the transportation industry, and while we cite works from related bodies of industry (like supply chain management, operations management or strategic management) quite frequently, we did not extend our findings to these connecting sectors or include them in any study as a control industry. We encourage researchers to replicate our studies in different modes of

transportation, different corporate functions, or different institutional contexts to see whether our results hold true.

Furthermore, there are significant limitations to this study when it comes to internal and construct validity. For the most part of this study, we use the terms sustainability, sustainable development, and CSR interchangeably and see them as different manifestations of the same construct, even though that might indeed not be the case. There is a multitude of definitions of CSR and sustainability that change according to the institutional context and body of literature. "Sustainability" might mean something different in a transportation context than it means in a strategic management or supply chain context. While we defined our concepts in the introduction of this thesis and stuck to them throughout the essays, we feel the need to acknowledge this breadth of definitions. What is more, the vagueness of the constructs discussed, and their complexity made accurate measurements difficult. Some of our studies (particularly essays 4 and 5) have employed novel and untested measurements of CSR, and consequently, while we did our best to validate our measurements, we need to acknowledge that there is a possibility for bias in our operationalization. Furthermore, given that our empirical studies were done on real-life data, internal validity is an issue. While our quantitative studies are based on panel data to improve our ability to infer causality from our findings, and our qualitative studies pay special attention to determining the causal order of analyzed processes, we cannot exclude the possibility that some causal order or attributed effects might be misinterpreted or more complex than discussed. The transportation industry is highly complex and dependent on many factors, and it is impossible to account for all eventualities and confounding factors.

In terms of statistical conclusion validity, we tried to employ as many robustness checks as possible to present results of the highest possible quality. While we are confident that our methods are appropriate and show a high degree of statistical conclusion validity, we deem it necessary to stress the fact that all our quantitative data comes from secondary sources (media coverage, BTS data, Bloomberg, etc.). Apart from the obvious problem of having to rely on data that cannot be fact-checked, there are also some limitations when it comes to missing data. No study used any observations that were incomplete, however, in some studies, we had to omit observations due to missing financial data (essay 4) or operational data (essay 5). While the sample size of every model is always clearly communicated, and it is unlikely that a handful of missing observations have a significant impact on our findings, we want to acknowledge this limitation to our statistical conclusion validity.

## Concluding remarks

An efficient and competitive transportation industry plays a key role in a globalized economy. It enables efficient supply chains and links firms, countries, and people. However, we must not close our eyes to the negative externalities of transportation. Environmental degradation and social injustices need to be central issues in transportation management and research in the years to come, otherwise the damage caused by transportation will be severe and irreversible. Emission of pollutants, invasive species, and habitat loss have to be reduced and the corresponding costs internalized by transportation firms. At the same time, the profits generated by transportation have to be allocated fairly to all stakeholders to curtail an exploitation of the workforce and communities.

It is difficult to foresee what the future will bring for the transportation industry. We are currently observing major geopolitical changes that have the potential to either acerbate or alleviate these issues. A protectionist climate of trade tariffs and crumbling international governance bodies create a stage with toothless global governance that lacks appropriate responses to issues like climate change and growing social injustice. Transportation firms could take advantage of this opportunity to increase margins by reducing their sustainability efforts, but at the same time, they would also struggle to maintain networks and market access in an environment of reversed globalization, leaving their economic outlook uncertain at best. Increasing global tension, terrorist activity, and environmental disasters will also leave their mark on the industry and severely disrupt vulnerable transportation links in global supply chains. Conversely, international economic projects like the European Union or China's "One Belt One Road" initiative have the potential to be major drivers of economic integration over numerous economic regions and could thus also be used to provide a roadmap of sustainability governance for member countries – if the importance of sustainability in transportation is realized and advocated in the course of these projects. Furthermore, the question of which legislative bodies will set and monitor these guidelines remains, as there is a major risk of leading member countries designing policies and regulations with their own benefits in mind, at the expense of other countries and with dire consequences for the environment.

Technological advancements are also expected to profoundly transform the transportation industry as we know it, and I argue that they should be seen as a mixed blessing at best. Granted, big data applications will allow us to optimize routes and handling processes and in turn reduce transportation times and emissions. More fuel-efficient engines and the use

of alternative fuels will decrease the dependence on fossil fuels and lessen the environmental impact of transportation. Cloud-computing and the Internet of Things will further advance the tracing and tracking of shipments and visibility in supply chains, which will improve safety and security in transportation immensely. However, not all technological trends can be expected to have a completely positive impact. For example, trends toward automatization, e.g., Alphabet's driverless cars "Waymo" or Amazon's drone delivery, will have far-reaching effects on entire economies. While the driverless car technology holds the potential to improve road transportation safety and decrease transportation time and costs for firms, it will have unforeseeable consequences and ripple effects, as every truck, van, or lorry we see on the street today will be one additional unemployed person, and we as a society will need to find ways to deal with this loss of labor and purchasing power, and the resulting increased need for welfare systems. Similarly, we see sharing economy networks like Uber taking the forefront of personal individual urban transportation, but apart from issues with the legal gray area they are operating in, we can also see clear trends of them pushing their drivers into self-exploitation by designing incentive schemes that motivate them to work unreasonably long hours at low wages.

We do not know how changes in political systems and technology will affect transportation in the 21st century. However, three things are clear: Firstly, the advancements in computation and data applications are crucial for addressing sustainability issues in transportation and will give data-savvy transportation firms an immense edge in their competitiveness. Indeed, whoever controls the data also controls the future of transportation. Secondly, the only way to govern the externalities of transportation is collaboration. We all are and will be affected by climate change, pollution, and environmental degradation in one way or another, consequently, it is of the utmost importance that we come together and address these pressing issues jointly. Thirdly, the time to act is now. We are all in the same leaking boat, and if we do not act in concert as soon as possible, it might be too late to plug the hole and keep us from sinking. Thus, I hope this dissertation on sustainability issues in transportation management can inspire further research and improvement actions for the betterment of the industry.

# Appendices

## Appendix A – Web of Science search string

TS=(“maritime transport*” OR “maritime supply chain” OR “maritime logistics” OR “marine transport*” OR “ship transport*” OR “sea cargo” OR “sea transport” OR “sea transportation” OR “liner ship*” OR “container shipping” OR “ocean freight” OR “line carriers” OR “container port” OR “shipping routes”)

AND

(TS=(“social” OR “job satisfaction” OR “labo* practice” OR “ethic*” OR “compliance” OR “CSR” OR “stakeholder” OR “safety” OR “accident” OR “security” OR “society”)

OR TS=(“competitiveness” OR “efficiency” OR “optimization” OR “profitability” OR “cost*” OR “risk management” OR “quality” OR “utilization” OR “performance” OR “growth” OR “investment” OR “finance” OR “economics” OR “network design” OR “ship scheduling” OR “ship routing” OR “fleet size”)

OR TS=(“green” OR “environment” OR “pollution” OR “emission*” OR “waste” OR “fuel consumption” OR “environmental” OR “ecological”))

NOT TS=cruise

## Appendix B – List of articles in data sample


Acciaro, M. (2014). A real option application to investment in low-Sulphur maritime transport. International Journal of Shipping and Transport Logistics, 6(2), 189-212

Acciaro, M., and McKinnon, A. C. (2015). CARBON EMISSIONS FROM CONTAINER SHIPPING: AN ANALYSIS OF NEW EMPIRICAL EVIDENCE. International Journal of Transport Economics, 42(2), 211-228

Accorsi, R., Manzini, R., and Ferrari, E. (2014). A comparison of shipping containers from technical, economic and environmental perspectives. Transportation Research Part D-Transport and Environment, 26, 52-59

Adland, R., and Strandenes, S. P. (2007). A discrete-time stochastic partial equilibrium model of the spot freight market. Journal of Transport Economics and Policy, 41, 189-218

Agarwal, R., and Ergun, O. (2008). Ship scheduling and network design for cargo routing in liner shipping. Transportation Science, 42(2), 175-196

Agra, A., Christiansen, M., and Delgado, A. (2013). Mixed Integer Formulations for a Short Sea Fuel Oil Distribution Problem. Transportation Science, 47(1), 108-124

Alizadeh, A. H., and Talley, W. K. (2011). Vessel and voyage determinants of tanker freight rates and contract times. Transport Policy, 18(5), 665-675

Alvarez, J. F. (2009). Joint routing and deployment of a fleet of container vessels. Maritime Economics & Logistics, 11(2), 186-208

Alvarez, J. F., Longva, T., and Engebrethsen, E. S. (2010). A methodology to assess vessel berthing and speed optimization policies. Maritime Economics & Logistics, 12(4), 327-346

Alyami, H., Lee, P. T.-W., Yang, Z., Riahi, R., Bonsall, S., and Wang, J. (2014). An advanced risk analysis approach for container port safety evaluation. Maritime Policy & Management, 41(7), 634-650

Ambrosino, D., Anghinolfi, D., Paolucci, M., and Sciomachen, A. (2009). A new three-step heuristic for the Master Bay Plan Problem. Maritime Economics & Logistics, 11(1), 98-120

An, F., Hu, H., and Xie, C. (2015). Service network design in inland waterway liner transportation with empty container repositioning. European Transport Research Review, 7(2)

Arslan, O., and Turan, O. (2009). Analytical investigation of marine casualties at the Strait of Istanbul with SWOT-AHP method. Maritime Policy & Management, 36(2), 131-145

Asgari, N., Farahani, R. Z., and Goh, M. (2013). Network design approach for hub ports-shipping companies' competition and cooperation. Transportation Research Part a-Policy and Practice, 48, 1-18

Asteris, M., and Collins, A. (2010). UK Container Port Investment and Competition: Impediments to the Market. Transport Reviews, 30(2), 163-178

Bae, M. J., Chew, E. P., Lee, L. H., and Zhang, A. (2013). Container transshipment and port competition. Maritime Policy & Management, 40(5), 479-494

Balland, O., Girard, C., Erikstad, S. O., and Fagerholt, K. (2015). Optimized selection of vessel air emission controls-moving beyond cost-efficiency. Maritime Policy & Management, 42(4), 362-376

Bang, H.-S., Kang, H.-W., Martin, J., and Woo, S.-H. (2012). The impact of operational and strategic management on liner shipping efficiency: a two-stage DEA approach. Maritime Policy & Management, 39(7), 653-672

Bensassi, S., Martinez-Zarzoso, I., and Suarez, C. (2014). The effect of maritime transport costs on the extensive and intensive margins: Evidence from the Europe-Asia trade. Maritime Economics & Logistics, 16(3), 276-297

Berle, O., Rice, J. B., Jr., and Asbjornslett, B. E. (2011). Failure modes in the maritime transportation system: a functional approach to throughput vulnerability. Maritime Policy & Management, 38(6), 605-632

Bichou, K. (2011a). Assessing the impact of procedural security on container port efficiency. Maritime Economics & Logistics, 13(1), 1-28

Bichou, K. (2011b). A two-stage supply chain DEA model for measuring container-terminal efficiency. International Journal of Shipping and Transport Logistics, 3(1), 6-26

Bichou, K. (2013). An empirical study of the impacts of operating and market conditions on container-port efficiency and benchmarking. Research in Transportation Economics, 42, 28-37

Bichou, K., Lai, K.-H., Lun, Y. H. V., and Cheng, T. C. E. (2007). A quality management framework for liner shipping companies to implement the 24-hour advance vessel manifest rule. Transportation Journal, 46(1), 5-21

Blayac, T. (2007). Modelling and estimating a value of travel time savings for sea transport models. An empirical study in stated preferences for the regular lines between the French Mediterranean seashore and Corsica. International Journal of Transport Economics, 34(1), 87-111

Brett, V., and Roe, M. (2010). The potential for the clustering of the maritime transport sector in the Greater Dublin Region. Maritime Policy & Management, 37(1), 1-16

Brooks, M. R., and Ritchie, P. (2006). Mergers and acquisitions in the maritime transport industry 1996-2000. Transportation Journal, 45(2), 7-22

Brouer, B. D., Alvarez, J. F., Plum, C. E. M., Pisinger, D., and Sigurd, M. M. (2014). A Base Integer Programming Model and Benchmark Suite for Liner-Shipping Network Design. Transportation Science, 48(2), 281-312

Button, K., Chin, A., and Kramberger, T. (2015). Incorporating subjective elements into liners' seaport choice assessments. Transport Policy, 44, 125-133

Cariou, P., and Cheaitou, A. (2012). The effectiveness of a European speed limit versus an international bunker-levy to reduce CO2 emissions from container shipping. Transportation Research Part D-Transport and Environment, 17(2), 116-123

Cariou, P., and Wolff, F.-C. (2013). Chartering practices in liner shipping. Maritime Policy & Management, 40(4), 323-338

Carlos Perez-Mesa, J., Galdeano-Gomez, E., and Salinas Andujar, J. A. (2012). Logistics network and externalities for short sea transport: An analysis of horticultural exports from southeast Spain. Transport Policy, 24, 188-198

Castells Sanabra, M., Usabiaga Santamaria, J. J., and Xavier Martinez De Oses, F. (2014). Manoeuvring and hotelling external costs: enough for alternative energy sources? Maritime Policy & Management, 41(1), 42-60

Cetin, C. K., and Cerit, A. G. (2010). Organizational effectiveness at seaports: a systems approach. Maritime Policy & Management, 37(3), 195-219

Chang, C.-h., Lan, L. W., and Lee, M. (2015). An integrated container management model for optimizing slot allocation plan and empty container repositioning. Maritime Economics & Logistics, 17(3), 315-340

Chang, S.-M., Wang, J.-S., Yu, M.-M., Shang, K.-C., Lin, S.-H., and Hsiao, B. (2015). An application of centralized data envelopment analysis in resource allocation in container terminal operations. Maritime Policy & Management, 42(8), 776-788

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Chao, S.-L., and Chen, B.-C. (2015). Effects of switching costs on customer loyalty in the liner shipping industry. Maritime Economics & Logistics, 17(3), 341-358

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Ducruet, C., and Jo, J. C. (2008). Coastal cities, port activities and logistic constraints in a socialist developing country: The case of North Korea. Transport Reviews, 28(1), 35-59

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## Appendix C – Main path analyses

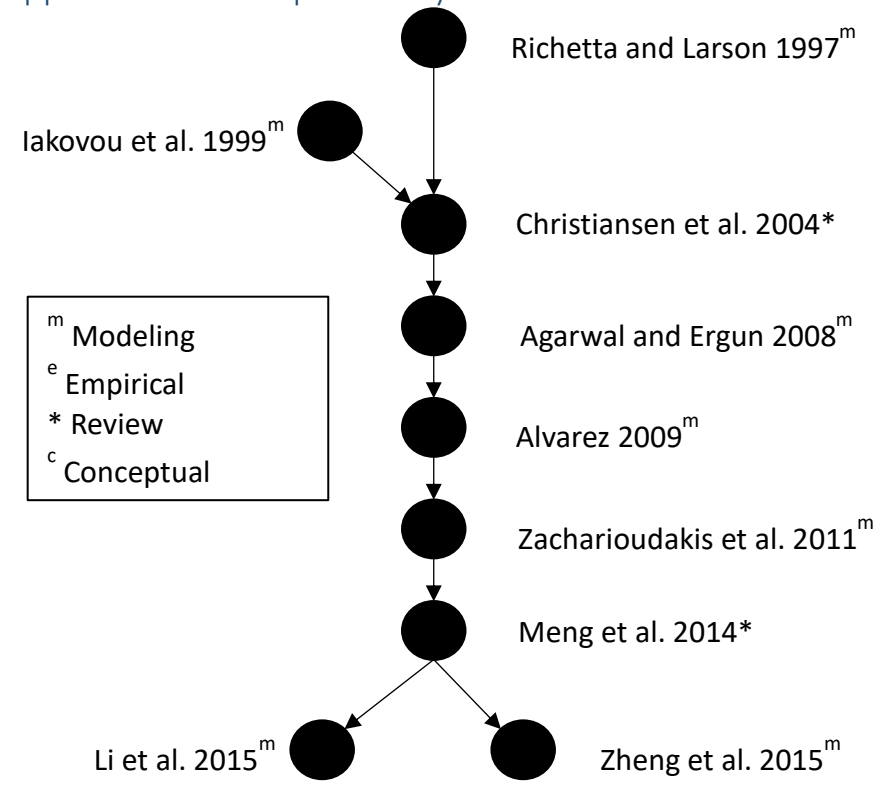



*Figure 10: Economic dimension main path*

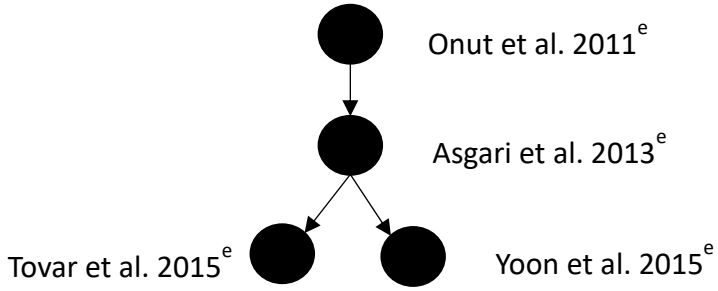



*Figure 11: Port selection and management main path*

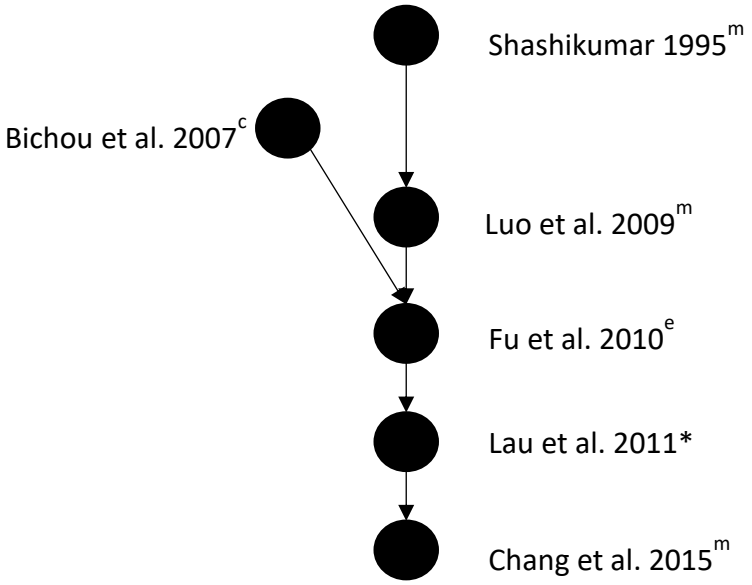



*Figure 12: Shipping markets main path*

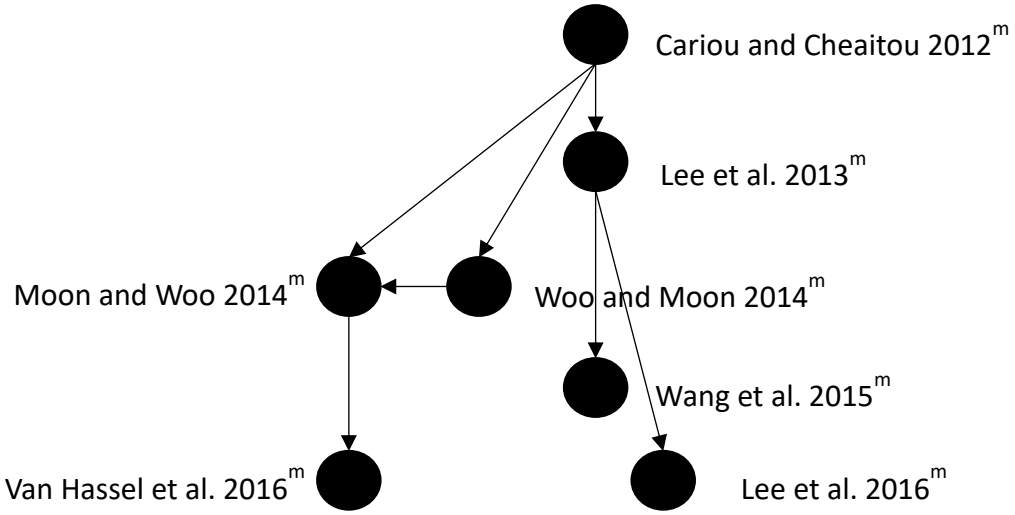



*Figure 13: Environmental dimension main path*

# Appendix D – Overview of awards and nominations

*Table 29: Overview of shipping line awards*

| Company | Award | by |
|---|---|---|
| **Maersk** | Special award in support of the IMO's theme for World Maritime Day "Sustainable Development | Sea Trade Awards |
| | Most Desired Employer 2012 | Global HR consultants, Antal International |
| | The Best Partner Award | LG Electronics |
| | Environment Award | Lloyds List |
| | Clean Air Excellence Award | US Environmental Protection Agency |
| | Social Media Campaign of the Year | European Digital Communications Awards |
| | DHL Shore Crew Award | Volvo Ocean Race |
| | Triple-E ships honoured as a top sustainable solution at Rio+20 | United Nations Conference on Sustainable Development (UNCSD) |
| | Innovation Technology of the Year | Containerization International Awards |
| | CSR Strategy Award 2011 | KPMG |
| | Sustainable Shipping Operator of the Year Award | Sustainable Shipping |
| | "Best Global Shipping Line" and "Best Green Service Provider - Shipping Line" | Asian Freight & Supply Chain Awards |
| | Earth Day Award | US Federal Maritime Commission |
| | European Business Award 2010 | European Climate Foundation |
| | Green Innovative Award 2010 | Hong Kong Shipping Registry |
| **MSC** | FCA Leadership Award for Environmental Excellence | CIFFA - Forwarders Celebrating Associates |
| | EVO Container Liner Shipping Award | Dutch Shippers Council Awards |
| **CMA CGM group** | Award for Corporate Social Responsibility 2014 | Lloyd's List |
| | Environment Award | Global Freight Awards 2013 |
| | Environment Award | Lloyd's List Asia Awards |
| | Clean Air Award | Sustainable Shipping Awards |
| **Evergreen Line** | Environment Award | Lloyd's List |
| | Training Award | Lloyd's List |
| | 2011 Clean Air Action Plan Air Quality Award | The Ports of Los Angeles and Long Beach |
| **Hapag-Lloyd** | GOGREEN Carrier Certificate 2015 | DHL |
| | Global Freight Awards: Innovation Award | Lloyd's List |

| Company | Award | by |
|---|---|---|
| **Hapag-Lloyd** | The Highest Quality of Customer Service | Hoyer Global USA |
| | Hanse Globe – Hamburg's Award for Sustainable Logistics | Logistik Initiative Hamburg |
| | 2014 CN EcoConnexions Partnership Award | CN Rail |
| | Silver Rescue Medal | German Maritime Rescue Association |
| | 2012 Blue Circle Award (EcoAction Program) | Port Metro Vancouver |
| | Fair Company – Providing fair working conditions for students | Karriere.de |
| | Gold-Award Green Gateway Programs | Port of Seattle |
| | Green Flag Environmental Achievement Award | For our vessels docking at the port of Long Beach |
| | Green Supplier | GreenCarrier Sweden AB |
| **COSCO** | Best Investor Relationship in Transportation Industry | IR Magazine |
| | Most Social Responsible Corporate award | 2011 China CEO & CFO Investment Forum |
| | Social Responsibility Award for Listed Companies | Responsible China |
| | First Place 2013 | Top 100 Chinese Enterprises for CSR |
| | Platinum Awards for Financing Performance, Environmental Responsibility and Investors' Relationships | Asset magazine |
| **CSCL** | 2010 Shanghai public satisfaction company | Shanghai |
| **Hamburg Süd** | HANSE GLOBE | Logistik-Initiative Hamburg |
| | Notable and valuable contribution to small producers in betterment of coffee in Honduras | CoHonducafe Foundation |
| | Customer Service Award | 19th Australian Shipping & Maritime Industry Awards |
| | Environmental Transport Award | 19th Australian Shipping & Maritime Industry Awards |
| | Quest for Quality Award | Logistics Management - USA |
| | Best Green Service Provider Shipping Line Award 2014 | Cargonews Asia |
| | Best Green Service Provider Shipping Line Award 2013 | Cargonews Asia |
| | Green Calls Award | Haropa Awards "green calls" / ESI |
| | Best Green Service Provider Shipping Line Award 2012 | Cargonews Asia |
| | Green Flag Award | Port of Long Beach |
| | Air Quality Award | Port of Los Angeles |
| **Company** | **Award** | **by** |

| | | |
|---|---|---|
| **Hamburg Süd** | Gulf Guardian Award | US Environmental Protection Agency |
| | Green Flag Award | Port of Long Beach |
| | ESI Award | HAROPA |
| **Hanjin Shipping** | have not listed any relevant environmental or social awards | |
| **OOCL** | 2015 Singapore Environmental Achievement Award (Regional) (SEAA) | Singapore Environment Council (SEC) |
| | 2014 Hong Kong Awards for Environmental Excellence (HKAEE) Gold Award - The Transport and Logistics Sector category | Hong Kong SAR |
| | Dual Reporting Standards for Environmental Data Integrity | Lloyd's Register |
| | Environmental Achievement Awards | Port of Long Beach |
| | 2013 San Pedro Ports "Clean Air Action Plan" Award | Port of Long Beach and Port of Los Angeles |
| | Gold Award – Transport and Logistics | Hong Kong Awards for Environmental Excellence |
| | Environmental Transport Award | Lloyd's List |
| | Green Award 2012 | The Marine Department of the Hong Kong SAR Government and Hong Kong Shipowners Association |
| | Service Excellence | Netfrate LLC |
| | Green Flag Program – Certificate of recognition | Port of Long Beach |
| | Environment Protection Award | Seatrade China Awards |
| | Green Culture Award 2010 | Marine Department HKSAR |

# Appendix E – Interview questionnaire

## *Part A – General Questions*

- What is your job position and area of management responsibilities?
- How many years of experience do you have in the industry?
- How much experience do you have when it comes to sustainability?
- How is your port organized and managed? Do you have an organizational chart available?
- What type of business model do you have adopted? (public/private/tool/landlord port)

## *Part B – Sustainability questions*

**Definition of sustainability:** Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. We distinguish between three types of sustainability: economic, environmental, and social. To be sustainable, an organization should fulfill a minimum performance in each of these three dimensions.

### General

- Does your port have a (holistic) sustainability concept?
    - If yes: What are its main aspects? Does it have a quantifiable, written objective?
    - How is it monitored? Do you employ any benchmarks?
    - What was the main reason for devising the sustainability concept?
    - Do you have a sustainability report?
    - Who is responsible for its implementation?
    - What are the main challenges and difficulties for implementation?
- Which (ISO) certificates do you have?
- Are you aware of the other ports' sustainability efforts?
- Do you think that investments in sustainability improve your competitive power?

### Economic dimension

- What is the general business strategy of your port?
- What are the most important goods transshipped in terms of value and volume? Are you specialized in any specific kind of cargo?

- How do you evaluate your operational performance?
- Are there congestions in your port? If yes, what is the bottleneck?
- How strong is competition with other Danube ports?
- Do you cooperate with other ports to facilitate transshipments?
- How strong is competition with other modes of transportation?
- What additional services do you offer?
- How do you evaluate the market potential? What are the growth segments?
- In which areas do you plan to invest?
- Do you monitor customer satisfaction? If yes, how? If no, why not?
- What kind of IT solutions do you employ in your operations?
- How do investments in ecological/social initiatives affect the price of your port services?

### Environmental dimension

- What are the most important policies and regulations that you have to follow? How hard is it to fulfill these requirements?
- Does your current strategy address any of the following issues: emissions (CO2, NOx, SOx, etc.), alternative fuels, water quality, (landside) habitat loss, dredging, eco-design, recycling, reuse, waste and waste water management, energy saving programs, renewable energy, on-shore power supply for vessels, etc.?
- How do you measure and monitor the environmental impact of your operations? Do you have any kind of eco-accounting?
- How do you deal with the disposal of physical assets (e.g., old cranes, containers, etc.)?
- What other efforts do you undertake to lessen your environmental impact? Can you give an example?
- Do you think that customers demand environmental performance in ports? Are they willing to pay a premium?

### Social dimension

- Does your port engage in corporate social responsibility practices? If yes, what are they?
- What systems have you employed to improve safety, security, and the health of your employees?

- How do you assess your impact on local communities?
- Is there an ongoing exchange with regional stakeholder groups? Who are they?
- Is there an ongoing exchange with other port professionals and experts? If yes, with whom?
- How do you assess the availability of skilled employees? Do you invest in training and education?
- Do you monitor employee satisfaction? If yes, how does it affect your port performance? If not, why?
- Do you receive any governmental funding or subsidies? If yes, for what?

### Inter/Multimodal transportation

- How do you evaluate your port's geographic location and competitive position in the international transportation network?
- To what modes of transportation is your port linked?
- How would you assess your port's capability of facilitating intermodal transports?
- What are the advantages of implementing a water-side segment in an intermodal transport?

## *Part C – Conclusion and outlook*

- How do you evaluate your sustainability efforts compared to other ports in the three dimensions of sustainability?
- What sustainability trends do you see in inland waterway transportation?
- What challenges and threats do you see for IWT regarding sustainability development?
- Do you think that public investment in IWT is sufficient? Why?
- What about governmental support? What policies are affecting you?
- Is there anything else you would like to talk about?
- Who else would be knowledgeable in your organization about this topic?

## Appendix F – Topic modeling methodology

As the current CSR discourse in aviation is anything but well-established (Cowper-Smith and de Grosbois 2011), we used topic modeling to shape the current discussion into a set of applicable keywords (Steyvers and Griffiths 2009). We applied a machine learning algorithm ingrained in latent Dirichlet allocation (LDA) to identify appropriate keywords for our Factiva search. LDA models a data sample of unstructured test as a set of documents that each are seen as a sequence of words. It then assumes that the documents are made up by an unknown distribution of topics, with each document discussing one or multiple topics. In LDA, the number of topics is chosen by the user. These topics are made up of sets of keywords that have a high chance of co-occurrence. In essence, the algorithm assumes that documents are generated by sampling topic-related keywords out of an unknown likelihood distribution. It then assumes a random distribution of topics over all documents, and a random distribution of words over these topics. From this random starting point, LDA is able to gradually shape distinct topics and the correlated keywords in several thousand iterations of the algorithm by updating the likelihood distribution in a Bayesian process (Blei et al. 2003). Consequently, LDA enables us to establish the structure and development of a common body of literature over time by revealing the main themes and logical connection between topics and documents (Blei 2012). The notation of the generative process of the algorithm is

$$p(\beta_{1:k}, \theta_{1:D}, z_{1:d}, w_{1:D})$$
$$= \prod_{i=1}^{K} p(\beta_1) \prod_{d=1}^{D} p(\theta_d)$$

$$\prod_{n=1}^{N} p(z_{d,n} | \theta_d p(w_{d1,n} | \beta_{1:K}, z_{d,n}))$$

where $\beta$ are the topics and denote a distribution over a specific vocabulary, $\theta$ denotes the document (so $\theta_{d,k}$ is the proportion of topic *k* in document *d*), $z_{d,n}$ is the topic assignment of the *n*th word in document *d*, and $w_{d,n}$ describes the *n*th word of document *d* (Blei 2012, Blei et al. 2003).

Our text sample for LDA consists of roughly 115 documents (around 2 million words, see Table 30) of prolific sustainability and CSR publications from the past 30 years to account for changes in CSR report language over time (Wang and McCallum 2006). Common words with low topical value (e.g., “the,” “is,” etc.) were removed from the sample by a prior

defined stop-word list. Sources include highly cited research papers and reports from the United Nations, International Air Transport Association, International Labor Organization, the International Civil Aviation Association, and other influential organizations. Airline CSR reports or communications are not included to prevent endogeneity issues. To run our topic model, we employ the open source software package MALLET (Machine Learning for Language Toolkit) due to its well-tested and established approach, its user-friendliness and adaptability, and its availability (McCallum 2002). We ran multiple topic models to identify documents in our initial sample that would generate keywords that are clearly not associated with aviation and removed them from the data set accordingly. For example, a United Nations report on sustainability that discussed aviation, but also general sustainability, would use the word "freshwater supply" so prominently that it showed up as a distinct keyword in a general sustainability topic.

*Table 30: Overview of data set*

| **Name** | **Issuer** | **Year** |
|---|---|---|
| Public Consultation on CSR | EU | 2008 |
| Corporate Social Responsibility – National public policies in the European Union | EU | 2008 |
| Strategy on CSR | EU | 2015 |
| CSR - national public policies in the EU | EU | 2011 |
| Sustainability in the EU | EU | 2011 |
| The European Aviation Safety Program Document | EU | 2015 |
| Airline Reporting Topics | GRI | 2013 |
| Airport Operators Sector Supplement – Reference Sheet | GRI | 2013 |
| Snapshot of Airport Sustainability Reporting | GRI | 2013 |
| Cyber security in Aviation | IATA | 2016 |
| Safety Report | IATA | 2016 |
| CORSIA and EU | IATA | 2017 |
| Aircraft Noise | IATA | 2013 |
| Green Taxes | IATA | 2016 |
| Carbon Offset Program | IATA | 2008 |
| Global Aviation Safety Plan | ICAO | 2016 |
| Sustainable alternative fuels for aviation | ICAO | 2016 |
| Environmental Report 2010 | ICAO | 2010 |
| Environmental Report 2013 | ICAO | 2013 |
| Environmental Report 2016 | ICAO | 2016 |
| Report on Environmental Management System (EMS) Practices in the Aviation Sector | ICAO | 2012 |
| Flightpath to a Sustainable Future | ICAO | 2012 |
| Global Aviation and Our Sustainable Future | ICAO | 2012 |
| World Employment and Social Outlook | ILO | 2017 |

| Name | Issuer | Year |
|---|---|---|
| Global Wage Report 2016/17 | ILO | 2016 |
| WESO trends | ILO | 2017 |
| ISO 26000 Wording Protocol | ISO | 2012 |
| ISO 26000 Training Protocol | ISO | 2012 |
| ISO 26000 and OECD | ISO | 2012 |
| ISO 26000 and SDGs | ISO | 2012 |
| ISO 26000 and benefits | ISO | 2012 |
| ISO 26000 and IR Framework | ISO | 2012 |
| ISO 26000 and GRI Guidelines | ISO | 2012 |
| Building trust in the air: Is airline corporate sustainability reporting taking off? | PWC | 2011 |
| Sustainable Aviation – A decade of progress 2005-2015 | SustainableAviation | 2015 |
| The sustainable aviation progress report 2013 | SustainableAviation | 2013 |
| The sustainable aviation progress report 2011 | SustainableAviation | 2011 |
| The sustainable aviation progress report 2009 | SustainableAviation | 2009 |
| The sustainable aviation progress report 2006 | SustainableAviation | 2006 |
| Our Common Future | UN | 1987 |
| World Summit Outcome | UN | 2005 |
| Transportation Sustainable Development Goals | UN | 2016 |
| Better Business better world | UN | 2017 |
| Environmental and Social Impact Assessment Guidelines | WBCSD | 2004 |
| The GHG Protocol: A corporate reporting and accounting standard | WBCSD | 2004 |
| Adapting to Climate Change – Impacts for Business | WBCSD | 2008 |
| GlobalCompact Principles | UN | 2017 |
| The European Aviation Safety Program Document | EU | 2015 |
| Aviation Benefits Beyond Borders Global Summary 2016 | ABBB | 2016 |
| Aviation Benefits Beyond Borders Global Full Report | ABBB | 2016 |
| Aviation Climate Action Framework | ATAG | 2015 |
| UN Aviation Action Plan | UN | 2014 |
| Global Safety Report | ICAO | 2011 |
| Global Safety Report | ICAO | 2012 |
| Global Safety Report | ICAO | 2013 |
| Global Safety Report | ICAO | 2014 |
| Global Safety Report | ICAO | 2015 |
| Global Safety Report | ICAO | 2016 |
| Global Safety Report | ICAO | 2017 |
| State of global aviation safety | ICAO | 2013 |
| SDG_SAF | ICAO | 2017 |
| SDG_CAP | ICAO | 2017 |
| SDG_SEC | ICAO | 2017 |
| SDG_ECON | ICAO | 2017 |

| Name | Issuer | Year |
|---|---|---|
| SDG_ENV | ICAO | 2017 |
| ICAO Journal: The Environment | ICAO | 2016 |
| Consumer Protection | IATA | 2017 |
| Unruly Passengers | IATA | 2015 |
| Future of the airline industry | IATA | 2017 |
| ISAGO Manual | IATA | 2016 |
| The economic and social benefits of air transport | ATAG | 2008 |
| The Impact of the Restructuring of Civil Aviation | ILO | 2003 |
| Annual report of the council | ICAO | 1999 |
| Annual report of the council | ICAO | 2000 |
| Annual report of the council | ICAO | 1995 |
| Annual report of the council | ICAO | 1996 |
| Annual report of the council | ICAO | 1997 |
| Annual report of the council | ICAO | 1998 |
| Annual report of the council | ICAO | 2005 |
| Annual report of the council | ICAO | 2004 |
| Annual report of the council | ICAO | 2003 |
| Annual report of the council | ICAO | 2004 |
| Annual report of the council | ICAO | 2007 |
| Annual report of the council | ICAO | 2010 |
| Annual report of the council | ICAO | 2008 |
| Annual report of the council | ICAO | 2012 |
| Annual report of the council | ICAO | 2011 |
| Annual report of the council | ICAO | 2009 |
| Annual report of the council | ICAO | 2006 |
| The Adoption of CSR in the airline industry | Cowper Smith and de Grosbois | 2011 |
| CSR and firm performance in the airline industry | Tsai and Hsu | 2008 |
| Exploring the green image of airlines | Hagmann et al. | 2015 |
| CSR disclosure in response to major airline accidents | Vourvachis et al. | 2016 |
| Synergy of corporate social responsibility and service quality for airlines | Kwanglim et al. | 2015 |
| Financial impacts of CSR | Lee and Park | 2010 |
| Air transportation in a carbon constrained world: | Scouridis et al. | 2011 |
| Transport and climate change | Chapman | 2007 |
| Air transport globalization, liberalization, and sustainability | Goetz and Graham | 2004 |
| Aesthetic labor, cost minimization and the labor process | Spiess and Waring | 2005 |
| Customer perceptions of airline social responsibility and its effect on loyalty | Chen et al. | 2012 |
| Evaluating corporate social responsibility of airlines using entropy weight and grey relation analysis | Wang et al. | 2015 |
| Corporate social responsibility and firm performance in the airline industry | Lee et al. | 2013 |

| Name | Issuer | Year |
|---|---|---|
| Effects of different dimensions of corporate social responsibility on corporate | Inoe and Lee | 2011 |
| Corporate social responsibility programs choice and costs assessment | Tsai and Hsu | 2008 |
| Corporate social responsibility reporting among European low-fares airlines | Coles et al. | 2013 |
| Motivations and barriers for corporate social responsibility reporting | Kuo et al. | 2016 |
| CSR in aviation | Philipps | 2006 |
| Green IT in aviation | Jongsaguan and Ghoneim | 2004 |
| Environmental reports Asia and Europe | Mak et al. | 2007 |
| Environmental reports Japan | Mak and Chan | 2008 |
| Environmental reports Asia Pacific | Mak and Chan | 2011 |
| Strategic factors of CSR implementation | Chang et al. | 2015 |
| 100 Environmental report study | Lober et al. | 1997 |

After we were confident that our initial sample was focused exclusively on aviation, we ran the algorithm at 5,000 iterations with 20 topics and 20 associated keywords, which gave us an initial sample of keywords that we labeled according to their contents (see Table 31). We then followed several steps to condense the results to a more usable format.

*Table 31: Initial results*

| Topic | Weight | Label | Keywords |
|---|---|---|---|
| 0 | 0.10165 | Reporting | reporting sustainability environmental reports companies report information corporate gri company disclosure performance european readers issues data financial state stakeholders play |
| 1 | 0.05611 | Safety | safety aircraft actions guidance training management provider procedures operations operational applicable handling sms ground personnel ensure program identified/assessed requirements found |
| 2 | 0.00149 | Development | countries development ofthe environmental environment economic resources world cent developing growth resource species sustainable international population production policies areas land |
| 3 | 0.18986 | Safety | aviation icao project states safety air civil training international security program implementation technical regional development services traffic council navigation management |
| 4 | 0.10705 | Emissions | aviation icao emissions aircraft fuel climate environmental change fuels noise global alternative report sustainable caep states chapter international air carbon |
| 5 | 0.0741 | Emissions | emissions ghg company data year target reporting |

| | | | |
|---|---|---|---|
| | | | chapter inventory scope electricity emission companies corporate protocol accounting base business information control |
| 6 | 0.06792 | Safety | safety icao aviation accidents accident states global united america regional rate region commercial boeing runway state aircraft air republic fatalities |
| 7 | 0.11825 | Emissions | aviation noise aircraft emissions airports airport air environmental industry sustainable fuel airlines report progress work program quality local flight engine |
| 8 | 0.03677 | Airline operations | air states aviation cent international icao services aircraft council navigation united civil year airlines traffic passenger european chapter system scheduled |
| 9 | 0.01642 | Safety | safety aviation european easa states actions plan rmt oversight icao gasp implementation commission risk stakeholders regulation state performance ssp system |
| 10 | 0.14442 | Airline operations | transport air industry jobs million global economic world aviation sustainable gdp total sdg transportation tourism growth direct billion traffic sector |
| 11 | 0.06896 | Safety | crew security aircraft nations state united passenger unruly flight states convention passengers board international article law behavior person cabin countries |
| 12 | 0.10783 | Social impact | csr social companies public business european development national government sustainable policies responsibility commission smes initiatives environmental states member responsible enterprises |
| 13 | 0.78139 | Development | international development including management based process group number include systems industry developed issues years approach time level key impact provide |
| 14 | 0.10717 | Social impact | iso social organization responsibility impacts rights human guidelines organizations local environmental community health stakeholders practices guidance development cement principles significant |
| 15 | 0.04465 | Employees | page employment wage labor firms cent countries wages enterprises workers growth average firm share ilo figure inequality data innovation income |
| 16 | 0.02118 | Safety | accidents accident flight aircraft iata safety crew number rate report page risk fatal management training total fatality ground section contributing |
| 17 | 0.16596 | Airline operations | airlines iata air industry aviation airline passenger safety cargo billion travel security global fuel passengers million airports governments airport data |
| 18 | 0.10508 | Development | global business sustainable world water goals change development energy countries infrastructure |

| | | | |
|---|---|---|---|
| | | | people data opportunities climate sanitation percent sector companies food |
| 19 | 0.06155 | Reporting | csr airlines airline corporate performance social management journal responsibility industry study activities green firm research air model tourism financial costs |

MALLET allows for hyperparameter optimization, which alters the algorithms parameters to improve the distributional fit with a given data sample. In simple words, hyperparameter optimization allows for a better fit of distribution of topics over words and of words over topics and thus allows for some differentiation between overall topics probabilities. As a result, MALLET provides a "weight" to its results which indicates how specific or widespread a given topic is, wither lower weights indicating the more niche topics. In a first step, we deleted topics with a weight lower than 0.05, as they were clearly not strongly established within our data sample (see Table 32).

*Table 32: Results after deletion of topics*

| Topic | Weight | Label | Keywords |
|---|---|---|---|
| 0 | 0.10165 | Reporting | reporting sustainability environmental reports companies report information corporate gri company disclosure performance european readers issues data financial state stakeholders play |
| 1 | 0.05611 | Safety | safety aircraft actions guidance training management provider procedures operations operational applicable handling sms ground personnel ensure program identified/assessed requirements found |
| 3 | 0.18986 | Safety | aviation icao project states safety air civil training international security programme implementation technical regional development services traffic council navigation management |
| 4 | 0.10705 | Environment | aviation icao emissions aircraft fuel climate environmental change fuels noise global alternative report sustainable caep states chapter international air carbon |
| 5 | 0.0741 | Environment | emissions ghg company data year target reporting chapter inventory scope electricity emission companies corporate protocol accounting base business information control |
| 6 | 0.06792 | Safety | safety icao aviation accidents accident states global united america regional rate region commercial boeing runway state aircraft air republic fatalities |
| 7 | 0.11825 | Environment | aviation noise aircraft emissions airports airport air environmental industry sustainable fuel airlines report progress work programme quality local flight engine |
| 10 | 0.14442 | Airline | transport air industry jobs million global economic |

| | | | |
|---|---|---|---|
| | | operations | world aviation sustainable gdp total sdg transportation tourism growth direct billion traffic sector |
| 11 | 0.06896 | Safety | crew security aircraft nations state united passenger unruly flight states convention passengers board international article law behavior person cabin countries |
| 12 | 0.10783 | Social impact | csr social companies public business european development national government sustainable policies responsibility commission smes initiatives environmental states member responsible enterprises |
| 13 | 0.78139 | Development | international development including management based process group number include systems industry developed issues years approach time level key impact provide |
| 14 | 0.10717 | Social impact | iso social organization responsibility impacts rights human guidelines organizations local environmental community health stakeholders practices guidance development cement principles significant |
| 17 | 0.16596 | Airline operations | airlines iata air industry aviation airline passenger safety cargo billion travel security global fuel passengers million airports governments airport data |
| 18 | 0.10508 | Development | global business sustainable world water goals change development energy countries infrastructure people data opportunities climate sanitation percent sector companies food |
| 19 | 0.06155 | Reporting | csr airlines airline corporate performance social management journal responsibility industry study activities green firm research air model tourism financial costs |

Subsequently, we consolidated labels that were topically similar. Due to the nature of the algorithm, it can happen that multiple topics discuss similar issues, if they are using a distinct language. For example, while publications on crew safety training and in-flight safety standards can both be seen under the more general label of safety, the language employed might be different enough to shape them into two distinct safety topics. To consolidate, we combined labels with the same names and joined the keywords accordingly (see Table 33)

*Table 33: Results after consolidation of labels*

| Label | Keywords |
|---|---|
| Reporting | reporting sustainability environmental reports companies report information corporate gri company disclosure performance european readers issues data financial state stakeholders play csr airlines airline corporate performance social management journal responsibility industry study activities green firm research air model tourism financial costs |
| Safety | safety aircraft actions guidance training management provider procedures operations operational applicable handling sms ground personnel ensure program identified/assessed requirements found aviation icao project states safety air civil training international security programme implementation technical regional development services traffic council navigation management safety icao aviation accidents accident states global united america regional rate region commercial boeing runway state aircraft air republic fatalities crew security aircraft nations state united passenger unruly flight states convention passengers board international article law behavior person cabin countries |
| Environment | aviation icao emissions aircraft fuel climate environmental change fuels noise global alternative report sustainable caep states chapter international air carbon emissions ghg company data year target reporting chapter inventory scope electricity emission companies corporate protocol accounting base business information control aviation noise aircraft emissions airports airport air environmental industry sustainable fuel airlines report progress work programme quality local flight engine |
| Airline operations | transport air industry jobs million global economic world aviation sustainable gdp total sdg transportation tourism growth direct billion traffic sector airlines iata air industry aviation airline passenger safety cargo billion travel security global fuel passengers million airports governments airport data |
| Social impact | csr social companies public business european development national government sustainable policies responsibility commission smes initiatives environmental states member responsible enterprises iso social organization responsibility impacts rights human guidelines organizations local environmental community health stakeholders practices guidance development cement principles significant |
| Development | global business sustainable world water goals change development energy countries infrastructure people data opportunities climate sanitation percent sector companies food international development including management based process group number include systems industry developed issues years approach time level key impact provide |

After consolidating the labels, we had to delete labels that were either too generic (i.e., not airline-focused enough), or too distinct from the CSR literature (e.g., general airline operations). The "exclusivity" measurement provided by the MALLET diagnostics file provided good guidance in this decision, as it denotes a benchmark of how commonly or rarely keywords of a given topic are associated with keywords of another topic. Removing topics with low exclusivity resulted in four distinct labels that are overall consistent with the existing, more qualitative discussion of CSR in aviation (Cowper-Smith and de Grosbois

2011) (see Table 34).

*Table 34: Results after deletion of niche and unrelated labels*

| Label | Keywords |
|---|---|
| Reporting | reporting sustainability environmental reports companies report information corporate gri company disclosure performance european readers issues data financial state stakeholders play csr airlines airline corporate performance social management journal responsibility industry study activities green firm research air model tourism financial costs |
| Safety | safety aircraft actions guidance training management provider procedures operations operational applicable handling sms ground personnel ensure program identified/assessed requirements found aviation icao project states safety air civil training international security programme implementation technical regional development services traffic council navigation management safety icao aviation accidents accident states global united america regional rate region commercial boeing runway state aircraft air republic fatalities crew security aircraft nations state united passenger unruly flight states convention passengers board international article law behavior person cabin countries |
| Environment | aviation icao emissions aircraft fuel climate environmental change fuels noise global alternative report sustainable caep states chapter international air carbon emissions ghg company data year target reporting chapter inventory scope electricity emission companies corporate protocol accounting base business information control aviation noise aircraft emissions airports airport air environmental industry sustainable fuel airlines report progress work programme quality local flight engine |
| Social impact | csr social companies public business european development national government sustainable policies responsibility commission smes initiatives environmental states member responsible enterprises iso social organization responsibility impacts rights human guidelines organizations local environmental community health stakeholders practices guidance development cement principles significant |

In a last step, we needed to remove duplicate keywords and residual artefacts (non-related topics with keywords like “framework,” management,” “guidelines,” etc.), as well as keywords that would be too generic for news data search and thus net a high number of false positives. In this step, we also re-wrote the labels into search strings (e.g., using asterisks to account for plurals or differences in spelling between British and American English). We arrived at four distinct and robust search strings (see Table 35).

*Table 35: Final search string*

| Label | Search string |
|---|---|
| Disclosure | sustainability report* OR environmental report* OR sustainability disclosure OR csr report* OR corporate social responsibility report* OR sustainability report* |
| Safety | safety management OR safety training OR safety record OR security training OR security management OR accident* OR fatalit* OR unruly passengers |
| Environment | emission* OR sustainable fuel OR climate change OR environmental OR noise OR carbon OR ghg OR greenhouse gases |
| Social | social policy OR social impact OR social responsibility OR sustainable policy OR responsible enterprise OR human right* OR community involvement OR community development OR health OR stakeholder* OR social management |

# Appendix G – Corporate social responsibilty in aviation – Data collection guidelines

## *Introduction*

This document serves as a guidline for the data collection process for a study of corporate social responsibility efforts of passenger airlines. It will provide detailed information on the necessary steps and settings, give a short overview of the process, and include some examples of the data collection process.

## *The project*

This project is part of a series of studies on corporate social responsibility (CSR) in transportation management. We try to answer how sustainability and corporate social responsibility are discussed in the transportation industry, how practices are diffused in the industry, and how it affects the operational and financial performance of companies that adopt them.

In this particular study we would like to find out whether airlines have a "corporate social responsibility aspiration level," an internal level of CSR aspiration that guides their external communication efforts. We are particularly interested in how this level changes over time, and in particular how it is affected by the communication level of other airlines in the same alliance. However, CSR data is quite hard to come by, so we decided to capture airline communication and media coverage of CSR over the course of 25 years. For this, we have defined four CSR-related search strings that will guide the further search process.

## *What are we looking for?*

We are interested in positive CSR reporting activities or media coverage of the 62 airlines in question. Even though the search strings have been adopted and improved in a lengthy process, there will still be many reports that are NOT adequate results for our data, due to the ambiguity of many terms. At the end of these guidelines, I will provide some examples of what we are looking for (and what does not classify for the dataset). Specifically, we want to include:

- Any positive CSR report by the airline in question
- Any media coverage (either by media outlets or other reporting institutions) of positive CSR of an airline
- The same CSR event can classify multiple times, if it is covered by multiple news sources, or covered multiple times over the course of time. Our rule of thumb is

that a report is only discarded as a duplicate if it is about the SAME event of the SAME airline on the SAME day and from the SAME source.

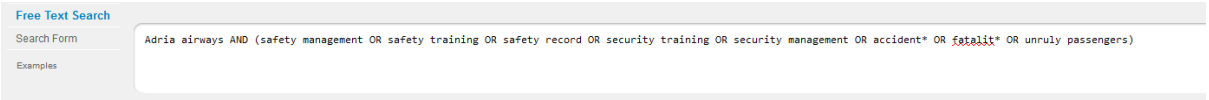
- Similarly, a single CSR event can classify for multiple airlines, e.g., when a report ranks the Top5 airlines in terms of safety.
- The study period is from the 01.01.1993 to 31.12.2017, i.e., the past 25 years.
- Overall, we need four distinct searches for 62 airlines, resulting in 248 searches overall. While some of these searches will yield comparatively few results, the major airlines in particular might net hundreds, if not thousands of hits.

### *The data collection process*

The data collection will be done in the news database Factiva.

#### Step 1: Enter search terms

The first step is to enter an airline name followed by a search string. The search strings and the airline names can be found in the enclosed Excel sheet AirlineCSRData (tab "Airlines" and "SearchStrings." Please make sure that the format is Airline name AND (keyword 1 OR keyword 2 OR …); the brackets are important.

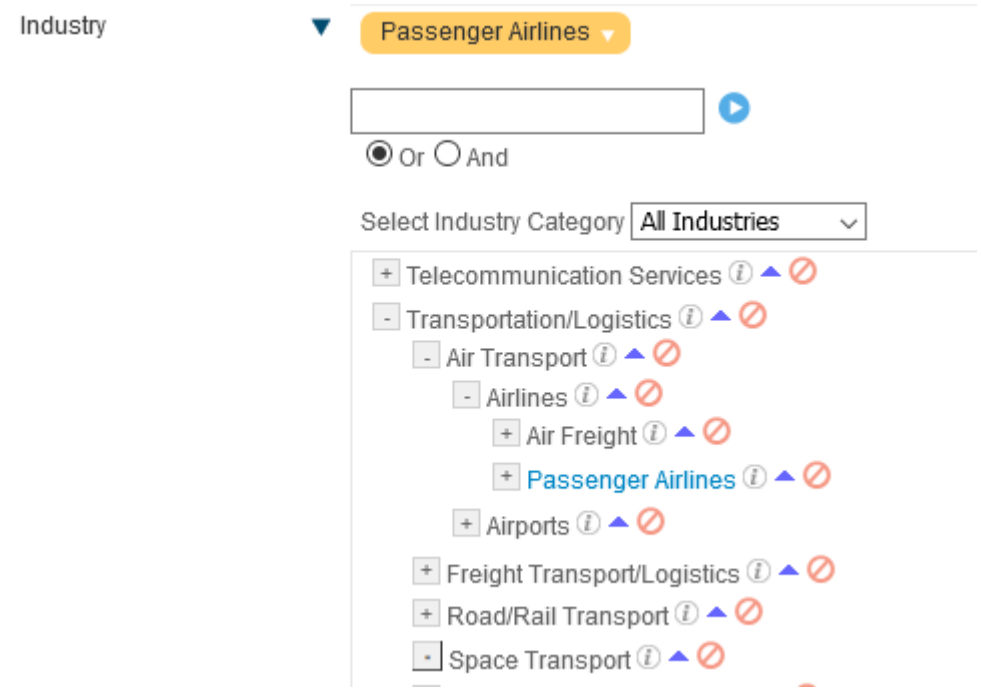



#### Step 2: Set date

Under the search form, use the "Date" drop-down field to "Enter date range," then enter 01/01/1993 to 31/12/2017. It should look like this:


#### Step 3: Set passenger airline industry

To limit search results and focus exclusively on the airline industry, set "passenger airlines" as industry in the "industry" tab by clicking the blue triangle first, then the plus next to "Transportation/Logistics" category, then the plus next to "Air Transport" and the plus next to "Airlines," then click on "Passenger Airlines" directly. If everything works correctly, the result should look like this:

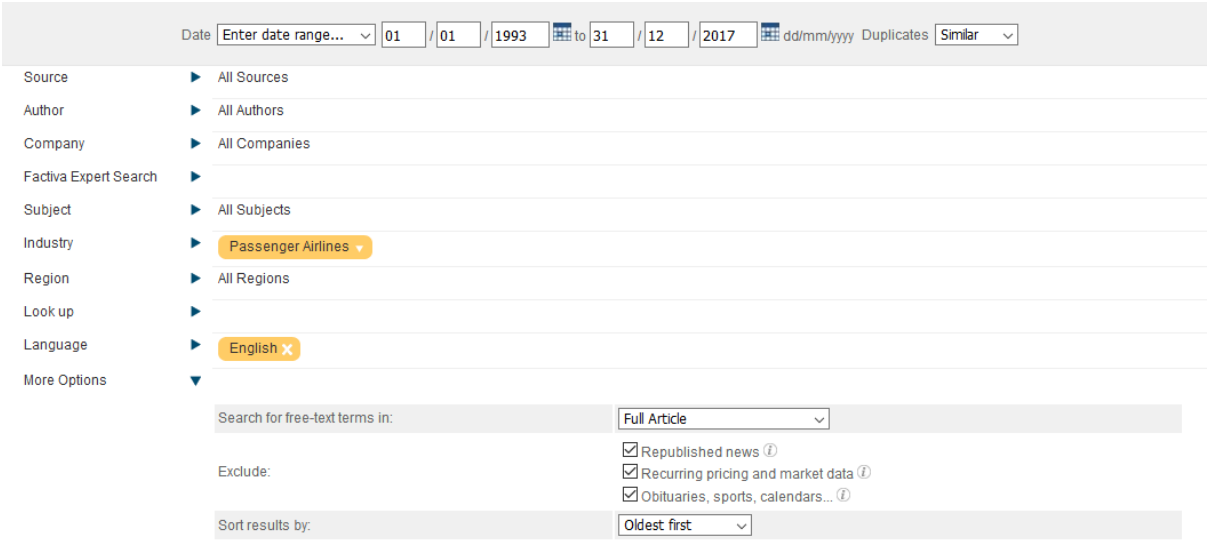



### Step 4: Set language and additional options

For language, English should be the default language. Remove any other language if selected by clicking the white cross. Then, click the blue triangle next to the "More Options" category. In the first drop-down menu, change search type from "Headline and Lead Paragraph" to "Full Article." Then, in the "Exclude" section, tick all three boxes ("Republished news," "Recurring pricing and market data," "Obituaries, sports, and calendars"). The menu should look like this:


### Step 5: Last check and start search:

Do a last check whether date, industry, language and additional options are correct; it should look like in the picture below. Please also make sure that the search term is correct. Then click the blue "search" button under the free text search form.




## Step 6: Getting the articles

The next screen will show you the search results. The fastest way to analyze the search results is to download them as pdf file. To do so, click the white box next to "headlines" to mark all hits on this page (up to 100). Then, click the adobe reader icon and choose "article format" as download option. If the option is greyed out, make sure to click the white box next to "headlines" first. **Only 100 articles can be downloaded at a time. If the search yielded more results, you will need to download multiple files.**


Please save the files for later processing/checking in the following date format. I will copy these files in case I need to do more in-depth analysis later.

**Airline_Label_#-#** ***(for example, the 3rd file for Air China in the environment label would be saved as AirChina_Environment_201-300)***

## Step 7: Analyze and document the articles

Now scroll through the article and document positive CSR communication/media coverage in the attached Excel sheet AirlineCSRData. There is no need to read the entire article, just focus on the highlighted terms (automatically done by Factiva) to quickly decide whether a report is relevant or not. If an article is not relevant, proceed to the next one. If an article is

relevant, please write down Carrier name, label number, report month, report year, keyword highlighted (can be multiple words if multiple words are highlighted), and news source (either abbreviated name or full name, but please try to be consistent) in the Excel sheet, in the tab ReportData. You can use the column “Collection completed?” in the “Airlines” tab to keep track of which airlines you have already completed.

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | Airline | Label | Month | Year | Keyword | Source |
| 2 | Austrian | 2 | 10 | 1995 | Accident | Reuters |
| 3 | Austrian | 3 | 10 | 1995 | Accident | SCMP |
| 4 | Austrian | 4 | 11 | 1996 | Accident | FT |
| 5 | Austrian | 5 | 11 | 1996 | security tr | AP |
| 6 | Austrian | 6 | 3 | 2002 | accident | JTSC |
| 7 | Austrian | 7 | 2 | 2003 | accident | AUS |
| 8 | Austrian | 8 | 1 | 2004 | fatalities | AUS |
| 9 | Austrian | 9 | 1 | 2004 | accident | APA |
| 10 | Austrian | 10 | 1 | 2004 | accident | AUS |
| 11 | Austrian | 11 | 1 | 2004 | accident | reuters |
| 12 | Austrian | 12 | 1 | 2004 | accident | reuters |
| 13 | Austrian | 13 | 2 | 2004 | Accident | AUS |
| 14 | Austrian | 14 | 2 | 2004 | Accident | GERMND |

### *Examples*

The following examples should help you to get a feel for what kind of reports we are looking for. If you feel unsure, take a screenshot or mark the article otherwise, and contact me to clarify. You can also collect ambiguous reports and send them to me in bulk, so I can have a look at all of them.

**ANA among world's top 5 safest airlines: German magazine.**

228 words
4 March 2002
Japan Transportation Scan
JTSC
English


BERLIN, March 1 Kyodo

Major Japanese airline All Nippon Airways (ANA) is one of the world's top five safest airlines, having caused no deaths since 1973, according to the latest issue of German airline magazine Aero.

The other top five are Qantas Airways of Australia, Finnair, Cathay Pacific Airways of Hong Kong and **Austrian Airlines**, the magazine said.

From 1973 to 2001, the five did not cause any **accidents** resulting in death, according to a survey conducted by Aero on the flying history of 61 major airlines around the world.

The survey did not take into account **accidents** caused by factors such as air turbulence and **accidents** such as fires and collisions that caused damage only to planes.

Japan Air System (JAS) was in 11th place. While one of its planes crash-landed at Hanamaki Airport in Iwate Prefecture in 1993, catching fire and injuring 20 people, there were no deaths.

Japan's largest airline, Japan Airlines (JAL) ranked 35th because of a jumbo jet crash in 1985 that killed 520 people.

Air India and Aeroflot of Russia were among the lowest on the list. The number of deaths caused by Aeroflot flights between 1973 and 2001 was 4,564.



Document jtsc000020020330dy3400028

This is a relevant article. It will show up for searches for all relevant airlines mentioned. Please document this type of report as described above; it is probably a good idea to just document for the airline you are currently searching, not for all at the same time; if your search is Austrian Airlines, document if or Airlines – you will encounter this article again if you are searching e.g., for Finnair, to document it for them).

business
**AUA is one of the nine safest airlines in the world**

115 words
23 February 2004
Austria Today
AUS
English


The German magazine "Aero International," which covers civilian airways, claims in its March edition that **Austrian Airlines** Group (AUA) is one of the nine safest airlines in the world. Nine of the fifty that the magazine surveyed have had no deaths in **accidents** in the last 30 years and therefore receive the top mark of 0.00. Only two other European airlines, Finnair and Virgin Atlantic Airways, receive the top mark. The other six are based in Asia and Australia. The four big European airlines, British Airways, Lufthansa, Air France and KLM, all receive ratings close to the top one.

Document AUS0000020040223e02n0002t

Even though this is a similar topic, the date and the source are different. It should be documented for Austrian Airlines.

**Twelve airlines sign pact on accident payments.**

308 words
31 October 1995
Reuters News
LBA
English
(c) 1995 Reuters Limited

KUALA LUMPUR, Oct 31 (Reuter) - Twelve airlines signed a pact waiving limitations on the amount of compensation that can be paid to aircrash victims.

The new Intercarrier Agreement on Passenger Liability was signed at the annual meeting of the International Air Transport Association in the Malaysian capital.

Under present liability limits for passengers travelling to, or stopping in, the United States, death or personal injury claims are limited to proven damages up to $75,000 per person.

Compensation for the rest of the world ranges from $25,000 to $75,000.

The new pact will do away with any ceiling on compensation, apparently in part to avoid costly suits challenging the compensation awards.

Compensation guidelines are based on the 1929 Warsaw Convention.

A statement issued at the IATA meeting said the convention's liability limits, which have not been amended since 1955, "are now grossly inadequate in most countries".

Under the pact, recoverable damages would be determined and awarded according to the law of the victim's country.

IATA Director General Pierre Jeannoit told reporters last week ahead of the conference that the association backed the agreement.

Efforts to amend the Warsaw Convention had been unsuccessful over the last 20 years, Jeannoit said.

"So, the airlines have taken the initiative this year of arriving at an agreement among themselves on how to deal with the situation and hopefully this will set the pattern for governments around the world to support it," he said.

It is not clear how many of the 234 member airlines of IATA will eventually sign the agreement.

The 12 which signed on Tuesday were: Air Canada, Canadian Airlines International, **Austrian Airlines** , KLM, Scandinavian Airlines, Swissair , Air Mauritius, South African Airways, Egypt Air, Saudi Arabian Airlines, Nicaragua's TACA International Airlines and Japan Airlines.

(c) Reuters Limited 1995

Document lba0000020011103drav02imi

This is an example of an airline providing compensation over the legally mandated minimum. Even though they are probably doing it to reduce the risk of lawsuits as mentioned in the text, it is still an example of voluntary social responsibility, and should be documented.

**Air security: United wants to install stun guns in cockpits**

By DAVE CARPENTER
AP Business Writer
622 words
16 November 2001
12:44 AM
Associated Press Newswires
APRS
English


CHICAGO (AP) - In the latest steps to improve safety in the skies, United Airlines on Thursday became the first major U.S. carrier to say it will arm its pilots with stun guns and also announced special **security training** for flight attendants.

Both measures are subject to federal government approval.

The nation's second-biggest carrier said it is prepared to soon start installing advanced Taser stun guns in electronically coded lock boxes in the cockpits of all of its more than 500 planes, enabling pilots to fend off hijacking attempts.

The weapons fire an electronic charge that temporarily disables attackers, allowing time for them to be restrained. Pilots will be trained in how to use the devices.

"United and its pilots believe Tasers are an important addition to enhanced cockpit security. Tasers will incapacitate an attacker without endangering the airplane," said Andrew Studdert, chief operating officer and executive vice president of the Elk Grove Village, Ill.-based carrier.

New training for flight attendants will include self-defense and other methods intended to help passengers and improve cabin safety. United declined to discuss specifics, indicating that could compromise its effectiveness.

Airlines have been moving to shore up security since the Sept. 11 terrorist attacks - sometimes on government orders but often on their own.

Most have strengthened cockpit doors well in advance of the Department of Transportation's Dec. 31 deadline. United and others have done so with iron bars, while JetBlue Airways lined the fortified cockpit doors of its jets with Kevlar - the material inside bulletproof vests.

Among other measures, **Austrian Airlines** put armed sky marshals on board all of its flights to and from North America and carriers have considered giving stun guns to flight attendants or even arming pilots with hand guns.

While this article focuses mostly on another airline, it shows that Austrian Airlines has increased in-flight security. As a result, it should be documented as a positive CSR.

politics
**Kazak president to visit Vienna**

138 words
7 September 2004
Austria Today
AUS
English


President of Kazakstan Nursultan Nasarbajev will visit Vienna on Thursday and Friday to meet with Austrian and UN officials and to sign several bilateral agreements. Nasarbajev had to postpone the visit, orginally scheduled for late last year, owing to an **accident** that former President Thomas Klestil had. Nasarbajev will meet with President Heinz Fischer and may have an informal meeting on Saturday with Chancellor Wolfgang Schüssel, who will be attending a government retreat in Retz on Thursday and Friday. Foreign Minister Benita Ferrero-Waldner and her Kazak counterpart Kasymschomart Tokajev will sign bilateral agreements on double taxation and cooperation in the economic, agricultural, ecological, industrial and technical areas. Nasarbajev is expected to raise the possibility of beginning direct flights by **Austrian Airlines** to Almaty and new Kazak capital Astana.

Document AUS0000020040907e0970002w

This report includes the words accident and Austrian Airlines; however, it is NOT related to any CSR activity of Austrian Airlines and should thus not be documented.

**Europe Stock Focus:Austrian Air Seen Stuck On One Engine**

By Madeline Chambers
Of DOW JONES NEWSWIRES
767 words
26 September 2000
02:30 PM
Dow Jones International News
DJI
English


VIENNA -(Dow Jones)- **Austrian Airlines** AG (R.AAI) has pulled out of its stock-market dive in recent weeks but few expect the share to gain much altitude in the near term.

Seen as an extremely weak player in an unfashionable sector, the company's **accident**-prone management has badly damaged investor confidence. In the longer term, **Austrian Airlines** may gain from its participation in Star, the world's largest airline alliance. For now, however, analysts see little but turbulence ahead.

"A negative surprise seems more likely than a positive one and if the stock breaks the EUR13 level, it could slide to EUR10, at least - and pretty fast," said Doris Stadtler, a fund manager at Raiffeisen KAG.

Analysts largely decline to give targets for the stock; some reckon it trades at a vast and undeserved premium to its peers. Ratings range from hold to reduce.

**Austrian Airlines** closed up 13 cents, or 1%, Monday at EUR13.14. The benchmark ATX index was flat. The stock has fallen by around 13% over the past three months, compared with a 2.7% gain by the ATX.

The share has leveled off in the past month, following a 60% decline that stretched over 15 months. Analysts trace the slide to the company's decision in May 1999 to raise about EUR218 million through a capital increase for new airplanes - just as other airlines, reacting to growing competition, began to cut back.

Prior to that, **Austrian Airlines** was viewed as one of Vienna's favored performers. "Being in **Austrian Airlines** now is like shutting the door after the horse has bolted," said Rebecca Langley, an analyst at Dresdner Kleinwort Benson in London, who has the stock on hold.

The news since the capital increase has been overwhelmingly grim. One of the few airlines not to hedge on fuel prices, **Austrian Airlines**' profit has been mauled by the rising oil price. "That looks like a serious misjudgment," said Langley.

Karl Knezourek, **Austrian Airlines** investor relations manager, defends the policy, although he said the group will consider hedging once prices fall.

"We have never hedged; in the past we have gained from not hedging," he said, noting that hedging doesn't totally remove the effects of fuel costs.

**Austrian Airlines** also hasn't helped itself by issuing belated profit warnings. In March, weeks before it was due to post full-year 1999 earnings, it slashed its profit forecast, carving 12% from the share price. Fuel costs and subdued demand due to the Kosovo crisis helped cut 1999 net profit by 82% to EUR15.7 million.

In August, at a news conference, management said rising fuel costs meant **Austrian Airlines** would miss its pretax profit target this year of EUR73 million. It plans to cut costs by EUR50.9 million, by freezing recruitment and saving fuel.

"I can't see how they will achieve that," said Gabriele Kainrath, an analyst at Raiffeisen Zentralbank in Vienna, who has the stock on neutral.

These are economic news and not connected to CSR. “Accident” is a false positive in this regard. It should NOT be documented. You will probably see many economics reports like this.

REUTERS

**Telekom Austria buckles under "sell on good news".**

326 words
23 August 2001
11:54 PM
Reuters News
LBA
English


VIENNA, Aug 23 (Reuters) - Shares in Telekom Austria buckled under profit-taking on Thursday after a well-received set of first-half results that beat analysts' forecasts. "It's a typical case of sell on good news," said one trader in reference to the stock's 1.3 percent fall to 7.61 euros.

Group earnings before interest, tax, depreciation and amortisation rose 10.1 percent to 704.6 million euros. A consensus forecast from analysts was looking for 680 million euros, with estimates ranging from 661 to 699 million.

Traders also said the fall in the share price was a natural correction after it rallied four percent both on Tuesday and Wednesday.

"It's no tragedy - fundamentally, things are now looking pretty good at Telekom Austria," said another trader.

The 20-share ATX index ended 0.33 percent higher at 1,206 points, taking its year-to-date gains to nearly 13 percent.

**Austrian Airlines** drew solid demand, ending 1.54 percent higher at 11.20 euros. "After yesterday's published figures I would have thought they'd fall below 10 euros," said a trader.

Net losses in the airline ballooned to 72.4 million euros ($67 million) in the six months from 17.9 million in the same period last year, while losses before tax and interest crumbled to 31.5 million euros from a profit of 7.5 million.

Oil and energy group OMV also saw good demand, ending 1.38 percent higher at 106.15. "Some buy orders have materialised again in OMV, but I think that 110 euros will prove a resistance," a trader said.

Steelmaker Voest-Alpine initially fell 2.3 percent over uncertainty surrounding the future performance of the group after Chief Executive Peter Strahammer died in a mountaineering **accident** on Wednesday. The stock ended 0.6 percent higher at 33.2 euros on volume just short of 100,000 shares.

Document lba0000020010823dx8n00xcz

Again, this is economic news that are unrelated to CSR of Austrian Airlines. It should NOT be documented.

**EDITORIAL - Fear of flying hits airlines seriously.**

662 words
17 November 2001
Bangkok Post
BKPOST
0
English
(c) 2001

One of the quickest and most surefire ways of losing a great deal of money is to start an airline, as many former millionaires can testify.Even airlines which receive direct or veiled government patronage, support and even subsidies have not been immune to huge losses with some, such as Sabena, Ansett, Canadian 3000 and Swissair, suffering total collapse in recent weeks.Others are on the brink and almost all, from Qantas to **Austrian Airlines**, are laying off staff and cutting back on equipment and the frequency with which routes are serviced. Over 100,000 airline staff have been laid off within the US alone.Now comes more unwelcome news closer to home. Thai Airways International has debts approaching two billion US dollars and must shape up or go under in three years, according to Virabongsa Ramangkura, the company board chairman and acting president.

It is in dire financial straits, with debt running at 18 times the equity and unable to borrow any further.Thai International's problems have been accumulating ever since the days when the military regarded it as its personal fiefdom. Getting the extent of the problem out in the open was a vital first step in beginning the necessary restructuring. At least with the way things are going, THAI can expect less competition as other carriers cut back on routes on which they cannot guarantee a consistent load factor of at least 80%. Some of these are among THAI's most productive.The events of Sept 11 are being blamed by most airlines for their problems and there is no doubt that the terrorist attacks in the United States were a major contributing factor in curbing non-essential travel. But airlines have been in trouble for a long time and the horrors of Sept 11 forced them to admit it and to push the collective panic button.Then, just when it appeared it might be safe to reach for the skies again, along came a fresh disaster. Monday's crash in New York of an American Airlines Airbus two minutes after take-off killed 265 people and eroded what little confidence had been returning.As a result, air travel itself has come under siege again. There have been increasing manifestations of air rage caused by **unruly passengers**, many of them fuelled by alcohol and deprived of their nicotine fixes by smoking bans. Then came alarm over the possibility of acquiring deep vein thrombosis while in cramped conditions on long-haul flights. And now a sudden fear of flying altogether, in part generated by the massive and continuing publicity accorded an air disaster. While understandable, this is irrational. More people have been killed in road **accidents** in the United States in the past two months than the number of those killed in the World Trade Center and Pentagon terrorist atrocities; yet no one is abandoning the automobile.To put this in a broader perspective, we need only turn to the World Health Organisation which, in a 1999 report, said that 1,171,000 people are killed and 10 million injured annually in road traffic **accidents**. And these do not adequately represent the magnitude of the problem because in many parts of the world, road **accident fatalities** go unreported. A World Bank affiliate has pointed out that this is the equivalent of 2,925 jumbo jets each carrying 400 persons crashing in a single year with no survivors. And this would happen every year. Imagine the uproar. Air travel would cease. But these are highway deaths and because road **accident fatalities** happen one or two at a time, interest and remedial action are minimal. Air travel is, in fact, a lot safer than most surface travel and those people who have cancelled their holidays in Thailand and elsewhere because they are afraid to fly because of recent events are doing a disservice to themselves and the airlines who so desperately need their support.

Document bkpost0020011117dxbh0000d

This is a report of negative CSR of Austrian Airlines (layoffs). We are not interested in negative CSR but focus only on positive coverage. As a result, this article should NOT be documented.

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