

Bachelor Thesis  
Economie & Bedrijfseconomie

*The operational effects of mergers and acquisitions  
within the European Union*

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## **Abstract**

This paper examines the operating performance of mergers and acquisitions within the European Union. The data is collected from the period 2009 until 2015 and consists of 1484 deals. All of the eight accounting-based measures that are examined in this paper use EBITDA as proxy to examine the operating performance. It is corrected for both changes in working capital and industry effects. For comparison across deals, the measure is deflated by assets or revenue. Classic and newly introduced determinants are checked for influence on the post-event operating performance. These are: cross-border effect, experience of the acquirer effects, industry relatedness, method of payment, relative size, leverage of the acquirer, and the cash position of the acquirer. The experience of the acquirer within M&A and the pre-event operating performance has positive significant effects on the post-event operating performance. The relative size of the target has a significant negative effect. The research concludes, based on the preferred operating measure, that there is a positive relation of a merger or acquisition on the operating performance of the firm. This effect is significant at the 5% level. The change in operating performance was significantly negative for the all models that did not take the change in working capital into account. All other change models show no significant effect. Comparing the change model with the OLS model, based on the preferred operating measure. There is still a positive effect of merger and acquisitions on the operating performance of the firm, while controlled for the named variables. This effect is however not significant. This means that there is no statistical significant reason to conclude that the operating performance of the combined firm after a merger or acquisition differs significantly from the situation before the merger or acquisition, when controlled for the named determinants/variables.

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## 1. Introduction

With transaction volume within the market of global merger and acquisition (hereafter referred to as “M&A”) reaching 4.1 trillion dollars in 2018, we can safely state that the subject is of broad and current interest. After a significant decline during and shortly after the ‘08 crisis, the global M&A market recovered well. 2018 was recorded to have the third highest ever recorded year in M&A volume (JP Morgan, 2019). The key drivers of this growth in M&A activity are low borrowing costs, stronger balance sheets, positive global growth and stronger cash flows. The US tax reform implementation that came into effect in 2018 also played a significant part in the recent M&A growth by providing access to overseas funds and higher cash flows (JP Morgan, 2019).

Earlier research put most of the focus on the short term returns of mergers and/or acquisition announcements, measured by the means of market-based returns (Martynova, Oosting, & Renneboog, 2006). This however introduces the problem that before any conclusion can be made, you have to assume that markets are efficient.

More recent research focus on accounting-based measures to research the profitability of the M&A-deal. Accounting-based measures are, in contrary to market-based measures, backward-looking. They might therefore introduce less biases and hence, might be a better way of examining the real performance. Past research using this measure is inconsistent and can have contradicting conclusions. Heron & Lie (2002) saw a significant increase in post-M&A operating performance. Whereas Clark & Ofek (1994) saw a significant decline over the 3 years following M&As. Gosh (2001) saw no significant effect of M&As on operating performance. One of the contributing reasons for the differences between these studies is the way operating performance is measured. How this paper handles the differences around the choice of operating performance measure will be discussed in the next section.

This paper tries to contribute to existing literature on many points. Firstly, this study tries to contribute to existing literature by expanding the literature on the accounting-based approach of looking at M&A. This is needed as current research is contradictive. Secondly, this paper uses a more recent time frame. Almost all previous studies use sample periods that lay within the last century. Using a more recent sample period might reveal interesting insights. Thirdly, this paper

will focus on mergers and acquisitions within Europe. As empirical research on M&A operating performance within Europe is very limited and again uses older data. One of the most recent research papers (Martynova, Oosting, & Renneboog, 2006) uses data between 1997 and 2001. Whereas the paper Gugler (2003) uses even older data (1981-1998). The final contribution to existing literature is the introduction of an additional hypothesis/variable. Namely, the experience of the acquirer within the field of mergers and acquisitions and its effect on the operating performance. Intuitive it should be quite logical that if a company (and therefore its employees) has more experience in something it is better able to perform that task. Research however suggests that there is an overall U-shaped relationship between experience and M&A performance (Haleblian & Finkelstein, 1999).

The dataset used in this paper consists of 1484 number of deals within the timeframe of 1/1/2009 until 31/12/2015. The M&A-event data is collected from Zyper and the accounting data is collected from Orbis. These databases are both managed by Bureau van Dijk. All variables are present in these databases or can be computed by using variables of these databases. For the methodology, the approach of Martynova et al. (2006) is used for both combining the firms prior to the merger, as well as the used models.

The rest of this paper is organized as follows. Section 2 is the literature review and is divided between the literature on mergers and acquisitions in general, the performance of mergers and acquisitions, the literature on the performance measures used and the determinants of the post-transaction performance. Section 3 gives insights on the used methodology. The data is discussed in section 4 and the results are presented in section 5. Finally, section 6 will consist of the conclusion and suggestions for future research.

## 2. Literature Review

### 2.1 Literature on mergers and acquisitions

Before we go deeper into the literature around the performance of M&A the ground work has to be established, namely why do firms engage in mergers and acquisitions? Halebian et al. (2009) reviewed 167 empirical articles, published from 1992 until 2009. They eventually come to the conclusion that there are four categories with regards to the reasons why firms would acquire or merge. These are: value creation, managerial self-interest, environmental factors and firm characteristics.

#### 2.1.1 Value Creation

The first way of creating value is by market power. The idea behind market power is that if you have a bigger share of the industry you are better able to control prices. An analysis of airline mergers of the 80s show that ticket prices on routes where there was no M&A activity were lower than for a matched sample of routes where there was M&A activity (Kim & Singal, 1993). This shows that M&A can lead to market power which may result in the fact that the firm can ask higher prices of the customer.

The second way to create value is efficiency. When the combined firm is more efficient than the two firms separate it can lead to value creation (Panzar & Willig, 1981). McGuckin & Nguyen (1995) give an example in their paper. They research 28,294 plants over the period 1977-1987. The findings suggest that plants that have a change in ownership show higher productivity.

The third value creation option is resource redeployment. When resources can be used twice for the same cost it can lead to value creation. The abnormal return of the acquirer is thus associated with the degree of resource complementarity between the target and the acquirer firm (King, Slotegraaf, & Kesner, 2008).

The last point of value creation is market discipline. When the target company is run by ineffective managers, market discipline can be used for value enhancement (Jensen, 1986). One example of discipline shown by the market is firing management. This is consistent with the findings that CEOs often get fired after the completion of an acquisition (Martin & McConnell, 1991).

### 2.1.2. Managerial self-interest

Manager's self-interest can be the reason for M&A. Evidence found for instance that the compensation of the CEO of the acquiring firm generally increases after an acquisition. Also, this increase is not linked to the performance of the acquisition itself (Harford & Li, 2007). A second element of managerial self-interest is managerial hubris. When managers are overconfident about their own abilities to make successful acquisitions it will often lead to value-destroying acquisitions (Hayward & Hambrick, 1997). This can be one of the explanations why Hayward (2001) found that experience and performance have a U-shaped relationship.

### 2.1.3. Environmental factors

The environment the companies are in can impact the likelihood of M&A activity. Beneish et al. (2008) for instance researched that sin industries are motivated by regulatory pressure to do domestic diversifying acquisitions. Network also plays a role. Research suggests that firms that have interlock partners that have a lot of M&A-activity will also themselves engage in more M&A-activity (Caldarelli & Catanzaro, 2004).

### 2.1.4. Firm characteristics

The characteristics of the acquirer can also play a role for M&A activity. Acquisition experience in the past for instance has a positive effect on the likelihood of an acquisition. Strategy and firm position can also play a role (Haleblian et al., 2006).

## 2.2 Literature on the performance of mergers and acquisitions

As the number of M&A deals and the total value of these deals increased, so did the coverage of the subject by academic literature.

Earlier research focuses mainly on examining the difference between the return of the bidder and the target. They use the market-based approach for the measurement of performance. The main findings are that acquirer stockholder gain from a merger or acquisition, whereas the stockholders of the bidder company show negative or no significant returns (Dennis & McConnell, 1986; Huang & Walking, 1987; Mandelker, 1974). The conclusion that the stockholders of the target firm gain from the merger is of course not surprising. Bidders have to pay a premium on top of the market price. The combined firm shows on average a positive post-M&A event return (Bradley, Desai & Kim, 1988; Leeth & Borg, 2000).

Research that uses accounting measures to estimate operating performance show similar results. Rau & Vermaelen (1998) show that bidders in mergers underperform in the three years after an acquisition. Agrawal et al (1992) find that the stockholders of the acquiring firm show significant losses over the five-year post-merger period of around 10 percent. Corporate performance of the combined firm after mergers do on average increase significantly (Healy et al. , 1990).

Recent research around mergers and acquisitions also focus on the existence of merger waves, which characteristics influence the post-transaction performance and around special situation such as M&A in times of distressed situations.

Industry mergers and acquisitions are driven by regulatory and technological shocks. They however only happen if there is enough overall capital liquidity (Harford, 2005). Valuation can also impact M&A waves (Rhodes-Kropf & Viswanathan, 2005). Bruton et al. (1994) show that in a distressed situation, prior experience has the biggest impact on the successfulness of the acquisition. Research around the characteristics that influence post-transaction performance will be discussed in section 2.4.

### 2.3 Literature on the performance measures of mergers and acquisitions

As discussed above, the main two approaches for measuring the performance of mergers and acquisitions are the market-based approach and the accounting-based approach. The conclusions drawn by researches are quite similar for the two approaches. This sub-section will shine a light on the pros and cons of both approaches.

The most popular approach among academics is the market-based approach. A cumulative abnormal return (CAR) is calculated around the announcement date of the acquisition. This will then be compared with the expected return, calculated by the means of a market model such as the capital asset pricing model (CAPM). The main advantage of this approach is that it is quite easy to calculate and reproduce. Because the CAR estimation around the announcement date is relatively small, it will also be less influenced by noise or other influences. The market-based approach however also has some downsides. Firstly, CAR estimation needs an estimation window to estimate expected return by means of a market model. Because M&A activity occurs in waves it can be that for instance industry effects impact the calculations. This can distort the estimation



and therefore the drawn conclusions. The second problem of this approach is that stock prices are forward looking. This means that there is an uncertainty that these prices do not correctly represent the value of the underlying business (Zollo & Meier, 2008).

The accounting-based approach tries to solve the problems of the market-based approach. As accounting measures are backward-looking it eliminates the problem that a forward-looking metric might not be a good representation of performance. Next to this, research has pointed out that gains of mergers and/or acquisitions only materialize after a longer period and not directly after the event (Healy, Palepu, & Ruback, 1990). The problem that using an accounting-based approach has, is that researchers are not clear about what the right and best measure is of operating performance. In this paper this problem is fixed by using multiple accounting-based measures. The chosen measures are in line with the research of Martynova et al. (2006).

## 2.4 The determinants of post-transaction performance

### 2.4.1 Deal specific determinants

#### *Cross-border effects*

In the paper of Rossi and Volpin (2003) they concluded that cross-border M&A accounted for a substantial part of total transactions, namely 25 percent.

Both target and bidder can benefit from cross-border deals. An explanation is that they can expand their business into new markets. Other possible reasons are the possibility of the existence of imperfect international capital markets, internalizing R&D of the target and imperfect product markets (Sun et al. , 1996).

There can however also be a negative cross-border effect. These can arise from cultural differences and/or differences in regulation. These two examples might make it hard for managers to successfully manage the combined firm and therefore have a negative impact on operating performance (Schoenberg & Reeves, 1999).

Gugler, Mueller, Yurtoglu & Zulehner (2003) find for the above mentioned positive and negative explanations that cross-border deals show no significant effect on the operating performance, compared with domestic deals.

Because of the above mentioned reasons it is expected that cross-border effects do not play a significant role in operating performance around mergers and acquisitions.

#### *Experience of the acquirer within mergers and acquisitions*

The experience effect is a hypothesis/variable that is not widely used as a determinant for mergers and acquisition performance. There is however good evidence that this variable has effect on this performance. Hayward (2001) for instance found that in some instances, previous acquisition experience is able to predict future acquisition performance. Other research suggests that the relationship between experience and performance of the acquisition is a U-shaped function. They also found that performance is better if the second acquisition is related to the previous one. As well as that inexperienced managers inappropriately overgeneralize their experience and therefore the return of the subsequently dissimilar acquisition is worse. Experienced managers on average make this mistake less (Haleblian & Finkelstein, 1999).

Because of the above mentioned reasons it is expected that experience of the acquirer does have a positive significant effect on operating performance around mergers and acquisitions.

#### *Industry relatedness*

Industry relatedness can impact operating performance of the company both positively as well as negatively.

Industry related acquisitions can result in financial and/or operational synergies. It can however also be the case that it will make the combined company bureaucratically rigid (Shin & Stulz, 1998) or that the deal is influenced by rent-seeking behavior of managers (Scharfstein & Stein, 2000).

Because of the above mentioned reasons it is expected that industry relatedness does not have a significant effect on operating performance around mergers and acquisitions.

#### *Method of payment*

Method of payment can in most instances be subdivided between cash, stock or a combination of the two.

Research by Linn (2001) shows that the use of cash as the method payment is associated with a better post-operating performance than the use of stock. Two possible explanations for this

observation come to mind. Firstly, the cash payed is quite often financed with debt (Martynova, Oosting, & Renneboog, 2006). This can lead to higher operating performance as explained by the free-cash-flow hypothesis of Jensen (1976). Secondly, cash as form of M&A payment is associated with more replacements of management after the event (Parrino & Harris, 1999). As previously mentioned, market discipline might lead to value creation.

The academic world is still dived on the impact of method of payment on operating performance after a M&A-event, despite the research by Linn (2001) and the two explanations for the fact that cash payments should result in higher post-M&A operating performance. Martynova et al. (2006) and Powell & Stark (2005) for instance found no significant effect.

Because of the above mentioned reasons it is expected that cash as the method of payment does have a positive significant effect on operating performance around mergers and acquisitions.

#### 2.4.2 Firm specific determinants

Not only deal characteristics can have an impact on the post-M&A operating performance. Also the firm characteristics might have an impact. To control for these firm specific characteristics, this paper will use the following variables as control variables; relative size, leverage of the acquirer and the cash positions of the acquirer. These will now be discussed more in-depth.

##### *Relative size*

As with many of the previously discussed determinants of post-transaction performance, the impact of relative size is not totally clear.

Large targets are expected to outperform the smaller targets as realizing synergies both financial as well as operational is easier. Whereas it can also be the case that larger targets are harder to integrate. This might lead to less operating performance.

It is therefore no surprise that academic literature is contradicting. Clark & Ofek (1994) find that relatively bigger targets are harder to integrate outweigh the named benefits. While Martynova et al. (2006) find that larger targets outperform smaller ones. A lot of research is also indecisive about the impact of relative size on post-transaction performance (Healy et al., 1990; Heron & Lie, 2002).

Because of the above mentioned reasons it is expected that relative size does not have a significant effect on operating performance around mergers and acquisitions.

#### *Leverage of the acquirer*

The most important effect that leverage of the acquirer can play has already briefly been discussed in the 'method of payment' part. Jensen (1986) introduces the topic of agency theory around free cash flows. If the acquirer is more highly leveraged there will be less free cash flow, hence less cash and thus less room for managers to make bad (M&A) decisions.

Martynova et al. (2006) also touch upon the leverage of the acquirer, but take a slightly different reasoning to come up with the same conclusion. They argue that bond covenants for highly leveraged firms can be of significant influence with regards to the decision of M&A decisions. Namely that if bond covenants are strict, management will not engage in poor transactions. They do however not find a statistically significant effect. Others also have not found a statistically significant effect (Switzer, 1996; Clark & Ofek, 1994).

Because of the above mentioned reasons it is expected that the leverage of the acquirer does not have a significant effect on operating performance around mergers and acquisitions.

#### *Cash position of the acquirer*

This point is highly related with the above mentioned point about the leverage of the acquirer. Jensen (1986) argues that firms that have high cash levels make suboptimal decisions. These decisions also relate to mergers and acquisition decisions. Poor decisions in the selection of mergers and/or acquisition targets will lead to poor post-transaction operating performance.

Because of the above mentioned reason it is expected that the cash position of the acquirer does have a negative significant effect on operating performance around mergers and acquisitions.

### 3. Methodology

In this section the methodology will be explained. As already mentioned, this paper tries to stay as close to the approach of Martynova et al. (2006) as possible. The main reason for this decision is that this is the most recent research about the subject and incorporates a lot of the shortcomings of previous papers. Such as adjusting for the change in working capital (as will be further explained). As well as the fact that they also researched the operating performance around mergers and acquisitions within Europe specifically. By staying as close to their approach, a better comparison can be made between results.

The rest of this section will be structured as follows. Section 3.1 will talk about which operating performance measurements will be used. Section 3.2 talks about how to measure the operating performance of the combination of the two firms properly with an adjustment for industry-wide performance. In sub-section 3.3 the change-model will be touched upon. In 3.4 the regression model with all of its variables will be discussed.

#### 3.1. Operating performance measurement

Most previous work on the subject uses earnings before interest, taxes, depreciation and amortization (EBITDA) as performance measurement. Martynova et al. (2006) however argues that this is not a “pure” measurement of cash flow performance as no adjustment is made for the changes in working capital (WC).

Powell & Stark (2005) uses multiple approaches in the calculation of operating performance. They take EBITDA and “purified” EBITDA, just like Martynova et al. (2006) as performance measure. They then scale it by market value of assets, adjusted market value of assets, book value of assets or revenues.

To get the most comprehensive and robust conclusion as possible, this paper will make use of the following performance measures:

- (1)  $(EBITDA - \text{change in WC}) / \text{Book value of Assets}$
- (2)  $(EBITDA - \text{change in WC}) / \text{Revenue}$
- (3)  $(EBITDA) / \text{Book value of Assets}$
- (4)  $(EBITDA) / \text{Revenue}$

Next to these four performance measures, there will also be an industry adjustment for all of the four measures. There therefore will be a total of eight performance measures used in this paper. Namely, the four types of measures presented above and for each of these measures both the raw measure as well as the industry adjusted measure. The industry adjustment will be discussed in the sub-chapter below.

### 3.2. Measurement of the combined firm with industry adjustment

In this paper all the operating measures will be calculated for the 3 years before the event and 3 years after the event. The median value of the 3 years before the event (“Median pre-M&A event performance measure”) will be calculated after this. As well as the median value of the 3 years after the event (“Median post-M&A Event performance measure”). These median values will be used, by both the change model as well as the intercept model, to determine if the operating performance differs significantly after the event, with regards to before the event.

The calculations of the pre-event performance measures are slightly different than the calculations of the post-event performance measures. The reason for this is that, before the event the companies report their financial results separately. After the results these financial results are consolidated.

As pointed out in the sub-chapter above, this paper will also take into account an industry adjustment when calculating the performance measures. This adjustment should be made as the M&A effect has to be isolated. This is because there are more effects that affect the operating performance, such as industry trends (Healy, Palepu, & Ruback, 1992). By using industry adjusted performance measures, this paper is also capable of being able to shine a light on the difference between firms that are engaged in M&A-activity and firms in the same industry that are not. In this paper the 2-digit US SIC codes are used for the industry specification. The industry data is obtained from the Orbis database. The formulas used for the calculations of the (industry adjusted) performance measures are presented in appendix 1 and a visual overview is presented below.

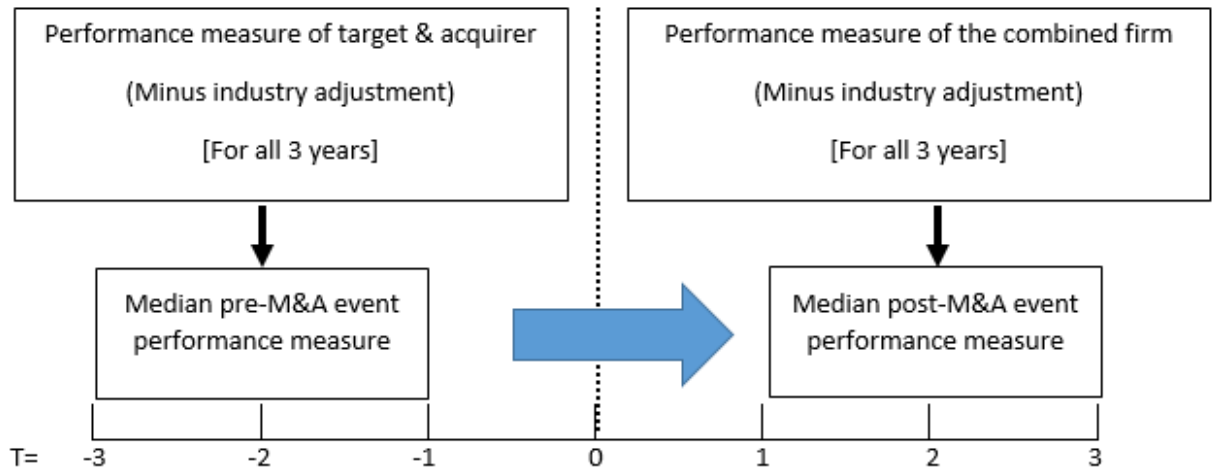


Figure 1: visual presentation on the performance measures pre- and post-event.

### 3.3 Change model

To be able to answer the main question, if there is a significant operational effect of M&A on operating performance, this paper first uses the change model. The reason for the use of the change model is the fact that it is relatively easy to calculate and to interpret. It is therefore a good way to get the first insights before performing the regression model. The change model is widely used in research around this topic and a substantial part is already explained in the sub-chapter above (Martynova et al., 2006; Gosh, 2001; Powell & Stark, 2005).

The performance measures both 3 years before the event are calculated and the median value of these three values will be taken. The same approach applies to the 3 years after the event. After this, a Wilcoxon signed rank test is performed. This test is used to examine if the median performance post-event differs significantly from the pre-event median performance.

As mentioned, this model is useful to answer the main research question of this paper. To examine if the control variables/determinates introduced in section 2.4 have significant effect, another model should be introduced, namely the regression model. This is needed, because in the case that these determinates have significant effect, they should be controlled for.

### 3.4. Regression model

As explained above, the regression model (also known as Intercept model or OLS regression) will also be used. The approach is based on both Martynova et al. (2006) and Healy et al. (1992). It is viewed as a better approach than the change model as it is able to include control variables. The control variables that will be tested and used in this paper have been presented in sub-chapter 4.2. The basic univariate intercept model is presented below.

$$Operating\ measure_{Post-event,i} = \alpha + \beta * Operating\ measure_{Pre-event,i} + \varepsilon$$

Where alpha ( $\alpha$ ) is the intercept, which captures the change between the operating performance pre-event and post-event. Beta ( $\beta$ ) gives a value which can be interpreted as the influence of the pre-event operating performance on the post-event operating performance. Epsilon ( $\varepsilon$ ) is the error term.  $i$  is an event.  $Operating\ measure_{Post-event, (industry)}$  is the median value of the operating measure of the three years before the event and  $Operating\ measure_{Pre-event, (industry)}$  is the median value of the operating measure of the three years after the event.

The determinants mentioned in section 2.4 will be added to the basic univariate intercept model explained above. These are: cross-border effect, experience of the acquirer effects, industry relatedness, method of payment, relative size, leverage of the acquirer, and the cash position of the acquirer. The multivariate intercept model, after inclusion of all these above mentioned determinants is as follows:

$$\begin{aligned} Operating\ measure_{Post-event,i} &= \alpha + \beta_1 * Operating\ measure_{Pre-event,i} + \beta_2 * Dummy_{Cross-border\ effects,i} \\ &+ \beta_3 * Experience_i + \beta_4 * Dummy_{Industry,i} + \beta_5 * Dummy_{Payment\ method,i} \\ &+ \beta_6 * Relative\ Size_i + \beta_7 * Leverage_i + \beta_8 * Cash_i + \varepsilon \end{aligned}$$



## 4. Data

In this section the data will be discussed. First in sub-section 4.1 the data selection process is touched upon. It describes the filters used to arrive at the final dataset and the reasons for the chosen filters. Sub-section 4.2 gives an description of the data.

### 4.1. Data selection

The sample of European mergers and acquisition has been retrieved from the Zephyr and Orbis database.

First, the database of Zephyr has been used to identify the merger and acquisition events. The following filters have been applied:

- The deal must be a merger or acquisition
- The deal must be completed and confirmed
- The acquirer and the target must have its headquarters within the European Union
- The deal must be completed between the period 1/1/2009 and 31/12/2015
- The stake (%) that the acquirer has in the target must be below 49,9% before the event and above 50,01% after the event
- Deal value must be known and higher than 5 million euros (including estimates)
- Both the target and the acquirer can operate in all sectors except for the banking sector

2849 events remained after all the above mentioned filters have been applied. After this, an additional filter has been applied to make sure that both the acquirer and target had a known BvB ID-Code. This is needed to be able to obtain the accounting data from the Orbis database. This filtered out 1365 observations. The final sample size therefore consists of 1484 observations. However, note that the samples of the different models with the different operating measures have less observations than this. This is because not all the needed information was available for the 1484 observations.

The reason for the selection of the specific time period is because pre-2009, there is no accounting information available on the companies in the Orbis database. The Orbis Historical database does have accounting information on the companies before 2009, but not the

information needed for the calculation of all the variables. Post-2015 deals have not been taken into account in order to make sure that there are values known three years after the event.

The filter for the stake has been applied to make sure that the variables are calculated in the proper way. If this filter was not applied reporting requirements/accounting regulations might introduce inconsistencies in the variables.

The deal value has been applied as extremely small deals are prone to more outliers and therefore might impact the research in a negative way.

The reason for the exclusion of the banking sector is because this sector is extremely specific and the operating performance measures applied in this paper are not the appropriate option for analyzing the operating performance within this specific sector and will therefore, if included, negatively impact the results of this paper (Rhoades & Bull, 1994).

The variables that have been collected from the Zephyr database are: Acquirer BvB ID number, Target BvB ID number, Deal method of payment, Acquirer primary US SIC code and Target primary US SIC code.

As previously mentioned, accounting data has been collected from the Orbis database. The variables that have been collected are: Country ISO code, Book value of assets, Revenue<sup>1</sup>, EBITDA<sup>1</sup>, Enterprise value<sup>1</sup>, Working capital, Cash and cash equivalents, Loans and Debt. Method of payment has been collected from Zephyr. This data has been manually merged with the Zephyr data. After this the operating performance measures have also been manually calculated as described in sub-section 3.1.

To be able to adjust for industry performance, the median performance of the industries have to be calculated. This is done by the use of 2-digit US SIC codes. For all of the industries, the following information has been extracted out of the Orbis database: EBITDA<sup>1</sup>, Working capital, Revenues<sup>1</sup> and Assets<sup>1</sup>. After this, all of the four operating performance measures have been calculated for

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<sup>1</sup> This data had two columns in the database with different sources of input, resulting in the fact that one column had missing values when the other had a known value. These have been merged to ensure that this research contains as much variables per deal as possible.

each of the individual industries. Calculations regarding the adjustment for industry are presented, as explained in sub-section 3.2., in appendix 1.

#### 4.2. Data description

Below the data is examined in a structured manner in table 2., to get a better overview of the data. The deals are almost equally split between the examined years. 60 percent of the deals are related based on industry relatedness, whereas 40 percent of the deals are between companies that do not primarily operate in the same 2-digit US SIC code industry. 81,3% of all deals were done by acquirers that have done less than 20 deals in the past. 28 deals have been struck by acquirers that have acquired more than 200 targets in the past (1,9%). 33,8% of all acquirers had a relative cash position of under 5%. A combination of the method of payment had the preference for most of the acquirers, namely 37,6%. Payments done only by cash accounted for 19,3% of all deals. 70,7% of all deals were domestic deals. With regards to relative size, there were 461 observations missing. The known values are relatively equally distributed with spikes for the smallest and largest qualification (both around 15% of all deals). On average, acquirers are not highly leverage. The average is 25,7% and 35,5% of all acquirers had a leverage of below 20%.

	# of Observations	Percent %
<b>Year</b>		
2010	227	15,3%
2011	236	15,9%
2012	202	13,6%
2013	234	15,8%
2014	273	18,4%
2015	312	21,0%
Total		100%
<b>Industry Relatedness*</b>		
Related	891	60,0%
Unrelated	593	40,0%
Total		100%
<b>Experience of the acquirer**</b>		
< 5 deals done in the past	682	46%
5 <> 20 deals done in the past	524	35,3%
20<>50 deals done in the past	183	12,3%
50 – 100 deals done in the past	51	3,4%
100 – 200 deals done in the past	16	1,1%
200+ deals done in the past	28	1,9%
Total		100%
<b>Relative Cash Position***</b>		
Cash <5%	501	33,8%
Cash 5% - 10%	225	15,2%
Cash 10% -20%	220	14,8%
Cash 20%>	191	12,9%
Unknown	347	23,4%
Total		100%
<b>Payment Method</b>		
Cash	287	19,3%
Debt	5	0,3%
Shares	81	5,5%
Mixed	558	37,6%
Unknown	553	37,3%
Total		100%
<b>Cross-Border</b>		
Domestic	1049	70,7%
Cross-Border	435	29,3%
Total		100%

Relative Size****		
Target size <5%	220	14,8%
Target size 5% - 10%	76	5,1%
Target size 10% - 20%	69	4,6%
Target size 20%>	244	16,4%
Unknown	875	59,0%
Total		100%
Leverage of the acquirer*****		
Leverage <20%	527	35,5%
Leverage 20% - 30%	170	11,5%
Leverage 30% - 40%	110	7,4%
Leverage 40%- 50%	88	5,9%
Leverage 50%>	128	8,6%
Unknown	461	31,1%
Total		100%

Table 2: A comprehensive overview of the data

\* Relatedness of the industry is based on the 2-digit US SIC codes.

\*\* Experience is defined as all previous completed deals done by the company that are in the Orbis database.

\*\*\*Relative cash position is calculated as (Cash and Cash Equivalents / Assets of the acquirer) at T=-1

\*\*\*\* Relative size is calculated as (Revenue of the target / Revenue of the acquirer) at T=-1

\*\*\*\*\* Leverage of the acquirer is calculated as ((Debt + Loans) / Book value of assets) at T=-1

## 5. Results

As mentioned in the methodology section of this paper, two models have been used to research the operating performance around mergers and acquisitions within the European Union. The results of these two models will be discussed in this section. Firstly, a look is given to the change model. As previously explained, this is done to get a good insight into the data. Secondly, the results of the primary research method will be discussed and analyzed, namely the regression model. In sub-section 5.2. there will be a comprehensive overview of all the results.

### 5.1. Results from the change model

A change model has been applied to the four types of performance measures. All these four types have also been controlled for industry effects. Therefore, the change model and the corresponding Wilcoxon signed rank test have been performed eight times. In table 3 below the results for the change model are presented.

<b>Measure 1</b> $\frac{(EBITDA - \Delta NWC)}{Assets}$	<b>Raw Performance Measure</b>			<b>Industry Adjusted Performance Measure</b>		
	Median (%)	% Positive	Number of observations	Median (%)	% Positive	Number of observations
T = -3	8,23	85,6%	202	-0,11	48,9%	190
T = -2	8,56	86,4%	273	0,50	51,5%	260
T = -1	9,23	86,1%	361	0,58	53,8%	342
Median Pre-Acquisition Performance	8,73	88,8%	376	0,23	51,7%	356
T = 1	8,46	84,3%	908	-0,41	47,8%	908
T = 2	9,00	83,2%	905	0,08	50,5%	905
T = 3	8,81	84,9%	784	-0,43	48,1%	784
Median Post-Acquisition Performance	9,19	87,5%	376	0,32	52,5%	356
Difference in Median	0,46	46,3%	376	0,09**	41,6%	356

Table 3.1: results of the change model on operating performance measure 1.

\*/\*\*/\*\* The Wilcoxon signed rank test shows significant results at the 10%/5%/1% level.

<b>Measure 2</b>  $\frac{(EBITDA - \Delta NWC)}{Revenue}$	<b>Raw Performance Measure</b>			<b>Industry Adjusted Performance Measure</b>		
	Median (%)	% Positive	Number of observations	Median (%)	% Positive	Number of observations
T = -3	11,19	86,6%	194	3,68	66,3%	190
T = -2	10,09	87,5%	265	3,13	64,6%	260
T = -1	11,11	86,9%	350	4,31	69,9%	342
Median Pre-Acquisition Performance	10,57	89,3%	364	3,88	67,7%	355
T = 1	10,62	84,7%	900	3,72	66,4%	900
T = 2	10,90	84,2%	891	3,71	66,9%	891
T = 3	11,03	85,3%	777	4,01	67,2%	777
Median Post-Acquisition Performance	10,69	88,2%	364	4,05	69,9%	355
Difference in Median	0,12	53,8%	364	0,17	50,7%	355

Table 3.2: results of the change model on operating performance measure 2.

\*/\*\*/\*\* The Wilcoxon signed rank test shows significant results at the 10%/5%/1% level.

<b>Measure 3</b>  $\frac{EBITDA}{Assets}$	<b>Raw Performance Measure</b>			<b>Industry Adjusted Performance Measure</b>		
	Median (%)	% Positive	Number of observations	Median (%)	% Positive	Number of observations
T = -3	8,69	89,0%	308	0,26	51,9%	243
T = -2	17,45	88,0%	593	7,60	71,1%	357
T = -1	16,76	88,0%	726	6,99	70,2%	483
Median Pre-Acquisition Performance	15,97	87,1%	757	6,31	68,0%	506
T = 1	8,60	86,2%	1089	-0,34	47,2%	1089
T = 2	8,49	85,2%	1097	-0,48	46,9%	1097
T = 3	8,49	86,5%	951	-0,85	43,8%	950
Median Post-Acquisition Performance	8,96	87,7%	757	-0,33	48,2%	506
Difference in Median	-7,01***	19,9%	757	-6,64***	20,6%	506

Table 3.3: results of the change model on operating performance measure 3.

\*/\*\*/\*\* The Wilcoxon signed rank test shows significant results at the 10%/5%/1% level.

<b>Measure 4</b> <i>EBITDA</i> <i>Revenue</i>	<b>Raw Performance Measure</b>			<b>Industry Adjusted Performance Measure</b>		
	Median (%)	% Positive	Number of observations	Median (%)	% Positive	Number of observations
T = -3	10,07	89,5%	295	3,37	67,5%	243
T = -2	17,48	88,1%	447	10,42	78,1%	360
T = -1	18,12	89,2%	575	11,23	76,3%	486
Median Pre-Acquisition Performance	16,78	88,2%	601	10,24	75,4%	508
T = 1	11,26	87,3%	1073	3,95	68,2%	1073
T = 2	11,42	87,0%	1075	3,67	66,7%	1075
T = 3	11,54	87,6%	936	4,00	69,2%	935
Median Post-Acquisition Performance	11,41	88,9%	601	3,90	71,1%	508
Difference in Median	-5,37***	21,3%	601	-6,34***	22,0%	508

Table 3.4: results of the change model on operating performance measure 4.

\*/\*\*/\*\* The Wilcoxon signed rank test shows significant results at the 10%/5%/1% level.

Taking a look at the industry adjusted performance measures. Measure 1 shows a significant positive result (0,09) at the 5% significance level. Whereas measures 3 and 4 show negative significant results for the industry adjusted performance measure. Namely, -6,30% and -7,36%, at the 1% significance level. This comes as no surprise as the exclusion of the change in working capital ( $\Delta WC$ ) is known to introduce a downward bias in the performance measures, as already identified by Martynova et al. (2006). It is also in line with previous research that also saw unadjusted performance measures significantly deteriorate after acquisitions (Powell & Stark, 2005).

As Martynova et al. (2006) suggests, this paper will focus on the industry adjusted performance measures 1 and 2. The reason for this is that these measures include the change in working capital ( $\Delta WC$ ) in the formula. It therefore does not have the downward bias that the performance measures have that do not include  $\Delta WC$ . This is regarded as more “pure” operating performance measure and therefore better suited for this analysis. What stands out is that



measure 1 is significant at the 5% significance level. Whereas measure 2 is not significant at any of the three significance levels. Both measure 1 as measure 2 show slightly positive results.

Based on the change model on the industry adjusted operating performance measure 1, it can be concluded that M&A has a positive effect on the post-event operating performance with a significance level of 5%. However, because of previously explained inconsistencies between the different operating measures, no real conclusions can be made based on the change model as a whole. As previously explained, the change model is only used as an initial way to look at the underlying data. In the next sub-chapter the results of the regression model will be discussed.

## 5.2. Results from the regression model

A multivariate OLS regression is a better method of analyzing the operating performance around mergers and acquisitions. This is for the reason that determinants of post-M&A operating performance can be added as control variables in this model. The model that has been discussed in sub-section 3.4 has been performed. Before this however, white tests have been performed to test for heteroscedasticity and the model has been altered in an appropriate way to account for this (White, 1980). The existence of multicollinearity within the model was also researched (Mansfield & Helms, 1982). Multicollinearity has not been observed, so no alterations have been made to that regard. The results from the industry adjusted and working capital adjusted OLS-regression are provided below in table 4.

The industry adjusted and change in working capital adjusted model with assets as deflator has a 1% statistical significant joint F-statistic and an R-squared of 0,149. The model deflated by revenue does not show a significant F-statistic and has an R-squared of only 0,019. This is not similar to the research of Martynova et al. (2006). Their model deflated by revenue has the highest R-squared (0,159). Whereas the model deflated by sales has a R-squared of only 0,081. A possible explanation of the fact that Martynova et al. (2006) found that the model deflated by sales has a higher R-squared is because of the chosen sample period. Their sample period is from 1997 until 2001. This period is characterized by technology firms. These firms do, on average, possess less assets than firms in other industries. Also, assets play less of a role in the business model of technology firms.

For the rest of this chapter, there will be looked into the industry- and working capital adjusted model deflated by assets particularly. This is done because the models that do not account for the change in working capital have a negative bias. This is in line with previous research (Martynova, Oosting, & Renneboog, 2006). This is also observed in the data. Three out of the four models that do not account for the change in working capital have a significant negative constant. These models are provided in appendix 2. The industry adjustment is also necessary, as industry effects have to be filtered out. When this is not done the conclusions can be biased. An example is that, in the case when the industry of both the target and the acquirer is performing well over the three years post-M&A event, it can lead to the conclusion of a significant positive operating performance. In this case, the conclusion that the event was positive for the operating performance of the company is wrong, as the reason for this positive change is because of the performance of the total industry. The reason for the choice of assets as deflator instead of revenue is because the model has a higher R-squared than the model deflated by revenue. Intuitively, it can also be argued why assets might be a better deflator than revenue. An increase in operating performance will in many instances lead to an increase in revenue. When using the operating measure deflated by revenue, this increase will thus have effect of both the nominator as well as the denominator. This problem is less/not present when using assets as deflator.

The model shows a positive constant (0,0144). This means that the models shows a positive effect of a merger or acquisition event on the post-event operating performance. The positive constant is however not statistical significant. It is in line with the conclusion of the change model that showed a positive value of 0,09 with a 5% significance. The observation that the OLS model shows a non-significant effect and the change model a significant effect is in line with previous research (Gosh, 2001; Powell & Stark, 2005).

The median pre-event operating performance had a strongly significant and positive effect on post-event operating performance. 0.475 at a 1% significance level. This is as expected. It is no surprise that, how a company has been operating in the near past (3 years before the event), has influence on how a company will operate in the near future (3 years after the event).

If the deal was struck between companies with headquarters in different countries within the European Union had little to no effect (0,018). The effect was not significant. This is in line with previous research (Gugler, Mueller, Yurtoglu, & Zulehner, 2003). An explanation for the non-significant effect is that a cross-border deal can have both positive as well as negative implications. Cultural differences and differences in regulation can negatively impact the operating performance (Schoenberg & Reeves, 1999). Whereas possible explanations for a positive effect are imperfect international capital market, internalizing R&D and imperfect product markets (Sun et al. , 1996).

Method of payment also showed little to no effect. -0,005 for shares-only payment, -0,019 for mixed payment and -0,006 for cash only payments compared to the unknown value. None of these method of payment options were significant. Therefore the data showed no evidence of the explanation of Linn (2001), that deals payed for with cash show better post-deal operating performance than deals payed for with stock. The findings are however in line with the other previous research that also showed no significant effect of method of payment on the post-M&A event operating performance (Powell & Stark, 2005; Martynova et al., 2006).

Relative size of the target showed a negative effect on the post-event operating performance (-7,18e-06). The coefficient is statistical significant at the 5% level. The hypothesis that relative size would have no significant effect is there for wrong. The findings are equal to the findings of Clark & Ofek (1994). They stated that relatively larger targets are harder to integrate and therefore outweigh the benefits. The findings around relative size are not the same as Martynova et al. (2006). They found that larger targets outperform smaller ones. This was however not significant. An explanation for this difference can be that Martynova et al. (2006) uses a relatively small subset of only 66 observations for their conclusion around this topic.

Leverage of the acquirer showed a negative effect of -0.060 on the post-event operating performance. It is therefore not in line with the free cash flow agency theory of Jensen (1986). Jensen argued that acquirers that are more levered will have less free cash flow available and hence less options for the managers of the firm to make bad (M&A) decisions. The coefficient

was not significant. This is in agreement with previous research (Switzer, 1996; Clark & Ofek, 1994; Martynova et al., 2006).

Relative cash position of the acquirer also showed a negative effect (-0,055) on post-M&A event operating performance. The coefficient is however not significant. A significant negative effect was expected due to the agency theory of Jensen (1986). When a company has a higher relative cash position, managers of the company can more easily make bad decisions or engage in so called “pet (M&A) projects” (Jensen, 1986). An explanation on why this agency theory is not observed might be that the companies in this sample have good corporate governance.

The experience of the acquirer show a significant (at the 1% significance level) positive effect on the post-event operating performance (of 0,0001). This is in agreement to the hypothesis stated in sub-section 2.4.1. The finding is in line with previous research that found that experienced managers make less mistakes with regards to overgeneralization of experience (Haleblian & Finkelstein, 1999).

An overview on the expected effects of the determinants and the actual effect of the determinants are provided in table 5.

Multivariate OLS Regression (Industry adjusted)				
(EBITDA – ΔWC) devided by:	Assets	t-statistic	Revenue	t-statistic
Constant	0.0144	0.64	-0.238	-0.81
Median pre-M&A event operating performance	0.475***	5.39	0.504	1.29
Cross-border	0.018	0.89	0.223	1.05
Industry relatedness	0.016	1.21	-0.162	-0.72
Method of payment				
• Shares	-0.005	-0.35	0.408	1.30
• Mixed	-0.019	-1.15	0.238	0.98
• Cash	-0.006	-0.33	0.274	1.08
Relative size of the target	-7.18e-06**	-2.28	0.0008	1.01
Leverage of the acquirer	-0.060	-1.02	-0.160	-0.75
Relative cash position of the acquirer	-0.055	-0.68	-0.014	-0.03
Experience of the acquirer	0.0001***	2.59	0.0007*	1.94
Number of observations	317		317	
F-statistic	13.51***		1.33	
R-squared	0.149		0.019	

Table 4: Industry- and change in working capital adjusted multivariate OLS regression

\*\*\*/\*\*/\* Significant at the 1%/5%/10% level.

Overview on the effect of the determinants on pre-event operating performance		
Determinants	Expected	Result
Cross-border effects	No significant effect	No significant effect
Experience of the acquirer	Positive significant effect	Positive significant effect
Industry relatedness	No significant effect	No significant effect
Method of payment	Positive significant effect	No significant effect
Relative size	No significant effect	Negative significant effect
Leverage of the acquirer	No significant effect	No significant effect
Cash position of the acquirer	Negative significant effect	No significant effect

Table 5: an overview on the expected effects of the determinants stated in section 2.4 in comparison with the found effects.

## 6. Conclusion

### 6.1. Conclusions about the research

This paper researches the operating performance around merger and acquisition events within the European Union. The sample of 1484 observations has been obtained from the sample period that stretches from 1/1/2009 until 31/12/2015. Where most of the previous research about performance of mergers and/or acquisitions uses a market-based approach, this paper uses an accounting-based approach. This is in line with the recent shift from the market to an accounting based approach. The reason for the decision to use this approach is that it does not suffer from the main limitation that the market-based approach has. Namely the fact that you first have to assume that market prices are efficient and a (near) perfect proxy of performance.

The research around M&A performance that uses accounting measures to assess operating performance have been contradicting. Numerous research showed a positive significant effect of a M&A-event on the operating performance of the company (Powell & Stark, 2005; Heron & Lie, 2002; Linn & Switzer, 2001). While other papers found no significant effect (Gosh, 2001; Lev & Mandelker, 1972). There are also researches that found significant negative effects (Yeh & Hoshino, 2002; Clark & Ofek, 1994; Meeks, 1977).

The most likely reason for these differences is the differences in operating performance measure used (Bruner, 2002). When the measure is not adjusted for change in working capital, it introduces a negative bias. Whereas not accounting for industry effects can also introduce biases. This paper tries to mitigate these biases by presenting two different models (the change model and the OLS regression model) for eight different performance measures.

The change model is used to get the first insights into the data. The conclusion that can be drawn from operating performance measures three and four come as no surprise and are in line with previous research. These are the measures that do not control for the change in working capital. As stated by Martynova et al. (2006), these introduce a negative bias. Measure 2 (deflated by revenue and controlled for the change in working capital) shows no significant effect. The operating performance measure that does control for the change in working capital and is deflated by assets (measure 1) shows significant (5%) positive effects of mergers and acquisitions

in the 3 years after the event, compared to the 3 years prior to the event for the industry adjusted measure. The none industry adjusted measure 1 showed no significant effects. These conclusions based on the change model are predominantly in line with previous research conducted by Powell & Stark (2005).

As mentioned above, the change model has only been used to gain some first insights into the data and will not be used to derive the main conclusion of the paper. The reason for this is, when there are determinants that influence the post operating performance, it should be controlled for. The most appropriate operating performance measure identified is the measure that is takes change in working capital and industry effects into account and is deflated by assets. From all eight determinants that were added as control variables, three are statistically significant. As expected based on previous research, the median pre-M&A event operating performance has a positive significant (1%) effect on the median post-M&A event operating performance (of 0,475). Relative size of the target has a negative significant (5%) effect on the post-event operating performance. The experience of the acquirer in the field of M&A has a significant (1%) positive effect of 0,0001.

The model showed a positive constant of 0,014. Meaning that operating performance increased after the M&A-event after controlling for past performance and other determinants. The result was however not significant. This means that there is no statistical significant reason to conclude that the operating performance of the combined firm after a merger or acquisition differs significantly from the situation before the merger or acquisition, when controlled for the named variables.

## 6.2. Suggestions for future research and limitations

In this sub-section the suggestions for future research and the limitations of this paper are discussed. It consists of four sections.

### 6.2.1. Operating performance measure

The choice of using accounting data instead of stock price data as input for the measurement of operating performance eliminates the main downside of using a market-based approach. Namely, that you first have to assume that markets are efficient. There is however no evidence to assume that using accounting data, and as in this paper using EBITDA (adjusted or not), is a perfect proxy of operating performance. Future research should therefore be conducted around the question of which variable will be able to represent operating performance the best, such that the variable is the least biased as possible.

### 6.2.2. Comparable portfolio construction and industry effects

If no appropriate adjustment is made for industry effects, it can be the case that a conclusion that is made on the effect of the merger or acquisition is actually due to an industry effect. An industry adjustment has been made in this paper to account for this. This approach has been used by multiple other papers (Parrino & Harris, 1999; Gugler et al., 2003; Meeks, 1977). There is however evidence that matching not only by industry but also adjusting for size is a better approach (Lev & Mandelker, 1972). This is for the reason that you want to construct a portfolio as similar to the company as possible, as you want to control for the performance the company would have had if it did not do the merger or acquisition deal. Future research therefore should keep this goal in mind and try to construct a more suitable portfolio than merely using 2-digit US SIC codes.

### 6.2.3. Sample

The original sample, after applying all the needed filters, consists of 2849 observations. The OLS model that has been used however has only 317 observations. This is due to missing information such as, but not limited to BvB ID's and working capital information. Biases might arise from the fact that the deals that do have all the needed information are substantially different from the other deals in the original sample. Hence, conclusions on a sample (all the mergers and acquisitions within the European Union in the specific period) will be based on a small sub-sample



of this sample which might not be a good representation of it. Future research can reduce these potential biases by using additional databases to try to collect the currently missing variables.

#### 6.2.4. Robustness checks

This paper only uses the median values for estimating operating performance. This is done because the median values are less prone to outliers as average values. Martynova et al. (2006) did however check if the result of their tests would be different if average values would have been taken instead of median values. The conclusion was, unsurprisingly, that the use of median values showed less volatility. A limitation of this research is that this robustness check falls outside of the scope of this paper.

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## 8. Appendix

### Appendix 1 – Formulas for the calculations of the operating performance

#### Appendix 1.1 – Calculation of the change in working capital

All variables used in the calculations of appendix 1 are copied directly from the Orbis database, except for change in working capital. Working capital is copied directly from the Orbis database.

To derive the change in working capital the following formula has been performed:

$$\text{Change in working capital} = \Delta WC = \text{Working capital}_{T=0} - \text{Working capital}_{T=-1}$$

#### Appendix 1.2 – The operating performance measure pre-M&A event

$$\text{Operating measure}_{\text{Pre-event, Firm}} = \frac{EBITDA_{\text{acquirer}} + EBITDA_{\text{target}}}{\text{Revenue}_{\text{acquirer}} + \text{Revenue}_{\text{target}}}$$

or

$$\text{Operating measure}_{\text{Pre-event, Firm}} = \frac{(EBITDA_{\text{acquirer}} - \Delta WC) + (EBITDA_{\text{target}} - \Delta WC)}{\text{Revenue}_{\text{acquirer}} + \text{Revenue}_{\text{target}}}$$

or

$$\text{Operating measure}_{\text{Pre-event, Firm}} = \frac{EBITDA_{\text{acquirer}} + EBITDA_{\text{target}}}{\text{Book value of assets}_{\text{acquirer}} + \text{Book value of assets}_{\text{target}}}$$

or

$$\text{Operating measure}_{\text{Pre-event, Firm}} = \frac{(EBITDA_{\text{acquirer}} - \Delta WC) + (EBITDA_{\text{target}} - \Delta WC)}{\text{Book value of assets}_{\text{acquirer}} + \text{Book value of assets}_{\text{target}}}$$

#### Appendix 1.3 – The operating performance of the industry

Pre-event:

$$\begin{aligned} &\text{Operating measure}_{\text{Pre-event, Industry}} \\ &= \text{Weight}_{\text{acquirer}} * \frac{EBITDA_{\text{peer of acquirer}}}{\text{Revenue}_{\text{peer of acquirer}}} + \text{Weight}_{\text{target}} * \frac{EBITDA_{\text{peer of target}}}{\text{Revenue}_{\text{peer of target}}} \end{aligned}$$

or

$$\begin{aligned} &\text{Operating measure}_{\text{Pre-event, Industry}} \\ &= \text{Weight}_{\text{acquirer}} * \frac{(EBITDA - \Delta WC)_{\text{peer of acquirer}}}{\text{Revenue}_{\text{peer of acquirer}}} + \text{Weight}_{\text{target}} \\ & * \frac{(EBITDA - \Delta WC)_{\text{peer of target}}}{\text{Revenue}_{\text{peer of target}}} \end{aligned}$$

or

*Operating measure* <sub>Pre-event, Industry</sub>

$$= Weight_{acquirer} * \frac{EBITDA_{peer\ of\ acquirer}}{Book\ value\ of\ assets_{peer\ of\ acquirer}} + Weight_{target} * \frac{EBITDA_{peer\ of\ target}}{Book\ value\ of\ assets_{peer\ of\ target}}$$

or

*Operating measure* <sub>Pre-event, Industry</sub>

$$= Weight_{acquirer} * \frac{(EBITDA - \Delta WC)_{peer\ of\ acquirer}}{Book\ value\ of\ assets_{peer\ of\ acquirer}} + Weight_{target} * \frac{(EBITDA - \Delta WC)_{peer\ of\ target}}{Book\ value\ of\ assets_{peer\ of\ target}}$$

With:

$$Weight_{acquirer} = \frac{Revenue_{acquirer}}{Revenue_{acquirer} + Revenue_{target}}$$

And:

$$Weight_{Target} = \frac{Revenue_{target}}{Revenue_{acquirer} + Revenue_{target}}$$

Post-event:

$$Operating\ measure_{Post-event, Industry} = \frac{EBITDA_{peer\ of\ combined\ firm}}{Revenue_{peer\ of\ combined\ firm}}$$

or

$$Operating\ measure_{Post-event, Industry} = \frac{(EBITDA - \Delta WC)_{peer\ of\ combined\ firm}}{Revenue_{peer\ of\ combined\ firm}}$$

or

$$Operating\ measure_{Post-event, Industry} = \frac{EBITDA_{peer\ of\ combined\ firm}}{Book\ value\ of\ assets_{peer\ of\ combined\ firm}}$$

or

$$Operating\ measure_{Post-event, Industry} = \frac{(EBITDA - \Delta WC)_{peer\ of\ combined\ firm}}{Book\ value\ of\ assets_{peer\ of\ combined\ firm}}$$

Where Peer of the acquirer/target is the median value of the peer portfolio created based on the 2-digit US SIC codes.

Appendix 1.4 – The operating performance of the firm post-M&A event

$$\text{Operating measure}_{\text{Post-event, Firm}} = \frac{\text{EBITDA}_{\text{combined firm}}}{\text{Revenue}_{\text{combined firm}}}$$

or

$$\text{Operating measure}_{\text{Post-event, Firm}} = \frac{(\text{EBITDA} - \Delta\text{WC})_{\text{combined firm}}}{\text{Revenue}_{\text{combined firm}}}$$

or

$$\text{Operating measure}_{\text{Post-event, Firm}} = \frac{\text{EBITDA}_{\text{combined firm}}}{\text{Book value of assets}_{\text{combined firm}}}$$

or

$$\text{Operating measure}_{\text{Post-event, Firm}} = \frac{(\text{EBITDA} - \Delta\text{WC})_{\text{combined firm}}}{\text{Book value of assets}_{\text{combined firm}}}$$

Appendix 1.5 – Industry adjusted operating performance measure

$$\begin{aligned} \text{Operating measure}_{\text{Pre-event, Firm, Industry adjusted}} \\ = \text{Operating measure}_{\text{Pre-event, Firm}} - \text{Operating measure}_{\text{Pre-event, Industry}} \end{aligned}$$

and

$$\begin{aligned} \text{Operating measure}_{\text{Post-event, Firm, Industry adjusted}} \\ = \text{Operating measure}_{\text{Post-event, Firm}} - \text{Operating measure}_{\text{Pre-event, Industry}} \end{aligned}$$



## Appendix 2 – Multivariate OLS regression models

### Appendix 2.1 – Working capital adjusted regression

	Multivariate OLS Regression (Not industry adjusted)			
<b>(EBITDA – <math>\Delta WC</math>) devided by:</b>	<b>Assets</b>	<b>t-statistic</b>	<b>Revenue</b>	<b>t-statistic</b>
Constant	0.063**	2.15	-0.201	-0.67
Median pre-M&A event operating performance	0.472***	4.78	0.519	1.34
Cross-border	0.018	0.92	0.211	1.03
Industry relatedness	0.015	1.09	-0.160	-0.71
Method of payment				
• Shares	-0.012	-0.72	0.405	1.30
• Mixed	-0.017	-1.07	0.238	0.98
• Cash	-0.010	-0.55	0.269	1.04
Relative size of the target	-7.72e-06**	-2.52	7.67e-05	0.99
Leverage of the acquirer	-0.047	-0.83	-0.105	-0.52
Relative cash position of the acquirer	-0.051	-0.63	-0.022	-0.05
Experience of the acquirer	0.0001***	2.58	0.0007*	1.87
Number of observations	324		324	
F-statistic	11.57***		1.92**	
R-squared	0.149		0.020	

Table 6: Change in working capital adjusted multivariate OLS regression

\*\*\*/\*\*/\* Significant at the 1%/5%/10% level.

## Appendix 2.2 – Industry adjusted regression

	Multivariate OLS Regression (Industry adjusted)			
<b>(EBITDA) devided by:</b>	<b>Assets</b>	<b>t-statistic</b>	<b>Revenue</b>	<b>t-statistic</b>
Constant	-0.035***	-4.45	-0.548**	-1.97
Median pre-M&A event operating performance	0.316***	8.75	1.254***	17.59
Cross-border	0.009	1.36	0.114	0.56
Industry relatedness	0.007	1.23	-0.438*	-1.83
Method of payment				
• Shares	0.015	1.14	0.200	0.51
• Mixed	-0.00001	-0.00	0.261	0.90
• Cash	0.010	1.20	0.152	0.56
Relative size of the target	0.00002***	10.90	0.0001**	2.03
Leverage of the acquirer	-0.004	-0.21	1.640	1.24
Relative cash position of the acquirer	0.0212	0.81	0.492	0.83
Experience of the acquirer	0.00004	0.90	-0.0009	-0.96
Number of observations	439		441	
F-statistic	34.8***		39.87***	
R-squared	0.490		0.846	

Table 7: Industry adjusted multivariate OLS regression

\*\*\*/\*\*/\* Significant at the 1%/5%/10% level.

## Appendix 2.3 – Unadjusted regression

	Multivariate OLS Regression (Not industry adjusted)			
<b>(EBITDA) devided by:</b>	<b>Assets</b>	<b>t-statistic</b>	<b>Revenue</b>	<b>t-statistic</b>
Constant	0.025**	2.69	-0.563**	-2.25
Median pre-M&A event operating performance	0.333***	9.88	1.251***	17.22
Cross-border	0.010*	1.69	0.105	0.62
Industry relatedness	0.005	1.00	-0.392**	-1.99
Method of payment				
• Shares	0.015	1.24	0.2401	0.74
• Mixed	0.004	0.69	0.306	1.25
• Cash	0.011	1.44	0.212	0.98
Relative size of the target	0.00002***	10.38	0.0002**	2.19
Leverage of the acquirer	-0.005	-0.27	1.347	1.18
Relative cash position of the acquirer	0.001	0.02	0.640	1.18
Experience of the acquirer	0.00004	1.12	-0.0009	-1.06
Number of observations	520		524	
F-statistic	30.04***		39.22***	
R-squared	0.500		0.843	

Table 8: Not adjusted multivariate OLS regression

\*\*\*/\*\*/\* Significant at the 1%/5%/10% level.