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Citation: Kiesel, F., Ries, J.M. and Tielmann, A. (2017). Reprint of "The impact of mergers and acquisitions on shareholders' wealth in the logistics service industry". International Journal of Production Economics, 194, pp. 261-277. doi: 10.1016/j.ijpe.2017.11.007

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The impact of mergers and acquisitions on shareholders' wealth in the logistics service industry

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Abstract: Logistic service providers are facing significant challenges in recent years due to intensified competition and ever-increasing customer expectations for cohesive high-standard services at low cost. To cope with these developments many companies aim for external growth to realize operational efficiencies and exploit productive opportunities of new markets and diversified services. Accordingly, 2015 has even become the most active year for mergers and acquisitions in logistic service industry. However, studies examining the post-merger performance effect and its determinants are scarce. Consequently, this paper takes up this issue by analysing a sample of 826 transaction announcements taken place between 1996 and 2015 and their performance effect in terms of short- and long-term abnormal shareholder returns. The results reveal, that although overall transactions exhibit significant positive abnormal returns, post-merger performance for the acquiring companies differs considerably according to the logistic services offered. In the short-term trucking, railway, 3PL and air cargo companies experience significant positive abnormal returns of about 0.6%-2.6%, while sea freight carriers realize only marginal effects and CEP companies do even not show any significant reaction. In the long-term, railway and 3PL companies realize a significant abnormal return of about 20%-24%, while trucking, sea freight and air cargo carriers do not exhibit significant returns and CEP companies do even experience significant losses of about –17%. Overall, diversifying transactions of established full-service providers outperform focus-increasing transactions of specialised operators.

Keywords: Logistics, freight transportation, shareholders wealth, abnormal returns, event study

Introduction

In the last decades, the demand for logistic services has increased considerably due to the ongoing transformation of manufacturing involving its global dispersion and fragmentation. As a result, the logistics industry has undergone significant changes in accordance to the market developments towards more cohesive and global services. Simultaneously, freight rates, especially in shipping, were declining continuously since almost a decade wherefore logistics service providers (LSPs) find themselves in a situation in which costumers are expecting high-standard services at a low cost (Meidutė-Kavaliauskienė et al., 2014). This situation has even worsened with the emergence of the financial crisis and its impact on the world economy. Particularly, logistics service providers in asset-intensive businesses were affected by fierce competition following the decline in international trade. In 2009, for example, Hapag-Lloyd had to be provided with a loan guarantee of up to $1.75 billion from the German government to stay afloat. In fact, all of the world's major shipping companies were struggling during the crisis period and experienced significant losses (e.g. Maersk incurred a loss of $2.09 billion in 2009). Similarly, in 2008 and 2009 the airline industry was

incurring losses of $26.1 billion and $4.6 billion mainly due to the drop in freight cargo (IATA, 2016). Even in the years after the crisis, logistics service providers were facing a high competitive pressure due to the constant low growth rates in the world trade (Deutsche Bank, 2016). Besides, the accelerating pace of digitization, will also create new challenges for the logistics service industry due to changing customer expectations and the emergence of new competitors (PWC, 2016). Start-ups, like e.g. Matternet[1], Veritread[2] or Postmates[3], and even former customers (e.g. Görtz Retail GmbH or JA Apparel Corporation) already entered the market and intensified competition. Therefore, logistics service providers are required to develop concepts that take up these challenges. It seems obvious that, in the market with estimated revenues of approximately $4.6 trillion, even well-established companies have to go through a transformation process to claim their position (PWC, 2016).

Beside internal changes and organic growth to cope with the outlined challenges, mergers and acquisitions (M&A) are important vehicles influencing firms' business, product and geographic strategy (Ferreira et al., 2014). Indeed, 2015 has become one of the most active years for M&A in the logistics service industry with a total deal value of approximately $178 billion (PWC, 2015). The majority of acquisitions made were of horizontal nature and served expansion purposes in terms of geography and market positioning (cf. PWC, 2010 and see, for example, BBA Aviation PLC's acquisition of Landmark Aviation or XPO Logistics Inc.'s acquisition of Norbert Dentressangle SA). However, M&A increasingly serve the need to expand intermodal capabilities or services provided (Carbone and Stone, 2005) as e.g. XPO's $335 million acquisition of Pacer in early 2014 (PWC, 2015) or UPS's $1.8 billion acquisition of Coyote Logistics, a high-tech and asset-light start-up (KPMG, 2016). Aimed at covering entire value chains by positioning as integrated logistic providers offering customized capabilities across the spectrum of logistics services and serving customers all over the globe, M&A have become an increasingly attractive option for logistic companies to pursue growth and thus represent an integral part of their corporate strategy nowadays (Hertz and Alfredsson, 2003, Carbone and Stone, 2005).

Nevertheless, successful M&A activities are challenging and impose significant financial and operational risks (King et al., 2004). Previous research revealed that many M&A transactions reduce shareholders' wealth and miss the intended strategic objectives (Meyer, 2001). Moreover, the post-merger performance seems highly dependent on the corresponding industry (Campa and Hernando, 2004). The impact of M&A in the logistics service industry in terms of stock market reaction after the announcement and post-merger performance however, has, with the exception of Darkow et al. (2008) for the period 1991-2006 and Andreou et al. (2012) for the U.S. market that both focus on short-term effects, not been considered so far. Consequently, the paper at hand takes up this issue by analysing a sample of 826 transaction announcements taken place between 1996 and 2015 and their performance effect in terms of short- and long-term abnormal shareholder returns to identify the conditions for successful M&A in the logistics service industry. This is done in two steps by examining the short-term announcement effects on shareholders' wealth using cumulative abnormal returns (CARs) and by investigating the long-term stock performance of the newly formed enterprise during the integration period using buy-and-hold abnormal returns (BHARs). This

[1] Matternet is a transportation system made up of Unmanned Aerial Vehicles (UAVs), landing stations and routing software. For further information, see www.matternet.us.

[2] Veritread is a heavy haul marketplace where shippers can connect with and get bids from trusted carriers. For further information, see www.veritread.com.

[3] Postmates offers an Urban Logistics platform that connects customers with local couriers who can deliver from any store or restaurant on-demand. For further information, see www.postmates.com.

paper offers several contributions for researchers as well as managers. Firstly, this is the first study to explore M&A in the global logistics service industry which enables comparisons across different regions and services offered. Secondly, apart from frequently considered announcement effects, we also reveal that there are significant long-term effects during and after the integration period. Finally, we provide a discussion of the boundary conditions for improving shareholders' wealth using regression analysis.

The remainder of this paper is organized as follows. Section 2 provides a structured overview of related studies on the post-merger performance in general and in the logistics industry before developing the research hypothesis for the following analysis. Section 3 outlines the methodology including a description of the data sources, the data selection process and the empirical models. The findings of the short-term and long-term event studies are presented in Section 4 that also includes the results of cross-sectional regression analyses aimed at identifying most influential factors of post-merger performance. Finally, Section 5 concludes the paper by summarizing the results and discussing implications for managers and researchers.

Literature review and hypothesis development

Logistics literature on mergers and acquisitions

In the logistics service industry, M&A activity has seen a persistent growth over the past years (cf. Figure 1) that is likely to continue given the increasing demand for efficient and specialised services. Due to the ongoing transformation of manufacturing involving its global dispersion and fragmentation, the strategic challenge of designing global value networks has become predominantly an inter-firm activity (Brennan et al., 2015). This also requires logistic services capable to integrate complex networks with global flows of goods and information (cf. Christopher, 2016). As has been shown, interventions impeding international trade and thus hindering integrated logistics services seem to exhibit significant negative valuation effects for the affected companies (Tielmann and Schiereck, 2017). Besides its ever-increasing practical importance, only few industry-specific M&A studies aimed at shedding light on transaction rationales and performance implications for the involved logistic companies (cf. Table 1).

Although the motives for M&As are rather diverse, several categories of transaction rationales have been discussed in literature ranging from value creation and managerial self-interest to firm characteristics and environmental factors (see Trautwein, 1990, Seth et al., 2002 and Haleblian et al., 2009). Most studies, however, refer to value creation motives and assume that involved companies do either expect to benefit from synergistic gains by realizing operational efficiencies and exploiting productive opportunities of new markets and products which will induce gains for shareholders of acquiring and target companies (cf. Berkovitch and Narayanan, 1993 and Seth et al., 2002) or aim at limiting competition by increasing market power and facilitate collusion which is again expected to be beneficial for both shareholders (cf. Trautwein, 1990 or Haleblian et al., 2009). Besides value creation, several studies have examined managerial motives involved and emphasize opportunistic behaviour of the management aimed at compensation and risk reduction or exaggerated self-confidence of managers and overestimation of target values. Both, opportunism and overconfidence, is assumed to induce falling shareholder values for the acquirer, rising shareholder values for the target and zero total gains (see Seth et al., 2002).

Beginning in the early 1980s and mostly driven by geographical or service expansion, M&A activity swept across the international logistics service industry including all types of transport operators (Ojala, 1993). Liberalization of trade and deregulation of the transport markets has fuelled the geographical expansion of multinational logistics service providers.

Combined with the rise of numerous new competitors from emerging countries after several waves of privatization, this led to fierce competition in the logistics industry and consolidation trends in emerging countries (PWC, 2010). In the light of this, M&A motives for leading multinational logistics service providers targeting local providers in emerging countries are seen in expected profits from improved geographical coverage as well as establishing domestic operations in fast-growing markets. Financially-better equipped logistics service providers from emerging countries, in contrast, rather aim for economies of scale in the strongly fragmented domestic market (PWC, 2010). Studies from the European logistics market moreover reveal that the degree of sectoral concentration in the logistics industry is not affected by M&A (cf. Hofmann and Bachmann, 2010), wherefore market power and collusion do not seem to fuel transactions.[4] In contrast, many of the mostly horizontal transactions in the European logistics market seem to be driven by synergistic gains obtained from economies of scale and scope and geographical expansion followed by access to specialized capabilities for higher-valued services in existing markets (Hofmann and Bachmann, 2010). Analyzing the strategic development of European Third Party Logistic Providers (3PL), it is revealed that external growth frequently aimed at providing more cohesive services and/or better geographical coverage (Hertz and Alfredsson, 2003, Carbone and Stone, 2005). In addition, the increasing diversification towards more extensive logistic services being pursued by traditional transport operators results in the existence of multiple player, trying to find profitable strategic positions in the 3PL market. However, only a few market leaders offer a wide range and scope of services, while most firms focus on a diversified portfolio of services (Carbone and Stone, 2005). Similarly, it has been shown that operational synergies are of especial importance for M&A of 3PL providers in the U.S. (Wu and Cheng, 2006). Comparable results have also been found in the North American trucking industry and the maritime transport industry, where transactions were mostly motivated by the need to consolidate existing operations while at the same time they sought geographic expansion (Brooks and Ritchie, 2005, 2006). Taken as a whole, previous studies of M&A in the logistics service industry indicate strong synergistic motives aimed at realizing operational efficiencies and exploiting new opportunities by acquiring physical, human, information, knowledge and relational resources and then bundling them together to create inimitable and firm-specific capabilities (Wong and Karia, 2010).

Although many M&A studies apparently refer to these value creation motives, the empirical results of previous studies on the post-merger performance of acquiring and target firms remain ambiguous (cf. Seth et al., 2002 and Nguyen et al., 2012). Early cross-industry studies, typically examining the performance effect of transactions on the acquiring firm, suggest that acquisitions did not enhance firm value either in the short-term (Dodd, 1980; Eckbo, 1983) or in the long-term (Agrawal et al., 1992; Loderer & Martin, 1992). In some studies, acquisitions were even found to corrupt acquiring firm value (Chatterjee, 1992; Seth et al., 2002). In addition to the acquirer's effects, analyses reveal that targets often experienced significant positive returns (Asquith and Kim, 1982; Datta et al., 1992). These results have also been supported by combined acquirer and target analyses revealing significantly positive joint outcomes which, however, mostly originate from target gains while acquiring firms realize no or negative abnormal returns (Housten et al., 2001; Carow et al., 2004). A comprehensive summary of post-merger performance effects in cross-industry M&A studies can be found in Bruner (2002).
However, previous research has identified a significant degree of performance variation across different industries (cf. Campa and Hernando, 2004) and the literature focussing on

[4] We note, however, that as the logistics industry is quite diverse, this may hold true for certain segments.

performance implications of M&A in the logistics service industry remains scarce (cf. Andreou et al., 2012 and see Table 1 for an overview of empirical studies on post-merger performance implications in the logistics service industry or related sub-sections).

Author(s) (year)	Industry sample	Period	Sample size	Key findings
Alexandrou et al. (2014)	Water transportation	1984-2011	1266	• Positive abnormal average returns for shareholders of acquirer firms and shareholder of target firms, whereby cross-border and focus-increasing deals tend to outperform national and diversifying deals. • Acquirers' shareholder gains vary significantly across maritime sectors and regions but are generally driven by smaller acquirer size, higher acquirer profitability, stock financing and cross-border deals.
Andreou et al. (2012)	Freight transportation in USA	1980-2009	289	• Positive average synergistic deal value that accrues mostly to targets' shareholders rather than to acquirers' shareholders. • Tender offers have a positive impact on synergistic value whereas target returns are positively influenced by diversifying transactions and acquirer returns are positively influenced by friendly transactions.
Cortés et al. (2015)	Air transportation in South America	1996-2013	28	• Target firms realize significant positive abnormal returns especially in cases where transactions are considered to be strategic and the shareholders expect the integration to create substantial synergies. • Acquirers' shareholders do not realize significant abnormal changes in stock returns around the transaction announcement.
Darkow et al. (2008)	Freight transportation	1991-2006	200	• Positive abnormal returns for shareholders of acquirer firms, target firms and the combined entity, whereas cross-border transactions generate significantly higher abnormal returns than national ones and transactions with large volumes appear more successful than smaller ones. • From an acquirer's perspective focusing transactions perform better than diversifying ones from whereas diversifying transaction outperform focusing ones from the target's perspective.
Kammlott and Schiereck (2011)	Water transportation	1980-2007	213	• Negative abnormal returns for the acquirers' shareholder simultaneously to positive abnormal returns for the targets' shareholders with distinctive regional, temporal and direction-specific differences. • Transnational transactions exhibit significant negative abnormal returns for acquirers with regional differences (e.g. European transactions are evaluated significantly more successful than Asiatic) and transactions before ORA (Ocean Shipping Reform Act) outperform transactions after deregulation went into effect.
Levin and Weinberg (1979)	Railroad transportation in USA	1967-1971	221	• Although there is wide variety in the efficiency of transactions, with regard to geographical configuration horizontal mergers achieve higher gains in market share than vertical, lateral or mixed transactions.

				• Given that gains in market share reflect underlying cost and service quality improvements, merger-related cost savings and performance improvements in terminal and interchange operations outweigh those in line-haul operations.
Merikas et al. (2011)	Water transportation	1995-2009	111	• Most transactions in shipping can be traced back to growth motives realized by investments in undervalued targets that are frequently less profitable than the acquiring firms. • The likelihood of acquisition increases with decreasing profitability in relation to assets and decreases with increasing levels of debt in relation to the market value of the firm's outstanding shares.
Samitas and Kenourgios (2007)	Water transportation in USA	2000-2007	15	• The average cumulative abnormal return is significant and positive after the announcement of the merger or the acquisition and remains stable for different event windows. • Especially for tramp shipping firms that do not serve standardized routes but operate on the basis of individual chartering, the announcement of transactions have a direct positive impact on stock value.
Singal (1996)	Air transportation in USA	1985-1988	14	• Shareholder of acquiring and target firms earn significantly positive abnormal returns in contrast to rival firms' stockholders that on average neither benefit nor lose from transactions due to contradictory effects of more efficient operations and less competition. • Consolidating transactions in which both firms operate in the same geographic market are expected to induce significantly higher efficiency and market power gains than expanding transactions and abnormal stock returns are correlated with profit changes due to market anticipation.
Slovin et al. (1991)	Air transportation in USA	1965-1988	42	• Shareholder of acquiring and target firms earn significantly positive abnormal returns under and after CAB (Civil Aeronautics Board) regulation, however, whereas abnormal returns for acquiring firms decrease, abnormal returns for target firms increase after deregulation. • For the period of CAB regulation, rival firms earn positive average excess returns for transactions with nontrivial changes in industry concentration, but after deregulation, transactions have no significant valuation effects on rival firms.

Table 1: Related studies analyzing mergers and acquisitions performance in the logistics service industry

Levin and Weinberg (1979) analyzed changes in market shares to measure the effect of U.S. railroad mergers and found that horizontal mergers achieve higher gains in market share than vertical, lateral or mixed transactions. Considering the share price reactions to horizontal airline-acquisitions involving domestic interstate carriers traded on the New York or American Stock Exchange, Slovin et al. (1991) showed that shareholders of acquiring and target firms earn significantly positive abnormal returns before and after deregulation. These findings are in line with Singal (1996) who also showed that rival firms' stockholders neither benefit nor lose from transactions due to contradictory effects of more efficient operations and less competition. More recently, Cortés et al. (2015) revealed that in M&A of South American airlines, target firms realize significant positive abnormal returns whereas there are no significant abnormal changes in stock returns for acquirers' shareholders. For the tramp shipping industry in the U.S., Samitas and Kenourgios (2007) found that M&A have a direct positive impact on shipping firms' stock prices and increase financial value in the long run. This finding is supported by Merikas et al. (2011) who considered a global sample of M&A from the maritime transport industry. They revealed that transactions are supposed to enable growth by investments in undervalued targets that are frequently less profitable than the acquiring firms. Considering transactions in the global shipping market, Kammlott and Schiereck (2011) found negative abnormal returns for the acquirers' shareholders simultaneously to positive abnormal returns for the targets' shareholders with distinctive regional, temporal and direction-specific differences. In a more recent study, Alexandrou et al. (2014), however, showed positive abnormal average returns for shareholders of acquirer firms and shareholders of target firms whereas acquirers' shareholders gains vary significantly across maritime sectors and regions. Darkow et al. (2008) are among the first to analyze the impact of M&A in the logistics service industry as a whole. Considering 200 transactions between 1991 and 2006 they revealed significant positive abnormal returns for both, acquirer and target. Similarly, Andreou et al. (2012) showed that for M&A of freight transportation firms in the U.S., apart from these acquirer's and target's shareholder gains, the transactions also create synergistic gains for the newly formed organization.

As there has been shown a significant degree of performance variation (cf. Campa and Hernando, 2004) across industries which has, with the exception of Darkow et al (2008) for the period 1991-2006 and Andreou et al. (2012) for the U.S. market, not been considered, a further more in-depth analysis of the performance implications of M&A in the logistics service industry can provide valuable insights for researchers and practitioners. In addition, a closer look at prior studies on the performance implications of M&A in the logistics service industry reveals that most empirical studies either consider local markets or focus on specific transport operators (e.g., tramp or liner shipping, railroads and airlines). Consequently, these studies neither take into account attempts to better geographical coverage by not considering a global transaction sample that also enables regional comparisons nor cover recent trends towards providing more cohesive and non-asset-based services which includes transactions across different groups of logistics service providers. In addition, the analysis is usually only performed for the announcement effect using a short time period and rather small sample sizes (cf. Table 1). For instance, Singal (1996) examines M&A in the U.S. airline industry for the period 1985-1988 analyzing the stock market reactions for acquirers, targets and rivals. Cortés et al. (2015), in contrast, considers the effect of transaction announcements taking place in South America in the period 1996–2013, but the sample only contains 28 M&As. Finally, as most studies only consider events prior to the financial crisis reaching its peak in 2008, they do not allow for pre- and post-crisis comparisons. The paper at hand takes up these issues by examining 826 M&A announcements from the global logistics service industry between 1996 and 2015 and analysing their performance impact in terms of short-term and long-term stock price effects.

2.2. Theoretical expectations and hypothesis development

Given the limitations of specific theoretical frameworks for M&A in the logistics service industry, we deduce our hypotheses with regard to the effects to acquirers' and targets' shareholders wealth and the underlying performance drivers based upon the general literature and the findings from previously conducted local or service-specific studies. As outlined before, a number of theories have been proposed to explain the general impact of M&A revealing negative or insignificant transaction effects to the acquiring firm shareholders (cf. Eckbo, 1983; Agrawal et al., 1992 or Seth et al., 2002), positive returns to the target firm shareholders (cf. Datta et al., 1992) and positive joint outcomes in the short-term as well as in the long-term (cf. Carow et al., 2004, Barber and Lyon, 1997 or Chakrabarti et al, 2009). Since for different transport operators both positive and negative stock price effects to the acquiring companies have been observed in the post-announcement period (cf. Kammlott and Schiereck, 2011 or Alexandrou et al., 2014), our hypotheses are:

H1a. *Mergers and acquisitions in the logistics service industry will not induce significant short-term abnormal returns for the acquiring firms' shareholders*.

H1b. *Mergers and acquisitions in the logistics service industry will induce significant short-term positive abnormal returns for the target firms' shareholders*.

H1c. *Mergers and acquisitions in the logistics service industry will induce significant positive long-term abnormal returns for the joint firms' shareholders*.

Although the demand for logistics services is, apart from general trends, such as the global dispersion and fragmentation of manufacturing (cf. Brennan et al., 2014), closely correlated with the global economic development and international trade flows in the short run, the logistic markets are quite diverse with regard to their regional structures. However, the general economic conditions affect the scale of international trade, which has an impact on the logistics industry (Alexandrou et al., 2014). Several studies show a positive correlation between the volume of freight traffic and economic growth, measured by the total global GDP (e.g. Gao et al., 2016; Nielsen et al., 2003). Therefore, in order to consider the impact of general developments in global trade flows measured in changes of the GWP, our second hypothesis is:

H2. *Post-merger abnormal returns for the acquiring firms' shareholders are significantly higher in times of economic upturn.*

As has been shown in previous studies, many transactions in the logistics service industry aim for synergistic gains by exploiting productive opportunities of better geographical coverage or utilisation of specialized capabilities for more cohesive and higher-valued services (see, for example, Hertz and Alfredsson, 2003, Carbone and Stone, 2005). Whereas international expansion is mostly driven by leading multinational logistics service providers targeting emerging markets (PWC, 2010), diversification is pursued by traditional transport operators (Carbone and Stone, 2005). Although international and diversifying transactions bear a high risk of overpayments due to asymmetric information and cultural differences (Shimizu et al., 2004), especially the leading logistics service providers targeting these transactions have often already gained experience across service segments and international markets. Therefore, the benefits of such expansions are highly likely to outperform the associated risks. Accordingly, our hypotheses with respect to potential synergies are:

H3a. *Diversified acquiring companies do realize significantly better post-merger abnormal returns for its shareholders in the short- as well as in the long-term.*

H3b. *Diversifying transactions do realize significantly better post-merger abnormal returns for the acquiring firms' shareholders in the short- as well as in the long-term.*

H3c. *Cross-continental transactions do realize significantly better post-merger abnormal returns for the acquiring firms' shareholders in the short- as well as in the long-term.*

Data and methodology

Sample construction

The sample of transactions for the event study is obtained from the Securities Data Corporation (SDC) Platinum / Thomson Reuters database. It includes all M&A events announced between January 1st, 1996, and December 31st, 2015. LSPs are identified by the four-digit Standard Industrial Classification (SIC). In order to analyze the impact of transactions on stock performance in more detail, we defined different categories of logistic service providers with regard to scope of primarily services offered and related aspects. Table 2 provides an overview of the categories, transportation carrier (TC LSP) including corresponding infrastructure provider, courier, express and parcel provider (CEP LSP) and third-party logistics service provider (3PL LSP), as well as their corresponding SIC codes (for a more detailed description of classification criteria, see Hofmann and Lampe, 2013). Companies in the category TC LSP are transport operators that haul products in the sub-categories sea freight, air cargo, railway or trucking. In contrast, companies in the category CEP LSP offer more specific services and are placed between transportation carriers and 3PL LSP. In general, 3PL LSP offer a bundle of more customized services that go beyond basic transportation services. This may require subcontracting transport carriers if they do not own transportation assets themselves (cf. Berglund et al., 1999 or Hofmann and Lampe, 2013).

For consideration in the initial sample the transaction announced between January 1st, 1996, and December 31st, 2015 had to meet the following criteria. First, at the time of the transaction announcement the primary business activity of both the acquirer and the target were in the logistic service industry (cf. SIC codes in Table 2). Second, after the completion of the transaction, the acquirer intended to own a majority stake of at least 50% of the outstanding shares or of the private equity. Third, the transaction had to be completed by the time of the analysis. These criteria lead to an initial sample of 3,632 M&A transactions. In a next step, all non-exchange listed acquirer companies were excluded from the sample and events with insufficient stock data and/or weak trading pattern in the estimation and event period were removed.[5] If a company in eight of ten trading days in the year prior to the event was not actively traded (equals non-zero-returns), the event was eliminated. The liquidity was checked to estimate the beta more efficiently without too many zero-trading observations in the estimation period. All relevant stock data was obtained from Thomson Reuters Financial Datastream.

LSP category		**SIC code**
Transportation carrier (TC LSP)	Sea freight	4412, 4424, 4432, 4449, 4491, 4499
	Air cargo	4512, 4522, 4581

[5] Note that stock returns with sufficient trading volumes are a prerequisite for analyzing the impact of M&A deals on the shareholders' wealth.

	Railway	4011, 4013, 4741
	Trucking	4212, 4213, 4231
Courier, express, parcel (CEP LSP)		4215, 4513
Third party logistics (3PL LSP)		4214, 4221, 4222, 4225, 4226, 4731, 4783, 4789

Table 2. Classification of logistic service providers using the four-digit Standard Industrial Classification.

Events that were distorted by other M&A during the [–10; +10] event window were eliminated to control for confounding events. This lead to the elimination of 584 events. In addition, we eliminated all events that could be affected by announcements about alliance founding (e.g. New World Alliance), open skies agreements (e.g. EU-US Open Skies Agreement), free trading agreements (e.g. NAFTA) or granting cabotage rights (e.g. unrestricted cabotage permit for all EU members) which lead to 51 additional confounding events. Following the outlined selection criteria, a final sample of 826 M&A events in the logistic service industry between the years 1996 and 2015 was derived. Figure 1 illustrates the frequency of transactions for the different LSP categories over time in comparison to the average deal value. After a sharp decline in 2007, the number of transactions among logistic service providers increased up to the level before the financial crisis.

The majority of transactions is undertaken by transport operators. Most of the deals in this cluster were realized by trucking carriers (219), followed by sea freight carriers (182) and air cargo carriers (114), whereas M&A announcements of railroad carriers are rare (43). The second largest LSP category is 3PL (223) followed by CEP which shows, with a clear distance, the smallest number of transactions (45). Most of the transaction partners are headquartered in the U.S., followed by Europe and Asia. Acquirer from countries outside these regions (Rest of World) are rather rare which is in line with previous observations that international expansion into emerging markets is mostly driven by leading multinational logistics service providers (PWC, 2010). Overall, in 310 transactions acquiring and target companies are from different nations and in 146 transactions even from different continents which reveals a strong presence of geographic expansion within the industry (cf. Figure 2). Similarly, Figure 3 shows that there is a strong tendency for diversification in recent years. In 408 transactions, the acquirer and the target exhibit a different primary SIC code and in 252 transactions they are even found to be from different LSP categories. This supports the argument that logistics service providers aim for expanding their role from supportive primary functions to more cohesive customer-oriented services such as inventory management, packaging or manufacturing (Chapman et al., 2003). In the course of this, the business models of LSPs defined as the conceptual model of the architecture of the firm and its network of partners expressing the company's logic of creating and delivering value (cf. Zott et al., 2011) no longer seek for efficiency rather than for new knowledge, customer satisfaction and innovative services to meet customers' evolving needs (Chapman et al., 2003).

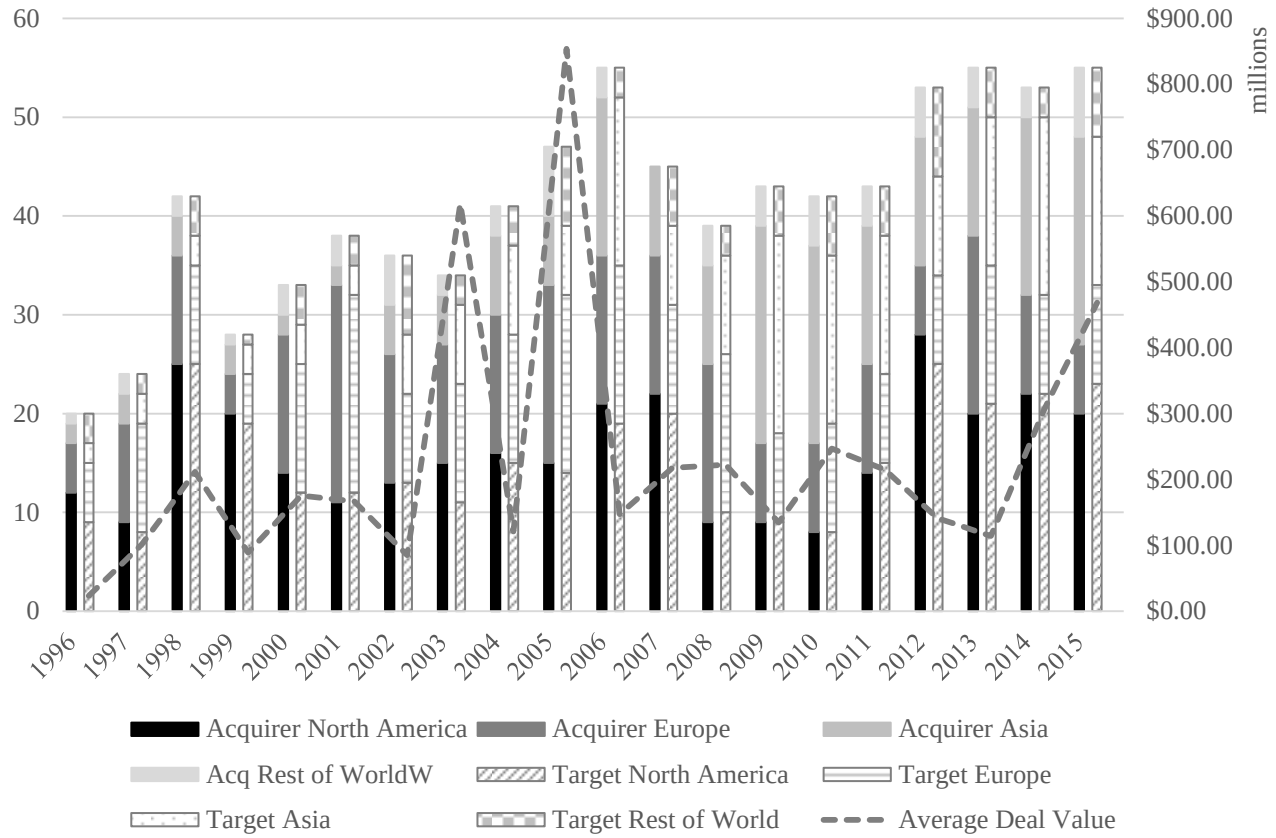


Figure 1. Development of acquirers and targets by year and region.

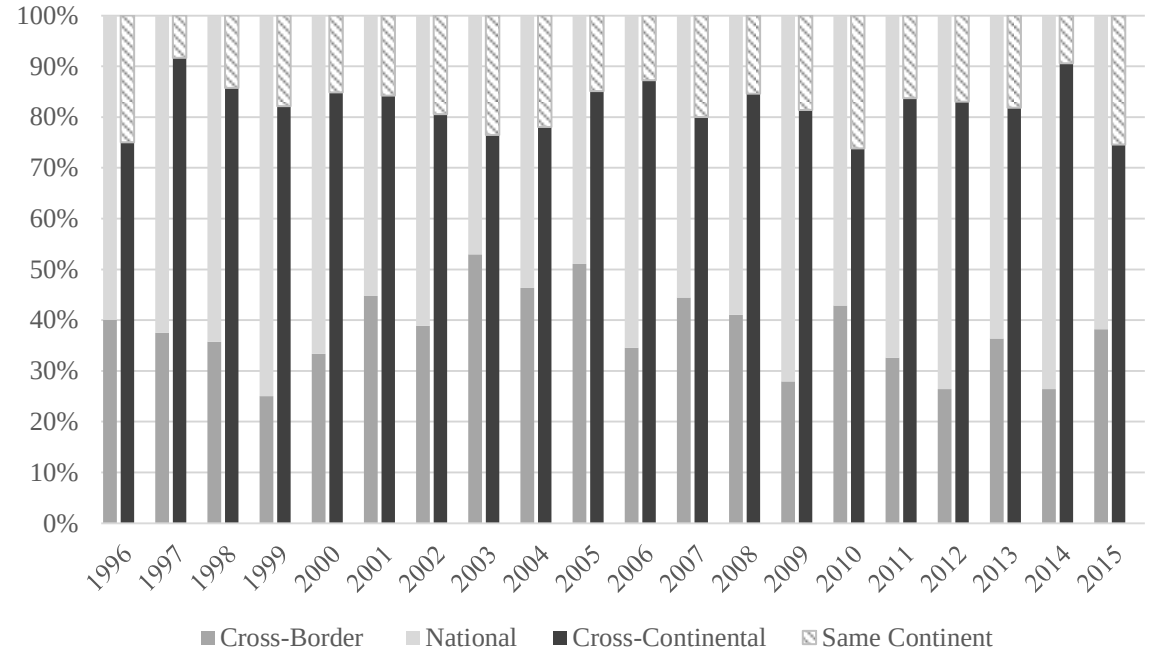


Figure 2. Development of domestic and international M&A

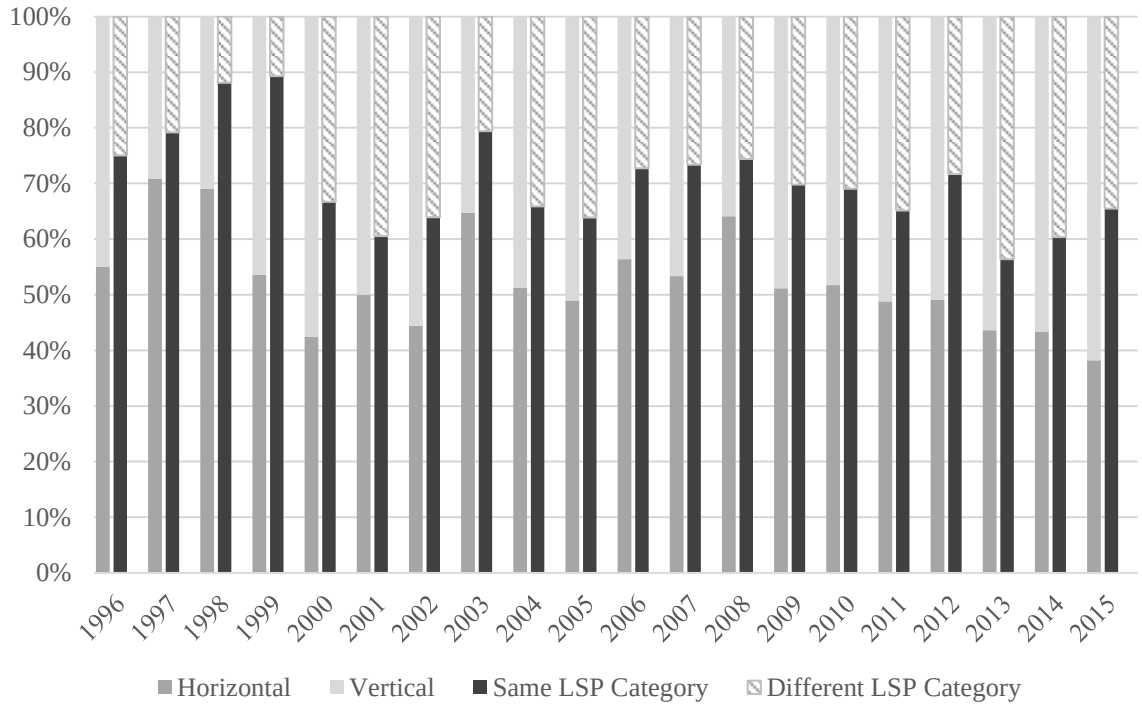


Figure 3. Development of diversifying and focus increasing M&A

Methodology

In order to determine whether M&A have a significant performance effect in terms of short-term and long-term shareholder returns, we employ the event study methodology as introduced by Dodd and Warner (1983) and Brown and Warner (1985) and extended by Barber and Lyon (1997). This is done in two steps by examining the short-term announcement effects on shareholders' wealth using CAR and by investigating the long-term stock performance of the newly formed enterprise during the integration period using BHAR. This approach is commonly used in financial research (cf. Binder, 1998 or Corrado, 2011) and has more frequently been applied in the domain of operations management research to analyze the performance impact of product recalls in order to develop appropriate recall strategies (cf. Zhao et al., 2013 and Ni et al., 2014), in assessing relationship between environmental operations management and firm performance (cf. Lam et al., 2016 and Tang et al., 2016) or in studying the impact of quality initiatives or new supply and/or delivery contracts (cf. Lin and Su, 2013 and Yang et al., 2014). This methodology is based on the fact that the effect of an announcement will be reflected in the share price of a firm (Fama, 1970). Assuming the rationality of the capital market, the share price incorporates all relevant information on expected net cash flows of a company (Mackinley, 1997). Therefore, it provides a valuable link between managerial decisions, actions and the resulting value created or destroyed for the firms' shareholder. According to the efficient market hypothesis, one can thus measure financial effects from managerial decisions and their impact on the corporate. In the following, we describe the main steps of this methodology.

Short-term analysis

The short-term analysis is based on the assumption that capital markets incorporate new information immediately after the first announcement of a transaction (Fama, 1970). However, due to the fact that we consider international M&A announcements, the information may need some time to be fully incorporated in the stock price. As in some cases we cannot exclude possible anticipation effects, we extend the event window to a [–5; +5] period, including five trading days prior to the official announcement and the five trading days

following the announcement. Using extended event windows obviously reduces the power of the methodology as one cannot exclude other possible announcement effects distorting the results.[6] For each event, we then calculate the realized return and the 'normal' return.[7] The normal return is estimated using ordinary least squares estimates over a 252-trading day period (one whole trading year) beginning 262 days prior to the event day (*t=−262*) ending 11 days prior to the event day (*t=−11*).

Our variable of interest is the difference between the company's realized return and the normal return that we would expect on day *i* without the M&A announcement. In analogy to prior event studies (cf. Binder, 1998 or Corrado, 2011), we use the market model to estimate the abnormal return[8]:

$$AR_{i,t} = R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i R_{m,t}) \quad (1)$$

where $R_{i,t}$ is the return of company *i* on day *t*, $R_{m,t}$ is the return of the benchmark index on day *t*, $\hat{\alpha}_i$ and $\hat{\beta}_i$ are the regression coefficients of company *i*. Datastream's value-weighted total return national stock market index of LSP *i*'s country of origin is used as the benchmark index.
The cumulative abnormal return (CAR) for stock *i* during the event window $[\tau_1,\tau_2] \epsilon [-5; +5]$ is calculated as:

$$CAR_{i,[\tau_1,\tau_2]} = \sum_{t=\tau_1}^{\tau_2} [R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i R_{m,t})] \quad (2)$$

Finally, for a sample of *N* transactions, the average CAR (ACAR) for a given event window is derived by:

$$ACAR_{[\tau_1,\tau_2]} = \frac{1}{N} \sum_{i=1}^{N} CAR_{i,[\tau_1,\tau_2]} \quad (3)$$

ACARs are calculated for the interval $[\tau_1;\tau_2] \epsilon [-5; +5]$.

Long-term analysis
In addition to the short-term event study, we use the BHAR method to measure the return difference between the event firms compared to the benchmark market. Lyon et al. (1999) show that the BHAR approach is robust, while other long-term approaches (e.g. the calendar time method) are miss-specified in non-random samples. The long-term value creation (in the 36 months following the focal acquisition) was therefore assessed using the BHAR

[6] Note that we eliminated all major events from the sample that could have been affected by announcements about alliance founding (e.g. New World Alliance), open skies agreements (e.g. EU-US Open Skies Agreement), free trading agreements (e.g. NAFTA) or granting cabotage rights (e.g. unrestricted cabotage permit for all EU members) in the [5, +5] event window. In total, we excluded 51 additional confounding events. These steps resulted in a substantial reduction of observation, but helped to improve the quality of the dataset and the related results.

[7] Note that this is the expected return without the announcement effect.

[8] To control for robustness, we also applied the four-factor model by Carhart (1997). Fama and French (1993, 1996) extended the single index model to a three-factor model which was further extended by Carhart (1997) who added a fourth factor that captures the momentum effect as described by Jegadeesh and Titman (1993). The detailed results of the four-factor model are found to be similar to the ones obtained from the market model and were therefore not provided in the paper.

methodology in analogy to Barber and Lyon (1997) and Mitchell and Stafford (2000). The BHAR approach allows the assessment of abnormal returns over a longer time horizon and overcomes the limitations resulting of the use of narrow windows around the announcement dates that only measures the expected cash flows. The 36-months return from a buy-and-hold strategy was computed for the three years after the M&A announcement and was then referenced against the world-wide benchmark. Consequently, the market-adjusted BHARs can be calculated as:

$$BHAR_{i,[\tau_1,\tau_2]} = \Pi_{\tau_1}^{\tau_2}(1 + R_{i,t}) - \Pi_{\tau_1}^{\tau_2}(1 + R_{m,t}) \quad (4)$$

where $R_{i,t}$ is the return of company i on day t and $R_{m,t}$ is the return of the world-wide benchmark index on day t.

Tests of significance

The outlined methodology allows us to calculate the abnormal return for each event. In a next step, we analyse whether the vector of abnormal returns is significantly different from zero. Therefore, we use two parametric test statistics and one non-parametric test statistic. First, we apply the Boehmer et al. (1991) test. This test is commonly used for event studies as it is robust against volatility-changing events and standardizes the abnormal returns. However, the more recent test of Kolari and Pynnönen (2010), known as KP-test, indicates an overreaction of the null-hypothesis for the BMP-test, if correlation is ignored. The KP-test adjusts the variance of the mean abnormal return in the event period using the correlation of the residuals in the estimation period and therefore accounts for cross-sectional correlation. We also apply the nonparametric test statistic introduced by Corrado (1989), which was later refined by Corrado and Zivney (1992), known as CZ-test. To assess significance of the long-term analysis, the BHARs are tested for changes significantly from zero with the t-test and the skewness-adjusted *t*-test, originally developed by Johnson (1978). As BHARs are positively skewed (e.g. Barber and Lyon, 1997; Kothari and Warner, 1997), the Johnson (1978) test transforms the usual *t*-test to eliminate this skewness bias.

3.2.4 Analysis of determinants

In order to identify the determinants of the stock market reactions following upon the transaction announcements a cross-sectional regression analysis is conducted. The multivariate ordinary least squares regression follows:

$$ACAR_{i,[\tau_1,\tau_2]} = \beta_0 + \sum_{i=1}^{m} \beta_j Var_j + \epsilon \quad (5)$$

where $ACAR_{i,[-1;\ +1]}$ is the abnormal return of firm $i \in \{1,\ldots,m\}$, during the [−1; +1] event window, β_0 is the regression constant, β_i are the regression coefficients for the independent variables with $j \in \{1,\ldots,m\}$, Var_j are the independent variables with $j \in \{1,\ldots,m\}$, and ε is the error term. In order to explain the ACARs during the [−1; +1] and the event window, macroeconomic, company specific and event specific variables are tested in the following section. Similarly, OLS regressions based on the same independent variables are used to assess the determinants for the long-term performance of the company, measured by the 36 months buy-and-hold abnormal returns.

Empirical results

Short-term stock market analysis

In the following, we discuss the results of the short-term stock market analysis describing the immediate effect at the time the M&A is announced. Table 3 reports the results for the

acquirer companies, whereas Table 4 provides the corresponding results for the target companies. Upon the announcement of a transaction, acquirers earn a significant 1.31% abnormal return in the [−1; +1] event-window around the announcement date. In absolute numbers, this equals an average increase of $34.5 million in the market value of the acquirer's equity. This gain in company value is highly significant according to all test statistics. The positive effect is also shown in larger event windows such as the [−5; +5] event window. In the 5 days prior to and 5 days subsequent to the M&A announcement, the value gain remains comparatively stable at about 1%. This finding is in line with prior research (cf. Table 1), but reveals the exceptional role of M&A in the logistics service industry. Unlike results from the majority of other industries (cf. Eckbo, 1983; Agrawal et al., 1992; Seth et al., 2002), positive short-term returns to acquirers represent the capital market's perception of value-creating synergies and expected future benefits of the transaction. Therefore, the results contradict our hypothesis **H1a** postulating that M&A announcements do not have an impact on the acquirers' company value in short-term.

Event window	ACAR	Median CAR	CAR >0	BMP (Z-score)	KP (Z-score)	CZ (Z-Score)	Sample Size
[−5; +5]	0.98%	0.60%	54.36%	3.951***	4.037***	2.034***	826
[−2; +2]	1.32%	0.81%	56.78%	6.447***	6.310***	4.375***	826
[−1; +1]	1.31%	0.75%	58.23%	7.571***	7.313***	5.504***	826
[0; 0]	0.60%	0.08%	51.82%	5.084***	5.012***	3.710***	826

Table 3. Event study results for acquirer firms.

This table summarizes the stock market reaction to M&A announcements of acquirer companies in the logistic service industry. The CARs are calculated for acquirers over multiple event windows for firms in the logistic service industry between 1996 and 2015. The sample includes 826 acquiring firms from the logistic service industry. ACARs are tested for statistical significance using the parametric BMP and KP test procedure and the nonparametric CZ rank test. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Most of the target companies are private wherefore the sample size becomes much smaller. However, our sample includes 40 listed target companies that will be analyzed in more detail. The results clearly indicate that targets earn notably positive and highly significant abnormal returns during the days surrounding the transaction. On the announcement day itself, the company's stock price increases by almost 15% and exhibits a positive trend. During the three days around the announcement ([−1; +1] event window) the stock prices increase by more than 19%. The highest ACAR of 22% can even be found in the [−5; +5] event window. All results are highly statistically significant and consistent with the findings of prior studies. For the logistics service industry, similar but less pronounced positive effects of up to 14.8% have been reported in Darkow et al. (2008) Other cross-industry studies on international transactions of non-financial companies find that the targets' shareholders realize an average abnormal return of 20%-30% (cf. Bradley et al., 1983; Datta et al., 1992; Campa and Hernando, 2004). For freight transportation companies Andreou et al. (2012) show that most of the synergistic gains of the M&A accrue to the target companies' shareholders. Our overall results for target companies are thus in line with the prior findings and the expectations outlined in hypothesis **H1b**.

Event window	ACAR	Median CAR	CAR >0	BMP (Z-score)	KP (Z-score)	CZ (Z-Score)	Sample Size
[−5; +5]	22.00%	13.31%	75.00%	4.810***	4.508***	2.888***	40
[−2; +2]	21.27%	12.40%	80.00%	5.295***	5.015***	4.486***	40
[−1; +1]	19.02%	8.72%	82.50%	5.045***	4.868***	5.087***	40
[0; 0]	14.93%	6.02%	80.00%	4.670***	4.485***	5.634***	40

Table 4. Event study results for target firms.

This table summarizes the stock market reaction to M&A announcements of target companies in the logistic service industry. The CARs are calculated for targets over multiple event windows for firms in the logistic service industry between 1996 and 2015. The sample includes 40 target firms from the logistic service industry. ACARs are tested for statistical significance using the parametric BMP and KP test procedure and the nonparametric CZ rank test. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Summarizing, we find that the capital market reactions, and therefore the investors' expectations, differ significantly, depending on whether the company is acquirer or target. In contrast to prior literature, however, both companies can realize a positive effect. Therefore, one can conclude that M&A announcements in the logistics service industry are expected to induce financial advantages for acquirer and target companies alike. Consequently, unlike shown in many cross-industry studies, companies in the logistics service industry gain a positive shareholder wealth following an M&A announcement. These results are also highlighted in Figure 4 that illustrates acquirers' and targets' shareholders gain in terms of positive abnormal returns upon the announcement of a transaction. While acquirers' shareholders exhibit a comparatively small but positive effect, the target's exhibit a significant abnormal stock returns of more than 20%.

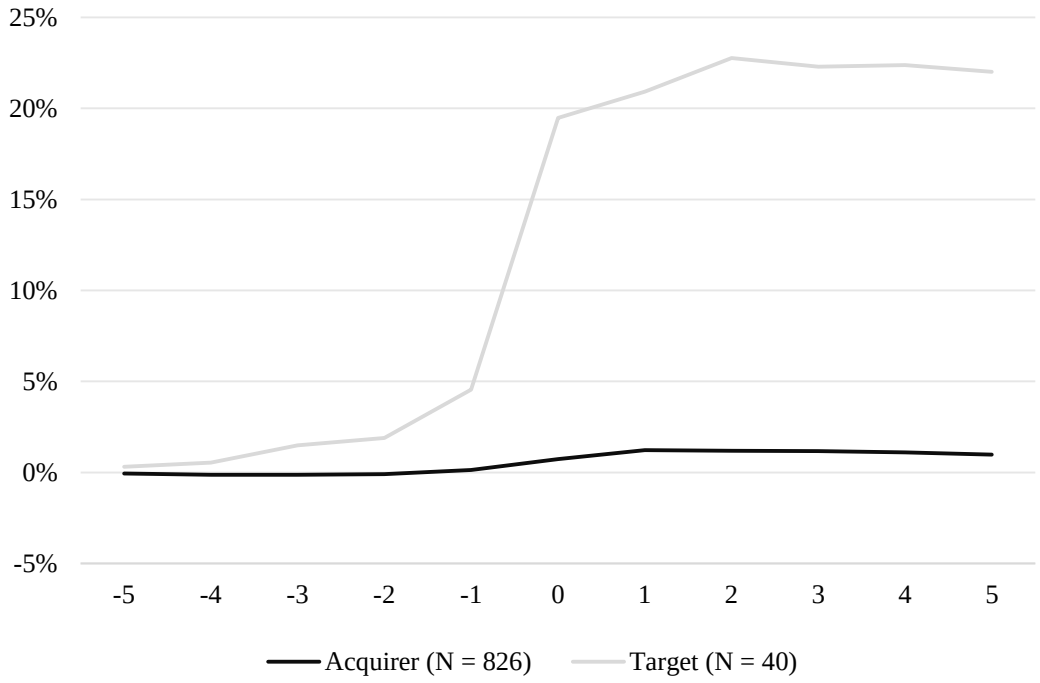


Figure 4. CAARs of the acquiring and target firms.

This figure illustrates the ACAR development of the acquirer and target companies in the logistic service industry during the [−5; +5] day event window surrounding M&A announcement date t = 0. The acquirer sample consists of 826 companies from the logistics service industry, the target sample includes 40 exchange-listed firms from the logistics service industry.

Table 5 Panel A to Panel F similarly reports the event study results for the acquiring companies, but accounts for the different LSP categories. Significant positive results of transaction announcements can, in short-term, be obtained for trucking, railway, air cargo, and 3PL. With regard to the [–1;+1] event window the average abnormal stock returns range from 1.3% to 2.6% and are higher for carriers in the asset-intense railway and air cargo industries than for trucking and 3PL companies. In contrast to Alexandrou et al. (2014), we do not find significant positive abnormal returns for sea freight carriers in most of the event windows. Only in the [–1;+1] event window the ACAR is slightly positive with 0.6% and significant

according to the BMP-test and the KP-test. However, extending the event window, we do not find more significant results.[9] In addition, the results indicate that CEP companies do not benefit from M&A in the short-term. The ACAR is weakly significant for the [−1; +1] day event window, but leaks in significance for all other event windows.

Event window	ACAR	Median CAR	CAR >0	BMP (Z-score)	KP (Z-score)	CZ (Z-Score)	Sample Size
Panel A: Trucking							
[−5; +5]	0.91%	0.95%	55.71%	1.751*	1.820*	1.351	219
[−2; +2]	1.28%	0.59%	52.05%	2.940***	2.777***	2.153**	219
[−1; +1]	1.25%	0.57%	56.16%	3.525***	3.141***	2.736***	219
[0; 0]	0.62%	0.05%	52.51%	2.692***	2.503**	2.441**	219
Panel B: Railway							
[−5; +5]	1.31%	−0.18%	48.84%	1.422	1.676*	0.119	43
[−2; +2]	2.03%	1.09%	55.81%	2.699***	2.937***	1.541	43
[−1; +1]	2.00%	1.56%	67.44%	2.980***	3.107***	1.998**	43
[0; 0]	1.01%	0.22%	60.47%	2.122**	2.155**	1.825*	43
Panel C: Sea freight							
[−5; +5]	–0.20%	–0.44%	46.70%	–0.179	0.021	−0.510	182
[−2; +2]	0.53%	0.54%	53.85%	1.391	1.505	0.512	182
[−1; +1]	0.64%	0.44%	55.49%	1.910*	1.989**	0.911	182
[0; 0]	0.11%	−0.23%	43.96%	0.786	0.971	−0.318	182
Panel D: Air cargo							
[−5; +5]	2.45%	2.13%	58.77%	2.758***	2.943***	1.657*	114
[−2; +2]	2.39%	0.99%	63.16%	3.728***	4.134***	2.607***	114
[−1; +1]	2.59%	1.39%	60.53%	4.291***	4.883***	4.095***	114
[0; 0]	1.48%	0.58%	60.53%	3.551***	4.201***	3.877***	114
Panel E: CEP							
[−5; +5]	−0.07%	−0.60%	44.44%	0.194	0.489	0.345	45
[−2; +2]	0.55%	0.12%	51.11%	0.834	0.757	1.352	45
[−1; +1]	0.65%	0.37%	62.22%	1.548	1.907*	1.837*	45
[0; 0]	−0.38%	0.10%	51.11%	−0.957	−1.010	−0.765	45
Panel F: 3PL							
[−5; +5]	1.39%	1.02%	60.09%	3.374***	3.301***	1.795*	223
[−2; +2]	1.47%	1.36%	61.88%	3.871***	3.889***	3.112***	223
[−1; +1]	1.28%	0.89%	58.74%	4.187***	4.185***	3.055***	223
[0; 0]	0.65%	0.07%	51.57%	2.976***	2.969***	2.164**	223

Table 5. Event study results for acquiring firms by LSP category.

This table summarizes the stock market reaction to M&A announcements of acquirer companies in the logistic service industry split into the LSP categories trucking, railway, shipping, air cargo, CEP, and 3PL. The CARs are calculated for acquirers over multiple event windows for firms in the logistic service industry between 1996 and 2015. ACARs are tested for statistical significance using the parametric BMP and KP test procedure and the nonparametric CZ rank test. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

For most of the LSP categories, the positive effect for the acquiring companies can be confirmed. However, it is shown that the ACAR vary across the different LSP categories (cf. Figure 5 for an overview of the abnormal returns for each LSP category). Overall, air cargo companies seem to benefit most from M&A announcements. The ACAR in the [−5; +5] day event window is 2.45% which can be traced back to increased market power and more efficient operations of the involved airlines (cf. Singal, 1996). Other transportation carriers such as railway and trucking companies similarly exhibit positive stock price effects in the short run which are more distinct closely around the announcement date. While trucking companies frequently strive for consolidation of existing operations and expansion at the

[9] Note that Alexandrou et al. (2014) provide only the [−3; +1] day event window which does not allow comparisons of extended periods.

same time to satisfy increasing customer demands (cf. Brooks and Ritchie, 2005), railway carriers rather focus on leveraging synergistic gains from consolidation. The positive ACAR for 3PL companies of 1.39% in the [−5; +5] day event window is likewise highly significant according to BMP and KP test and can be attributed to improved offerings to new and existing customers from more cohesive services and/or better geographical coverage (cf. Hertz and Alfredsson, 2003).
In contrast to the prior literature, these results indicate that M&A announcements lead to positive abnormal short-term returns for acquirers' and targets' shareholders. In addition, we find that the positive effect varies across the subcategories.

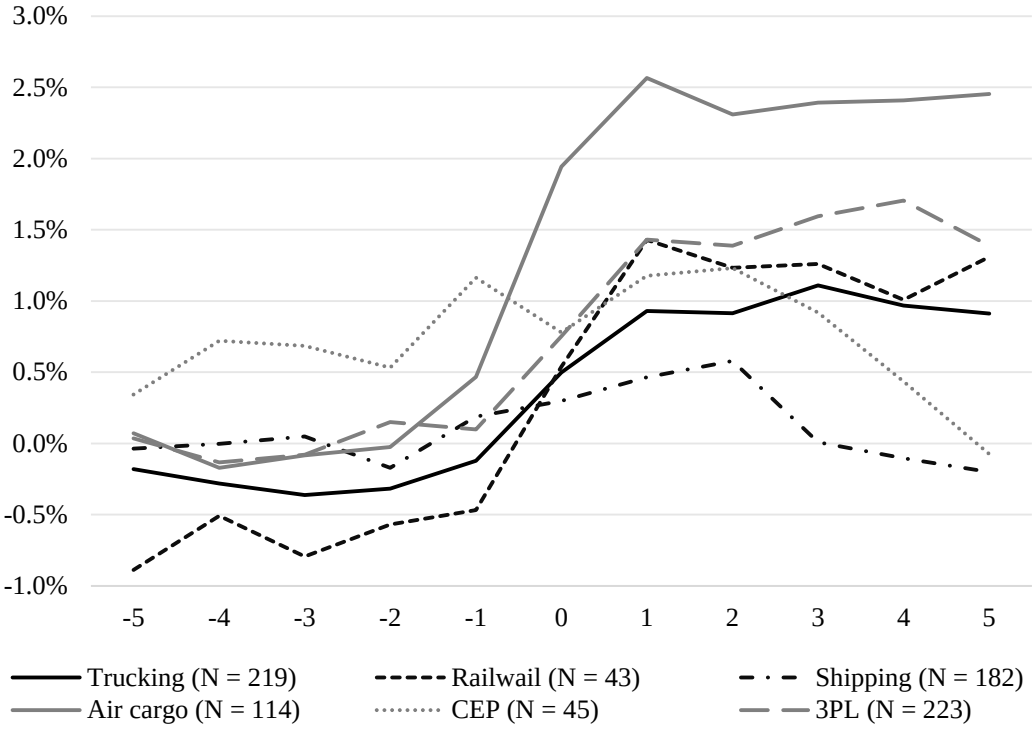


Figure 5. CAARs of the acquiring firms divided by LSP category.
This figure illustrates the ACAR development of the acquirer in the logistic service industry according to the LSP categories during the [−5; +5] day event window surrounding the M&A announcement date t = 0. The six different LSP categories are trucking, railway, sea freight, air cargo, CEP and 3PL.

Long-term stock market analysis
The short-term stock market reaction suggests that LSP companies do benefit from M&A transactions which has also been indicated in the literature (cf. Darkow et al., 2008, Alexandrou et al., 2014). However, as the realization of synergistic gains is highly dependent on the integration process and may require more time to become effective (Häkkinen et al., 2005), we extent the scope of this study by a long-term analysis. In the course of this, we measure the stock performance of the combined company 6, 12, 24, and 36 months following the M&A announcement using the BHAR approach. Table 6 presents the results of this long-term analyses. As transactions require time for alignment and the adjustment of assets, processes, IT, etc. in both companies, the performance does not change rapidly. However, we find that after 36 months the BHAR increase by 7.6% and are significant at the 5% level.[10] LSP companies seem to perform significantly better than their peers do. Therefore, we find evidence for hypothesis **H1c**. Panel B to Panel G again take account for the different LSP

[10] Note that due to the extended observation period the sample size is becoming smaller as events with insufficient data were excluded from the analysis.

categories. The results indicate that in the long-term the success of the merger integration differs across the LSP category. The overall positive effect is mainly pushed by two categories, 3PL and railway, exhibiting 36 month BHAR of 24.2% and 20.0%, respectively. Whereas the BHAR of 3PL is highly significant, the BHAR of railway companies is only of weak significance due to the comparatively small sample size. In contrast, CEP and air cargo companies exhibit significant negative results of –17.3% 36 month after the transaction and of –11.6% 24 month after the transaction that dampen the positive effect for the overall sample. The results for the categories trucking and sea freight remain insignificant.

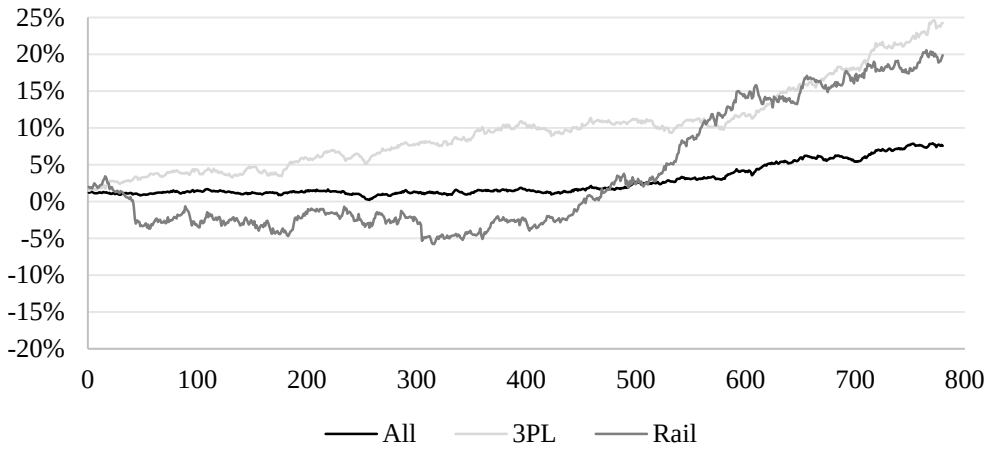
	Buy-and-Hold Abnormal Return Mean	Student's t-test t-value	Skewness-adjusted Johnson test j-value	Sample size
Panel A: Overall sample				
BHAR 6	1.304%	1.4375	1.4379	826
BHAR 12	0.481%	0.3502	0.3502	825
BHAR 24	2.642%	1.1885	1.1895	764
BHAR 36	7.567%	2.365**	2.3703**	714
Panel B: Trucking				
BHAR 6	0.654%	0.3552	0.3552	219
BHAR 12	−1.433%	−0.5217	−0.5214	218
BHAR 24	2.831%	0.6275	0.6287	202
BHAR 36	4.089%	0.7264	0.7278	188
Panel C: Railway				
BHAR 6	−2.426%	−0.5287	−0.5358	43
BHAR 12	−3.125%	−0.5287	−0.5345	43
BHAR 24	3.325%	0.4667	0.4686	40
BHAR 36	19.847%	1.8631*	1.8213*	38
Panel D: Sea freight				
BHAR 6	0.145%	0.0826	0.0831	182
BHAR 12	−0.680%	−0.2467	−0.2466	182
BHAR 24	5.733%	1.1237	1.1292	172
BHAR 36	7.147%	1.0768	1.0799	163
Panel E: Air cargo				
BHAR 6	2.323%	0.9236	0.9249	114
BHAR 12	−1.358%	−0.3349	−0.3336	114
BHAR 24	−11.586%	−2.0313**	−2.0034**	104
BHAR 36	−11.125%	−1.4201	−1.4077	99
Panel F: CEP				
BHAR 6	−0.671%	−0.2462	−0.2487	45
BHAR 12	−6.098%	−1.5415	−1.5351	45
BHAR 24	−12.965%	−1.6387	−1.6247	42
BHAR 36	−17.276%	−1.8678*	−1.8340*	40
Panel G: 3PL				
BHAR 6	3.485%	1.9369*	1.9433**	223
BHAR 12	6.262%	2.3322**	2.3426**	223
BHAR 24	10.180%	2.4629**	2.4741**	204
BHAR 36	24.234%	3.2381***	3.2950***	186

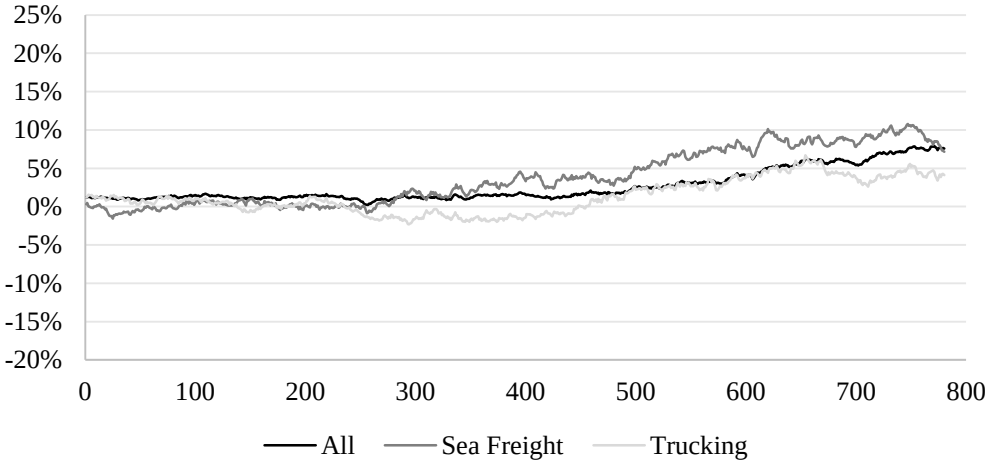
Table 6. Long-term stock effect of mergers and acquisitions in logistics.

This table provides the BHAR values of the transaction data sample. BHARs report abnormal buy-and-hold returns 6, 12, 24, and 36 months after the M&A announcement. BHARs are tested for statistical significance using the parametric student's t-test and the skewness adjusted Johnson (1978) test. ***, **, * denotes statistical significance at the 1%, 5%, and 10% level, respectively.

Figure 6 illustrates the overall BHAR development and the BHAR development for each LSP category. It is revealed that 3PL companies seem to benefit earlier from the transaction. After 6 months the BHAR is already at 3.5%, and after 12 months around 6.3%. However, the largest increase can be observed at the beginning of the third year after the transaction where the BHAR increases from 10.2% to the 24.2%. Railways companies, in contrast, show abnormal negative BHARs in the first year after the M&A. These companies start to benefit from the deal after approximately two years and show a rapid increase in market value in the third year after the announcement. In contrast, CEP and air cargo companies perform significantly worse than their peers. However, this must be interpreted carefully due to the comparatively small sample size of CEP, railway and air cargo companies. The BHAR of air cargo amounts to −11.6% 24 months after the M&A announcement and is significant at the 5% level. Moreover, the BHAR also remains stable for the third year, but leaks significance. Schosser and Wittmer (2015) argue that cost and revenue synergies are the two main

determinants for airline mergers. Moreover, in their analysis it is shown that the majority of M&A do not induce superior profitability which may lead to poor stock performance in the post-merger period. CEP companies exhibit negatively increasing but mostly insignificant abnormal returns. The BHAR of −17.3% 36 months after the announcement is weakly significant and indicates that CEP companies as acquirer in M&A transactions are less successful than the average. According to the Global CEP Market 2015-2019 report, intensified competition from vendors has led to reduced revenues and shrinking margins. This encourages regional differentiation that is carried out by series of rather small acquisitions (McKinsey, 2015) containing a high risk of overpayments. For trucking and seas freight carriers the long-term abnormal returns are positive but not statistically significant.





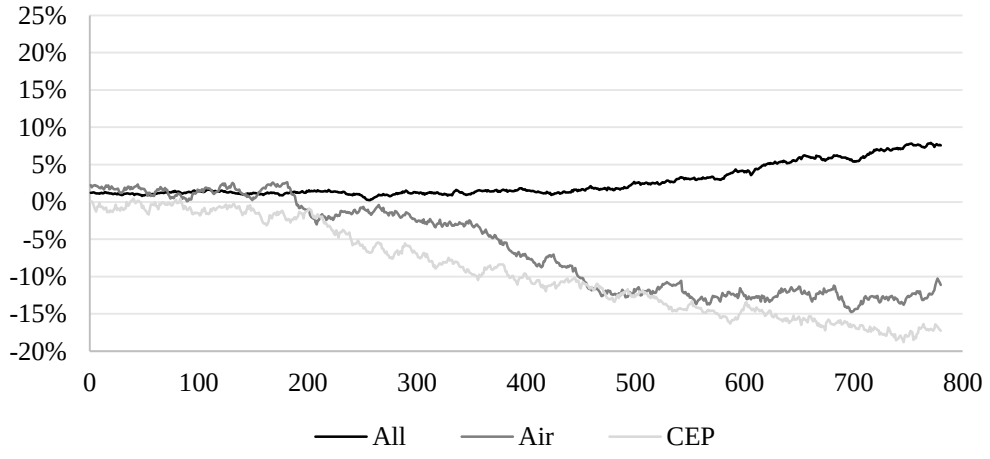


Figure 6. BHARs of the acquiring firms divided by LSP category.

This figure illustrates the BHAR development of the acquirer in the logistic service industry according to the LSP category during the 36 months after the M&A announcement date t=0. The six different LSP categories are trucking, railway, sea freight, air cargo, CEP and 3PL.

Overall, we can find that the capital market reactions during the post-merger integration period are significantly positive wherefore it can be concluded that M&A in the logistics service industry can leverage synergistic gains and improve expected returns of newly formed companies. But again, stock market developments differ significantly across the considered LSP categories and the considered integration period. Based on the overall sample as well as the LSP categories railway, air cargo and 3PL, we can conclude that successful integration processes may require up to three years after the initial announcement to become effective and to generate abnormal financial returns.[11] The strong post-merger integration results of 3PL companies that carry out several activities including management and execution of transportation and warehousing (cf. Berglund, 1999), can be traced back to their competencies in integrating physical and informational flows across the supply chain. However, whereas some categories such as 3PL companies exhibit notable positive results, other such as CEP companies do not seem to benefit at all or even exhibit significant losses 36 month after the transaction announcement. In order to identify potential determinants of M&A performance in short-term and long-term, the next section provides the results of several regression models.

Cross-sectional regression analysis

In order to gain further insights into potential dependencies, we conduct multiple cross-sectional regression analyses. As part of this, we analyse the abnormal returns of the acquirer in the short-term [−1; +1] event window to test the impact of different variables on the acquirer's company value. In addition, we examine the impact on the buy-and-hold returns 36 months after the initial M&A announcement using the same set of independent variables. The considered variables are explained in the following sections and include macroeconomic variables such as the GWP growth, acquirer-specific variables such as the location of the headquarters, deal-specific variables such as the payment type and operational variables such as the crude oil price growth. The variable definitions are summarized in Table 7.

For testing our hypotheses **H2, H3a, H3b** and **H3c** as well as the determinants of short-term abnormal wealth effects for the acquiring company and of the long-term success of the combined company, we define a set of 20 variables clustered in four sets: (i) macroeconomic variables, (ii) acquirer-specific variables, (iii) deal-specific variables and (iv) operational variables.

Macroeconomic variables

As the demand for logistics services is highly correlated to international trade, the revenue growth rates of LSPs are strongly influenced by the total global economic development. *GWP GROWTH* as the growth rate of gross world product in the year prior to the announcement is intended to address hypothesis **H2**. The relevant data is obtained from the World Bank database. In addition, the most eminent macroeconomic shock in the last decades without any doubt was the global financial crisis. We control for this shock introducing the variable *CRISIS*, covering the period from September 2007 to June 2009 (cf. National Bureau of Economic Research, 2010). Finally, we also control for regional differences. The variables *NORTH AMERICA*, *EUROPE* and *ROW* describe whether the acquirer's headquarter is

[11] Note that as the time lag between the announcement and the start of the post-merger integration process is unknown, some synergistic potential may be unlocked earlier

located in this region or not whereas Asia is remains our base category. *ROW* covers all countries that do not belong either to North America, Europe or Asia.

Acquirer-specific variables

Prior literature provides evidence that, apart from macroeconomics factors, company characteristics have a significant influence on the stock returns caused by M&A announcements. Alexandrou et al. (2014), for example, show that smaller acquirers in the shipping industry do benefit more from transactions than their larger peers. The size of an acquirer is also an indicator of its bargaining power (cf. Moeller et al., 2005). Therefore, we introduce the variable *LN SIZE* as the logarithm of the market capitalization of the acquirer in US-Dollar. In order to prevent that the M&A announcement is already reflected in the market capitalization, we consider the value on the last trading day one year prior to the event. In addition, we control for the operating performance of the acquirer before the event. Whereas earlier studies focused on changes in earnings per share, more recent research employs operating income as a more appropriate performance measure (cf. Barber and Lyon, 1996). In order to compare the performance across companies, the operating income, however, has to be rescaled. Thus, return-on-assets (*ROA*) is commonly used as an indicator for the operating performance of a company and is accordingly incorporated in our analysis. Furthermore, transactions frequently aim for leveraging synergistic gains (cf. Section 2). As has been shown in Singh and Montogomery (1987) and Lubatkin (1987), merging firms capture synergies mostly through asset divesture and resource redeployment. Thus, the variable *LN TOTAL ASSETS* is introduced as the logarithm of the acquirer's total assets in US-Dollar on the last trading day in the year prior to the event. Finally, we have introduced several variables describing the company's business scope. *BUSINESS DIVERSITY* is a proxy for the diversification of the business before the announcement and is measured by the number of SIC codes of the acquirer to address hypothesis **H3a**. Companies with only one SIC code are assumed to be completely focused on one type of product or service whereas a higher number of SIC codes indicates a more diversified business. As the previous results already revealed that the success of transactions is also dependent on the LSP category of the acquirer, we also include the dummy variables *TRUCKING*, *RAILWAY*, *SEA FREIGHT*, *CEP*, and *3PL* in our model, using the LSP category *AIR CARGO* as our reference.

Deal-specific variables

In order to consider transaction specifics, we also introduce several deal-specific variables in our models such as *DEAL VALUE KNOWN*. We control for the data availability and the complexity of evaluating the transaction by introducing this dummy variable that is defined as 1, if the deal value is public, and 0 otherwise. Although international and diversifying transactions bear a high risk of overpayments due to asymmetric information and cultural differences, especially the leading logistics service providers have often already gained experience across service segments and international markets (cf. Carbone and Stone, 2005). To control for these factors, we introduce the variables *CROSS-CONTINENTAL* and *HORIZONTAL*. *CROSS-CONTINENTAL* is defined as 1, if the acquirer's and the target's headquarter are not located on the same continent, and 0 otherwise, whereas *HORIZONTAL* is defined as 1, if acquirer and target exhibit the same four-digit SIC code, and 0 otherwise. These variables aim for addressing potential risks and benefits of diversification and geographical expansion which is captured by hypothesis **H3b** and **H3c**, respectively. Finally, we control for the payment type of the transaction, introducing the dummy variable *CASH PAYMENT* which is defined as 1, if the transaction is fully paid in cash, and 0 otherwise. Prior literature reveals that payments in cash can have significant positive effects on the acquirer's stock returns (cf. Travlos, 1987; Chang, 1998; Faccio and Masulis, 2005).

Operational variables

During the last decades, LSPs also faced huge operational challenges due to high volatile oil prices and shrinking profit margins. Alternative energies are still not able to fulfil the demand wherefore crude oil remains one of the principal energy sources. Consequently, operational costs of LSP are heavily influenced by the oil price (beside personnel expenditures fuel cost remain one of the major cost factors for logistic companies, cf. EU Commission, 2015). Hence, LSPs have to improve their business activities and manage their assets more efficiently in times of increasing oil prices also using M&A as a suitable instrument. We therefore introduce the variable *CRUDE OIL PRICE GROWTH*, defined as the percentage change of the crude oil price between one trading year before and ten trading days before the M&A announcement to control whether the development of the average oil price has an impact on the performance of the acquisition. Finally, to capture the development of the operational revenues we also included the Baltic Dry Index in our analysis. The Baltic Exchange, based in London, issues the Baltic Dry Index that provides information about sea freight rates for a wide range of commodities, such as coal, iron, and grain. In analogy to crude oil price growth, the variable *BALTIC DRY INDEX GROWTH* is defined as the percentage change of the Baltic Dry Index between the last trading day one year and 10 days prior to the event. Table 7 summarizes the definitions and source of data for each variable.

Variable	Variable definition	Source
Macroeconomic variables		
GWP GROWTH	Percentage change of the gross world product between the last trading day two years and one year prior to the M&A announcement.	World Bank
CRISIS	Dummy variable defined as 1, if the M&A was announced during September 2007 and June 2009, 0 otherwise.	Securities Data Corporation (SDC)
NORTH AMERICA	Dummy variable defined as 1, if the company's headquarter is located in North America, 0 otherwise.	Datastream
EUROPE	Dummy variable defined as 1, if the company's headquarter is located in Europe, 0 otherwise.	Datastream
ROW	Dummy variable defined as 1, if the company's headquarter is located neither in Europe, North America or Asia, 0 otherwise.	Datastream
Acquirer-specific variables		
LN SIZE	Logarithm of the market capitalization in US-Dollar of the acquirer on the last trading day in the year prior to the year of the event.	Datastream
ROA	Return-on-assets of the acquirer according to the annual financial report one year prior to the year of the event.	Datastream
LN TOTAL ASSETS	Logarithm of the total assets in US-Dollar of the acquirer on the last trading day in the year prior to the year of the event.	Datastream
BUSINESS DIVERSITY	Acquirer' business scope according to the amount of different four-digit Standard Industry Classification codes.	Datastream
TRUCKING	Dummy variable defined as 1, if a company's main sector belongs to trucking activity according to Standard Industry Classification (codes 4212, 4213, 4231), 0 otherwise.	Datastream
RAILWAY	Dummy variable defined as 1, if a company's main sector belongs to railway activity according to Standard Industry Classification (codes 4011, 4013, 4741), 0 otherwise.	Datastream
SEA FREIGHT	Dummy variable defined as 1, if a company's main sector belongs to sea freight activity according to Standard Industry Classification (codes 4412, 4424, 4432, 4449, 4491, 4499), 0 otherwise.	Datastream
CEP	Dummy variable defined as 1, if a company's main sector belongs to courier, express or parcel activity according to Standard Industry Classification (codes 4215, 4513), 0 otherwise.	Datastream
3PL	Dummy variable defined as 1, if a company's main sector belongs to third party logistics providers according to Standard Industry Classification (codes 4214, 4221, 4222, 4225, 4226, 4731, 4783, 4789), 0 otherwise.	Datastream

Deal-specific variables		
DEAL VALUE KNOWN	Dummy variable defined as 1, if the deal value is reported, 0 otherwise.	Securities Data Corporation (SDC)
CROSS-CONTINENTAL	Dummy variable defined as 1, if the acquirer's headquarters and the target's headquarters are located on different continents, 0 otherwise.	Securities Data Corporation (SDC)
HORIZONTAL	Dummy variable defined as 1, if the acquirer and target are in the same LSP category according to the four-digit Standard Industry Classification code, 0 otherwise.	Securities Data Corporation (SDC)
CASH PAYMENT	Dummy variable defined as 1, if the payment of the deal is fully made with cash, 0 otherwise.	Securities Data Corporation (SDC)
Operational variables		
CRUDE OIL PRICE GROWTH	Percentage change of the crude oil price growth between the last trading day one years and 10 days prior to the M&A announcement.	Datastream
BALTIC DRY INDEX GROWTH	Percentage change of the Baltic Dry Index between the last trading one year and 10 days prior to the M&A announcement.	Datastream

Table 7. OLS regression variable definitions.
This table summarizes the definition and the source of the variables for the cross-sectional regression analysis.

Regression results for explaining the short-term effects
Table 8 summarizes the results of the multivariate cross-sectional regression analysis. In a first step, we analyse the factors that potentially influence the cumulative abnormal returns observed in the [−1; +1] event window. In a next step, we split the overall sample into the six different LSP (sub-)categories trucking, railway, sea freight, air cargo, CEP and 3PL.

The results reveal that the variables *GWP GROWTH* and *BUSINESS DIVERSITY* lack of significance. Therefore, we have to reject the hypotheses **H2** and **H3a** in the short-term. Moreover, we cannot identify a significant effect for the variable *HORIZONTAL* wherefore we have to reject hypothesis **H3b**. In contrast to our expectations, the variable *CROSS-CONTINENTAL* is weak significant and negative. Thus, we have to reject hypothesis **H3c** in the short-term as well. However, the transaction performance seems to be dependent on the location of the acquirers' headquarters. *NORTH AMERICA* exhibits a weak significant positive effect in the short term, whereas slightly higher significant positive returns can be identified for companies from the rest of the world sample. On average, they realize 1.56% higher returns compared to M&A announcements of Asian acquirers. The coefficient of the variable *CRISIS* is negative but lacks of significance. Consequently, announcing transaction in the course of the financial crisis inducing the potential need to merge, does not have an impact on the returns in the short-term. This finding is in contrast to prior studies from other industries suggesting that M&A during the financial crisis perform significantly better. Acharya et al. (2011), for example, show that the acquirer gains positive abnormal returns due to the fire-sale prices. However, this effect cannot be confirmed for the logistics service industry as a whole. Considering the specifics of the different service offerings, the dummy variables reveal that the results clearly differ across the LSP categories. Sea freight, trucking, CEP, and 3PL perform significantly worse than the base category air cargo. Therefore, we split the sample into the different LSP categories to analyse the determinants of each category in more detail in the following paragraph. Transparency in terms of known deal values exhibits a highly significant positive effect on the short-term success of the M&A as investors can assess the transaction more precisely. In addition, it is easier to estimate whether the potential synergy effects may exceed the premium for the acquisition itself (Perry and Herd, 2004). As expected, investment decisions in other countries are viewed negatively by the capital market. Due to better information availability, it is less likely that acquiring companies overpay for local targets (Goergen and Renneboog, 2004). The results also indicate that the operational variables taking account of changes in revenues or cost by analyzing crude oil price and Baltic Dry Index developments do not have any effect on the cumulative abnormal

returns in the short term. Thus, potential changes in revenue or cost of the acquirer in the period before the M&A announcement seem not to impact the M&A success.

In a further step, we split the sample according to the different LSP categories to take account for structural differences. For trucking companies, acquirer located in North America realize significant higher returns from M&A than their peers. The CARs are on average 2.57% higher than for trucking companies headquartered in Asia. Analyzing the North American trucking market, Brooks and Ritchie (2005) emphasized that there are no ownership restrictions impeding cross-border acquisitions, wherefore Canadian firms use M&A as a tool to access route densities in the U.S. market. The results also reveal that transparency in terms of known deal values has a significant positive effect on the abnormal returns. Known deal values facilitate the comparison between the synergy estimates and the paid premium and therefore allow to control whether the transaction is expected to be beneficial or not. The analysis of determinants for the short-term stock performance of railway and sea freight carriers remains inconclusive. This indicates that railway carriers, operating in a highly regulated and country specific environment (Laurino et al., 2015), and shipping are unique industries in which the short-term M&A performance may not be explained by the identified logistic-relevant factors. Air cargo exhibits a negative and significant coefficient for the variable *CRISIS*. As airlines were heavily influenced by the financial crisis experiencing losses of around $31 billion in 2008/09, transactions during the crisis period show by 9.84% lower abnormal returns than the average. For CEP companies, in contrast, that are operating around the globe, the results suggest that the short-term performance measured by the abnormal returns is highly dependent on the GWP growth in the year prior to the transaction. An increasing expected demand for parcel services in a soaring world economy, seems to fuel transaction outcomes in terms of higher abnormal returns. This may be explained by the need to acquire additional resources, to expand geographically or to enter new product markets in the presence of increased customer demands (see Brooks and Ritchie, 2005, for a similar explanation in the trucking industry). Counterintuitive is the result for the positive and significant crude oil price growth. However, if the oil price increased before the M&A announcement, the management of the acquirer has less cash flow and may have to select the investments more carefully (cf. Lang et al., 1991). This leads to selective behaviour when deciding on potential targets which results in higher cost savings and better synergies. Furthermore, in contrast to air cargo, 3PL companies benefit from M&A announcements during the financial crisis period. This can be interpreted similarly to the positive effect of crude oil prices affecting CEP companies. The management has less cash flow wherefore M&A decisions require more careful evaluation. In these periods, acquirers may also benefit from fire-sale prices in the M&A market (cf. Acharya et al., 2011). Finally, 3PL companies with better operating performance show significantly positive abnormal returns around the announcement date. This can be interpreted again as the ongoing perception of the investors.

Summarizing, the short-term performance of M&A announcements can be explained by several macroeconomic and deal-specific factors, such as the GWP development or presence of an economic downturn, the country of origin of the acquirer as well as the transparency of deal values or the assumed rigor in selecting potential candidates. However, the respective LSP categories exhibit significant differences that underline the heterogeneity of the logistics service industry.

CAR[−1; +1]	Overall	Trucking	Railway	Sea freight	Air cargo	CEP	3PL
Macroeconomic variables							
GWP GROWTH	−0.0041	0.0003	0.0015	−0.0022	−0.0183	0.0118***	−0.0021

	(−1.40)	(0.12)	(0.15)	(−0.71)	(−1.62)	(3.26)	(−0.73)
CRISIS	−0.0075	0.0114	−0.0123	0.0101	−0.0984**	0.0140	0.0667**
	(−0.63)	(0.93)	(−0.31)	(0.65)	(−2.39)	(0.84)	(2.35)
NORTH	0.0121*	0.0257**	−0.0352	0.0155	0.0157	0.0587	0.0087
AMERICA	(1.83)	(2.34)	(−1.37)	(1.18)	(0.85)	(1.23)	(0.81)
EUROPE	0.0047	0.0081	N/A	0.0054	0.0200	0.0239	0.0129
	(1.02)	(0.94)		(0.65)	(1.52)	(0.81)	(1.16)
ROW	0.0156**	0.0248	N/A	0.0108	0.0524	N/A	0.0107
	(2.28)	(1.34)		(0.86)	(1.29)		(1.04)
Acquirer-specific variables							
LN SIZE	−0.0005	0.0049	0.0108	0.0027	0.0129	−0.0135	−0.0078
	(−0.19)	(0.60)	(0.57)	(0.50)	(1.32)	(−1.16)	(−1.55)
ROA	0.0004	−0.0012	−0.0051	−0.0009	0.0016***	0.0038*	0.0010**
	(1.36)	(−0.84)	(−1.66)	(−1.05)	(2.66)	(1.75)	(1.99)
LN TOTAL	0.0001	−0.0049	−0.0107	−0.0010	−0.0073	0.0009	0.0017
ASSETS	(0.05)	(−0.56)	(−0.52)	(−0.18)	(−0.75)	(0.16)	(0.26)
BUSINESS	−0.0000	0.0010	0.0029	−0.0010	0.0001	0.0094	0.0022
DIVERSITY	(−0.08)	(0.94)	(0.49)	(−1.01)	(0.05)	(1.69)	(1.24)
TRUCKING	−0.0143*						
	(−1.68)						
RAILWAY	−0.0141						
	(−1.16)						
SEA FREIGHT	−0.0176**						
	(−2.30)						
CEP	−0.0171*						
	(−1.75)						
3PL	−0.0176**						
	(−2.12)						
Deal-specific variables							
DEAL VALUE	0.0147***	0.0193*	0.0099	0.0076	0.0071	−0.0103	0.0080
KNOWN	(3.23)	(1.80)	(0.76)	(0.83)	(0.48)	(−0.57)	(0.9)
CROSS-	−0.0075*	−0.0040	−0.0364	−0.0072	−0.0211	−0.0134	0.0024
CONTINENTAL	(−1.76)	(−0.35)	(−0.93)	(−0.95)	(−1.59)	(−1.00)	(0.32)
HORIZONTAL	0.0008	−0.0030	0.0098	0.0117	0.0064	−0.0122	−0.0098
	(0.23)	(−0.37)	(0.52)	(1.50)	(0.55)	(−0.64)	(−1.4)
CASH PAYMENT	−0.0045	−0.0046	0.0079	0.0072	−0.0057	−0.0052	−0.0051
	(−0.84)	(−0.38)	(0.35)	(0.61)	(−0.36)	(−0.27)	(−0.55)
Operational variables							
CRUDE OIL PRICE	0.0000	0.0000	0.0000	0.0000	0.0003	0.0005**	0.0001
GROWTH	(1.51)	(0.41)	(0.00)	(0.22)	(1.38)	(2.44)	(1.27)
BALTIC DRY	−0.0023	−0.0075*	0.0000	−0.0003	0.0078	−0.0051	−0.0067
INDEX GROWTH	(−1.04)	(−1.83)	(0.01)	(−0.10)	(1.01)	(−0.99)	(−1.50)
CONSTANT	0.0263	−0.0077	0.0579	−0.0252	−0.0714	0.1090	0.1057
	(0.89)	(−0.13)	(0.48)	(−0.48)	(−0.74)	(0.86)	(1.50)
Sample size	754	187	41	172	106	44	204
R^2	0.0610	0.0895	0.1302	0.0909	0.2314	0.3423	0.1303
Adjusted R^2	0.0353	0.0097	−0.2886	0.0035	0.1033	0.0248	0.0609

Table 8. Results of the cross-sectional OLS regression for the short-term effects.

This table summarizes the OLS regressions of the cumulative abnormal returns (CARs) of firms in the LSP industry that announced an M&A between 1996 and 2015. The dependent variable is the CAR in the [−1; +1] event window. The sample includes 754 companies and is further divided into the six LSP categories trucking, railway, sea freight, air cargo, CEP, and 3PL. The t-statistics for testing the significance of the coefficients using robust standard errors are given in parentheses. ***, **, * denotes statistical significance at the 1%, 5%, and 10% level, respectively.

Regression results for explaining the long-term effects

The results of the univariate analysis reveal that the short-term and long-term success of M&A differ significantly across the considered LSP categories. In order to analyse potential

determinants of post-merger performance in the long-term in more detail, we conduct multiple cross-sectional regression analyses that are summarized in Table 9. The dependent variable is the BHAR 36 month after the initial M&A announcements that is based on a sample of 652 transactions. The independent variables are the same as in the short-term regression analysis.

The results indicate that the *GWP GROWTH* is not significant in the long-term. As for the short-term, we can conclude that although logistics service providers are supposed to depend on the general economic developments (cf. Gao et al., 2016; Nielsen et al., 2003), these developments do not influence the transaction performance of the industry as a whole. Consequently, we have to reject hypothesis **H2** in the short- term and in the long-term. Similarly, general downturns of the world economy or the emergence of the financial crisis do not have an impact on the post-merger performance of the combined company which confirms the results of the short-term analysis. However, it can be observed that diversified companies exhibit significantly higher long-term abnormal returns which supports hypothesis **H3a**. In addition, horizontal transactions perform significantly worse than diversifying ones which also indicates that companies do benefit from business diversification and endeavor towards more cohesive services. This is evident with our hypothesis **H3b**. Both variables, *BUSINESS DIVERSITY* and *HORIZONTAL*, indicate that overall logistics service providers benefit from new business models based on more cohesive customer-oriented services such as inventory management, packaging or manufacturing (Chapman et al., 2003). Moreover, the results for the overall sample show that the long-term success of M&A is highly dependent on the location of the acquiring companies' headquarters. In comparison to the base category, *NORTH AMERICA, EUORPE* and *ROW* perform significantly better. This is in line with the findings of the short-term analysis. On the other hand, we do not find any impact of the variable *CROSS-CONTINENTAL* and have to reject hypothesis **H3c** in the long-term as well. However, we note that while cross-industry studies usually expose a negative impact of cross-border and cross-continental transaction (cf. Goergen and Renneboog, 2004), in the logistics service industry the benefits and risks of geographic expansions seem to be balanced and do not allow for a categorical answer so that there is no significant difference between domestic and cross-continental transactions observable. Overall, providing a wide range of integrated services combined with good geographical coverage seem to be decisive success factors nowadays. However, we find this result only for the long-term period which highlights that there is a substantial time lag between the initiation of M&A and the synergies becoming effective.

Finally, we consider the determinants for each LSP category separately again. The M&A performance of trucking companies seems to rely on similar determinants as the overall sample. In addition, the results indicate that smaller acquirers do benefit more from transactions than larger ones. This can be explained by the growth potential of the transaction and the low level of sectoral concentration in trucking (cf. Hofmann and Bachmann, 2010). Especially smaller trucking carriers that do not dispose of the required investment funding for internal growth, have identified the need to consolidate existing operations while expanding geographically at the same time to catch up with versatile customer expectations (cf. Brooks and Ritchie, 2005). This is in line with the finding that total assets induce a significant positive effect on the long-term performance. Total assets are cost intense and M&A can reduce the cost due the synergies and the joint utilization of resources. Similar but less distinct results can be found for railway carriers. Whereas the size of the acquirer exhibits a negative effect on the 36 month BHAR, the total assets show a significant positive impact. In contrast to trucking companies, however, we do not find benefits of diversification for this subsample which indicates that railway companies rather profit from focussing on their core services. For sea freight carrier, the analysis of determinants of the long-term stock performance remains

again inconclusive and the only significant variable is the location of the acquirers' headquarters. This dependency is surprising as most sea freight companies operate in an international environment. In contrast to trucking and railway carriers, for air cargo carrier the size of the acquirer exhibits a positive effect on the 36 month BHAR, whereas the total assets show a significant negative impact. These results are in line with the findings of Singal (1996) who reveals that for airline M&A the market power is an important factor and therefore larger companies realize higher revenues in the future. Lowering assets, on the other hand, does also improve profitability given that revenues remain stable. Moreover, market transparency in terms of publicly known deal values has a negative influence on the post-merger performance of air cargo carriers. This strongly indicates that acquiring private firms is better than established ones which can be explained by the fact that private carrier generally operate more efficient in terms of personnel and aircraft utilization than public ones (cf. Backx et al., 2002). Similarly to the short-term findings, for CEP companies the long-term stock performance is highly dependent on the GWP development. In times of economic prosperity, more parcel and courier services are required. Finally, 3PL companies that traditionally offer a broader range of international services, also exhibit a positive correlation with *GWP GROWTH* in the long term. As those companies usually require a critical size to be reliable but have less assets than traditional carriers, they do strongly benefit from offering integrated solutions and their competencies in managing international networks (cf. Berglund et al., 1999). The requirement of integrating high asset companies, however, strongly prevents leveraging synergistic gains and thus significantly lowers the post-merger stock performance.

Overall, we can summarize that diversification is one of the most important post-merger performance determinant for logistics service providers in our study. We find strong support for hypotheses **H3a** and **H3b**. The fact that geographic expansion does not exhibit significance may result from more balanced occurrence of benefits and drawback in internationalization than it has been shown in other industry or cross-industry studies. Again, the respective LSP categories exhibit significant differences that underline the heterogeneity of the logistics service industry. While traditional carriers such as trucking or railroad service providers (with the exception of air cargo companies) seem to benefit from consolidating smaller but asset-intense operations to provide better services, system integrators rather rely on merging larger operations with less assets. In addition, it becomes evident that especially the parcel segment is in the long-term much more dependent on the general economic development than transportation carriers.

BHAR	Overall	Trucking	Railway	Shipping	Air cargo	CEP	3PL
Macroeconomic variables							
GWP	0.0409	0.0152	0.0622	0.0327	−0.0418	0.1545***	0.0987**
GROWTH	(1.59)	(0.34)	(0.50)	(0.50)	(−0.60)	(3.00)	(2.18)
CRISIS	0.0933	−0.0593	0.3190	−0.0197	0.1522	−0.1051	0.7190
	(0.70)	(−0.25)	(0.65)	(−0.07)	(0.45)	(−0.31)	(1.56)
NORTH	0.2863***	0.7384***	1.6338***	0.0128	−0.0604	0.2952	−0.1857
AMERICA	(2.68)	(4.07)	(4.25)	(0.07)	(−0.31)	(1.14)	(−0.54)
EUROPE	0.3369***	0.5263***	N/A	0.4869***	−0.1764	N/A	0.2159
	(3.61)	(3.37)		(3.01)	(−0.79)		(0.72)
ROW	0.6289***	0.2150	N/A	0.6344**	−0.0175	N/A	0.4013
	(3.2)	(0.60)		(2.46)	(−0.05)		(1.04)
Acquirer-specific variables							
LN SIZE	0.0385	−0.2681**	−0.5061*	0.0888	0.2005**	−0.0222	0.2461*
	(0.83)	(−2.41)	(−1.85)	(0.86)	(2.16)	(−0.18)	(1.88)
ROA	−0.0025	0.0068	−0.0002	−0.0093	0.0077	−0.0205	−0.0140
	(−0.49)	(0.59)	(−0.01)	(−0.63)	(0.84)	(−0.86)	(−1.29)
LN TOTAL	−0.0660	0.3447**	0.5543*	−0.0556	−0.2764***	0.0860	−0.5223***

ASSETS	(−1.37)	(2.59)	(1.80)	(−0.52)	(−3.18)	(0.72)	(−3.24)
BUSINESS	0.0416***	0.0385**	−0.0131	0.0290	−0.0196	0.0397	0.0769
DIVERSITY	(3.52)	(2.32)	(−0.16)	(1.30)	(−0.54)	(0.55)	(1.63)
TRUCKING	−0.0995						
	(−0.84)						
RAILWAY	0.2415						
	(1.60)						
SEA	0.0117						
FREIGHT	(0.10)						
CEP	−0.3147**						
	(−2.29)						
3PL	0.0316						
	(0.26)						
Deal-specific variables							
DEAL	−0.1159	−0.1421	−0.1860	−0.0847	−0.4661**	0.1493	0.1357
VALUE	(−1.5)	(−1.12)	(−0.50)	(−0.54)	(−2.32)	(0.51)	(0.61)
KNOWN							
CROSS-	−0.0591	−0.1721	0.2825	−0.1578	−0.0714	0.2159	−0.0327
CONTINENT	(−0.66)	(−0.69)	(0.89)	(−0.94)	(−0.29)	(1.06)	(−0.18)
AL							
HORIZONTA	−0.1711**	−0.2413*	−0.3479	−0.1535	0.1742	−0.1010	−0.1937
L	(−2.46)	(−1.83)	(−0.86)	(−1.23)	(1.05)	(−0.59)	(−1.09)
CASH	0.0764	−0.0677	0.1856	−0.0201	0.3609	−0.6470	0.0112
PAYMENT	(0.85)	(−0.47)	(0.69)	(−0.09)	(1.57)	(−1.68)	(0.05)
Operational variables							
CRUDE OIL	−0.0015	0.0007	−0.0011	−0.0028	−0.0016	0.0051*	−0.0046*
PRICE	(−1.32)	(0.40)	(−0.21)	(−1.23)	(−0.41)	(1.74)	(−1.96)
GROWTH							
BALTIK DRY	−0.0700**	−0.1251**	0.1480*	−0.0217	−0.0243	0.0077	−0.1677**
INDEX	(−2.53)	(−2.06)	(1.94)	(−0.32)	(−0.38)	(0.06)	(−2.14)
GROWTH							
CONSTANT	0.3840	−2.2117*	−2.5306	−0.6520	2.1409*	−2.5410**	5.5722***
	(0.66)	(−1.76)	(−1.51)	(−0.60)	(1.80)	(−2.40)	(2.75)
Sample size	652	161	37	154	93	39	168
R^2	0.0964	0.2331	0.5369	0.1411	0.1894	0.5840	0.2098
Adjusted R^2	0.0678	0.1537	0.2751	0.0478	0.0315	0.3676	0.1318

Table 9. Results of the cross-sectional OLS regression for the long-term effects.

This table summarizes the OLS regressions of the 36-month buy-and-hold abnormal return (BHAR) of firms in the LSP industry that announced an M&A between 1996 and 2015. The sample includes 652 companies and is further divided into the six LSP categories trucking, railway, sea freight, air cargo, CEP, and 3PL. The t-statistics for testing the significance of the coefficients using robust standard errors are given in parentheses. ***, **, * denotes statistical significance at the 1%, 5%, and 10% level, respectively.

Conclusion

In the last decades, the conditions for logistics service providers have changed fundamentally due to an ever-increasing global dispersion and fragmentation of manufacturing, varying growth rates in world trade volumes since the financial crisis and intensified competition by the rise of numerous new competitors from emerging countries and the ongoing wave of digitization. It seems obvious that even well-established companies have to go through a transformation process to claim their market position (PWC, 2016) by providing more cohesive and global logistics services that meet customer requirements at the lowest possible cost. This has also led to a significant increase of M&A activity. Previous research, however, revealed that transactions may pose significant risks for shareholders' wealth as the post-merger performance seems highly dependent on the corresponding industry (Campa and Hernando, 2004) and as many deals miss their intended objectives (cf. Savor and Lu, 2009; Seth et al., 2002). Therefore, the present study aimed at shedding light on the performance

impact of M&A activities in the global logistics service industry and its potential determinants. To the best of our knowledge, the impact of M&A in the logistics service industry in terms of short-term announcement effects on shareholders' wealth and long-term stock performance of the newly formed company has, with the exception of the short-term analysis provided in Darkow et al. (2008) for the period 1991-2006 and Andreou et al. (2012) for the U.S. market, not been considered in the literature so far.

Managerial implications

The results reveal that unlike in the majority of other industries, both, acquiring and target companies can realize a positive effect in the short term. Therefore, it can be concluded that M&A announcements in the logistics service industry are expected to induce value-creating synergies beneficial for acquiring and target companies alike. It is also shown that the capital market reactions during the post-merger integration period are significantly positive which indicates that the transactions can leverage synergistic gains and improve expected returns of newly formed entities in the long run. However, a successful integration processes may require up to three years after the initial announcement to become effective and to generate abnormal financial returns. In addition, considering the different categories of services provided, the abnormal returns in the short term and in the long term are highly divers. While trucking, railway, air cargo and 3PL companies obtain significantly positive abnormal returns in the days surrounding the M&A announcement, sea freight carrier and CEP companies do not exhibit any significant effect in short-term. Overall, the short-term performance of M&A announcements seems to be governed by macroeconomic and deal-specific factors such as the general economic development or presence of an economic downturn, the location of the acquirers' headquarters or the existence of market transparency in terms of known deal values. Considering the long-term effect 36 months after the M&A announcement, the difference between the LSP categories is even more distinct. While railway and 3PL companies realize an abnormal return between 20% and 24%, air cargo and CEP companies experience losses between –11% and –17% in the same period. In the long-term, traditional carriers such as trucking or railroad service providers seem to benefit from consolidating smaller but asset-intense operations to provide better services, whereas system integrators rather rely on merging larger operations with less assets. It also becomes apparent that especially the parcel segment is in the long-term much more dependent on the general economic development than traditional transportation carriers. In addition, it can be concluded that diversification is one of the most important post-merger performance determinant for logistics service providers in the long term. The fact that geographic expansion does not exhibit significance may result from a balanced occurrence of benefits and drawback of internationalization than it has been shown in other industry or cross-industry studies. At the same time, managers must be aware that not all acquisitions generate positive returns. The results reveal that horizontal deals in the long-term lead to significant losses. Therefore, it seems to be essential for LSPs to broaden their service portfolios in order to meet varying customer expectations. This can be supported by acquisitions supporting geographic expansion and business diversification.

Research implications

Considering the importance of M&A in the logistics service industry for realizing synergistic gains in the presence of fierce competition and ever-increasing customer expectations and the lack of comprehensive research on this subject, we hope that the provided results will enable further research in this area. We examined M&A performance for the logistics service industry over a period of 20 years from a shareholder's perspective. However, some limitations of the proposed approach have to be considered. Firstly, the generation of the subsamples is based on the primary SIC only. Different selection criteria might have been the

geographical focus of offered services, asset intensity of the considered companies, markets, or customers' industry to get other perspectives on M&A in the logistics service industry. On the other hand, categorizing LSPs requires cluster information, which can be difficult to obtain. Secondly, most of the LSPs operate in more than one category. Therefore, it is possible that some of the companies in our sample could have been allocated to other categories if the information would had been interpreted differently.

In addition, the results revealed that the stock market reactions can differ significantly across the six LSP categories which indicates a high level of heterogeneity among the companies. Therefore, a more granular analysis especially investigating the long-term implications for each of the LSP categories seems promising for further research. Especially the categories trucking, railway and CEP lack of in depth analyses of M&A rationales and outcomes. Moreover, using operational indicators as proxies for the long-term performance in the post-merger integration period may be beneficial to investigate the correlation between abnormal changes in stock returns and future operating results in the logistics industry. Finally, as the realization of synergistic gains is highly dependent on the integration process and may require more time to become effective (Häkkinen et al., 2005), further research should also examine the impact of integration processes and potential barriers on the post-merger performance in the logistics service industry.

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