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Focus, Asset Tangibility and Value Creation in M&A Transactions: Evidence from the Pharmaceutical Industry

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Abstract

Through mergers and acquisitions the pharmaceutical industry has changed in the last years like never before. The widespread paradigm that acquirers face negative returns at acquisition announcement, resulting in significant losses, no longer applies. Including the largest consolidation wave in 2013 to 2016, we find overarching highly positive returns for acquirers, targets and combined entities. With a differentiated analysis approach of categorizing events in specialization, diversification and R&D-driven acquisitions based on the acquirer and target's business model, we are able to assess intra-industry M&A success drivers holistically and from a completely new angle. Not only are we seeing specialization acquisitions from an acquirer perspective outperform the other two types by around 2%, but also targets in R&D-related acquisitions face an increase of roughly 50%, more than two times of the other groups' returns. Furthermore, the results highlight that acquirers earn the highest returns in asset deal transactions, while the sellers are worse off. Finally, we see the largest M&A wave in the industry ever since leads to positive and superior reactions of around 3%. In parallel, the tense market situation results in a paradigm shift not only for the affected M&A parties, but for the competitors as well. Where there was a parallel movement of the acquirers' and competitors' abnormal announcement returns in the early years of the millennium, there now is a shift in the opposite direction, meaning that good news for the acquirer now implies bad news for the competitor.

1. Introduction

The largest wave of mergers and acquisitions (M&A) within the pharmaceutical industry ever in the years 2013 to 2016 reached a total deal value of 832 billion USD. With a total M&A volume of approximately 2.7 trillion USD since 1985, roughly one third of the total transaction value has been realized only in those four years, putting the pharmaceutical industry among the most heavily consolidating sectors in the world. Drivers for the intense acquisition activity are some far-reaching challenges such as continuing patent expiries of global blockbuster drugs

(Sagonowsky 2017), a simultaneous slack in the industry wide R&D pipeline (DiMasi, Grabowski and Hansen 2016), increasing cost pressure due to government health reforms such as the growing importance of cost-effective substitute products (IMS 2015) or the emergence of innovative, though more complex biologics (Aitken and Kleinrock 2015; Aitken 2016). While these challenges are perceived rather homogeneously, the solution via M&A is discussed controversially.

Haucap, Rasch and Stiebale (2019) and Ornaghi (2009) analyze how M&A affects innovation of involved firms and report overall negative effects of mergers on innovation among pharmaceutical companies. However, while Ornaghi (2009) does not find a better merger performance along with higher levels of relatedness more recent studies come to an opposite insight with positive effects of relatedness on the success of mergers and alliances in the pharmaceutical industry (Distre and Rajagopalan 2012; Sears and Hoetker 2014). A similar shift can be observed in capital market valuation of acquisition activities. For a long time, it was largely undisputed that for a bidder an acquisition results in negative share price reactions, the target faces large positive stock returns while the reaction for the combined entity is neutral or slightly positive (e.g. Bruner 2002; Offenberg, Straska and Waller 2014; Xu 2017). But acquirer's returns in cross-industry M&A announcements significantly changed over the last years (Alexandridis, Antypas and Travlos 2017) and became on average significantly positive.

These findings give first motivation to reevaluate the success of M&A transactions in the pharmaceutical industry. Industry-specific empirical evidence so far offers mixed results (Ravenscraft and Long 2000; Higgins and Rodriguez 2006), and there is no comprehensive assessment how specialization and diversification activities differ in capital market perception. Furthermore, most studies only focus on acquisitions with public targets, leaving the impression that acquisitions generally follow the respective patterns. But only one third of all pharmaceutical transactions comply with this type of deal. The majority are acquisitions of private targets and asset deals.

We contribute to the literature technically as we extend the included transaction history of the pharmaceutical industry by the last M&A wave, covering the period from 2000-2016, and by three types of targets, namely listed firms, privately held companies and pure asset deals. This procedure results in a final sample of 886 transactions. From the research perspective, we offer new insight as we cluster acquisitions in the three groups of *Specialization*, *Diversification* and *R&D-Focus*. Therefore, acquirers and targets are assigned to one out of six categories, based on the individual business model the company primarily operates in. Given the combination of acquirer's and seller's category, we are able to assess transactions and the respective strategic focus thoroughly, allowing to derive deal type-specific success factors from a broad set of qualitative and quantitative variables. Finally, we provide a holistic evaluation for the whole pharmaceutical industry by analyzing the market reactions of competitors within the industry, too.

Our results highlight a set of novel key findings. First, we report significant positive stock returns at the announcement day for all affected parties. Second, we document clear differences between the various transaction types and respective M&A strategies. Besides the overall effect in terms of abnormal stock returns' height and direction, especially the relevant influencing factors of capital market reactions differ significantly. In a final step we are able to emphasize that market reaction paradigms fundamentally change over time and that this has not only consequences for the affected M&A parties, but also for the entire industry with its competitors as well.

The rest of the paper is organized as follows. Section 2 provides a short overview of the status quo of (pharmaceutical) M&A research. Section 3 describes the data collection process and research methodology. As the main part, section 4 lists all the empirical results covering various univariate, multivariate and propensity score matching analyses on multiple M&A dimensions from an acquirer, target, combined entity and competitor's perspective. Finally, Section 5 provides a summary and concludes the paper

2. Literature Review

Andrade and Stafford (2004) argue that acquisitions serve two primary roles, either as a chance for internal growth or capital increase, or in terms of market consolidation and the reduction of inefficiencies (Danzon, Epstein and Nicholson 2007). For the analysis of specialization or diversification as the superior strategy to long-term performance, it is rather undisputed consensus that a diversification on average destroys value. Although there are

positive effects such as risk mitigation, broader financing possibilities, tax advantages or reduced principal-agent problems, the negative effects such as increased coordination efforts, overinvestment and cross-subsidization of weak business units outweigh the benefits (e.g. Biggadike 1979; Lang and Stulz 1993; Berger and Ofek 1995; Scharfstein and Stein 2000). Similar to the general motives of M&A activities, the effort to further specialize or diversify is seen as a response to external industry specific shocks (Lamont and Polk 2002) while the dominant direction changes over time (e.g. Comment and Jarrell 1995).

The range of dedicated M&A studies within the pharmaceutical industry is rather limited and studies provide mixed results which partly deviate from the cross-industry average. Ravenscraft and Long (2000) analyze 65 US mergers from 1985 to 1996 after the *Hatch-Waxman Act in 1984* and report abnormal stock returns of 13.3% for target companies, -2.1% for acquirers and 0.6% for the combined entities. Higgins and Rodriguez (2006) investigate 160 acquisitions between 1994 and 2001 and find positive buyer returns of 3.9%. They also observe a much stronger positive impact if the buyer has previously collected detailed information about the target through alliances or cooperations. Danzon, Epstein and Nicholson (2007) analyze 383 transactions from 1988 to 2000 and look especially at differences and motives of small versus big pharmaceutical companies. Recent research with a focus on the pharmaceutical industry mainly concentrates on the detection of superior expansion strategies in terms of acquisitions versus alliances or in-licensing (e.g. Lungeanu, Stern and Zajac 2016). The main focus is on the pharmaceutical-specific R&D situation and the changing industry conditions of the recent years. Despite steadily rising R&D expenditures, companies are becoming less and less successful to reach market maturity of new and innovative drugs on their own, which is why many firms try to overcome this dilemma by focusing on one of the two expanding strategies to maintain their product pipeline (e.g. Banerjee and Siebert 2017-1 and 2017-2; Gou and Zhou 2016; Ornaghi 2009; Grabowski and Kyle 2008; Feyzrakhmanova und Gurdgiev 2015; Lakdawalla 2018; Garnier 2008; Barrow 2012). As a consequence, the strategies of big pharma are going to change in order to stay successful (Gleadle et al. 2014; Young 2014; Gautam und Xiaogang 2016). Phillips and Zhadnov (2013) show that the R&D intensity is directly linked with the M&A activity in the industry, as especially small companies invest more in times where a sale is easy. Furthermore, companies with a high R&D spent are lucrative targets (Lin and Wang 2016). However, these companies usually possess a strong bargaining position in acquisition negotiations resulting in high prices and respective premia (Upadhyay and Zeng 2017).

The transaction type where the acquirer only buys certain assets such as products, business units or market rights is quite common in the pharmaceutical industry. However, so far these specific asset deals are hardly included in empirical examinations, hence only evidence from cross-industry studies exists. From a buyer's perspective, asset deals offer the decisive advantage against complete takeovers that only dedicated areas will be acquired and have to be integrated into the existing company (Hanson and Song 2003 and 2006; Borisova, John and Salotti 2013; Clayton and Reisel 2013). Allegedly unimportant or inefficient areas as well as redundant administrative structures remain with the seller. The sale is most often triggered by the selling company, with the consequence that there is only one or just a few potential acquirers, decreasing the chance of an expensive competitive bidding (Sicherman and Pettway 1987; Sicherman and Pettway 1992). Finally, the seller remains as an independent company, which has, to some extent, further specialized as well. As a result, a seller's shareholder perspective is completely different compared to a complete acquisition. The wealth effects observed is empirical asset deal studies indicate that both the acquirer and the seller realize positive stock returns (Sicherman and Pettway 1987; Sicherman and Pettway 1992; Jory and Ngo 2015; Nguyen 2016).

To explain the competitors' share price reactions a broad set of models has been established, starting with the *Collusion Theory* in the early 1980s (Eckbo 1983 and 1985; Mitchell and Mulherin 1996), later followed by the *Acquisition Probability Hypothesis* (e.g. Song and Walking 2000), the *Productive Efficiency Hypothesis* (e.g. Fee and Thomas 2004; Shahrur 2005), *Buying Power and Purchasing Efficiencies/ Countervailing Power Hypothesis* (Fee and Thomas 2004) or the *Preemptive Merger Theory* (e.g. Fishman 1988; Fridolfsson and Stennek 2005; Molnár 2007). Unfortunately, none of these models can holistically explain an industry over longer time periods. Although there might be dominant patterns, it is likely that these patterns change over time if the overall market situation changes as well. Therefore, recent studies mainly focus on specific situations or areas (Dimopoulos and Sacchetto 2014; Uhlenbruck et. al. 2016; Filson, Olfati and Radoniqu 2015).

3. Data & Methodology

3.1. Sample Selection

This analysis differentiates between six groups, namely so-called *FIPCOs (Fully Integrated Pharmaceutical Companies), Biologics, Generics, Research and Development, MedTech* and *In Vitro / In Vivo Diagnostics*. A company is defined as a FIPCO if it is involved in various value adding activities from research to distribution of all kinds of different drugs, i.e. small molecules, biological substances or animal health and markets at least one authorized drug. As Biologics become more dominant in the human pharma sector (Aitken und Kleinrock 2016), there will be a separate group with companies which meet the same requirements as FIPCOs, but focus only on biological drugs. Although manufacturers of generic drugs are usually not involved in the area of drug research and development, they have a market share of more than 90%[1] for prescription medicines, frequently acquiring companies or dedicated portfolios, especially when they face the loss of patent protection. Companies in the area of research and development play an important role in drug discovery and are typically young and small firms, working on a handful of promising drug candidates. Especially for big organizations these companies play a key part in maintaining their drug development pipeline. The last two groups of *MedTech* and *Diagnostics* are not directly involved in the prescription medicine business, however their products are directly linked with the administration of those, hence they are regularly involved in M&A activities of big pharma companies. All other types of firms in the healthcare sector (e.g. healthcare provider, pharmacy chains or hospital provider) and pharmaceutical industry (e.g. pure OTC manufacturers, contract development and manufacturing organizations or chemical and API manufacturers) are out of scope. As companies regularly operate in more than one of the areas mentioned above, they are assigned to the group where they are doing most of their business. This type of company information was gathered via Thomson Reuters, Bloomberg and publicly available company profiles.

Given the wide range of different business models in the pharmaceutical industry, merely selecting the final sample only by the industry SIC code is too inaccurate. Therefore, as generally done by other studies as well (e.g. Guo and Zhou 2016; Banerjee and Siebert 2017-1), a stepwise filter approach was used in order to gather M&A announcement information on the types of companies described above. Transactions were taken from *Thomson Reuters*, where:
1) either the buyer or target has a *SIC Code* of 2833, 2834, 2835, 2836, 2899, 5122 or 0742[2]
2) the Thomson macro industry is *Healthcare* or *Materials* (excl. *Containers & Packaging*)
3) the transaction is completed and the deal value is at least 1 mil. USD
4) the share of the acquired company is above 50% after the transaction (If multiple acquisitions with the same target occur, only the first transaction with a share of more than 50% is considered.)
5) the acquisition was announced between 01.01.2000 and 31.12.2016.

This selection results in a baseline of 4,777 acquisitions with a cumulated deal value of 2.2 trillion USD. Next, all transactions were excluded where:
6) the deal purpose is clearly not pharma/ drug related (e.g. real estate, going private)
7) the deal value is below 50 mil USD
8) the company information is not available or the transaction cannot be unambiguously assigned to one ISIN (In this context, only those events were included, where the buyer comes from the EU, USA, Canada, Israel, Japan or Australia)

The final sample of 886 acquisitions with a cumulated deal value of 1.49 tril USD includes private target transactions (N = 320) and *Asset Deals* (N = 188), where the acquirer only buys dedicated business units, drugs, patents or brands of the selling company, which still exist after the transaction. Table 1 highlights the distribution

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[1] IMS Market Outlook 2015: The Role of Generic Medicines in Sustaining Healthcare Systems -
http://www.apmgr.org/docs/IIHI_Generics_Healthcare_Brief.pdf
[2] 2833 – Medicinal Chemicals and Botanical Products; 2834 – Pharmaceutical Preparations; 2835 – In Vitro and In Vivo Diagnostic Substances; 2836 – Biological Products, Except Diagnostic Substances; 2899 – Chemicals and Chemical Preparations, Not Elsewhere Classified; 5122 – Drugs, Drug Proprietaries, and Druggists' Sundries; 0742 – Veterinary Services for Animal Specialties

of the transactions for each year. The continuous increase in terms of number and size of M&A transactions becomes obvious.

Table 1: Overview of number and value of pharma M&A events for each year from 2000 to 2016. Deal values in mil USD.

Year	Events	Buyers	Deal Value	Min	Max	Median	Average
2000	39	34	102,194.2	51.5	75,960.9	212.5	2,620.4
2001	34	30	48,663.6	65.0	16,900.0	272.5	1,431.3
2002	27	23	65,468.0	50.0	59,515.0	190.0	2,424.7
2003	36	26	17,618.4	54.2	3,400.9	217.5	489.4
2004	38	34	83,470.9	50.0	60,243.4	186.5	2,196.6
2005	51	35	38,608.7	50.0	7,366.9	273.0	757.0
2006	64	52	69,388.0	50.0	16,600.0	230.0	1,084.2
2007	52	47	68,724.5	56.0	14,554.6	268.6	1,321.6
2008	57	40	82,103.2	50.2	27,733.6	234.3	1,440.4
2009	58	44	150,655.2	54.5	67,285.7	401.3	2,597.5
2010	56	39	68,702.0	55.4	23,898.9	316.5	1,226.8
2011	62	48	73,018.2	56.0	20,097.8	305.0	1,177.7
2012	59	42	45,057.6	54.1	7,183.4	285.0	763.7
2013	51	41	73,544.8	78.0	15,501.4	402.6	1,442.1
2014	75	57	212,452.0	50.4	68,445.4	379.2	2,832.7
2015	71	54	170,217.3	50.0	38,750.5	445.0	2,397.4
2016	56	45	118,736.4	50.1	29,540.0	378.2	2,120.3
Total	**886**	**301**	**1,488,623.0**	**50.0**	**75,960.9**	**300.0**	**1,680.2**

Given the range of different business models within the pharmaceutical industry, a definition of a deal as a specialization in case of identical SIC codes of acquirer and target (e.g. Berger and Ofek 1995; Lamont and Polk 2002) would result in a classification where that nearly all transactions in the sample were specialization deals. Other studies especially with the focus on pharmaceuticals define similarity as the overlap of commonly cited patents (Schildt and Laamanen 2006), a diversification if non-prescription medicines are acquired or as the number of therapeutic areas a company is operating in (Banerjee and Siebert 2017-2).

As an acquisition can be a specialization in one dimension, while it is a clear diversification in another area, all of the clustering approaches mentioned above are either too broad or too narrow, which might yield in misleading results. To overcome this classification problem, all transactions will be clustered in three categories based on the above mentioned groups of different business models (*FIPCOs, Biologics, Generics, etc.*):

1) *Specialization:* In general, two kinds of transactions will be handled as specialization deals. First, all events where the acquirer and the target come from the same business model category, e.g. both are mainly engaged in the Generics business. Although it might be the case, that to some extent acquisitions mean a diversification (e.g. new region, new therapeutic area), an identical business model results in similar management capabilities, market expertise, understanding of competition and regulatory frameworks, resulting in a stronger focus of the existing setup. Second, all[3] asset deals will be handled as a specialization as well. The reason is that typically an asset deal represents a specialization for both, the acquirer and the seller, further focusing on their specific business models, even though they might be in a different business model category (e.g. in 2014, Mylan (Generics) bought the majority of Abbotts (FIPCO) generics business).

2) *Diversification:* Consequently, all transactions, where the acquirer and the target come from different business model categories, are considered as diversification deals.

3) *R&D Focus:* As an exception of diversification deals, transactions where the target is a R&D company are categorized separately. Firstly, the risk and return profile of these targets is quite different to established

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[3] Except for eight asset deals with a clear focus on R&D, hence they are considered in the third group.

companies, as there is a high chance, that the drug candidates will not reach market approval. Secondly, the research areas are usually to some extent similar to the ones of the acquirer, hence they would be somewhere in between a pure specialization and some kind of diversification.

3.2. Research Methodology

To measure the short-term capital markets evaluation to M&A announcements an event study approach is used to determine the cumulated average abnormal returns (CAR) of the acquirers' stocks around the event day. Following Campbell, Lo und MacKinlay (1997), a period of 252 trading days prior to the event window is fixed, and the event window covers 21 days with 10 days prior and subsequent to the announcement day. Stock returns are calculated by the market model approach with the industry specific *MSCI ACWI Pharmaceuticals & Biotechnology Index (Thomson Ticker: M2AFPB $)* as benchmark index. Robustness checks have been conducted with the Capital Asset Pricing Model, Scholes and Williams Model and the Fama and French 3-Factor Model as well as the MSCI World as a different benchmark, all leading to similar results.

In order to identify the main success drivers, a broad set of control variables is used to perform multiple univariate and multivariate regression analyses on the CAR. For each event, 26 variables are gathered which are either deal, acquirer or target-specific, focusing not only on quantitative accounting measures, but also on drug portfolio characteristics. As the sample not only includes exchange listed target companies most of the company specific financial data are not available for private companies and subsidiaries and most of the parameters focus on the transaction or the acquirer. Where possible, dummy variables are used to account for the fact whether the information for a target is available. Unless otherwise stated, the information is taken from *Thomson Reuters*. In case accounting information is not available for a specific period, the last available information is used. The following list provides an overview of the variables as well as descriptive statistics.

Variable	Description	Mean / Median N = 886	
Deal-specific variables:			
D-DV	*Deal Value* – Value of the transaction in USD. For handling reasons, the logarithm is used (e.g. Moeller, Schlingemann and Stulz 2005; Danzon, Epstein and Nicholson 2007).	2.57	2.48
D-2013+	*M&A Wave* – Dummy variable that has the value 1, if the transaction was during the last M&A wave in 2013 to 2016, 0 otherwise (e.g. Jensen 1993; Andrade and Stafford 2004).	0.29	/
D-MoPCO	*Method of Payment (Cash only)* – Dummy variable that has the value 1, if the transaction was purely cash financed, 0 otherwise (e.g. Myers and Majluf 1984; Eckbo, Giammarino and Heinkel 1990; Fuller, Netter and Stegemoller 2002).	0.58	/
D-NAT	*Cross Border* – Dummy variable that has the value 1, if the acquirer and target come from different countries, 0 otherwise (e.g Rossi and Volpin 2004; Erel, Liao and Weisbach 2012; Xie, Reddy and Liang 2017).	0.47	/
D-USA	*Acquirer from the US* – Dummy variable that has the value 1, if the acquirer comes from the US, 0 otherwise (e.g. Rossi and Volpin 2004; Moeller and Schlingemann 2005; Mateev and Andonov 2017).	0.62	/
D-SPEC	*Specialization* – Dummy variable that has the value 1, if the acquisition is clustered into group one, 0 otherwise (e.g. Berger and Ofek 1995).	0.41	/
D-DIV	*Diversification* – Dummy variable that has the value 1, if the acquisition is clustered into group two, 0 otherwise.	0.33	/

Acquirer-specific variables:

A-DV/MC	*Deal Value to Market Cap* – Ratio of the transaction value to the market cap of the acquirer one day prior to the announcement (e.g. Danzon, Epstein and Nicholson 2007; Alexandridis, Antypas and Travlos 2017).	23.7%	5.6%
A-EBITDA	*EBITDA Margin* – Ratio of EBITDA of the acquirer in USD to the sales of the acquirer in USD.	-20.0%	23.8%
A-R&D	*R&D Ratio* – Ratio of the acquirer's total R&D spend in USD to the sales in USD in the year prior to the announcement.	51.9%	13.0%
A-SALES	*Sales Development* – Sales growth rate from the year prior to the announcement to the year of the announcement (e.g. Higgins and Rodriguez 2006; Danzon, Epstein and Nicholson 2007).	26.7%	10.5%
A-RoE	*Return on Equity* – The return on equity ratio of the acquirer in the year prior to the announcement.	6.0%	13.1%
A-Tq	*Tobin's Q* – Ratio of the acquirer's market value in USD to the book value in USD (incl. liabilities) one month prior to the announcement (e.g. Higgins and Rodriguez 2006; Fischer 2017). Values are capped at +15 (see Danzon, Epstein and Nicholson 2007).	2.31	1.91
A-PtBR	*Price-to-Book Ratio* – Ratio of the acquirer's market value in USD to the book value in USD (excl. liabilities) one month prior to the announcement. Values are capped at +15.	3.72	2.88
A-PA	*Drug Portfolio Age* – Average age of the drug portfolio (active incredient) since market authorization via FDA and EMA (e.g. Danzon, Epstein and Nicholson 2007). Information taken from federal databases (FDA – Orange and Green Book[4]; EMA - centralized authorization procedure[5]). Maximum values are capped at 15. For companies without information, the value is 15 as well. Final age calculate via *MAX(age FDA, age EMA)*.	11.46	12.32
A-NM	*New Medicines* – Absolute number of newly authorized drugs (innovative as well as generic formulations) in the period of one year prior to the announcement (e.g. Guo and Zhou 2016; Banerjee and Siebert 2017-1). Again, data is collected via federal databases and calculated via *MAX(number FDA, number EMA)*.	3.48	1.00
A-CT$_P$	*Phase of Clinical Trials* – The average phase of the clinical trials in the period of one year prior to the announcement. Each phase has a score (see Guo and Zhou 2016) ranging from 0 to 7 (pre-clinical studies = 0; Phase I = 2; Phase II = 3; Phase III = 5 and Phase IV = 7). Again, data is collected from federal FDA[6] and EMA[7] databases. Final value is calculated via *MAX(phase FDA, phase EMA)*.	2.57	3.33
A-CT$_N$	*Number of Clinical Trials* – Absolute number of clinical trials in Phase I-IV in the period of one year prior to the event. Again, data is collected from the federal databases and the final value is calculated via *MAX(CT FDA, CT EMA)*.	34.10	2.00
A-M&A	*M&A Experience* – Dummy variable that has the value 1, if the acquirer has done more than 5 similar acquisitions since 1990, 0 otherwise (e.g. Fuller, Netter and Stegemoller 2002; Golubov, Yawson and Zhang 2015).	0.59	/
A-FIPCO	*Acquirer is FIPCO* – Dummy variable that has the value 1, if the acquirer is categorized as a FIPCO, 0 otherwise.	0.55	/

[4] https://www.fda.gov/Drugs/InformationOnDrugs/ucm129662.htm
[5] https://mri.cts-mrp.eu/Human/Product/AdvancedSearch
[6] https://clinicaltrials.gov/
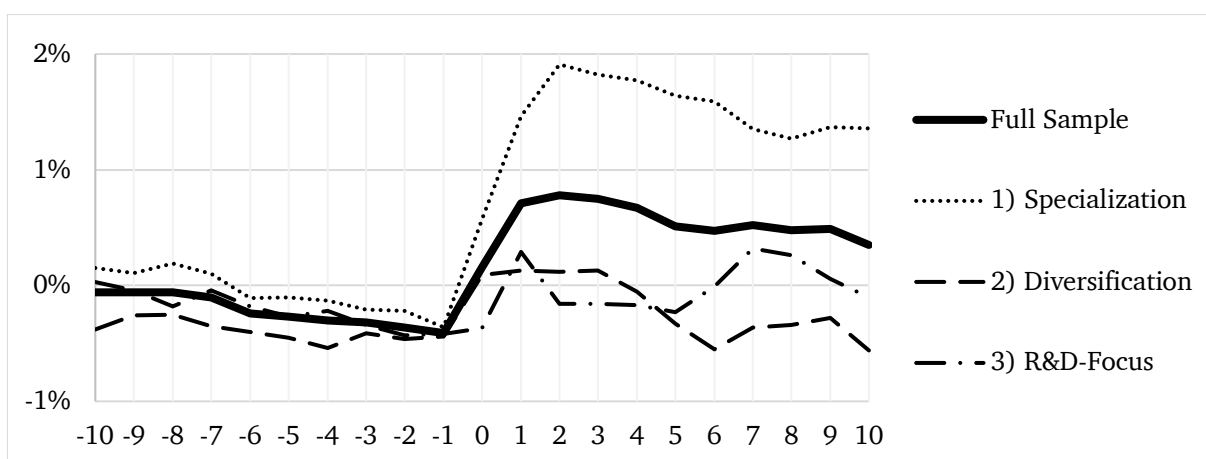[7] https://www.clinicaltrialsregister.eu/ctr-search/search

A-GEN	*Acquirer is Generics* – Dummy variable that has the value 1, if the acquirer is categorized as a generics manufacturer, 0 otherwise.	0.19	/

Target-specific variables:

T-NM	*New Medicines* – Same as *A-NM* only for the target company. For asset deals the respective information was customized.	0.29	0,00
T-CT$_P$	*Phase of Clinical Trials* – Same as *A-CT$_P$* only for the target company. For asset deals the respective information was customized.	1.11	0,00
T-CT$_N$	*Number of Clinical Trials* – Same as *A-CT$_N$* only for the target company. For asset deals the respective information was customized.	2.16	0,00
T-PRV	*Target is Private* – Dummy variable that has the value 1, if the target is a private company, 0 otherwise (e.g. Chang 1998; Fuller, Netter and Stegemoller 2002; Bargeron et al. 2008).	0.36	/
T-MV	*Market Value* – Dummy variable that has the value 1, if the (fair) value of the target is known, especially with regard to private companies and subsidiaries, 0 otherwise.	0.53	/

4. Results

4.1. Univariate Analyses

As a first step, we will focus on the overall results of the event study regarding the short-term reactions to a M&A announcement in the pharmaceutical industry, followed by a set of selected univariate analyses on some of the control variables mentioned earlier. The general discussion of the results will follow a two stage process. First, the results for the entire sample are presented, afterwards the three subsamples in terms of specialization, diversification and R&D-focus will be elaborated. Given the history of acquirer reactions to M&A announcements, irrespective of whether these studies are across industries (e.g. Kothari and Warner 2007) or pharma specific suggest that the overall returns are negative. On the other hand, significant differences in the outcome between the subgroups (e.g. Berger and Ofek 1995; Higgins and Rodriguez 2006) and in times of consolidation waves in the last couple of years (e.g. Alexandridis, Antypas and Travlos 2017) are likely.

Window	CAAR	P-Val		Neg.	Delta	P-Val	
1) Specialization (N = 366)					*1) – 2)*		
[-5;5]	1.8%	***	***	43%	1.7%	**	
[0;1]	1.8%	***	***	39%	1.3%	**	*
[0;2]	2.3%	***	***	39%	1.7%	***	**
2) Diversification (N = 293)					*2) – 3)*		
[-5;5]	0.1%			50%	0.1%		
[0;1]	0.6%	**	***	42%	-0.2%		
[0;2]	0.6%	**	**	42%	0.3%		*
3) R&D-Focus (N = 227)					*3) – 1)*		
[-5;5]	0.0%			48%	-1.7%	**	***
[0;1]	0.7%	*		42%	-1.1%	*	***
[0;2]	0.3%			43%	-2.0%	***	***

Window	CAAR	P-Val		Neg.
Full Sample (N = 886)				
[-10;10]	0.3%	**		51%
[-5;5]	0.7%	***	*	48%
[-1;1]	1.1%	***	***	43%
[0]	0.6%	***	***	47%
[0;1]	1.1%	***	***	42%
[0;2]	1.2%	***	***	44%
[0;5]	0.9%	***	***	47%
[0;10]	0.7%	***		48%

Figure 1: Cumulated abnormal returns of the acquirer for the full sample as well as the different subgroups. The first P-Value represents the parametric tests, the second the non-parametric tests. Significance levels are 10% (*), 5% (**) und 1% (***).

Figure 1 illustrates the results of the overall event study analysis for the full sample over the full event period as well as the three sub-groups for three selected event windows. Looking at the full sample, there is a highly significant abnormal return of a maximum and of 1.2%*** in the short period [0;2] after the acquisition announcement. At the same time, the share of negative announcement returns is at minimum around 42%, indicating that the majority of pharma M&A announcements imply a value increase for the acquirer. Taking a closer look at the differences of the three M&A strategies, the superiority of specialization transactions becomes obvious. With abnormal returns of 2.3%*** and a negative share of 39%, this type of transaction is the explicit driver of the overall positive M&A announcement returns. Both other groups, the diversification as well as the R&D-focus still have smaller, but partly insignificant returns of maximum 0.6%*** and 0.7%*. Consequently, the comparison of the sub-samples document significant higher returns of up to 2% of specialization deals compared to the other groups.

These initial results already highlight a clear discrepancy to the majority of past M&A research results, not only across industries, but particularly within pharma. First, the acquirer is not facing per se negative returns, second, there are important difference between transactions within an industry in terms of the M&A strategy. Although the well-known paradigm that from an investor perspective a specialization is advantageous over a diversifications holds true, R&D-driven acquisitions represent an exception to that habit. Even if they might be a specialization with regard to the future drug portfolio, investors are uncertain how to assess these deals, as there is a risk of not realizing potential sales or synergies.

The next section focuses on a set univariate analyses of some of the variables mentioned earlier. As these are regularly part of dedicated M&A research, the goal is to analyze if there is a significant influence within pharma as a whole, but in particular between the three different groups. Table 2 highlights the results of the univariate analyses for ten control variables for the event window [0;2]. Overall, most of the deal specific variables have a significant influence on the overall abnormal returns.

Within pharma, the last couple of years were marked by a set of patent expiries of large blockbuster drugs, while the development of new drugs became more expensive and, at the same time, less successful (DiMasi, Grabowski and Hansen 2016). Additionally, cost pressure due to governmental cost-cutting programs within the health sector as well as growing importance of innovative drugs like Biologics have put some of the big industry players under pressure. M&A waves are considered as an industry wide response to such external shocks (Jensen 1993; Andrade

and Stafford 2004), hence responses often differ within time and especially within the occurrence of a M&A wave (Cai, Song and Walking 2011; Fich, Nguyen and Officer 2018).

Table 2: Univariate analyses for ten of the 26 control variables for the event window [0;2]. Abnormal returns are given for the full sample (FS) as well as each of the three sub-groups 1) Specialization, 2) Diversification and 3) R&D-Focus. The first P-Value represents the parametric tests, the second the non-parametric tests. Significance levels are 10% (*), 5% (**) und 1% (***).

Variable	Condition	Group	A) Condition is True				B) Condition is False				A) – B)	
			N	CAAR	P-Val	Neg.	N	CAAR	P-Val	Neg.	Delta	P-Val
D-2013+	Year of the Transaction is 2013 or later.	FS	253	2.9%	*** | ***	38%	633	0.5%	*** | ***	46%	2.4%	*** | ***
		1)	97	4.0%	*** | ***	33%	269	1.7%	*** | ***	41%	2.3%	** | **
		2)	79	2.5%	** | ***	37%	214	-0.2%		44%	2.7%	*** | *
		3)	77	1.8%	** |	47%	150	-0.6%		55%	2.4%	** | **
D-MoP_CO	The acquisition is purely cash-financed.	FS	513	1.6%	*** | ***	40%	373	0.7%	** | *	49%	0.9%	* | ***
		1)	209	2.9%	*** | ***	35%	157	1.5%	*** | ***	45%	1.4%	**
		2)	166	1.0%	*** | ***	37%	127	0.0%		50%	1.0%	*
		3)	138	0.3%		50%	89	0.2%		55%	0.2%	
D-NAT	Acquirer and target are not from the same country.	FS	412	1.4%	*** | ***	41%	474	1.0%	*** | **	46%	0.4%	
		1)	196	2.5%	*** | ***	35%	170	2.0%	*** | ***	44%	0.5%	
		2)	140	0.4%	| **	44%	153	0.7%	* |	41%	-0.3%	
		3)	76	0.2%		49%	151	0.3%		54%	-0.1%	
D-USA	Acquirer is from the USA.	FS	548	0.8%	*** | **	47%	338	1.8%	*** | ***	39%	-1.0%	* | **
		1)	195	1.6%	*** | ***	45%	171	3.1%	*** | ***	32%	-1.5%	* | **
		2)	190	0.7%	** | **	42%	103	0.4%		44%	0.3%	
		3)	163	0.1%		54%	64	0.7%		47%	-0.6%	
A-DV/MC	Acquirer's ratio of deal value to market cap is greater than 20%.	FS	233	2.7%	*** | *	43%	653	0.7%	*** | ***	44%	2.0%	*** | **
		1)	120	4.8%	*** | ***	37%	246	1.1%	*** | ***	40%	3.7%	*** | **
		2)	71	0.8%		48%	222	0.5%	** | ***	41%	0.4%	
		3)	42	-0.1%		50%	185	0.3%		52%	-0.4%	
A-R&D	Acquirer's ratio of R&D spending to sales is less than 10%.	FS	372	2.1%	*** | ***	34%	514	0.5%	| **	51%	1.6%	*** | ***
		1)	185	3.3%	*** | ***	30%	181	1.2%	** | *	48%	2.1%	** | ***
		2)	151	0.9%	** | ***	36%	142	0.2%		49%	0.7%	| ***
		3)	36	1.2%		42%	191	0.1%		54%	1.1%	| *
A-SALES	Acquirer's sales growth rate is less than 7.5%.	FS	362	1.2%	*** | ***	46%	524	1.2%	*** | ***	42%	0.0%	
		1)	143	2.2%	*** | ***	46%	223	2.4%	*** | ***	35%	-0.2%	
		2)	114	0.7%		42%	179	0.4%	* | *	43%	0.3%	
		3)	105	0.4%		52%	122	0.1%		53%	0.3%	
A-Tq	Acquirer's Tobin's Q is less than 2.	FS	472	1.5%	*** | ***	42%	414	0.8%	*** | ***	45%	0.7%	
		1)	210	2.2%	*** | ***	42%	156	2.4%	*** | ***	35%	-0.2%	
		2)	160	1.1%	* | **	40%	133	-0.1%	* |	45%	1.2%	
		3)	102	0.9%		45%	125	-0.2%		58%	1.1%	
A-NM	Acquirer launched new drugs in the year prior to the announcement.	FS	470	0.8%	*** | ***	45%	416	1.6%	*** | ***	42%	-0.8%	
		1)	189	1.7%	*** | ***	41%	177	2.9%	*** | ***	37%	-1.2%	*
		2)	157	0.7%	*** | ***	40%	136	0.4%		46%	0.3%	
		3)	124	-0.4%		57%	103	1.1%		47%	-1.5%	
T-PRV	Target is a private company.	FS	320	0.9%	** | **	44%	566	1.3%	*** | ***	43%	-0.4%	
		1)	64	2.4%	*** | ***	34%	302	2.3%	*** | ***	40%	0.1%	
		2)	136	0.7%		44%	157	0.4%	* | *	41%	0.3%	
		3)	120	0.4%		50%	107	0.1%		54%	0.3%	

During the last M&A wave in the years 2013 and thereafter we can see significantly higher abnormal returns compared to the years before. The difference are around 2.5%***, irrespective of looking at the full sample or individual groups. Regarding the question, whether an acquisition is purely cash-financed (Myers and Majluf 1984; Eckbo, Giammarino and Heinkel 1990), significant differences become obvious. While it is a clear advantage with 1.4%** and 1.0%* within group 1) and 2), R&D-related transactions are rather unaffected. However, this is mostly in line with Fuller, Netter and Stegemoller (2002), who show that returns are higher, if the acquisition of small and private firms are financed either with stock-only or with a mix of stock and cash. As companies within group 3) are mainly small, innovative firms, this rule seems to hold true for pharma companies as well. Another often analyzed characteristic relates to the question, whether an acquisition takes place within the same country of the acquirer (e.g. Rossi and Volpin 2004; Moeller and Schlingemann 2005; Bassen, Schiereck and Wübben 2010; Mateev and Andonov 2017; Xu 2017). Within pharma, this is rather irrelevant, as none of the

results differ significantly across the groups. Clearly, the pharma industry especially within the countries of the final sample is so much standardized and regulated via the FDA and EMA that local factors do not seem to play a significant role. On the other hand, the question if the acquirer is a US company has a major influence (Martynova and Renneboog 2006; Mateev and Andonov 2017), at least for the specialization group. With -1.5%**, US acquirers face significantly less abnormal returns than acquirers from other countries. Frequently, higher corporate governance standards and investor protection in the USA are considered as the main driver.

Looking at the acquirer-specific characteristics stated above, only a couple of variables seem to have relevant influence on the short-term stock reactions. In the past, high volume acquisitions were always accompanied by significant losses for the acquirer (e.g. Moeller, Schlingemann and Stulz 2005; Gorton, Kahl and Rosen 2009; Alexandridis et al. 2013). The reasons normally being that these "megamergers" were either too expensive or resulted in complex and costly transformations, slowing down business development, finally leading to large and rather slow acting corporates. In the last couple of years, however, large scale acquisitions resulted in large positive abnormal return for the acquirer (Alexandridis, Antypas and Travlos 2017), which also applies to the pharma industry, at least for the specialization transactions. With a difference on 3.7%***, megamergers outperform "normal" acquisitions by far. Of high importance is the fact, that this is only true for specialization deals, as diversification and R&D-transactions face only minor or even negative reactions around the announcement day, however both are not statistically significant. As the centerpiece of the pharmaceutical industry, R&D has always been one of the most popular fields of research around the success of pharma companies (e.g. DiMasi, Grabowski and Hansen 2016; Guo and Zhou 2016; Banerjee and Siebert 2017-1). No matter if you look at the full sample or the specific groups, the smaller the current R&D spent is, the better the market assess the an growth strategy. However, again the difference is the highest for the specialization group with 2.1%***, compared to 0.7%*** and 1.1%*** for the diversification and R&D group. Although, to some extent, the sales development is related to R&D expenditure, in general there is no significant influence on the abnormal returns (Higgins and Rodriguez 2006; Danzon, Epstein and Nicholson 2007), which is also true for the given sample. Like with sales development, Tobin's Q does not seem to have a significant influence either, albeit the overall importance of this ratio is undisputed within M&A research (e.g. Lang, Stulz and Walking 1989; Lang and Stulz 1994; Andrade und Stafford 2004; Danzon, Epstein and Nicholson 2007; Fischer 2017). Although there are quite large differences in some of the groups' abnormal returns, none of the results depicts statistically significant results. The last acquirer-specific variable accounts for the drug portfolio and innovation capabilities. The overall figures show, that the market rates an acquisition higher, if the acquirer has not launched at least one new drug in the year prior to the announcement. However, only within the specialization group the difference of -1.2%* is slightly significant, despite the fact that the reaction of -1.5% within the R&D-Focus group is even higher.

The last analyzed univariate regression variable tests, whether the ownership structure of the target has an effect. Recent studies show that the involvement of private companies, either as acquirers or targets, can have a significant influence on the M&A reactions (e.g. Chang 1998; Fuller, Netter and Stegemoller 2002; Bargeron et al. 2008). Nevertheless, the results indicate that ownership has no influence within the pharma industry. Given the intense regulation and extensively available market intelligence on market authorizations and drug sales, the overall market situation with all its players seems already quite transparent.

4.2. Multivariate Analyses

The following section will have a closer look at the multivariate regression analyses of the 26 control variables mentioned earlier. Table 3 highlights the results of the multivariate analyses for a selection of event windows for the full sample as well as the distinction between the three sub-groups. In addition, another set of calculations provides information on how the model varies in case of focusing on the three major acquirer groups (FIPCOs, Generics and Biologics). Looking at the overall model for the full sample in dependence of the event window, in total 19 out of the 26 variable show significant values, seven of which are relevant, irrespective which window is used. For the deal-specific variables the results are in line with the ones of the univariate analyses. Again, D-2013^+, D-$MoPCO$ and D-USA are highly significant with up to 2.66%***, 1.86%*** and -1.33%**. Apart from that, only the two variables D-NAT and D-$SPEC$ with -1.01%* and 1.64%** are slightly significant for one window each. The latter one again underlines how crucial it is to acquire a similar business model.

For the acquirer-specific variables only four out of the 14 coefficients have significant values across all event windows. With up to 2.58%*** for *A-DV/MC*, transformations generally outperform smaller transactions within the pharmaceutical industry. The return on equity is negative and highly significant for all three timeframes. Values of a minimum of -2.29%*** imply that investors do not like expensive acquisitions, if the financial situation is already rather positive. Although the distinction if a company launched new drugs in the year prior to the announcement was mostly insignificant in the univariate analyses, there is an important negative influence up to -0.13%** per new drug launched. The last overarching significant variable is the distinction of generic drug manufacturers. On average, their acquisitions achieve a maximum of 4.14%*** higher returns in the days around the announcement day than the rest of other business models, however even FIPCOs seem to be good acquirers as well, as they achieve at least for the longer period a superior return of 1.49%* (*A-FIPCO*). Of the remaining acquirer-specific variables, another seven disclose significant values depending on the event window. Both *A-EBITDA* and *A-R&D* are highly significant for the longer timeframes and with 0.68%*** and 0.76%*** positive and similar to some degree. However, these two ratios are normally negatively correlated, meaning that for a concrete acquisition, both effects partly cancel each other out. Similar circumstances hold true for Tobin's Q (*A-Tq*) and the Price-to-Book ratio (*A-PtBR*). Usually these two ratios are positively correlated, meaning that for values of -0.51%** and 0.26%* the combined effect is rather attenuated. Furthermore, this fact also explains why the sign of both variables change between event windows. Although there were no significant differences for the sales development in the univariate analyses, there is a negative impact of -1.03%** for the longer time frame, showing that an acquisition is assed more pessimistic, if the outlook for a company is already promising without the acquisition. Finally the two research and drug portfolio-related factors portfolio age (*A-PA*) and the average clinical trial phase (*A-CTP*) have significant and positive values of 0.15%** and 0.29%** per full year of the average portfolio age and the average phase value of the clinical trial portfolio, meaning the more "outdated" the acquirer's drug portfolio is, the more the market values new revenue potential via external growth.

Table 2: Multivariate analyses for the 26 control variables. Results are given for the windows [-5;5], [0;1] and [0;2] for the full sample (FS), for the window [0;2] for each of the three sub-groups 1) Specialization, 2) Diversification and 3) R&D-Focus as well as for the three biggest acquirer groups A) FIPCOs, B) Generics and C) Biologics. Significance levels are 10% (*), 5% (**) und 1% (***). Variance Inflation Factors were all below 3.0, hence not separately stated. DW-Test = Durbin Watson-Test.

	Full Sample			(1)	(2)	(3)	(A)	(B)	(C)
Variable	**[-5;5]**	**[0;1]**	**[0;2]**	**[0;2]**	**[0;2]**	**[0;2]**	**[0;2]**	**[0;2]**	**[0;2]**
D-DV	-0.24%	-0.45%	-0.47%	0.27%	-1.60% *	-0.81%	-0.33%	1.23%	1.34%
D-2013[+]	2.05% ***	2.58% ***	2.66% ***	2.75% ***	2.41% **	3.43% ***	1.34% **	3.18% *	5.76% **
D-MoP$_{CO}$	1.66% **	1.81% ***	1.86% ***	2.48% ***	1.56% *	1.51%	1.39% **	2.19%	4.98% **
D-NAT	-0.48%	-1.01% *	-0,70%	-0.39%	-0.25%	-2.58% *	-0.46%	0.61%	-4.08% *
D-USA	-1.57% *	-1.33% **	-1.33% **	-2.14% **	0.18%	-3.42% **	-0.69%	-2.06%	-2.61%
D-SPEC	1.34%	0.84%	1.64% **	/	/	/	0.68%	4.14%	3.27%
D-DIV	0.06%	-0.32%	0.07%	/	/	/	-0.76%	1.07%	3.50%
A-DV/MC	1.37% **	1.80% ***	2.58% ***	5.83% ***	1.23% *	0.93%	2.11% ***	0.91%	2.07%
A-EBITDA	0.68% ***	0.14%	0.59% ***	0.72% ***	-0.30%	1.12% ***	0.44%	-6.41%	1.10%
A-R&D	0.76% ***	-0.15%	0.40% **	0.69% **	-0.61% *	1.21% ***	-0.13%	-9.60%	1.12% **
A-SALES	-1.03% **	-0.10%	-0.41%	-0.52%	-1.39% *	0.21%	0.94% **	3.41%	-1.59% **
A-RoE	-2.29% ***	-1.55% ***	-1.60% ***	-0.61%	-3.06% **	-2.69% ***	-1.01%	8.61%	-3.20% *
A-Tq	-0.51% **	0.47% ***	0.26%	0.73% *	0.21%	0.08%	0.16%	-0.57%	0.83% ***
A-PtBR	0.26% *	-0.16%	-0.06%	-0.03%	-0.27%	0.08%	-0.08%	-0.65%	0.02%
A-PA	0.09%	0.15% **	0.12% *	0.15%	0.12%	0.06%	0.22% **	0.07%	0.04%
A-NM	-0.13% **	-0.10% **	-0.11% **	-0.15% **	0.01%	-0.12%	-0.14% **	-0.16% *	-0.40%
A-CT$_P$	0.19%	0.25% *	0.29% **	0.65% **	0.11%	0.22%	0.13%	0.69% *	0.13%
A-CT$_N$	0.00%	0.00%	0.00%	-0.01%	0.01%	-0.01%	0.00%	0.00%	0.05%
A-M&A	-0.25%	-0.29%	-0.04%	-0.70%	-0.38%	0.74%	-0.36%	-2.11%	-2.07%
A-FIPCO	1.49% *	0.62%	0.56%	-0.10%	0.47%	1.19%	/	/	/
A-GEN	4.14% ***	2.88% ***	2.57% ***	2.65% *	2.34%	-0.01%	/	/	/
T-NM	0.28% **	0.13%	0.20% **	0.01%	0.88%	0.44% *	0.02%	-0.05%	0.63%
T-CT$_P$	-0.17%	0.04%	-0.04%	0.23%	-0.26%	0.01%	-0.01%	0.53%	-0.28%
T-CT$_N$	0.00%	-0.01%	-0.02%	-0.07%	0.00%	-0.10%	-0.01%	-0.04%	-0.16%
T-PRV	-0.12%	-0.05%	-0.32%	-0.31%	-0.87%	-0.65%	1.01%	-2.80%	1.22%
T-MV	-1.09%	-1.17% **	-1.21% **	-3.45% ***	-0.09%	-2.19% *	-0.57%	-2.56%	-6.44% ***
Intercept	-1.12%	-1.02%	-1.35%	-2.96%	2.32%	2-32%	-1.47%	0.09%	-4.73%
N	886	886	886	366	293	227	490	128	124
F-Statistic	3.50***	4.51***	4.85***	3.61***	1.78**	2.30***	2.19***	1.33	2.42***
R²	9.6%	12.0%	12.8%	20.3%	13.8%	21.5%	10.2%	23.6%	37.0%
Adjusted R²	6.8%	9.4%	10.2%	14.7%	6.1%	12.1%	5.5%	5.9%	21.8%
DW-Test	1.75	1.96	1.95	2.08	2.17	2.02	2.20	2.14	2.13

For the few target-specific variables, only *T-NM* and *T-MV* have a significant influence. This means, that for each newly launched drug of the target company, the abnormal returns at the announcement date are on average 0.28%** higher, highlighting the positive sales outlook. Additionally, if the market value of the target is transparent, the average abnormal returns fall by around -1.21%**, suggesting that if the market is aware of the fair value, deal prices and the respective premiums are considered as too high. All other variables do not seem to have a significant influence on the short-term abnormal returns of the acquiring firm.

Taking a closer look at the three M&A strategies 1) to 3), huge differences in the relevance of specific variables become obvious. Thus, depending on the group, not only the sign and value of individual variables are significant drivers, but also different variables in the each group are relevant. In total, only two out of all 24 variables have a significant influence for all three types of transactions. Again, across all groups, acquisitions in the last couple of years clearly outperformed earlier transactions with up to 3.43%***, however differences between diversification and R&D deals can be up to 1%. Secondly, the R&D expenditures have a major influence across the groups, although the way they are relevant is completely different. While a spending is highly positive for R&D-related acquisitions (1.21%***), the reaction is rather moderate for specialization deals (0.69%**), while it is negative in case of a diversification (-0.61%*).

For the rest of relevant variables, the importance differs significantly from group to group. For example, the absolute deal value has an influence of -1.60%*, but only if the acquisition is a diversification. On the other side, while acquirers from the US face high negative abnormal returns of -2.14%** and -3.42%** for specialization and R&D deals, a diversification is rather unaffected. Another example is the large difference between transactions which tend to be transformations. While the influence is 5.83%*** for specializations, R&D deals are again barely influenced by this circumstance. Comparable statements can be made for the majority of remaining significant variables (*D-MoP_{CO}, D-NAT, A-EBITDA, A-SALES, A-RoE, A-NM, A-CT_P, T-NM* and *T-MV*).

This pattern holds true when distinguishing between the different acquirer's business models as displayed in A) to C). Although due to the smaller sample sizes the overall explanatory power of the model increases to some extent, the number of relevant variables and respective significance levels decreases. Like before, the dummy variable which differentiates deals of the last M&A wave is the only significant factor across the three largest acquirer groups, however the spread further increases from 1.34%** for FIPCOs to 5.76%** for Biologics manufacturers. Although insignificant for Generics manufacturer deals, a similar difference between group A) and C) is valid for the method of payment with 1.39%** and 4.98%**. Apart from that, within in the deal-specific variables there is only one more minor significance for a negative impact of cross-border acquisitions within group C) of -4.08%*. For the acquirer and target-related variables this scattering of significance levels and magnitudes further intensifies. If a coefficient is significant at all, this is usually only the case for one of the three groups (i.e. *A-DV/MC, A-R&D, A-RoE, A-Tq, A-PA, A-CT_P* and *T-MV*). The exception to these are the sales development (*A-SALES*) and the acquirer's launch of new drugs in the year prior to the announcement (*A-NM*). However, the former factor already changes the sign between both groups. Taking the results of group A) to C) together, again we can see a clear necessity to have to differentiated view what type of company is doing what and that one pharmaceutical company cannot always be compared with another pharmaceutical company.

Taking together all the results of the univariate and multivariate analyses, a couple of key findings should be highlighted. Firstly, the fact that acquirers face negative abnormal returns during M&A announcements is not valid anymore, at least for the pharmaceutical industry. Taking into account the transactions of the largest industry consolidation wave ever, the investor reaction has significantly changed. Secondly, a clear differentiation of market participants, their respective business models and implicit capabilities is crucial to truly assess whether intra-industry transactions imply a stronger focus on a firm's existing business strategy or if they aim for adjacent or new markets via diversification, which need to go beyond standard industry classifications. Thirdly, not all deal, acquirer and target-related characteristics have the same influence for all types of transactions and business models. When assessing short-term abnormal returns to M&A announcements within the pharmaceutical industry, it is crucial to assess if the deal is either a specialization, diversification or research-driven.

4.3. Transaction Deep Dive – Asset Deals

The following sections will cover a set of deep dives on specific transactions types covering subgroups of the full sample mentioned earlier. As a first step, the focus will be on asset deals, as the implications for the acquirer and the selling company are quite different compared to "complete" acquisitions. The selling company continues to exist after the transaction, hence the consequences for the shareholders are by far not that severe. In parallel, the acquirer only buys certain assets, meaning that other potentially inefficient or redundant overhead functions remain with the seller. As a consequence, for both parties, this type of transaction is a kind of increased specialization, as the acquirers strengthen their business in the respective area and the seller in parallel releases previously bound capital and management resources. Consequently, not only the reaction of the acquirer is of high importance, but also the abnormal returns of the selling company are of a special interest. Out of the 886 transactions of the initial sample, 188 events represent an asset deal, where the acquirer only buys individual divisions, market authorizations or brands. Out of these 188 asset deals, 148 had a publicly listed selling company. Following the results of recent studies (Rosenfeld 1984; Sicherman and Pettway 1987 and 1992; Jory and Ngo 2015), in general slightly positive abnormal returns both for the acquirer and the seller are likely, however differences might occur, e.g. due to the performance prior to the transaction (Nguyen 2016).

Table 3: Comparison of cumulated abnormal returns for asset deals. Results for I) the acquirer (N = 188), II) the acquirer for all remaining "complete" acquisitions (N = 698), III) the acquirer for all complete specialization acquisitions (N = 186) and IV) the selling company in asset deal transactions (N = 144). Significance levels are 10% (*), 5% (**) und 1% (***).

	(I)			(II)			(III)			(IV)			(I) – (II)		(I) – (III)		(I) – (IV)	
Window	CAAR	P-Val	Neg.	CAAR	P-Val	Neg.	CAAR	P-Val	Neg.	CAAR	P-Val	Neg.	Delta	P-Val	Delta	P-Val	Delta	P-Val
[-10;10]	2.0%	*** **	43%	-0.1%		52%	0.7%	*	48%	1.3%		46%	2.1%	* **	1.3%	*	0.7%	
[-5;5]	2.2%	*** ***	39%	0.3%	*	51%	1.4%	**	47%	1.5%		48%	1.9%	** ***	0.7%		0.7%	
[0]	1.0%	*** ***	43%	0.5%	*** ***	49%	0.8%	** *	48%	1.9%	*	47%	0.5%		0.2%		-0.9%	
[0;1]	2.0%	*** ***	34%	0.9%	*** ***	44%	1.7%	*** ***	43%	2.1%	** *	43%	1.1%	* ***	0.3%		-0.1%	**
[0;2]	2.5%	*** ***	37%	0.8%	*** ***	45%	2.0%	*** ***	41%	1.8%		45%	1.7%	*** ***	0.5%		0.7%	***
[0;5]	2.3%	*** ***	38%	0.5%	**	49%	1.7%	*** *	43%	1.4%		49%	1.8%	** ***	0.6%		0.9%	**
[0;10]	2.4%	*** ***	38%	0.3%	*	51%	1.1%	**	50%	1.3%		53%	2.1%	** ***	1.3%	**	1.1%	**

Table 4: Multivariate analyses for I) acquirers (N = 188) and IV) sellers (N = 144) in asset deal transactions. Significance levels are 10% (*), 5% (**) und 1% (***). Values displayed for the acquirer (A) and seller (S) perspective, i.e. for the regression on group I), the financial and portfolio information was taken for the acquirer, for the regression on group IV), the information was taken for the seller. Variables without any relevant information for asset deals (e.g. specialization deals or total number of clinical trials) were not considered.

	(I) Acquirer in asset deals				(IV) Seller in asset deals		
Variable	[-5;5]	[0;1]	[0;2]	Variable	[-5;5]	[0;1]	[0;2]
D-DV	-1.09%	0.32%	-0.30%	D-DV	-1.18%	0.57%	0.54%
D-2013+	2.21%	0.84%	1.14%	D-2013+	1.24%	0.48%	0.29%
D-MoPco	0.96%	2.10% ***	1.39%	D-MoPco	0.08%	0.67%	1.04%
D-NAT	-2.07%	-1.33%	-1.26%	D-NAT	-0.41%	-0.75%	-0.57%
A-USA	-4.24% ***	-2.68% ***	-3.27% ***	S-USA	-0.24%	-0.19%	-0.24%
A-DV/MC	7.80% ***	6.38% ***	9.23% ***	S-DV/MC	5.45% ***	2.60% *	2.50% *
A-EBITDA	1.67% ***	-0.16%	0.76% **	S-EBITDA	2.89% ***	0.75%	0.79%
A-R&D	1.93% ***	0.07%	1.04% ***	S-R&D	6.65% **	-0.25%	0.70%
A-SALES	-2.30% ***	0.76%	-0.07%	S-SALES	-0.35%	1.63%	1.37%
A-RoE	0.20%	3.21% **	2.63% *	S-RoE	-4.06% **	-6.02% ***	-5.27% ***
A-Tq	0.56%	0.18%	0.42%	S-Tq	2.75% ***	4.07% ***	4.12% ***
A-PtBR	0.12%	-0.05%	-0.09%	S-PtBR	-0.89% **	-1.14% ***	-1.25% ***
A-PA	0.42% *	0.16%	0.17%	S-PA	-0.03%	-0.38%	-0.36%
A-NM	-0.10%	-0.07%	-0.04%	/	/	/	/
A-M&A	-1.24%	-0.63%	-0.34%	/	/	/	/
A-FIPCO	1.31%	-1.05%	-1.25%	S-FIPCO	-3.43%	0.41%	0.85%
A-GEN	5.12% **	1.72%	0.50%	S-GEN	-0.12%	2.47%	2.58%
/	/	/	/	$S\text{-}CAR_{T-1}$	-0.65%	-0.82%	-0.52%
Intercept	-1.37%	-0.98%	0.58%	Intercept	0.42%	-1.67%	-2.55%
F-Statistic	3.88***	3.35***	3.98***	F-Statistic	6.81***	7.97***	7.57***
R^2	27.9%	25.1%	28.5%	R^2	45.4%	49.3%	48.0%
Adjusted R^2	20.7%	17.6%	21.3%	Adjusted R^2	38.8%	43.1%	41.7%
DW-Test	1.92	2.25	2.18	DW-Test	1.91	1.74	1.79

Table 4 shows the abnormal returns not only for the acquirer and the seller in asset deals, but also the results of all the remaining complete acquisitions as well as all the remaining specialization deals are illustrated. Looking at the acquirer side (I), there are highly significant abnormal returns of up to 2.5%***, while the share of negative transactions reduces to a minimum of 34%. This already indicated that investors generally appreciate the acquisition of dedicated assets and that they favor these types of transactions over complete acquisitions as illustrated earlier (figure 1 depicts that the average abnormal return for the full sample was around 1.2%***). This behavior also supported when looking at the reactions of the complete acquisitions II) and III) and the respective comparisons with group I). Although in complete acquisitions the acquirers still face significantly positive returns of maximum 0.9%*** for the full sample of complete transactions and 2.0%*** for complete specialization deals only, they are both significantly lower compared to asset deals. Especially in the longer periods following an announcement, for the window [0;10] the differences between group I) and II) as well as I) and III) are 2.1%*** and 1.3%**.

When taking a look on the sellers' side, their market reactions are quite positive for all event windows as well. The abnormal returns range from 1.3% in the longer periods up to 2.1%* in the days around the asset deal announcement. However, although the reactions are quite high, the decisive difference with the group of acquirers (I) is that returns are no longer significant. Only at the announcement day itself as well as during the window including the day after low significance levels are shown. In parallel, the share of negative events rises to 53% in the days following the announcement, although the returns are still 1.3%. These results imply that, compared to the acquirer, the sellers in asset deals face abnormal returns which are much more scattered, meaning that for some events the results are quite positive, while for others they are obviously negative. Again, this is additionally supported taking into account the return comparison results of I) and IV). First, only the event windows in the days after the announcement show significant levels. Second, only the non-parametric tests certify the relevant differences, again implying a greater scattering of results. Again, these results are quite a novelty, at least for the pharmaceutical industry. Not only enjoy the acquirers, on average, the highest positive returns but, at the same time, the sellers of these transactions are, in general, worse off.

The second step of the asset deal analyses takes a closer look on the coefficients influencing the abnormal returns for acquirers and sellers and addresses the question, whether these differ for both groups. Table 5 summarizes the results of the multivariate analyses for the acquirer (I) and the seller (IV) in asset deals for three event windows. The variable values are collected from the perspective of the acquirer for group (I) und from the seller for group (IV). As Nguyen (2016) points out the seller's abnormal returns decisively depend on the returns in the year prior to the announcement, another variable ($S\text{-}CAR_{T\text{-}1}$) will be included in the regression. For the acquirers, only two variables have a significant influence across all three windows, while seven others have an important influence only with respect to specific event periods. In accordance with the full sample, US acquirers face significantly negative returns compared to their international counterparts, where the reactions are much higher with up to -4.24%***. A similar pattern applies for the relative transaction volume. With 9.23%***, again the results are much higher compared to the full sample from table 3, highlighting that acquisitions are more positive, the higher the relative asset value is. Given the remaining deal-specific variables, only the payment method has an influence of around 2.10%*** for the short period around the announcement day. For the company-specific coefficients, mainly the information regarding the financial situation (*A-EBITDA, A-R&D, A-SALES* and *A-RoE*) is of importance, however with mixed results. Apart from that, only the two variables regarding portfolio age and whether a company is a Generics manufacturer are marginally significant for the longer event period, highlighting that an older drug portfolio and the focus on Generics result in better results.

Looking at the sellers in asset deals the results are quite different compared with those for the acquirers. None of the deal-specific variables have a relevant influence on the abnormal returns. Furthermore, in total four company-specific variables have a significant influence across all windows, two more coefficients become important for the longer event window. Like the acquirer the selling company enjoys a significantly higher return of up to 5.45%***, the higher the relative selling price of the assets is. Secondly, based on the return on equity, the better the financial situation is the worse the market reacts around the announcement. Unlike the acquirers, the valuation ratios Tobin's Q and the price-to-book ratio with a maximum of 4.12%*** and -1.25%*** now play a crucial role for the

abnormal returns around the announcement day. Although in reality they are positively correlated, the overall influence is quite intense, keeping in mind that these ratios are in absolute values. Apart from this, only the two coefficients *S-EBITDA* and *S-R&D* are significant in the longer event window. However, as normally these two values are negatively correlated, in reality the overall effect will be rather small. In summary, the results show that asset deals are a completely different type of transaction compared to complete acquisitions. Not only do acquirer face significantly higher returns compared to "normal" acquisitions, but the sellers, on average, are worse off. Furthermore, multivariate regression highlights that again, the set of relevant coefficients for both sides differs fundamentally.

To further increase the robustness of these results, the asset deal acquirers will be matched with comparable events from the set of complete acquisitions using a *Propensity Score Method (PSM)*, in order to make sure, that the significantly better returns of asset deals do not only occur because of severe differences in the values of the events' control variables. Using the method of Rosenbaum and Rubin (1983) and (1984) two matching algorithms (direct two neighbors and maximum distance of 0.05%) will be used to reduce the bias of each control variable (Caliendo und Kopeinig 2008; Stuart 2010).

Table 5: Propensity Score Matching for asset deal transactions. Comparison with complete acquisitions. First N-value represents the number of asset deals, the second one the number of complete acquisitions. ΔM as the difference in sample means. Values highlighted where the bias is below the critical 5% value. The first P-Value represents the parametric tests, the second the non-parametric tests. Significance levels are 10% (*), 5% (**) und 1% (***). Bias as the difference in sample means divided by the average standard deviation.

Variable	Full Sample N = 188/692			Direct two Neighbors N = 188/270			Max. Distance: 0.05% N = 149/275		
	ΔM	Bias	P-Val	ΔM	Bias	P-Val	ΔM	Bias	P-Val
D-DV	-0.22	35.9%	*** ***	-0.05	9.3%		-0.08	15.2%	**
D-2013$^+$	-0.05	10.1%		-0.01	2.1%		-0.02	4.2%	
D-MoP$_{CO}$	-0.03	5.3%		-0.04	8.4%		-0.06	13.0%	
D-NAT	0.12	23.9%	*** **	0.01	2.8%		0.04	7.3%	
A-USA	-0.16	33.5%	*** ***	-0.04	8.0%		0.07	13.8%	
A-DV/MC	-8.1%	17.1%	* *	0.7%	2.2%		2.7%	8.2%	
A-EBITDA	16.9%	7.6%		7.5%	3.9%		-1.5%	0.7%	
A-R&D	-11.4%	5.2%	***	-10.3%	4.8%	**	0.5%	0.2%	**
A-SALES	5.6%	7.1%		4.0%	5.2%		3.1%	4.2%	
A-RoE	0.7%	1.1%		3.8%	7.7%		-1.1%	2.1%	
A-Tq	-0.33	22.5%	**	-0.05	4.0%		-0.07	5.0%	
A-PtBR	-0.49	17.4%	** *	-0.09	3.5%		-0.07	2.7%	
A-PA	0.38	10.7%		0.17	4.9%		0.33	9.1%	
A-NM	0.08	1.1%		-0.69	9.1%		-0.51	6.6%	
A-M&A	0.05	10.2%		0.00	0.7%		0.01	3.0%	
A-FIPCO	-0.09	17.6%	** *	-0.05	9.1%		-0.04	8.9%	
A-GEN	0.06	16.2%	**	0.00	0.3%		0.02	5.6%	
CAAR [0;2]	1.65%	21.9%	*** **	1.50%	21.2%	** ***	1.92%	25.4%	*** ***

Table 6 shows the results of the propensity score matching for asset deals. The first set shows the initial situation of the full sample, where clear differences in the means of the control variables for both groups become obvious. Only one variable has an initial bias of less than 5%. When matching the asset deals with the direct two neighbors of complete acquisitions, the size of the control group reduces to 270 complete acquisitions. As a result, the comparison of variable means highlights only one coefficient with minor significant differences (*A-R&D*). However, at the same time we are able to reduce the bias for ten of the 17 variables below the 5% threshold, while the remaining factors have a bias of less than 10%. Nonetheless, the difference in abnormal returns remains highly significant at 1.5%***, underlining the superiority of asset deals from an acquirer's perspective. The second matching procedure generally supports these results, however the outcome is slightly worse, not only due to the higher bias values and significance levels, but due to the fact that roughly 20% of asset deal events need to be excluded due to missing matching partners.

4.4. Target's Reaction to M&A Announcements

The following section is a deep dive into the market reactions of the acquired companies. Since asset deals were already discussed, they are excluded from further analysis. From the initial sample 279 transactions had publicly traded companies as takeover targets. In accordance to the results of past cross-industry and pharma-specific studies, significantly positive returns are likely (e.g. Bruner 2002; Ravenscraft and Long 2000), while again significant differences between the focus groups are likely, especially when focusing on R&D-driven acquisitions (e.g. Phillips and Zhadnov 2013; Upadhyay and Zeng 2017).
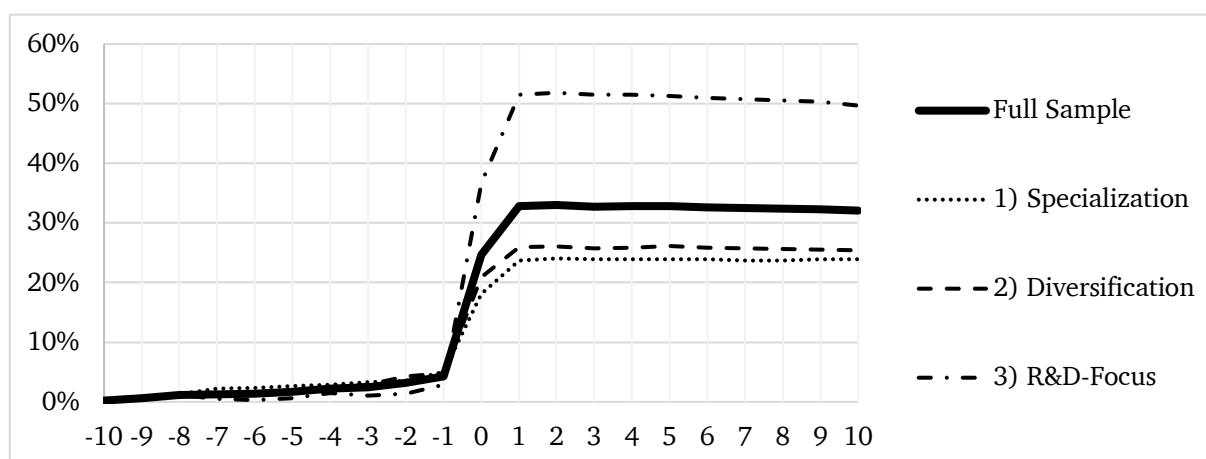
Window	CAAR	P-Val		Neg.
Full Sample (N = 279)				
[-10;10]	32.1%	***	***	14%
[-5;5]	31.4%	***	***	14%
[-1;1]	29.6%	***	***	14%
[0]	20.4%	***	***	21%
[0;1]	28.5%	***	***	16%
[0;2]	28.7%	***	***	14%
[0;5]	28.5%	***	***	15%
[0;10]	27.8%	***	***	17%

Window	CAAR	P-Val		Neg.	Delta	P-Val	
1) Specialization (N = 88)					*1) – 2)*		
[-5;5]	21.5%	***	***	15%	-3.1%		
[0;1]	18.7%	***	***	21%	-2.4%		
[0;2]	19.0%	***	***	17%	-2.2%		
2) Diversification (N = 109)					*2) – 3)*		
[-5;5]	24.6%	***	***	18%	-26.4%	***	***
[0;1]	21.1%	***	***	17%	-27.6%	***	***
[0;2]	21.2%	***	***	16%	-27.8%	***	***
3) R&D-Focus (N = 82)					*3) – 1)*		
[-5;5]	51.0%	***	***	6%	29.5%	***	***
[0;1]	48.7%	***	***	10%	30.0%	***	***
[0;2]	49.0%	***	***	7%	30.0%	***	***

Figure 2: Cumulated abnormal returns of the target for the full sample as well as the different subgroups. The first P-Value represents the parametric tests, the second the non-parametric tests. Significance levels are 10% (*), 5% (**) und 1% (***).

Figure 2 shows the abnormal returns of the M&A targets within the days around the announcement day. As expected the overall results are highly significant with on average positive reactions up to 32.1%*** for the full sample. Additionally the share of negative reactions drops to a minimum of 14%. The most striking result can be derived from comparing the different focus groups: Acquisitions which are R&D-driven result in abnormal target returns which are more than twice as high in comparison to the other two groups. With up to 51.0%*** and a share of negative reaction of a minimum of 6%, R&D-related deals clearly outperform specialization and diversifications deals which, on average, result in similar reactions of roughly around 20%***. Not only that these results certify some of the highest reactions in the pharmaceutical M&A research ever since, they also underline once more the fundamental importance of R&D in the context of takeovers, especially in industries where innovation is at the core of business activity.

Although the overall market reactions are quite clear, relevant coefficients with an overarching significance are not available. Furthermore, for targets of transactions with a focus on diversification not one single variable is significant at all, resulting in an overall poor explanatory power. Consequently, as table 7 illustrates none of the control variables is relevant irrespective of the focus group. Additionally, the differences in direction in height between the groups are more drastic, compared to earlier acquirer-focused analyses. Transactions conducted in the years 2013 to 2015, for example, again led to much higher returns than those announced earlier, but only for the specialization deals. Diversification-driven acquisition on the other hand are rather unaffected. Similar results are valid for the acquirer and target-specific variables, i.e. the relative transaction volume is much more relevant for R&D-targets than for the other groups. Conversely, the same applies to for *T-SALES, T-CTₚ* or *A-NM*. Finally, for the target of R&D-driven acquisitions it is particularly advantageous if the acquirer comes from the USA. With 35.8%* this variable has the strongest relevance of all. Furthermore potential R&D synergies are likely, as the total amount of clinical trials has a highly significant influence with 0.33%*** per clinical trial, again keeping in mind that the variable is based on absolute values. In summary we can see, that on one hand the returns for targets within the pharmaceutical industry are in general remarkably high, on the other hand the prediction power of the models is rather limited.

Table 6: Multivariate analysis for the target of complete acquisitions. Results for the window [0;2] for the full sample (FS) and for sub-groups 1) Specialization, 2) Diversification and 3) R&D-Focus. Significance levels are 10% (*), 5% (**) und 1% (***).

Variable	FS	(1)	(2)	(3)
D-DV	-4.54%	3.32%	0.20%	-8.52%
D-2013⁺	9.19% *	10.90% *	0.74%	6.20%
D-MoPₒₒ	3.86%	-2.26%	4.73%	-3.21%
D-NAT	2.97%	3.64%	3.61%	23.20%
T-USA	0.38%	-2.27%	12.70%	-1.10%
T-DV/MC	6.64% *	6.29%	7.77%	22.50% **
T-EBITDA	-1.03%	-6.57% **	0.44%	-2.21%
T-R&D	1.80%	-2.93%	2.76%	0.49%
T-SALES	1.39%	12.90% ***	-2.25%	-0.71%
T-RoE	-4.07% *	1.20%	-8.15%	0.46%
T-Tq	0.92%	1.92%	1.48%	0.24%
T-PtBR	-0.67%	-0.84%	-1.82%	-0.44%
T-PA	1.06% *	-1.35%	-3.08%	-1.50%
T-NM	-0.20%	0.44%	0.52%	0.48%
T-CTₚ	1.56%	2.48% **	-1.00%	-0.60%
T-CTₙ	-0.23%	-0.25%	0.40%	0.70%
A-USA	10.90% **	14.10% **	-1.77%	35.80% *
A-DV/MC	-6.59%	-7.40%	-11.80%	-40.60%
A-EBITDA	1.54%	3.97%	2.18%	-6.34%
A-R&D	-2.14%	-0.45%	-1.36%	-20.50%
A-SALES	5.08%	5.14%	4.68%	5.50%
A-RoE	-0.99%	-1.56%	-11.10%	-7.72%
A-Tq	-0.63%	0.79%	-0.13%	3.97%
A-PtBR	-0.46%	-0.35%	-0.28%	-3.00%
A-PA	0.42%	0.52%	-0.47%	-0.21%
A-NM	-0.30%	1.18% *	0.50%	0.81%
A-CTₚ	0.52%	-1.06%	2.02%	3.26%
A-CTₙ	0.14% ***	0.04%	0.03%	0.33% ***
Intercept	-6.53%	-31.80% *	-8.36%	-22.70%
N	279	88	109	82
F-Statistic	4.33***	3.44***	1.33	1.51*
R²	32.7%	62.0%	31.8%	44.4%
Adjusted R²	25.1%	43.9%	8.0%	15.0%
DW-Test	1.83	2.06	1.27	1.52

4.5. Combined Industry Returns

One of the last open topics of the analysis of short-term announcement effects is the question what the reaction of the combined entity is. Normally the acquirer is multiple times bigger than the target, with the consequence that, e.g. even with the highly positive returns of the target company, the overall wealth effect can be negative due to worse reactions on the acquirer's side. However, recent studies outline that the combined effect is normally positive on average (Bruner 2002; Offenberg, Straska and Waller 2014; Xu 2017).
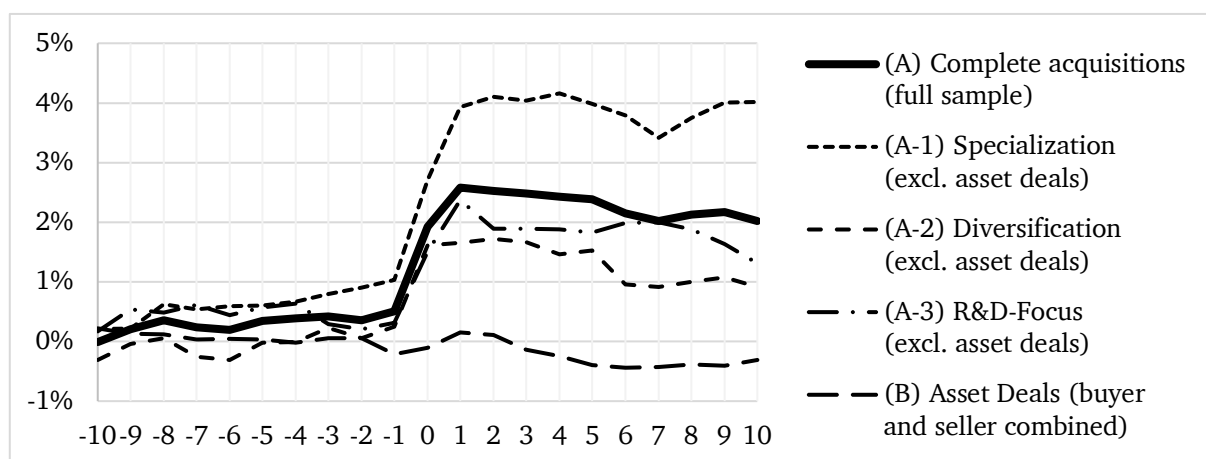
Window	CAAR	P-Val	Neg.	Delta	P-Val
(A) Complete acquisitions (N = 279)				*(A) – (B)*	
[-5;5]	2.2%	*** ***	38%	2.6%	*** ***
[0]	1.4%	*** ***	36%	1.3%	*** **
[0;1]	2.1%	*** ***	32%	1.7%	*** ***
[0;2]	2.0%	*** ***	33%	1.7%	*** ***
[0;10]	1.5%	*** ***	43%	1.6%	*** ***
(B) Asset deals (N = 148)					
[-5;5]	-0.4%		45%		
[0]	0.1%		49%		
[0;1]	0.4%	** **	45%		
[0;2]	0.3%	*	44%		
[0;10]	-0.1%		51%		

Window	CAAR	P-Val	Neg.	Delta	P-Val
(A-1) Specialization (N = 88)				*(A-1) – (A-2)*	
[-5;5]	3.4%	*** ***	32%	1.5%	
[0;1]	2.9%	*** ***	31%	1.5%	
[0;2]	3.1%	*** ***	28%	1.6%	*
(A-2) Diversification (N = 109)				*(A-2) – (A-3)*	
[-5;5]	1.9%	*** ***	37%	0.5%	
[0;1]	1.4%	*** ***	28%	-0.7%	
[0;2]	1.5%	*** ***	28%	-0.1%	
(A-3) R&D-Focus (N = 82)				*(A-3) – (A-1)*	
[-5;5]	1.4%	*	48%	-2.0%	* **
[0;1]	2.1%	*** ***	39%	-0.8%	
[0;2]	1.6%	*** *	44%	-1.5%	*

Figure 3: Cumulated abnormal returns of the combined entity for the full sample as well as the different subgroups of complete acquisitions. Combined returns based on the sum of the market cap weighted abnormal returns. For asset deal transactions buyer and seller returns are combined, however both companies of course stay separate firms after the transactions. The first P-Value represents the parametric tests, the second the non-parametric tests. Significance levels are 10% (*), 5% (**) und 1% (***).

Figure 3 illustrates the abnormal returns for the combined returns for the acquisitions with publicly listed targets. When looking at the full sample, in line with recent studies the returns are positive and highly significant with up to 2.2%***. However, keeping in mind that the targets reactions were between 20% and 50%, the combined returns are rather small. With a negative share of a minimum of 32%, two out of three acquisitions are value enhancing from an industry perspective, only one out of three is value decreasing. Taking a look at the three subgroups the combined returns are positive and highly significant for all three types of transactions. Although the R&D targets had by far the highest returns, still the relative size is not big enough to outperform the other two groups. With up

to 2.1%*** they are on a similar level as the diversification deals with 1.9%***. As before, in the "acquirers only" case, specialization acquisitions are once more the group with the highest returns of 3.4%***. Another important finding is that asset deals, in contrast to complete acquisitions, do not create value from a macroeconomic perspective, at least on average. Although both, the acquirer and seller generally face positive returns as seen before, potential gains of one side regularly balance out the losses on the side of the counterpart.

As a consequence this implies that from a holistic perspective within complete acquisitions, normally the target company is the winning part which is responsible for the increase of the capital stock. For asset deals however it is the other way around, meaning that the acquirer is the alleged beneficiary. Table 8 supports this as it shows the average and median of the weighted return shares of the above listed groups. Irrespective of the transaction types, within the group of complete acquisitions the target bears the major stake of the positive returns. Most interestingly, the average and median of specialization target's share is the highest with 2.8% and 1.6% of all groups, even though returns for these returns were the lowest of all target companies. At the same time, the acquirers in R&D-driven transactions have an average and median return which is with -0.7% and -0.6% clearly negative. In contrast, the situation for asset deals is the opposite. While the median for the acquiring and selling company is with 0.3% and 0.1% nearly the same, the difference of the average is 2.3% in favor of the acquirer, meaning that at least for some buyers the market highly welcomes the asset swap.

Table 7:   Average and median of weighted return shares for complete acquisitions and asset deals.

CAARs [0;2]	Acquirer	Target
(A) Complete acquisitions (N = 279)		
Average	0.2%	2.2%
Median	0.0%	1.0%
(A-1) Specialization (N = 88)		
Average	0.3%	2.8%
Median	0.2%	1.6%
(A-2) Diversification (N = 109)		
Average	-0.2%	1.7%
Median	0.4%	0.5%
(A-3) R&D-Focus (N = 82)		
Average	-0.7%	2.3%
Median	-0.6%	1.2%
(B) Asset deals (N = 148)		
Average	2.3%	0.0%
Median	0.3%	0.1%

4.6. The Influence of Merger Waves and Competitor's Reaction

One of the most interesting findings of the analyses carried out so far is the fact that acquisitions in the last couple of years significantly outperform the deals in the early years of this century. Contrary to previous studies (Alexandridis, Antypas and Travlos 2017; Li and Tong 2018) this anomaly is not only limited to public deals, but retains valid for all types of transactions, for both, acquirers and targets. Consequently an industry wide phenomena has to be the relevant driver as given by the biggest M&A wave ever since as the answer to an industry-wide tense market situation. In case that there is a paradigm shift of investor reactions to M&A announcements during tense consolidation waves (e.g. Cai, Song and Walking 2011; Fich, Nguyen and Officer 2018), this would directly imply a changed reaction of market competitors as well.

Table 8: Propensity Score Matching for transactions of the last M&A wave in the years 2013-2016 excluding asset deals. First N-value represents the number of "on-wave" deals, the second one the transactions in the years 2000-2012. ΔM as the difference in sample means. Values highlighted where the bias is below 5%. The first P-Value

represents the parametric tests, the second the non-parametric tests. Significance levels are 10% (*), 5% (**) und 1% (***).

Acquirer's CAARs	Full Sample N = 206/492			Direct Neighbor N = 206/206			Max. Distance: 0.125% N = 142/290		
Variable	ΔM	Bias	P-Val	ΔM	Bias	P-Val	ΔM	Bias	P-Val
D-DV	0.16	24.2%	*** ***	-0.03	4.8%		0.03	5.1%	**
D-MoP_{CO}	-0.04	8.9%		-0.04	7.8%		-0.03	5.2%	
D-NAT	0.06	12.9%		-0.01	2.9%		0.00	0.5%	
D-USA	0.03	6.5%		0.02	5.2%		0.03	5.7%	
D-SPEC	-0.03	7.8%		0.00	1.1%		0.01	1.2%	
D-DIV	-0.05	10.6%		-0.04	8.0%		-0.02	4.3%	
A-DV/MC	8.8%	11.6%	**	-1.5%	1.9%		3.8%	5.2%	
A-EBITDA	-47.9%	16.2%	***	-42.0%	14.1%	**	-0.7%	0.4%	
A-R&D	19.7%	7.7%		21.0%	8.1%		-3.7%	2.1%	
A-SALES	1.0%	1.2%	*	1.7%	2.1%		-3.8%	5.8%	*
A-RoE	-10.3%	16.7%	* ***	-2.3%	3.7%	***	-14.0%	23.7%	*** ***
A-Tq	-0.37	20.9%	*** ***	-0.17	9.7%		-0.17	9.4%	
A-PtBR	0.24	7.5%		0.17	5.3%		-0.20	8.1%	
A-PA	0.73	22.4%	**	0.25	7.8%		0.48	14.9%	
A-NM	0.98	10.9%	*	0.20	2.2%		0.36	4.2%	
A-M&A	-0.05	9.8%		-0.05	9.7%		-0.04	8.1%	
A-CT_{P}	0.42	21.6%	** *	-0.06	3.2%		0.45	22.7%	**
A-CT_{N}	-8.20	13.8%		-0.43	0.7%		-0.89	1.4%	*
A-FIPCO	-0.01	1.0%		0.00	0.0%		-0.02	3.9%	
A-GEN	0.03	7.4%		0.00	1.4%		0.02	4.7%	
T-NM	-0.27	30.7%		0.01	1.1%		0.07	6.7%	
T-CT_{P}	0.17	7.7%		-0.10	4.5%		-0.03	1.6%	
T-CT_{N}	1.17	9.5%		0.42	3.4%		0.87	7.0%	
T-PRV	0.06	12.2%		0.01	1.9%		0.03	6.2%	
T-MV	-0.05	10.4%		-0.01	0.3%		-0.02	4.5%	
CAAR [0;2]	2.8%	30.1%	*** ***	2.6%	28.3%	** ***	3.8%	39.9%	*** ***

To answer this the first step is to validate that recent acquisitions really outperform earlier ones. By applying the PSM method, table 9 underlines the superiority of deals in the years 2013 to 2016 compared to those of the years 2000 to 2012. Although it is not possible to completely prevent an increased bias for all 25 coefficients, the direct neighbor method manages to reduce the bias of 15 variables below 5% and for only one factor (*A-EBITDA*) above 10%. Like before, using a maximum distance results in the exclusion of a high number of events. Nevertheless, abnormal returns of the acquirers significantly differ with up to 2.6%*** and 3.8%***.

The next step is to define who are the direct competitors of a company. Using the company profile methodology (FIPCOs, Biologics, Generics, etc.), we define the competitors' reaction as the sum of market value weighted abnormal returns of all companies of the same class at the announcement day. Finally we can use these competitor returns to assess if market reactions have changed in time. As the main questions is how the competition reacts to generally positive and negative events, the focus will be on both, the top and flop 50 acquirer returns in each period. Table 10 summarizes the competitor returns for the events with the highest and lowest acquirer abnormal returns in the two periods 2000 to 2012 and 2013 to 2016.

Although significance levels are rather weak, a clear pattern together with a paradigm shift over time becomes obvious. In the early years of this century, there was a clear parallel movement of the competitors with the acquirer. For positive acquirer returns, competitors faced as well an increase of on average up to 1.66%** in the days around the announcement with a share of negative returns of a minimum of 36%. At the same time, for negative acquirer returns the competition lost around -1.51%* as well with a negative share of 60%. Since 2013 the reaction patterns changed, meaning that positive acquirer returns result in less positive returns of the competitors, illustrating that in times of a tense market situation, good news for one company worsens the situations of the others. Again, the same applies to negative acquirer returns, as the competitor returns are less negative in the last couple of years. The comparison of the means over time also highlights the significant changes in the reactions. Taken everything together it becomes obvious that, like Wann and Lamb (2016) said, good news in bad times are worth more than

good news in good times and that this also directly influences other market participants and result in an industry-wide shift of announcement reaction paradigms.

Table 9: Weighted abnormal competitor returns for the top and flop 50 acquirer reactions in the two periods 2000-2012 and 2013-2016. The first P-Value represents the parametric tests, the second the non-parametric tests. Significance levels are 10% (*), 5% (**) und 1% (***).

Window	CAAR	P-Val	Neg.	CAAR	P-Val	Neg.	Delta	P-Val
	(A-I) Top 50 deals since 2013			(A-II) Top 50 deals before 2013			(A-I) – (A-II)	
[-5;5]	0.06%		44%	1.66%	** *	40%	-1.60%	*
[0;2]	0.41%	*	36%	0.33%		36%	0.08%	
[0;5]	0.17%		42%	0.40%		46%	-0.23%	
	(B-I) Flop 50 deals since 2013			(B-II) Flop 50 deals before 2013			(B-I) – (B-II)	
[-5;5]	-0.11%		44%	-1.45%		48%	1.34%	
[0;2]	0.03%		42%	-0.67%	*	56%	0.70%	
[0;5]	-0.12%		54%	-1.51%	*	60%	1.39%	*

5. Conclusion

Through mergers and acquisitions in the last couple of years, the pharmaceutical industry has changed like never before. In order to keep pace with the dynamically changing industry due to continuing patent expiries of global blockbuster drugs, a slack in the industrywide R&D pipeline or an increasing cost pressure due to government health reforms such as the growing importance of cost-effective substitute products, the largest M&A wave ever since took place in the years 2013 to 2016. With our differentiated analysis approach of categorizing the events based on the acquirer's and target's business model in specialization, diversification and R&D-driven acquisitions, we were able to put the intra-industry M&A success factors in a new light.

The results of past M&A studies showed that acquirers faced negative returns at the acquisition announcement, resulting in significant losses. This rule no longer applies. As the first pharma-specific M&A study involving events in 2013 to 2016, it becomes obvious that the shareholder's reaction has changed. Taking together 886 acquisitions of the years 2000 to 2016 we find overarching acquirer returns of 1.2%, while there is clear outperformance of specialization deals with 2.3% in contrast to a diversification and R&D-driven acquisitions with 0.6% and 0.7%. The set of 26 deal, acquirer and target-specific qualitative and quantitative variables which were used for univariate and multivariate analyses highlighted that 19 had an overarching significant influence on the acquirer returns. The differentiated analyses outlined that, although the overall tendency for each variable is rather similar across the subgroups, significant differences between business models and M&A strategies exist, e.g. the relative transaction volume (A-DV/MC) for specialization deals is 5.8% vs. 0.9% for R&D acquisitions.

As a second step we showed that specific transaction types have a major impact on who is gaining abnormal return at all and to what extent. Supported by additional propensity score matching tests to increase the respective robustness, asset deal transactions with returns up to 2.5% clearly outperform complete acquisitions, not only for the full sample, but even compared to other specialization deals from an acquirer perspective. In parallel, the assessment of the selling company's coefficients revealed that there are clear differences with regards to the relevant value drivers. While the financial ratios are crucial for the acquirer (A-DV/MC, A-EBITDA, A-R&D and A-SALES), the seller's reaction is clearly driven by the company valuation ratios like Tobin's Q, Price-to-Book Ratio or the Return on Equity (S-Tq, S-PtBR, S-RoE).

The separate analysis of pure public acquisitions documented some of the highest target's returns given the past M&A literature. Although the overall abnormal return was on average roughly 30%, again there are major differences between the three subgroups. With roughly 50%, targets in R&D-related acquisitions gain more than twice as much of the relative value compared to the specialization and diversification targets with roughly 20%. Despite the clear results for the short-term market reaction, the multivariate models emphasized that none of the variables had a significant influence across the groups. However, again we see major differences in terms of

direction and magnitude for individual coefficients, e.g. if the acquiring company comes from the USA, the target's reaction is on average 35.8% higher for R&D targets than for diversification targets with -1.8%. The subsequent analysis auf the combined returns for both complete acquisitions as well as asset deals revealed that, although asset deals imply on overage the highest abnormal acquirer returns, the overall macroeconomic effect from buyer and seller combined equals each other out, meaning these deals appear value-neutral. In contrast, the complete acquisitions with up to 2.2% are in total value-enhancing, irrespective of the subgroup. However, again we see significant differences between the three acquisitions strategies. Although R&D targets had the highest returns, the combined effect of specialization transaction is by far the greatest compared to the other two types (3.4% vs. 1.9% and 2.1%).

Finally, we documented a clear paradigm shift of changed market reactions over time. Looking at the last M&A wave in the years from 2013 to 2016, we see a clear increase in abnormal returns of up to 2.4% compared to the years 2000 to 2012, further supported by additional Propensity Score Matching analyses. Due to the fact that this phenomena exists irrespectively of the transaction type, subgroup of company perspective, the overall industry situation seems to be responsible, which then has a direct influence not only to the affected M&A parties but as well to the competitors and the entire market. The final comparison of the market value-weighted competitor returns highlighted that besides the acquirer and the target company, the competitors face changed reactions too. Where there was a parallel movement of the acquirers' and competitors' abnormal announcement returns in the early years of the millennium, there is a shift towards the opposite direction, meaning that good news for the acquirer, now rather implies bad news for the competitors.

In summary, the study provides a new view at the M&A landscape in the pharmaceutical industry, while the differentiated transaction type approach can be easily extended to other industries as well. On one hand, the holistic view on the entire M&A landscape refutes the wide-spread paradigm of per se negative acquirer's reactions. Furthermore, the differentiated clustering in terms of business models and specialization strategies allows to highlight which takeover stra-tegies and influencing factors generally lead to superior short-term results amongst each other, finally emphasizing the criticality of a differentiated assessment of intra-industry takeovers.

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