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# **The Importance of R&D in Mergers and Acquisitions: Does Relatedness Matter?**

**Industrial and Financial Management  
Masters Thesis**

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## **Abstract**

There is a substantial amount of research indicating that M&As often fails in terms of creating value for the shareholders of the acquiring firm. Previous studies have found that as few as 20-40% of all M&As lead to value creation. In spite of this, M&As remains to be a popular growth strategy and as a result many researches have sought to investigate sources of value creation in this context. Emphasis has to a large extent focused on the relatedness and strategic fit between merging firms. Empirical findings on the subject, however, have provided inconsistent results on the matter.

By using R&D intensity as the main independent variable, this study aims to extend previous empirical findings on the subject of relatedness. It is hypothesized that an unrelated acquirer creates more value than a related when R&D intensity of the target is relatively high.

By applying an event study approach, our results suggest that the overall returns for acquiring firms are low. When solely comparing related and unrelated acquirers, it can be observed that returns for both sub-samples are essentially negative, although somewhat lower for unrelated firms. Furthermore, when introducing R&D intensity, our results support the hypothesis that there is a stronger association between R&D intensity and value creation in unrelated mergers than in related ones.

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## **I. Introduction**

### **1.2 Background**

Mergers and acquisitions (M&A) have during recent decades been subject to substantial growth, starting with the first merger wave on the U.S. market during the 1960s. However, M&A activity is no longer solely a U.S. event (Hitt, Harrison & Ireland, 2001). During the large M&A wave of the late 90s and early 2000s, European trading volumes equaled the volumes of the U.S. market (Gaughan, 2005). Summarized global statistics on M&A activity indicate a peak in 2007, with volumes of approximately 6000 billion USD. Since then, business volumes have dramatically decreased as a result of the financial crisis, and as of 2011 amounting to approximately 3000 billion USD <sup>1</sup>.

M&A theory suggests that synergy is an essential element for successful value creation (e.g. Harrison et al, 1991; Hitt et al, 2009). The general perception is that synergistic effects are achieved primarily through related M&As, i.e. mergers of two firms operating within the same line of business. The standard line of reasoning for this is the possibility of economies of scope and scale (Harrison et al., 1991). Synergies can according to Seth (1990) be found primarily within the following five areas: economies of scale, economies of scope, diversification, market power and coinsurance. Economies of scope and scale are by the nature of their benefits associated to related mergers, while diversification and coinsurance are connected to unrelated mergers (Seth 1990).

Maximizing shareholders' wealth is in theory in the first interest of all firms. However, adapting an M&A strategy to achieve growth and profit maximization does not necessarily go hand in hand with value creation. In fact, the vast majority of all M&As fail to create value for the shareholders of acquiring firms (Agrawal and Jaffe, 2000).

There is an ongoing debate on the importance of relatedness between merging firms in the context of value creation (Porter, 1987; Barney, 1988; Hitt et al,

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<sup>1</sup> [http://www.imaa-institute.org/statistics-mergers-acquisitions.html#MergersAcquisitions\\_Worldwide](http://www.imaa-institute.org/statistics-mergers-acquisitions.html#MergersAcquisitions_Worldwide)

2009). A popular assumption is that related mergers generally outperform unrelated mergers (e.g. Singh & Montgomery, 1987; Datta, Pinches & Narayan, 1991). However, empirical results remain inconsistent as other studies suggest that unrelated mergers are superior in terms of value creation (e.g. Harrison et al, 1991; Lubatkin, 1987).

Another way to increase innovation and growth is through investments in research and development (R&D). Several authors conclude a positive correlation between R&D expenditures and firm market value (e.g., Chauvin and Hirschey, 1993; Hall, 1988). Hall (1988) states that the rationale for this is that R&D expenses are seen as an intangible asset that will create positive cash flows in the future. Increased R&D expenditures may therefore lead to positive reactions on the market. As it is common for one firm to acquire another in order to get access to specific knowledge, R&D is sometimes also put in the context of M&As (Goold and Campbell, 1998). Goold and Campbell argue that the combination of knowledge in two different groups is an important source for synergy and value creation.

### **1.3 Problem discussion**

A general conception among managers has been that M&As is an efficient strategy to achieve growth and value maximization. However, empirical evidence shows that the majority of all M&As fail to create value (e.g. Porter, 1987; Dyer et. al. 2004), implying that this strategy is not very well applied in practice. Agrawal and Jaffe (2000) conclude that as few as 35-45 % of all M&As are successful.

Many researchers have sought to explain this phenomenon by identifying the strategic fit between merging firms as a crucial factor, often concluding that related mergers are more likely to succeed than unrelated mergers (e.g.Chatterjee et al., 1992). However, previous studies show mixed results on this matter as some conclude that related M&As are more likely to create value (e.g. Singh and Montgomery, 1987; Datta et al., 1992; Maquieira, 1998) while others suggest the opposite (e.g. Elgers and Clark, 1980; Hitt et al., 1991; Larsson and Finkelstein, 1999).

Earlier studies have also tried to investigate possible factors that influence value creation in M&As. Barney (1988) summarizes three situations in which the bidder might gain from an M&A; (1) when synergies appear from the merger, (2) when the bidding firm possesses private information about the target company that competing bidders do not possess, or (3) the number of targets are larger than the number of bidders. When speaking of synergies in unrelated M&As, one usually refers to financial synergies such as lower bankruptcy risk that appear through diversification (Steiner, 1975). In addition, Lubatkin (1987) mention lower cost of capital as a possible synergistic effect in unrelated M&As.

Although a majority of these studies have found related M&As to be superior in terms of overall value creation, the potential excess value created from a related acquisition appears to be absorbed by the target's shareholders (e.g. Singh & Montgomery, 1987; Seth, 1990; Lubatkin & O'Neil, 1988). Further, it is proposed by several researchers that unrelated M&As may in fact present at least an equal opportunity for value creation on behalf of the acquirer (e.g. Harrison et al., 1991; Barney, 1988; Larsson & Finkelstein, 1999).

Larsson and Finkelstein (1999) argue that the general conceptualization of the superiority of related mergers generally overlook the possibility of complementary synergies in unrelated mergers. In addition, they conclude that this serves as part of the explanation for the inconsistent results in previous research. Harrison et al. (1991) suggests that differences in resource allocation patterns between merging firms potentially can create unique synergies, including value creation for shareholders of the acquiring firm. In essence, the common perception that relatedness is a necessity in order to create value through M&As may be an inconsistent notion with regards to empirical findings in previous research. Based solely on this inconsistency, we find that M&As constitutes an interesting area to further explore.

R&D has in the context of mergers and acquisitions been subject to investigation. Several studies suggest that there is a negative relationship between engaging in M&A activity and investing in R&D (Burgelman, 1986; Hitt et al., 1991). This explains the growth strategy adopted by managers, where one strategy tends to exclude the other (Hitt et al., 1991). More specifically, managers choose between whether to grow through acquisitions or organically by investing in R&D.

Several studies have suggested that acquirers may gain greater value by exploring companies with differences in resource allocation patterns, contradictory to what is generally proposed in M&A theory (Barney, 1988; Harrison et al., 1991). In addition, Goold and Campbell (1998) proposed that synergy between firms could be achieved simply by exposing one set of people to another with a different mindset. Given the nature of unrelated acquisitions, different know-how between the firms assumingly exists; hence, the reasoning by Goold and Campbell therefore appears fitting for unrelated mergers.

Another interesting dimension is the level of impact of R&D throughout M&As. Embarking from the findings presented by Barney (1988), in combination with what is suggested by Harrison et al. (1991) and Goold and Campbell (1991), acquiring R&D intensive unrelated firms may represent a source of value creation for acquirers. Given these circumstances, we find that by comparing the R&D intensity between merging firms, and subsequently analyzing whether it has any implications on value creation, presents an interesting angle on the subject of M&As.

#### **1.4 Purpose statement**

The main purpose of this paper is to shed light on possible associations between R&D intensity and value creation in related/unrelated M&As. We also aim to contribute to previous research surrounding relatedness in M&As. The paper will be based on the following questions: *(1) Do unrelated mergers perform better than related? (2) Do investor value R&D intensity more in unrelated mergers than in related?*



## **II. Theory and Hypothesis**

### *2.2 Value Creation in M&As*

On the subject of value creation in M&As, Seth (1990) identified five primary areas where value is created: market power, economies of scope, economies of scale, financial diversification and coinsurance. Market power is defined as the ability to which a market participant or a group of participants can control the price, nature of the products sold or the product volume, and as a result generate extra-normal profits. Market power as a source of value creation in acquisitions is according to Seth (1990) especially associated with related, horizontal acquisitions, referring to previous research by Eckbo (1983) and Stillman (1983).

Gains achieved through economies of scale are generally found within the areas of purchasing or inventory management in scenarios in which the merging firms' operations include common raw materials or basic components. Economies of scale can also be achieved within different areas of a business such as advertising, distribution and R&D. As previously mentioned, economies of scale are by the nature of its benefits inherently linked to related acquisitions rather than unrelated acquisitions (Seth, 1990).

Economies of scope exist in a scenario when the cost of joint production for two products by a multi-product firm is less than the cost would be if two different firms would produce them separately (shareable inputs being the essential ingredient) (Seth, 1990). In addition, economies of scope may be achieved through the sharing of know-how or other intangible assets (Teece, 1980). Given the diverse nature of products brought together in unrelated mergers, economies of scope are as economies of scale, generally achieved in related ones (Seth 1990).

Seth (1990) finds that risk diversification is inherently associated with unrelated acquisitions. By acquiring a company with a different business cycle to its own, the acquirer will stabilize its income streams and reduce variance of the returns. Although several authors (e.g. Beattie, 1980) suggest that this sort of income smoothing is positively valued by investors, Seth (1990) argues that risk-averse investors typically diversify their own portfolios. Risk-pooling will (according to the theory of perfect markets) not lead to a positive re-evaluation of the one

company since the strategy can easily be adopted by individual investors. Overall, Seth (1990) underlines that markets aren't always perfect and that risk diversification therefore can be desirable under certain circumstances.

Coinsurance acts as a pure financial rationale for merging firms with less than perfectly correlated income streams. Following Lewellen (1971), Higgins and Shall (1975) argue that coinsurance leads to lower bankruptcy risk as a result of the imperfect correlating earnings of the merging firms. In turn, this will lead to higher expected cash flows to lenders, and according to Seth (1990), possibly higher debt capacity due to the increased leverage of the combined firms.

Lubatkin (1983) concluded that on average acquiring firms did not generate abnormal returns to its shareholders. In addition, in a comprehensive analysis of the extensive research conducted since the 70's on the subject of abnormal returns for acquiring firms, Bruner (2004) concludes that returns to shareholders have been essentially zero. However, when measuring value creation in the context of mergers and acquisitions, consideration of the current economic state should also be taken into account (Lubatkin & O'Neil, 1988). This leads to our first hypothesis:

**H<sub>1</sub>**: M&As do not create value for the shareholders.

### *2.3 The Role of Relatedness*

A common perception is that related acquisitions generally outperform unrelated acquisitions (e.g. Datta, Pinches & Narayan, 1991; Singh & Montgomery, 1987). However, empirical evidence has reported inconsistent results, where other researchers suggest that unrelated acquisitions may be superior in terms of value creation (e.g. Larsson & Finkelstien, 1999; Harrison et al., 1991; Lubatkin, 1987). In addition, a number of studies play down the role of relatedness, as they found no significant evidence of either merger type performing better than the other (Porter, 1987; Barney, 1988).

Singh & Montgomery (1987) found that although related acquisitions tend to outperform unrelated acquisitions, the target firm generally obtained the excess value created from the merger. Moreover, several studies have hypothesized that there are several features that tend to lead to higher value creation in unrelated transactions. Lubatkin (1983) and Campa and Kedia (2002) conclude that

unrelated M&As may be value enhancing if merger motives are part of a diversification-strategy. Accordingly, Steiner (1975) found that diversification (in terms of acquiring unrelated businesses) leads to cheaper cost of capital. Furthermore, Seth (1990) concludes that it provides income stability and lower bankruptcy risk. In accordance with the findings of Fama (1970), Barney (1988) and Lubatkin and O'Neil (1988) emphasizes that the majority of the excess value created in an acquisition is distributed to the shareholders of the target as a result of the bidding process. Therefore, it is suggested in their studies that the acquirer may gain greater value by avoiding an auction scenario and, hence, avoiding the winners' curse of overpaying.

Furthermore, Barney (1988) suggests that abnormal returns to the shareholders of the acquirer can be achieved when the merging firms enjoy private, uniquely or inimitable synergistic cash flows. Uniquely or inimitable synergistic cash flows exists when one of the bidders will gain greater value than its competitors as a result of a potential merger. According to Barney, the combined factors stated above should potentially mean that an auction scenario could be avoided because of the private synergy of the one company. In essence, the acquirer may be able to create abnormal returns to its shareholders as a result of a combined effect of the absence of an auction and the unique synergy.

Auctions, as described above, tend to lead to higher acquisition prices in market economies (Barney 1988; Lubatkin & O'Neil, 1988). al., 1991). In line with Barney (1988), Harrison et al. (1991) underline that the question does not lie within relatedness, but points out that unrelated acquisitions are more likely achieve the combination of a unique synergy and at the same time avoid auctions. Accordingly, we hypothesize:

**H<sub>2</sub>:** Investors react more positively to unrelated M&As than to related M&As.

#### *2.4 M&As and R&D*

A large amount of studies have been done on the subject of market reactions to R&D expenditures (e.g. Chan et al. 1990; Griliches, 1981; Woolridge, 1988). This research is based on the idea that R&D is a source of creation for intangible capital. Furthermore, it is argued that the market value of a firm thereby should

be reflected by the expected returns from the intangible capital created from R&D expenditures (Johnson and Pazderka, 1993). The vast majority of these studies report a positive correlation between R&D expenditures and market value of firms (e.g. Griliches, 1981; Johnson and Pazderka, 1993; Woolridge, 1988).

Previous studies have found that *corporate level* synergies created from a merger may be more closely related to enhanced performance than those that achieve *operational level* synergies (Harrison et al., 1991; Grant, 1988). Corporate level synergies may be achieved from combinations of intangible resources, for instance, R&D or marketing skills (Yavitz & Newman, 1982; Harrison et al., 1991). It can be argued that corporate level synergy is associated with know-how, and that the combination of different know-how therefore may lead to valuable synergistic effects. Goold and Campbell (1988) provides additional support for this notion, as they propose that synergy is created simply by exposing one set of people to another one with a different mindset. Given that research and development by its nature is a type of know-how, acquiring R&D intensive unrelated firms may present a source of value creation for acquiring firms.

Companies that have adopted an acquisitive growth strategy generally become less R&D intensive (Hitt et al., 1989; Hitt et al., 1991). More specifically, acquiring companies tend to overlook R&D investments and organic growth and instead focusing solely on acquisitive growth. This can be explained by several reasons. First of all, an acquisitive growth strategy is associated with high amounts of managerial time, thus, leaving little time for R&D (Hitt et al., 1989; Jemison & Sitkin, 1986). Extensive preparations and sometimes time consuming negotiations before an acquisition may divert managerial focus from long time investments, such as R&D (Hitt et al., 1989). Further, with the acquisition being a risk in itself, managers tend to put off R&D investments as that also is considered as a risky investment (Constable, 1986). An important part of a merger is, of course, the post merger integration process (Hitt et al., 2009). Kitching (1973) suggests that as many as half of all unsuccessful mergers are a result of poor post merger integration, adding that it might take a long time to achieve profitability from a merger.

### *2.5 Relatedness and R&D*

Swaminatan et al. (2008) argues that the combination of two merging firms' R&D is not necessarily compatible in spite of them operating within the same line of business. This further emphasizes the difficulties of post merger integration. According to Hitt et al. (2009), synergy is achieved primarily through complementary capabilities. Therefore, it can be argued that unrelated mergers may be a better fit in terms of acquiring R&D intensive firms. This notion is also associated with the difficulties of post merger integration. Since little or no integration of the acquired business in an unrelated M&A is needed, post merger integration is rarely an issue.

Even though businesses are not necessarily integrated with each other in unrelated mergers (i.e. diversifying mergers), learning between organizations is still important and corporate level synergy may still be obtained (Hitt et al., 2009). In other words, potential corporate level synergy may be created through the combination of different know-how between executives, even though the merging firms are not related per se (Goold & Campbell, 1988).

Resource allocation between the merging firms is often associated with relatedness. However, it is suggested by Harrison et al. (1991) that differences in resource allocation between the merging firms may be more lucrative than previously disclosed. In an attempt to evolve the findings of Barney (1988), Harrison et al. (1991) suggests that by seeking targets with differences in resource allocation patterns to its own, companies may be able to avoid the risk of overpaying.

Porter (1987) suggested that transferring of skills resulted in synergistic gains. This is essentially what is suggested by Harrison et al. (1991), as they argue that synergy may be obtained when merging firms possess strengths in different areas. For instance, if the acquirer possesses a weakness in R&D where the target instead is strong or vice versa. Harrison et al. (1991) states that these skills may be transferred as a result of the merger and thereby create synergy. In addition, Swaminatan et al. (2008) illustrates the importance of R&D with reference to a more rapidly shifting global market. Companies are hereby presented with two options; they can either invest in R&D themselves or acquire R&D through M&As.

Based on the notions presented above, we argue that unrelated acquirers should enjoy greater potential benefits when acquiring R&D intensive firms. First of all, corporate level synergies in terms of skill transfers and sharing of know-how theoretically would be greater in unrelated acquisitions. Secondly, the issue of post merger integration is generally not present in unrelated acquisitions. This in combination with the decreased risk of overpaying concluded by Harrison et al. (1991) leads to our third hypothesis:

**H<sub>3</sub>:** There is a stronger association between value creation and R&D intensity in unrelated M&As than there is in related M&As.

Above, arguments for our three hypotheses have been presented. Firstly, in line with several previous researchers, we argue that M&As do not create value for the shareholders. Secondly, the vast majority of the existing literature suggests that related acquisitions are superior in terms of creating value for shareholders. We present arguments for the opposite hypothesis; the risk of overpaying due to an auction decreases in unrelated M&As, acquirers enjoy lower bankruptcy risk and thereby lower cost of capital, and corporate level synergies through complementary capabilities and sharing of know-how are achieved. Lastly, R&D is a crucial aspect in the rapidly shifting global market, where technology constantly progresses. In unrelated acquisitions, corporate level synergy may be obtained in spite of that the companies are not necessarily integrated with each other. Further, no issues of post merger integration are present in unrelated mergers and the risk of overpaying as proposed by Harrison et al. (1991) is decreased when the target has differences in resource allocation patterns. Based on these arguments, we seek to find a stronger association between value creation and R&D intensity in unrelated M&As.

### **III. Methodology**

#### **3.2 Research design**

Since the purpose of this paper is to investigate how the market judges possible value creation through M&As, we have applied an event study approach where abnormal and cumulative abnormal returns (CARs) were calculated (Seth, 1990). The study can be classified as a quantitative comparative analysis as we compare related and unrelated M&As. Furthermore, the study will focus solely on the bidding firm, hence, abnormal returns to shareholders of the target firm will not be accounted for.

#### **3.3 Sample and Categorization**

##### *3.3.2 Sample Collection*

M&A data from U.S. firms between 2005 and 2012 was collected from the Zephyr database, offered by Bureau van Dijk, which contains information from over 500,000 deals. Firm specific stock data and financial statements were collected from Datastream. Due to the possibility of a few European target firms within our sample, the specific time frame was chosen in order to improve comparability regarding the reporting of R&D expenditures. The IFRS, which serves as the European counterpart to US GAAP was introduced in the European Union in 2005. All publicly traded companies within the European Union are obligated to report in accordance with the IFRS. Regulations regarding the reporting of R&D are similar between US GAAP and IFRS, thereby comparable in this study. Comparability of financial statements is crucial as R&D expenditures compose a part of the main independent variable in this paper.

##### *3.3.3 Sample Constraints*

The following constraints were applied to our sample: (1) The acquiring firm must be listed and 292 data points of trading days prior to the announcement date must be available. This is in order to capture 250 observations but simultaneously exclude a 42-day period prior to the announcement date due to possible information leakage (Schwert, 1996). (2) Only friendly offers were included in the sample since several authors conclude that the deal type affect abnormal returns (e.g. Cosh & Guest, 2001; Raj & Forsyth, 2002). Therefore, in order to achieve a homogenous sample, all hostile bids were excluded. (3) Deals

were also excluded if the acquirer already possessed a controlling stake (i.e. > 50%) in the target firm prior to the merger (Craninckx and Huyghebaert, 2011). (4) In line with McGahan (1999), all firms with a SIC code starting with 6 (financial institutions and insurance companies) have also been deleted. The final sample contained 131 deals. Relevant deal characteristics are presented in Table I and a distribution by primary firm sector is presented in Table II.

### 3.3.4 Defining Relatedness

Like in many similar studies, SIC-codes have been used as a measure of relatedness (e.g. Flanagan, 1996; Kaplan, 1992). Following Flanagan (1996), a merger has been defined as related on a three-digit basis, i.e., the first three digits must be identical for the merging firms. For unrelated mergers, the first digit in the SIC-codes must differ between the firms.

**Table I**  
**Deal characteristics**

The table provides relevant deal characteristics for all 131 mergers included in the sample. *Domestic* relates to a merger where both merging firms are American and *Cross-border* relates to a merger where the target firm is non-American. *Cash Payment* relates to a 100% cash offer by the acquiring firm. *Listed-* and *Unlisted target* relates to whether the target firm was listed and publicly traded or not.

	<b>Full Sample</b>		<b>Related</b>		<b>Unrelated</b>	
	N	%	N	%	N	%
Domestic	121	93.08	74	91.34	47	94.00
Cross-border	10	6.92	7	8.66	3	6.00
Cash Payment	66	50.38	19	23.46	47	94.00
Stock Payment	65	49.62	62	76.54	3	6.00
Listed target	50	38.17	20	24.69	30	60.00
Unlisted target	81	61.83	61	75.31	20	40.00



**Table II**  
**Distribution of Primary Sector**

A. Bidding firms.		Full Sample		Related		Unrelated	
		N	%	N	%	N	%
First SIC code digit	Sector						
0	Agriculture	1	0.76	1	1.23	0	0
1	Mining & construction	4	3.05	4	4.94	0	0
2	Food, textiles & chemicals	13	9.92	1	1.23	12	24.00
3	Manufacturing	53	40.46	33	40.47	20	40.00
4	Transportation	4	3.05	3	3.70	1	2.00
5	Wholesale & retail trade	9	6.87	2	2.47	7	14.00
7	Lodging & entertainment	40	30.53	33	40.47	7	14.00
8	Services	7	5.34	4	4.94	3	6.00

  

B. Target firms.		Full Sample		Related		Unrelated	
		N	%	N	%	N	%
First SIC code digit	Sector						
0	Agriculture	1	0.76	1	1.23	0	0
1	Mining & construction	4	3.05	4	4.94	0	0
2	Food, textiles & chemicals	4	3.05	1	1.23	3	6.00
3	Manufacturing	46	35.11	33	40.47	13	26.00
4	Transportation	4	3.05	3	3.70	1	2.00
5	Wholesale & retail trade	6	4.58	2	2.47	4	8.00
7	Lodging & entertainment	51	38.93	33	40.47	18	36.00
8	Services	15	11.45	4	4.94	11	22.00

### 3.4 Variables and Event Windows

#### 3.4.2 Abnormal Returns

Following a large number of authors (e.g. Seth, 1990; Flanagan, 1996; Swaminathan et al., 2008), abnormal returns (*AR*) have been used as a measure of value creation. Abnormal returns are defined as:

$$AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt})$$

where  $AR_{it}$  is the abnormal shareholder return for stock  $i$  at time  $t$ .  $R_{it}$  is the rate of return for stock  $i$  at time  $t$ . Alpha was calculated by  $E(R_{it}) - \beta_i \times E(R_{mt})$ . The capital asset pricing model provided the basis for  $E(R_{it})$  where the S&P500 composite index represented the market portfolio and 3-month U.S. Treasury-bills were used for the risk free rate. Previous researchers have used a wide variety of timeframes in order to estimate the firm specific parameters  $\beta_i$  and  $\alpha_i$  (e.g., Lambert and Larcker, 1985; Flangan, 1996). Roll (1992) states that there is

a trade off between using a large number of data points in order to achieve high statistical accuracy and not going too far back in time since there might have been a shift in the parameters of the return generating mechanism. We chose to estimate systematic risk and alpha by using ordinary least squares of daily returns for a 250-day period. Further, in line with the findings of Schwert (1996), 42 days prior to the event date were excluded in order to ensure that the parameters would not be affected by factors such as information leakage. Hence, our estimations are based on 250 days up until 42 days prior to the event date (-292, -42).

Since the purpose of this paper is to investigate how the market judges possible value creation through a merger, CARs for various time windows around the announcement date have been calculated. Calculations were made only on behalf of the acquiring firm; consequently, no investigation of abnormal returns to the targets' shareholders has been conducted. CARs were formulated as:

$$CAR_i(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AR_{it}$$

### 3.4.3 Independent Variables

As the main purpose is to investigate whether differences in R&D intensity between merging firms have diverse implications on related as opposed to unrelated acquirers, R&D intensity has been used as the main independent variable. Following previous studies, R&D intensity is defined as the ratio between total R&D expenditures divided by total sales for the year prior to the announcement date (Chan et al., 2001 and Harrison et al., 1991). Further, the difference between the merging firms was calculated by subtracting the intensity of the acquirer from the target's. A positive residual would thereby mean that the target had a higher R&D intensity than the acquirer and vice versa.

Four additional independent variables have been used as control variables: (1) *Relative sales* was used as a size variable and measured by the target firm's total sales divided by the bidding firm's total sales in the year prior to announcement. (2) *Domestic* relates to whether both merging firms are American or not. (3) *Payment* relates to whether the bid was a 100% cash offer or not. (4) *Listing* relates to whether the target firm was listed and publicly traded during the time

of announcement or not. Furthermore, two additional independent variables, industry and year of announcement, were applied in order to check for the robustness of our results.

#### *3.4.4 Event Windows*

According to Hackbarth and Morellec (2008), the most reliable studies regarding value creation in the context of M&As are drawn from short-term event windows. Based on this statement, our main analysis is calculated on a three-day period around the announcement date (-1, 1). That is, from one day prior to one day post the announcement date. The day of announcement is a popular event date when measuring market reactions in the context of M&As (e.g. Flanagan, 1996; Singh and Montgomery, 1987). The rationale for this is based on the assumption of M&As being value creating and that such an announcement therefor should be considered as a serious sign of potential value creation. If the announcement appeared on a weekend, the first trading day post that weekend has been used.

In addition, we applied various event windows in order to capture possible patterns in the timeframe. Using several event windows also makes it possible to check for the robustness of our results. Four additional short-term windows were used: (-2, 1), (-3, 1), (-2, 2) and (-3, 3). Further, following the results of Schwert (1996), we calculate for a 42-day price run-up period (-42, -1).

### **3.5 Statistical tests**

Several statistical tests were applied to this study. Firstly, student's t-tests were made in order to test for significance of the empirical results (i.e. calculations of CARs). Secondly, to investigate the relationship between the dependent (CAR) and independent variables (R&D Intensity), pairwise correlations and multivariate regressions were made. Finally, similar tests were made for five additional time windows in order to check for the robustness of our model.

## IV. Empirical Results

### 4.2 Cumulative Average Abnormal Returns

Table III presents cumulative average abnormal returns for the combination of the two populations, as well as the two groups respectively for the main time window (-1, 1). First of all, it can be noted that the cumulative average abnormal returns for the entire sample amounts to - 0.77%. Moreover, the results show that although related acquirers on average perform better than its unrelated counterparts, the average abnormal returns for both sub-samples are negative. However, the results for related acquirers are not statistically significant.

Furthermore, the results show that 41.22% of the companies in the sample enjoy positive CARs over a three-day period around the announcement. For the sub-samples, the rates are 43.2% for related and 38% for unrelated firms.

**Table III**  
**Cumulative Average Abnormal Returns**

Table III provides CARs for the entire sample as well as for the two sub-samples respectively. The sample includes all M&As that meet the constraints described in Chapter 2. Standard deviations, t-statistics, number of observations and percentage of positive CARs (% CAR>0) are also displayed. A positive CAR implies a positive reaction to the new information on the stock market  
\*\* Implies significance at 5% level.

	CAAR	Std Dev.	t-stat	# of Obs.	% CAR > 0
<b>Total</b>	-0,77%	6,106%	-1,434	131	41,22%
<b>Related</b>	-0,31%	6,876%	-0,407	81	43,2%
<b>Unrelated</b>	-1,501%**	4,564%	-2,327	50	38,0%

### 4.3 Pairwise Correlations

In Table IV, pairwise correlations between the main dependent variable (-1.1), the main independent variable (*R&D intensity*) and additional independent control variables are displayed. For the total sample (Panel A), no correlation regarding R&D intensity is found. Further, Panel A only displays significant correlation for *Relative Size* and *Payment* (-0,322), implying that relatively large acquisitions are paid non-cash. However, when dividing the sample into its subsamples (Related and Unrelated), a clear pattern becomes visible.

There is a significant negative correlation between CAR and R&D intensity among related mergers. Among unrelated mergers, an opposite sign for the correlation is found, however, significant only at the 10% level.

Table IV also illustrates low, significant correlations between some of the control variables among related mergers, notably, *R&D intensity* and *Relative sales* (-0,262) and between *Relative sales* and *Payment* (-0,319), indicating that cash offers seem less favored when the target firm is relatively large. Panel B provides a negative correlation between *Domestic* and *Listing* (-0,361), implying that domestic targets tend to be unlisted in unrelated M&As. However, it can be observed that only 10 international targets were included in the total sample.

**Table IV**  
**Pairwise Correlations**

We provide Pearson's correlation coefficients for the dependent variable (CAR), the main independent variable (*R&D intensity*) as well as for four independent control variables. *R&D intensity* is the difference between R&D expenditures relative to sales in the merging firms. *Relative sales* is a variable measured by the target firm's total sales divided by the bidding firm's total sales in the year prior to announcement. *Domestic* is a dummy variable taking the value 1 if the target is a U.S. firm and 0 else. *Payment* is a dummy variable taking the value 1 if the payment method was 100% cash and 0 otherwise. *Listing* is a dummy variable taking the value 1 if the target was listed and 0 if it was not. \* implies significance at 10% level, \*\* at 5% level and \*\*\* at 1% level.

A. Total sample						
	1	2	3	4	5	6
1. CAR (-1, 1)	1	0,02	-0,029	0,09	0,005	0,035
2. R&D intensity		1	-0,102	0,047	0,119	0,08
3. Relative Size			1	0,049	-0,322***	-0,125
4. Domestic				1	0,132	0,146*
5. Payment					1	0,012
6. Listing						1
B. Related mergers						
	1	2	3	4	5	6
1. CAR (-1, 1)	1	-0,272**	-0,042	0,025	0,025	-0,019
2. R&D intensity		1	-0,262**	-0,724	0,272**	0,018
3. Relative Size			1	0,068	-0,319***	-0,18*
4. Domestic				1	-0,170	0,01
5. Payment					1	0,055
6. Listing						1
C. Unrelated mergers						
	1	2	3	4	5	6
1. CAR (-1, 1)	1	0,238*	-0,172	0,022	0,063	0,118
2. R&D intensity		1	-0,15	0,063	0,06	0,144
3. Relative Size			1	-0,049	-0,02	-0,202
4. Domestic				1	-0,06	-0,361***
5. Payment					1	0,042
6. Listing						1

#### 4.4 Regression analysis

In Table V, the main time window, CAR (-1, 1), have been regressed on *R&D intensity* as well as on four control variables for the total sample and the two subsamples respectively. In Model 1 the dependent variable is regressed solely on *R&D Intensity* while control variables have been included in Model 3. Unsurprisingly, the same pattern found in Table IV is revealed in the regression analysis. When the sample is treated as a whole, no significant association between CAR and *R&D Intensity* is found, regardless of the number of control variables. However, when the subsamples are treated separately, a distinct pattern arises.

In Model 4 and Model 7, control variables have been disregarded and a regression on *R&D intensity* individually is displayed. We find a significant negative association between CAR and *R&D intensity* for related mergers. That is, if the target firm has high R&D intensity relative to the bidding firm, the average reaction on the stock market will be negative over a 3-day period around the announcement date. Opposite findings are displayed for unrelated mergers, implying a positive average reaction if the target's R&D intensity is higher than the bidder's. However, this variable is only significant at the 10% level.

In Model 2, Model 5 and Model 8, *R&D intensity* is disregarded and the dependent variable is regressed solely on the control variables. Although these models display insignificant results through all variables, some interesting differences can be noted. First, shareholders' average reaction is positive if the target is a U.S. firm in related M&As. Further, for unrelated mergers, the average reaction among shareholders is positive if the target is publicly traded.

Model 3 and Model 6 display regressions when all variables are included. For related M&As, *R&D Intensity* changes from significant at 5% level to significant at 1% level. There is a minor change in the explanatory power (Adj.  $R^2$ ) from 0,066 to 0,068. An opposite change is displayed for unrelated mergers, where *R&D intensity* loses significance. Further, none of the control variables becomes significant<sup>2</sup>.

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<sup>2</sup> For robustness reasons, independent variables on type of industry and year of announcement were also applied to the sample as a whole. The results were in line with our initial findings.

Table V

**Multivariate Regressions of Related and Unrelated CARs**

The table reports multivariate regressions of three-day CARs around the announcement day (-1, 1) to acquiring firms in 81 related and 50 unrelated M&As as well as for the total sample. *R&D intensity* is the difference between R&D expenditures relative to sales in the merging firms. *Relative sales* is a variable measured by the target firm's sales divided by the bidding firm's sales in the year prior to announcement. *Domestic* is a dummy variable taking the value 1 if the target is a US firm and 0 else. *Payment* is a dummy variable taking the value 1 if the payment method was cash and 0 otherwise. *Listing* is a dummy variable taking the value 1 if the target was listed and 0 if it was

\* implies significance at 10% level, \*\* at 5% level and \*\*\* at 1% level.

	Total			Related			Unrelated		
	(M1)	(M2)	(M3)	(M4)	(M5)	(M6)	(M7)	(M8)	(M9)
R&D intensity	0,02		0,01	-0,279**		-0,345***	0,238*		0,208
	(-0,016)		(-0,017)	(-0,058)		(-0,062)	(-0,012)		(-0,013)
Relative sales		-0,029	-0,028		-0,045	-0,115		-0,153	-0,127
		(-0,362)	(-0,364)		(-0,417)	(-0,405)		(-0,034)	(-0,034)
Domestic		0,095	0,095		0,138	0,169		-0,014	-0,019
		(-1,984)	(-1,994)		(-2,802)	(-2,677)		(-2,618)	(-2,59)
Payment		0,008	0,007		0,036	0,114		0,056	0,044
		(-1,564)	(-1,578)		(-1,955)	(-1,906)		(-3,382)	(-3,35)
Listing		0,018	0,017		-0,03	-0,041		0,089	0,067
		(-1,178)	(-1,185)		(-1,773)	(-1,687)		(-1,477)	(-1,468)
n	131	131	131	81	81	81	50	50	50
Adj. R2	-0,007	-0,021	-0,029	0,066	-0,031	0,068	0,037	-0,045	-0,023



#### 4.5 Additional Time Windows

As mentioned above, additional time windows have been used in order to check for robustness and potential patterns over time. Table VI presents CAARs for all additional time windows used in this study. The pattern of related M&As performing better than unrelated remains constant over all time frames. In the largest short-time window (-3, 3), relatedness outperform the counterpart by approximately 3,5%. However, significance for CAARs among related M&As remains low. In line with the results for CAR (-1, 1), unrelated M&As generate significant negative returns over all short-term time windows. Further, the pattern is declining over the number of observed days. That is, the longer the time window, the more negative the returns get.

For the run-up period (-42, -1), we observe an average significant positive CAR of 17,3% for related M&As. In contradiction, a negative average CAR of 9,2% is found for unrelated M&As, however, insignificant.

**Table VI**  
**Cumulative Average Abnormal Returns**

Table VI provides CAARs over all observed time windows. \*\* implies significance at 5% level.

A. Related M&As					
	CAAR	Std Dev.	t-stat	# of Obs.	
CAR (-2, 1)	0,139%	8,371%	0,149	81	
CAR (-3, 1)	0,577%	8,995%	0,574	81	
CAR (-2, 2)	0,767%	1,075%	0,675	81	
CAR (-3, 3)	1,148%	1,263%	0,813	81	
CAR (-42,-1)	17,274%**	6,994%	2,209	81	
B. Unrelated M&As					
	CAAR	Std Dev.	t-stat	# of Obs.	
CAR (-2, 1)	-1,910%**	5,772%	-2,316	50	
CAR (-3, 1)	-1,877%**	6,472%	-2,031	50	
CAR (-2, 2)	-2,137%**	6,390%	-2,341	50	
CAR (-3, 3)	-2,40%**	8,241%	-2,039	50	
CAR (-42, -1)	-9,156%	50,48%	-1,27	50	

Below, Table VII displays regressions on all independent variables for each time window observed. As for the main time window (-1, 1) illustrated in Table V Model 6, *R&D Intensity* has a significant negative association with CAR also for the additional short-term windows among related M&As. This proves that the

model is robust to alternative time windows. Regarding the run-up period (-42, -1), the regression does not corroborate a strong association between *R&D Intensity* and CAR. For unrelated mergers, positive signs for *R&D Intensity* are visible for each time window. As for related M&As, this is in line with the results presented in Table V.

**Table VII**  
**Multivariate Regressions for Additional Time Windows**

The table reports multivariate regressions of CARs around the announcement date to acquiring firms in 81 related and 50 unrelated M&As over six time windows. Independent variables are equal to those presented in Table V. \*\* implies significance at 5% level and \*\*\* at 1% level.

A. Related mergers						
	CAR (-1, 1)	CAR (-2, 1)	CAR (-3, 1)	CAR (-2, 2)	CAR (-3, 3)	CAR (-42, -1)
R&D intensity	-0,345*** (0,062)	-0,225** (0,078)	-0,226** (0,084)	-0,23** (0,096)	-0,233** (0,115)	0,019 (0,643)
Relative sales	-0,115 (0,405)	-0,055 (0,516)	-0,129 (0,555)	-0,115 (0,627)	-0,322*** (0,753)	-0,236 (4,226)
Domestic	0,169 (2,677)	0,077 (3,410)	0,049 (3,668)	0,056 (4,149)	0,038 (4,982)	-0,057 (27,949)
Payment	0,114 (1,906)	0,146 (2,428)	0,06 (2,612)	0,075 (2,954)	-0,022 (3,547)	-0,268 (19,898)
Listing	-0,041 (1,687)	-0,012 (2,149)	-0,001 (2,312)	-0,044 (2,614)	-0,061 (3,139)	-0,098 (17,612)
n	81	81	81	81	81	81
Adj. R2	0,068	-0,007	-0,01	-0,009	0,055	0,03
B. Unrelated mergers						
	CAR (-1, 1)	CAR (-2, 1)	CAR (-3, 1)	CAR (-2, 2)	CAR (-3, 3)	CAR (-42, -1)
R&D intensity	0,208 (0,013)	0,19 (0,017)	0,151 (0,019)	0,173 (0,019)	0,123 (0,024)	0,042 (0,148)
Relative sales	-0,127 (0,034)	-0,075 (0,044)	-0,072 (0,050)	-0,066 (0,049)	-0,012 (0,064)	0,144 (0,386)
Domestic	-0,019 (2,590)	-0,106 (3,341)	-0,109 (3,790)	-0,104 (3,725)	-0,129 (4,853)	-0,129 (29,359)
Payment	0,044 (3,350)	0,032 (4,321)	0,01 (4,902)	0,019 (4,819)	-0,054 (6,277)	-0,097 (37,975)
Listing	0,067 (1,468)	0,082 (1,894)	0,028 (2,149)	0,058 (2,112)	0,029 (2,751)	-0,044 (16,644)
n	50	50	50	50	50	50
Adj. R2	-0,023	-0,043	-0,067	-0,058	-0,079	-0,053

## **V. Discussion**

### **5.2 Hypothesis 1 & 2**

This study tests three hypotheses. Firstly, we hypothesized that M&As do not create value for the shareholders. Secondly, we expected to find unrelated mergers outperforming related ones. Our results suggest that there is no evidence for larger abnormal returns for acquirers in unrelated M&As around the announcement date. In contrast, the mean value (CAAR) is 1,2% lower for unrelated mergers. Based solely on these results, it would appear that our second hypothesis could not be accepted. However, before such a conclusion can be made the reliability of the data must be evaluated.

As visualized in Table III, CAARs are negative for the entire population, as well as for the two sub-samples respectively. However, only the results for unrelated acquirers (-1.501 %) show significance at the 5% level. Our results do indicate that related acquirers on average tend to perform better than acquirers in unrelated M&As.

Unlike what is proposed by studies suggesting that unrelated mergers are superior in terms of value creation on behalf of the acquirer, our results cannot be considered to support that notion. In contrast, these results, in spite of not being significant, appear to be in line with previous studies indicating low overall returns for acquiring firms (Bruner, 2004; Porter, 1987; Lubatkin, 1983). Our findings also seem to correspond with studies indicating that no significant importance can be stressed on the relatedness between firms in M&As (Porter, 1987; Barney, 1988). More specifically, no performance difference between the merger types can be established in this study.

Furthermore, additional time windows were used in order check for robustness within the sample. Table VI presents CAARs for all the observed time windows. It can be noted that a pattern arises in both sub-samples, where related acquirers appear to achieve greater returns for each extended time window. The negative returns presented in Table III transforms into a significant positive CAAR value of 17.274% for the longest time window (CAR -42,1). The opposite pattern can be observed for unrelated acquirers, where the returns become increasingly negative for each of the extended time windows. However, as the CAAR value

remains significant for all time windows except for the longest among unrelated acquirers, the opposite scenario is observed for related acquirers. Therefore, no immediate conclusions can be drawn from these results, in spite of the pattern.

It has been argued in research that firms that actively engage in M&A activity as part of a diversification strategy may create value for its investors (Swaminatan et al., 2008). Accordingly, the underlying reasons for engaging in M&As are important to understand. However, since we have no knowledge of the fundamental reasons behind the mergers observed in this study, no conclusions regarding the success of different merger strategies can be made. By gaining greater insight to the individual merger motives, one might be able to understand and explain our results to a greater extent.

### 5.3 Hypothesis 3

Lastly, it was hypothesized that if the target had a higher relative R&D intensity than the acquirer, unrelated mergers will outperform related counterparts. Table V provides results for the multivariate regression, where associations between CARs and the main independent variable as well as additional control variables are presented. It can be noted that none of the variables have a significant implication on the value creation (CAR -1, 1) when the sample is treated as a whole. When the sample is divided into its respective sub-samples, however, significance is achieved for R&D intensity in both samples. As hypothesized, our results show that unrelated mergers outperformed related mergers when acquiring, relative to it self, R&D intensive firms. More specifically, Table V (Model 4) indicates that CAR (-1, 1) drops 27,9% if *R&D Intensity* increases by 1. In contrast, unrelated acquirers would gain 23,8% if *R&D Intensity* increased by 1 (Model 7). Consequently,  $H_3$  can be accepted.

Elaborating on arguments stated by Barney (1988), our results suggest that unique synergy might be obtained in unrelated mergers if the target firm is R&D intensive. Further, our results partly confirm and partly question the conclusions made by Harrison et al. (1991). In line with Harrison et al., high R&D intensity in the target firm seems to be a source of value creation. However, this is only true for merging firms operating in different sectors. In contrast, high R&D intensity in the target firm seems to be a value destroyer among related mergers. This fact highlights the importance and difficulties of the integration process stated by

Hitt et al. (2009). Our findings also strengthen the arguments stated by Swaminathan et al. (2008), namely that two firms' R&D departments are not necessarily compatible just because they operate within the same line of business. We confirm that investors are aware of compatibility and integration difficulties and thereby value a merger in spite of this knowledge. It is here proposed that opposite results between the sub-samples are found for several reasons. The potential corporate level synergy that arises in an unrelated merger seems to be highly valued by investors. Since corporate level synergy and diversification are the rational reasons for unrelated M&As, there is no need for actually merging the firms' operational businesses. In other words, in an unrelated merger, the two firms' R&D departments will continue to function independently from each other and no particular risk of an integration failure is present. Lastly, in line with Harrison et al. (1991) we argue that the risk of overpaying decreases when there are differences in resource allocation patterns between the merging firms.

The difference between the sub-samples, in spite of being substantial, cannot be fully established with regards to the statistical significance of our results. The fact that significance is achieved for related but not for unrelated acquirers (significant at the 10% level) may be due to the different sample sizes in the respective sub-samples. As presented in Table III, the sample size for related mergers amounts to 81, while the corresponding number for unrelated mergers is 50. It is possible that significance at the 5% level could be achieved for unrelated mergers with an increased sample.

Table VI and Table VII show that our results are robust to variations in time windows, however, only for related mergers. Regardless of which time window is chosen, the results points towards significant negative results for unrelated mergers. Note that our results, in line with the conclusions made by Schwert (1996), suggest positive CARs for the run-up period of 17,3%. However, this is only true for related M&As. Regarding the unrelated sub-sample, a negative run-up of 9% is displayed in Table VI. Although CARs for the run-up period among unrelated M&As fail to obtain significance, our results suggest that investors are more skeptical towards unrelated M&As during a 42-day period prior to the announcement date.

Further, a negative reaction to R&D intensity in the target firm among related mergers is displayed for all time windows. Significance for unrelated mergers remains low throughout all time windows, indicating that further research is needed. Even though a sample size of 50 can be considered fairly large, an increased sample might reach significant results also for the sub-sample of unrelated mergers.

## **VI. Conclusions**

The objective of this paper is threefold. Firstly, we investigate whether M&As create value for the shareholder. Further, we compare value creation between related and unrelated M&As. Lastly, we examine possible differences in shareholder reactions towards R&D intensity depending on the strategic fit of two merging firms.

By applying an event study approach with the sample of 81 unrelated and 50 related M&As between 2005 and 2012, our results suggest that no value is created through M&As. Further, there is a small deviation in investors' reactions depending on relatedness. In this study, related mergers outperform unrelated by 1,2%. Negative cumulative abnormal returns for both related and unrelated mergers were found, although only significant for the latter.

As hypothesized, the results support our argument that differences in R&D intensity might be a source of value creation in unrelated M&As while contradict results were obtained for the opposite sub-sample. In other words, differences in resource patterns connected to intangible assets such as R&D might be a source to value creation in unrelated but not in related M&As. However, when controlling for various independent variables, significance was lost for the sample of unrelated mergers, suggesting that further research is needed.

We argue that the findings of this study justifies the need for further research regarding the implications of R&D intensity as well as other intangible resources in the context of M&As.

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