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Is M&A success decided before the deal goes through?

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Abstract

The aim of this paper is to contribute to the ongoing discussion about M&A performance and the impact pre-merger characteristics have on post-merger performance for the acquiring firm. The study is limited to acquisition deals that occurred in 2014 and the acquiring firm being located in the EU-15 area. Using the quantitative indicators method, econometric models were performed to measure the impact of nine separate accounting-based factors on post-merger performance. This thesis suggests a new method of using the performance measure return on assets. Instead of having a fixed time period used for all deals, using a five year average ROA reduces time dependent fluctuations and allows for different post-merger integration time frames. The results present us with insights that support that R&D intensity has a positive effect on post-acquisition performance, in particular for cross-industry deals. Furthermore, log revenue and inventory intensity seem to have negative and significant effects on predicted performance, even when controlling for industry, country, cross-border and cross-industry deals. Interaction variables also implies that larger acquirer firms tend to perform worse in cross-industry deals and that high R&D intensity leads to better cross-border post-acquisition performance.

Keywords: M&A, Success, Acquisitions, Performance, EU-15, Accounting, ROA, R&D

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1. Introduction

1.1 Background

The recent rise of special purpose acquisition companies (SPAC) (Dimitrova, 2017) has caused investment banks throughout North America to go into overdrive (Bloomberg, 2021) and the trend seems to be currently catching on in continental European countries. Being that the mergers and acquisitions market seems increasingly more popular and M&A activity is at an all-time high (Forbes, 2021), the question of whether acquisitions actually are value creating is very prominent. More so, being able to predict what actually determines if an acquisition will be successful could prove to be crucial for corporations trying to acquire growth efficiently in the future.

The topic of M&A deals is a well discovered field. Countless studies have been made the last couple of decades. One common approach in previous studies is to investigate reasons for successful and failed M&A deals. A recurrent result is that shareholders earn zero or negative returns in the long run after an acquisition (Cartwright & Schoenberg, 2006). Short-term gains are not sustained over time and do often deviate from the long-time value (King, Dalton, Daily & Covin, 2004). However, previous research results are inconsistent, and the variables and methods used to analyze it differ.

The majority of previous research is dedicated to large publicly listed firms in the US. However, very little focus has been paid to the European market. According to Jansen (2008) European acquisition activity stands for a substantial part of global M&A activity but is still often ignored in the literature. McCarthy and Dolfsma (2013) argues that the lack of studies is a consequence of insufficient reliable data. The aim of this study is to close the research gap and find explanatory characteristics of European acquisition deals using accounting-based variables. By using a vast

number of observations as a starting point, we aim to collect a big enough sample for the tested regressions to give statistically powerful results, despite inadequate data.

1.2 Purpose, limitations and research question

The purpose of the study is to investigate the factors that determine the successfulness of mergers and acquisitions from the acquirer's perspective. Previous studies have used return on equity as the dependent variable for any empirical findings, but there seems to be room for improvement by using a stabilized return on assets to measure acquiring firms' post-merger profitability. Granted that ROA will be the only measure of success, the study will not take into account any other incentives for acquiring a firm such as obtaining desirable technology or gaining a long term advantageous market share. Instead, this thesis will pursue the causation effects of variables found in a variety of different M&A theory segments. Accordingly, the research question this paper aims to answer is the following:

- *Are pre-acquisition firm characteristics predictive of M&A success in Europe?*

To answer this question, a dataset from all completed M&A deals during the year of 2014 is used to deploy a total of 8 multiple linear regression models. The first 4 models make use of a total of 566 observations whereas the remaining models use a total of 150 observations. This thesis therefore aims to contribute to a general understanding of pre-acquisition metrics and their impact on M&A performance as measured by return on assets.

Other limitations include only using data from firms partaking in an acquisition during the fiscal year of 2014, which means that any time variance will be foregone in this study. While this grants for similar economic circumstances for all firms being used in this study, questionability arises when trying to determine any long term decisive factors since no time variance is included. Another limitation is that the dataset used only presents us with acquirer firms headquartered in any of the European Union countries, prior to the accession of countries 2004, commonly referred

to as EU-15[1]. Finally, many of the independent variables can be measured differently depending on the accounting standards currently used in each country, which in a large sample like the one used in this study can result in dubious results.

1.3 Outline of thesis

This thesis is structured as follows: Chapter 2 will give a summation of previous research in the area of the topic and present relevant theories that are applicable to the study. After that, in chapter 3, the collected data and the variables that are used will be presented and described. In the fourth chapter the econometric and statistical methods of the study that are used to analyze the research question will be presented. The fifth chapter will present the empirical results of the study. Chapter 6 aims to discuss and analyze the results and link them to the theories and previous research while also concluding what this thesis will contribute to the current literature.

[1] EU-15 consists of the 15 member states prior to the 2004 enlargement of the union. These include Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, the United Kingdom (Pattitoni, Petracci & Spisni, 2014)

2. Theory and previous research

2.1 Motives

M&A motives

Trying to pinpoint the exact motives behind an acquisition from the perspective of the acquiring firm is hard since every deal is unique. The reasons for buying another firm can be complex and vary from case to case. However, countless studies have been made trying to locate the most common motives. According to Cox (2006) increase of market power, management efficiency and under-valuated target firms can be crucial motives. Another common motivational factor from the literature is to achieve synergies and increase the competitive advantage (Porter, 1985; Carpenter & Sanders, 2007). Renneboog and Vansteenkiste (2019) argues that market expansion is a driving motivational factor. Buying another company can expose the acquiring firm to new markets and customers. All above-mentioned studies agree that growth is a crucial motivational factor behind M&A activity.

M&A deals can be divided into three different directions depending on what motivation the acquiring firm has for making the deal. It can occur in a horizontal, vertical or diversified direction. An acquisition that takes a horizontal direction purchases a firm that operates in the same industry as the acquiring company. McCarthy and Dolfsma, (2013) finds that the main motivation for an acquisition in this direction is to provide synergies between the two concerned parties. The synergies can in turn provide new technical knowledge, strengthen the position in the market and give opportunities to enter new markets (Gopinath, 2003; Singh & Montgomery, 1987).

Amburgey and Miner (1992) describes a vertical acquisition as a deal that involves companies at different levels in the same supply chain. The reasons to do vertical directed acquisitions can be to create cost synergies or to claim resources and channels for distribution. The direction of the deal also matters when trying to figure out motives behind it. A M&A deal directed downwards in the supply chain allows companies to control resources, which can be a strong motivational factor. A

deal directed upwards in the stream may have other motives, such as strengthening or securing a position in the industry (D'Aveni & Ravencraft, 1994).

An important motivation for making a vertical M&A deal, independently of if it is directed up or down the chain, is the transfer advantages that come with it. When a firm can procure resources internally, it reduces transaction costs and makes for more straightforward transfer processes.

The third direction, the diversified merger, is a deal with a target firm that runs a business in a different industry than the acquiring firm. This type of deal is often motivated by an attempt to penetrate new areas of business. That can create value for big mature companies that want to grow, but it can also have the opposite effect. McCarthy and Dolfsma (2013) describes a common case where the management in a firm are acquiring businesses for the sole purpose of expansion. The consequence of this type of empire building attempt can be bad performance in the long run.

M&A waves

The term M&A waves is based on a frequently recurrent phenomenon in M&A history, that periods with a vast number of acquisition activity are often followed by periods of lower activity levels. McCarthy and Dolfsma (2013) as well as Martynova and Renneboog (2008) find evidence of several M&A waves in the last century, both in the US and globally.

The motives and patterns of waves differ, and each wave is unique in many aspects. The literature however argues that some characteristics are shared by most waves. The first is regarding the state of the economy. Waves often occur in the recovery phase after a significant setback in the economy, due to a war or crisis for instance. Secondly, waves seem to appear when interest rates are low, and the stock markets are prosperous as a result of that. The third shared characteristic is that waves are often followed by significant economic shocks, such as fundamental regulation changes or fast technological progress. Lastly, waves are connected to periods when changes in M&A regulations occur.

2.2 Performance measures

Since there are varied motives for going partaking in M&A activity, as mentioned in section 2.1, there are naturally more than one M&A performance measure depending on what the motive for the deal was. During this section we will explore what the different schools of thought try to assess, and further explain how the performance then can be measured.

Strategic management school

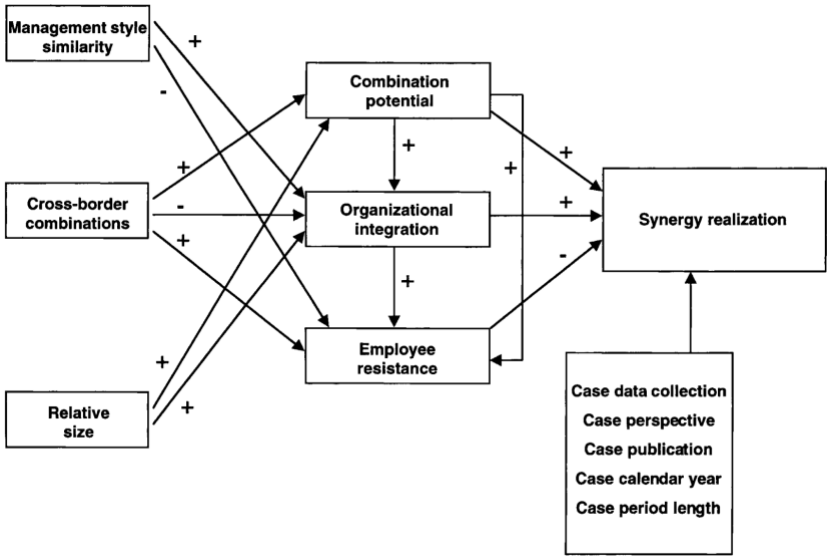
Scholars in the strategic management school have studied M&A in terms of combination potential. The main focus is on the pre-merger phase, where strategic fit is the main driver for M&A success (Bauer & Matzler, 2014).

The early work of strategic management school scholars was usually centered around management decisions being causational of post-merger performance. Notably, risk reduction was one of the first fields to be discovered. The theory is based on how the unsystematic risk reduction of corporations tends to differ from portfolio holders. For instance, if two income streams were to be negatively or weakly correlated, in terms of portfolio theory, the unsystematic or would decrease. The strategic management school however claims that if two corporations were to partake in a diversification merger, the unsystematic risk need not necessarily to decrease. The risk is instead dependent on management decisions which can alter the intrinsic risk profiles of the merged company (Lubatkin & O'Neill, 1987). This means that if the performance measure for M&A success is revenue or return based, there is no underlying assumption to be made about either vertical or horizontal mergers being more prone to result in a more successful combined entity.

In an attempt to bring a more complete understanding of M&A success, Larsson and Finkelstein (1999) came up with an approach to opt for having the synergy realization of the combined firm as a performance measure. The authors managed to create a framework based on the strategy perspective, but also captured crucial aspects from all schools of thought. With the use of multiple hypothesis testing using linear structural relations analysis, three relations were determining the three main factors that were explanatory for the synergy realization. As depicted in figure 3.1, combination potential and organizational integration both resulted in synergy realization.

Employee resistance having a negative effect on synergy realization is quite intuitive, since implementing synergies requires strategically enabling human resources. Partaking in cross-border acquisitions resulting in positive effects on combination potential is by the authors hypothesized as access to different geographical markets and potentially enabling global synergies. The negative effects for integration and employee compliance can be explained by the same geographical differences, with the addition of language barriers and cultural clashes.

Figure 3.1 Model for M&A performance



Source: Larsson and Finkelstein (1999)

Quantitative objective indicators

One of the more recent ways to tackle the complex subject of M&A performance is the quantitative indicators method. As the strategic management school studies tends to rely on using survey data or conducting case studies, measuring performance with accounting measurements allows authors to use larger datasets and therefore presumably allow for new discoveries.

There are mainly three different approaches to measure the success of an acquisition when using accounting-based measures: ratios, growth measures and operating cash flows. The ratios most commonly used tend to be return on assets, sales, investments, equity or capital employed. Growth measure typically captures year to year growth in sales, profit or assets. These accounting based studies indicate that there is a negative effect on both the target and the acquirer. Finally, cash flow

measure studies try to capture the post-acquisition effect on the standardized operating cash flow by normalizing it using the market value of assets (Thanos & Papadakis, 2012).

The advantages that come from using accounting measures can be reduced to three major ones according to Thanos and Papadakis (2012). The first one is that using such measures allows studies to focus on realized performance increases or decreases backed by annual reports. This becomes advantageous compared to either measuring abnormal returns or synergy realization, since there are no real subjective factors that play a part. The second one is that by using different performance measures, such as ROA and ROS, one can easily determine profitability and efficiency changes respectively post-acquisition. The final advantage is based on the possibility to measure long time synergy realization. This becomes possible since synergies between the acquiring firm and target are observable in long-term accounting performance. Additionally, the possibility of managers being biased, which would be rather common in survey studies, is eliminated.

Several authors have however pointed out that there seems to be a problem with measuring the results too early when using accounting-based and stock market measurements. This disallows measuring the M&A performance at the right time, when the post-acquisition integration is considered complete or in the final stage. Additionally, using a single dimension to measure M&A success grants for potentially impactful but unobservable dimensions of firm performance being unaccounted for (King et al. 2004). Finally, using accounting-based variables with data consisting of deals where the acquirer is headquartered in different countries raises the question of whether or not the measurements actually are comparable. As accounting principles and regulations vary across different sovereign states, the difference in how a given variable is measured leads to difficulty in comparing as well as interpreting any results (Weetman & Gray, 1991).

2.3 Determinants of M&A success

M&A intensive industries

Numbers from The Institute for Mergers, Acquisitions and Alliances (2021), show that industrials, high-technology and financials are the three most active M&A industries in terms of number of deals in the world in the last 35 years. In terms of total deal values, financials and energy and

power stands for the largest part. But the corporate world is constantly evolving and different industries dominate the M&A activity at different periods of time.

M&A activity increased rapidly as the world entered a new millennium, both in number of deals and in total value. The total M&A value in the US was higher in two years (1999-2000) than the previous 18 years combined. The dominating industries during those years were high-technology industries. Among the 10 most active industries in the area of M&A, four represented high-technology industries. Those are: computer hardware, electronics, biotech and pharmaceutical (Ranft & Lord, 2000).

Campa and Moschieri (2008) made a comprehensive study where they investigated the industry distribution for all M&A activity in the EU-15 area between 2001-2007. The results from the study showed that the most common industry, concerning the number of deals, was industrials (16 % of all completed deals). The second most common industry was financials and high-tech industries with 14 % out of all deals each. These three industries were the most M&A intensive industries during the whole tested period. In terms of total value of completed deals by industry, the results are quite different. Financials account for 33 % of the total M&A value in the test period and industrials represent only approximately one third of the value of the financial industry. Energy and power represent the second highest total deal value and high-tech industries stand for only about two percent of the total M&A value.

Size mismatch

According to Moeller, Schlingemann and Stulz (2004), relative firm size between the acquirer and target firm has an impact on post-merger performance. The conclusion from their study is that firms with relatively similar size will have a better chance to achieve successful mergers in terms of post-merger success than firms with considerable size differences. The results from the study are supported by Chung, Singh and Lee (2000) as well as Calipha, Tarba and Brock (2010).

One key problem factor for firms that acquire relatively small or big firms is integration. The difference in size can result in misunderstandings or disrespect from the larger firms' management to the smaller firms' organization. Lack of knowledge about how to manage a considerably smaller

or bigger organization can also lead to frictions and hurt the integration (Calipha, Tarba & Brock, 2010).

Bruton, Oviatt and White (1994) also studied the relationship between relative firm size and post-merger performance but came to a different conclusion. They studied approximately 800 M&A deals in the period of 1979-1987 using differences in revenue as measurement for relative size. The authors found no significant correlation between performance and relative size. commented the effect as: “Size mismatch can be overcome with the use of the right organizational structure and reporting relationship”.

2.4 Previous research

Bauer and Matzler (2014) explore the success of M&A in SMEs active in german speaking European countries. Using survey data collected from managers in acquiring firms with a sample size of 106, the paper intends to take more of a holistic approach than previous studies. The research model used compiles three different schools of thought that affect either or both the pre-merger and post-merger phase. The study finds strategic complementarity, cultural fit and degree of integration to all be strong indicators of M&A success. More importantly however is that the result of the study supports that there is an interdependence between the different schools of thought on how to explain M&A success and post-merger integration. This implies that in order to successfully determine what constitutes a firm’s ability to obtain M&A success, included explanatory variables need to explain both the pre-merger and post-merger integration phase.

Bruner (2004) provides us with a literature review of prominent M&A research leading up to and including the M&A wave that concluded in the year 2000. With 128 studies as the basis for his analysis, Bruner argues that there is persistent data to support that M&A does pay when looking at the combined joint value for all parties involved. Most of the profit is however obtained by the shareholders of the target firm, meaning that value creation for acquirers is limited and generating returns in excess of the opportunity cost of capital is fairly uncommon.

Renneboog and Vansteenkiste (2019) compiled results from 151 papers in the field to explore patterns and identify the factors that contribute to success or failure for M&A deals. The study

shows that findings from the previous studies are inconsistent, but some significant results were found. Serial acquisition performance decreases for every acquisition. One driving factor seems to be CEO overconfidence. Related or focused acquisitions outperform unrelated acquisitions. Shareholder intervention in the form of voting has positive effects on value. A similar study was made by Gomes, Angwin, Weber and Tarba (2013). The study reviews 13 factors that are potential critical factors for M&A performance by comparing results from previous papers. Connections between factors were also explored. The study finds that there are significant gaps in the literature about linkages between different factors that can affect the outcome of a merger or acquisition. They conclude that more effort should be directed towards trying to evaluate them in order to better understand post acquisition performance.

Hutchinson and Beckman (2020) analyses European SME M&A deals using 7 potential value driving factors and post-merger-ROA as a performance measure. The results from an OLS-regression disclose that most of the investigated factors have non-significant impact on post-merger performance. The study however finds evidence of previous M&A experience showing a very small, but significant negative effect.

A large part of the literature on M&A has however had a different focus. First day returns for publicly listed firms, especially in the US, has been a common theme in explaining the effect on shareholders (Eckbo, 2014; Kedia, Ravid & Pons, 2011; Andrade, Mitchell & Stafford, 2001). While such studies certainly provide insight into short term profitability for acquiring and target firms, the choice of measurement disallows understanding of long term effects. This study however intends to focus on EU-15 acquiring firms and certain characteristics allowing for post-acquisition success. This allows for this thesis to contribute to understanding current possible EU-specific firm characteristics that are predictive of both positive and negative post-acquisition profitability.

3. Data

3.1 Dataset

Data from 7633 European acquisition deals from 2014 were collected in order to test the research question. In addition, detailed information about the companies involved were possessed from 2013 (pre-acquisition) and for the period of 2015-2019. The dataset was obtained from Orbis (2021), which is a database that consists of financial information about private firms and is provided by Bureau van Dijk (BvD). The sample is limited by deals carried out by single buyer firms and single target firms, meaning firms that acquired more than one company in 2014 and firms that were bought by more than one company are removed. The final samples are significantly reduced by the limitations and missing data points. A further discussion on the subject will be carried out in the method section.

3.2 Dependent variable

Based on previous provided theory, return on assets was chosen as the most suitable and generalistic measure of acquisition performance. Using an accounting based dependent variable with data gathered from an independent provider enables this study to not bring bias into the original data sample, as survey based data would be prone to have non-respondents from unsuccessful acquisitions which leads to an unbalanced population estimate (Mandell, 1974).

While previous studies such as Zollo and Singh (2004) have used fixed time frames for measuring ROA a certain amount of years post acquisition, this method does not actively counteract the fluctuating nature of returns. In order to stabilize any volatility inherently caused by time specific industry or firm trends while also evening out different post acquisition integration time frames, the following definition of ROA is used:

$$ROA_{merged} = \left[\frac{1}{5}\sum_{t=1}^{5} ROA_{aquirer,\,t}\right] - ROA_{acquirer,\,t-1}$$

3.3 Independent variables

All independent variables are standardized to allow for smaller variable intervals. Presented below are the used explanatory variables and their associated formula.

Inventory intensity

Inventory intensity is the measure of the ratio between the years and inventory and total assets. The inventory of a company and how it is handled is a crucial component of the internal strategy of the firm (Feng, Li, McVay & Skaife, 2015), and therefore it would plausibly be causational to the successfulness of an acquisition. Furthermore, given that relative inventory becomes an indicator of how well managed the inventory is in relation to supply and demand of offered product mix; having a higher ratio would indicate that the firm in question is mismanaging inventory efficiency.

$$Inventory = \frac{Book\ value\ of\ inventory_{acquirer,\ t-1}}{Total\ assets_{acquirer,\ t-1}}$$

Current assets

Current assets (CA) are the total short-term assets for a firm. That includes cash, inventory, debtors, operating current assets and non-operating current assets. Current assets are often referred to as the best measure of the fundamental value of a firm (Capaldo, Cogman & Suonio, 2009; Mazzariol & Thomas, 2016).

$$CA = \frac{(cash+inventory+debtors+other\ operating\ and\ non-operating\ current\ assets)_{acquirer,t-1}}{Total\ assets_{acquirer,\ t-1}}$$

Capital intensity

Capital intensity (CI) explains the relationship between the acquirer's assets and revenue. If a firm has a high capital intensity value, it means it needs large amounts of assets to produce a good or service. Whether differences in CI between the acquiring firm and the target firm have positive or negative effects on post M&A performance are well discussed in previous studies. Ritterfeldt and Trygg (2008) mean that it can help utilize assets, which increases post M&A performance.

Audretsch (1989) however finds evidence that large CI differences can have a negative influence on profitability.

$$CI = \frac{Total\ assets_{acquirer,\ t-1}}{Revenue_{acquirer,\ t-1}}$$

Working capital

Working capital (WC) is the difference between assets and liabilities for the acquiring firm. Sagner (2007) argues that WC can never contribute to a company's profits, for the reason that it is just passive assets. Kumar and Bansal (2008) however find that a high WC helps post-merger performance since it reduces liquidity risk.

$$WC = \frac{Current\ assets_{acquirer,\ t-1} - current\ liabilities_{acquirer,\ t-1}}{Total\ asstets_{acquirer,\ t-1}}$$

Cost of goods sold

Cost Of Goods Sold (COGS) is the relationship between costs and production of goods or services sold, which can be explained as the production efficiency for a firm. If there is a big difference in COGS between the involved parts of a M&A deal, it can improve the bargaining power for the part with a relatively low COGS value, provided that the firms offer approximately the same product. Altunbas and Marques-Ibanez (2008) found that in M&A deals where there are clear differences in COGS between the involved firms and the firms that do not produce the same product, it can affect post-merger performance negatively. The reason for that according to the authors is the difficulties that come with integration of two different cost structures.

$$COGS = \frac{opening\ balance_{acquirer,\ t-1} - closing\ balance_{acquirer,\ t-1} + inventory\ puchases\ during\ t-1}{Total\ assets_{acquirer,\ t-1}}$$

Property plant and equipment

Property, plant and equipment (PPE) are the part of a firm's assets that are physical and cannot easily be converted into cash. The variable includes gross property and excludes capital expenditure and accumulated depreciation. A relative high PP&E value indicates stability and long-term growth for a firm.

$$PPE = \frac{Gross\ property,\ plant\ and\ equipment_{acquirer,\ t-1} - capital\ expenditure_{acquirer,\ t-1} - accumulated\ depreciation_{acquirer,\ t-1}}{Total\ assets_{acquirer,\ t-1}}$$

Log revenue

Revenue is the business generated income for a company. It is a commonly used and suitable measure of a firm's size. Revenue differs a lot between different companies, which makes it a highly skewed variable. The variable is logarithmic transformed in order to convert it into a more normalized variable. The operating revenue values used are presented in thousands and currency translated to USD by BvD.

$$Log\,rev\ =\ \ln\left(Operating\,revenue_{acquirer,\,t-1}\right)$$

Long term debt

Long term debt (LTD) is defined as debt that matures in more than one year. It refers to a firm's leverage and to what extent a firm finances their operations. Typical examples are bank loans, credit lines and bonds with obligations. Hitt, Harrison, Ireland and Best (1998) found that low to moderate debt was an attribute of successful acquisitions whereas the opposite was true for high amounts of debt.

$$LTD\ =\ \frac{Long\,term\,debt_{acquirer,\,t-1}}{Total\,assets_{acquirer,\,t-1}}$$

R&D intensity

The sub-sample of firms with reported annual R&D costs has the fewest observations comparatively to the other independent variables. According to The World Bank (2021), the total amount of firms that had R&D expenditure during the year 2020 was 13.51%. Given the lack of firms choosing to partake in in-house R&D, the following assumptions are presented:

Assumption 1: missing values in R&D expenditure corresponds to no in-house R&D activity taking place for any given firm. Therefore, any observations where the R&D variable have missing values, the value is forced to zero.

$$(1)R\&D\ =\ \frac{R\&D\,expenditure_{acquirer,\,t-1}}{Operating\,revenue_{acquirer,\,t-1}}\ \ and\ \nexists R\&D\ \Longrightarrow\ R\&D=0$$

Assumption 2: missing values cannot be interpreted as R&D activity not taking place in a specific firm. Therefore, observations with missing data points for R&D expenditure have to be excluded from the sample in order to not introduce bias to the multiple regression analysis.

$$(2) R\&D = \frac{R\&D\ expenditure_{acquirer,\ t-1}}{Operating\ revenue_{acquirer,\ t-1}} \quad and \quad \nexists R\&D \implies R\&D = \text{D.N.E.}$$

Note: D.N.E. stands for does not exist.

Assumption 1 will be tested in models 1-4 and assumption 2 will be tested in models 5-8. Further explanation of the deployed models will take place during the next section.

3.4 Control variables

Cross-border and cross-industry dummy variables

A dummy variable was constructed to capture the industry differences and similarities between the acquiring firm and the target firm in a specific deal. The deal specific dummy takes a value of 1 if the target firm and the acquiring firm operate in the same industry code and the value of 0 if it does not. This helps identify if cross-industry deals show different patterns than the sample with all deals included, in terms of post-acquisition success or failure.

In order to further identify patterns in the set of deals, a cross-border variable was included. The variable control for post-acquisition impact from acquisitions where the target firm is located in a different country than the acquirer in a specific deal. A dummy variable was used and it takes the value of 0 for domestic deals and 1 for cross-border deals.

The above mentioned dummy variables will also be tested for interaction effects, using R&D expenditure and log revenue, to capture otherwise unobserved causal relationships.

Industry and country specific effects

The dataset was also controlled for industry specific effects. Industries tend to differ in terms of technological complexity, which implies the integration period might vary significantly between different industries. The post-acquisition performance might thus be less noticeable for some

industries in a period of five years post-acquisition. Dissimilarities in capital intensity between industries might also explain differences in post-acquisition performance between industries. Industry dummies for the acquiring firms were conducted using BVD industry sectors. That gives a total of 29 dummies. Dummy variables for which country within EU-15 each acquiring firm has its headquarters were also constructed to control for country specific explanations in the sample.

3.5 Descriptive statistics

Since the regressions in this study were run with two different samples, descriptive statistics for including all independent variables is presented separately below, one for the cleansed dataset and one for each sub-sample.

The cleansed dataset (cleansing procedure explained in section 4.1) includes all obtainable data from EU-15 acquisitions during 2014, with the exception of the removal of extreme outliers. With a sample size of 6824, it is clear that observations for different variables vary greatly. More specifically, the used sample included firms that were less prone to have official reports of long term debt and inventory balance compared to working capital and current assets. Some notable outliers are still present (see appendix A.1), with capital intensity as the clearest example. While the maximum value amounts to 61339 for the whole sample, the sub-samples provided in table 3.1 and 3.2 show that CI lowers its mean and maximum towards more plausible values.

As for the sample used in models 1-4, with 566 observations, the descriptive statistics looks very much like the first sample. However, there is a drastic difference in capital intensity. The largest observation in the sample, seen in table 3.1, has the value of approximately 462. That gives a standard deviation of 19.464, which is far greater than for any other variable. As for the dummy variables, there are 256 cross-border deals and 35 cross-industry deals in this sample.

Table 3.1. Descriptive statistics if sample for models 1-4

	N = obs	Mean	Std. Dev.	Min	Max
ROA_{merged}	566	0.009	0.134	-0.347	1.302
Inventory	566	0.104	0.099	0.000	0.808
CA	566	0.436	0.187	0.018	0.994
CI	566	2.372	19.46	0.037	461.772
WC	566	0.104	0.191	-1.992	0.840
COGS	566	0.527	0.215	0.006	0.979
PPE	566	0.211	0.183	0.000	0.939
LTD	566	0.187	0.149	0.000	1.895
Log rev	566	6.096	0.984	2.903	8.447
Cross-border	566	0.452	0.498	0	1
Cross-industry	566	0.062	0.241	0	1
R&D intensity (forced zero)	566	0.013	0.077	0	1.560

In the sample used for model 5-8, which is presented in Table 3.2, it is noticeable that the smallest value for the log-revenue variable is 2.903. The interpretation is that no super small companies are included in the sample. Furthermore, 113 companies in the sample are cross-border and 20 are cross-industry. Capital intensity and log revenue has by far the highest standard deviation, which indicates great variation in the sample.

Table 3.2. Descriptive statistics if sample for models 5-8

	N = obs	Mean	Std. Dev.	Min	Max
ROA_{merged}	150	0.007	0.163	-0.333	1.302
Inventory	150	0.102	0.074	0.000	0.363
CA	150	0.425	0.158	0.132	0.960
CI	150	1.457	0.886	0.355	6.936
WC	150	0.131	0.142	-0.390	0.840
COGS	150	0.514	0.204	0.036	0.943
PPE	150	0.188	0.138	0.005	0.654
LTD	150	0.178	0.109	0.000	0.576
Log rev	150	6.368	1.001	2.903	8.447
Cross-border	150	0.753	0.433	0	1
Cross-industry	150	0.133	0.341	0	1
R&D intensity	150	0.048	0.144	0.000	1.560

4. Methodology

4.1 Data cleansing

One condition that has to be fulfilled in order to create the variables used in the regression is that all necessary information is available. Therefore, all observations with missing data points in tested variables were excluded in the presented results. All observations with a higher absolute value than three on the merged ROA variable were also removed. The original sample included observations where the acquiring firm had average returns amounting to 10 and sometimes even 100 times their reported total assets over the tested 5 year period. While excluding outliers can be questioned as it inherently introduces bias, the result of including such outliers would lead to more dubious results. One reasonable assumption is that ROA should in common cases be somewhere in the interval of -1 and 1 due to the natural scale of returns. Allowing it to reach the absolute value of 3 means that we allow our sample to outliers that are still within reason, as companies vary in capital structure and annually reported net income.

In addition, all deals with multiple acquirers or multiple targets were removed in order to make the sample as general and effective as possible. The effects of a deal that includes more than two firms can differ in many respects from a deal with one single acquirer and one target firm in terms of post-M&A performance. Lastly, in order to make the samples more standardized and fairer, a total of six outliers were removed. That includes one observation with a negative capital intensity value, four observations with a capital intensity value over 100 000 and one observation with a COGS value that was 30 times greater than the second largest. This kind of cleansing can be classified as a listwise deletion of data, where observations are excluded from the dataset if they are unsatisfactory. It can introduce bias to estimated parameters, but the practice is commonly used in previous studies with large samples (Kang, 2013).

4.2 Model specification

In order to address the research question, variables introduced in the theory section and further explained in the data section will be tested in relation to the acquiring firm's return on assets. A total of eight models has been conducted with the following model specifications:

$$ROA_{merged} = \boldsymbol{\beta_1}\, \boldsymbol{x_{t-1,i}} + \boldsymbol{\varepsilon_{1,i}} \quad (1)$$

$$ROA_{merged} = \boldsymbol{\beta_2}\, \boldsymbol{x_{t-1,i}} + \boldsymbol{\gamma_2 z_i} + \boldsymbol{\varepsilon_{2,i}} \quad (2)$$

$$\boldsymbol{ROA_{merged}} = \boldsymbol{\beta_3}\, \boldsymbol{x_{t-1,i}} + \boldsymbol{\gamma_3 z_i} + \boldsymbol{\varepsilon_{3,i}} \quad (3)$$

$$\boldsymbol{ROA_{merged}} = \boldsymbol{\beta_4}\, \boldsymbol{x_{t-1,i}} + \boldsymbol{\gamma_4 z_i} + \boldsymbol{\varepsilon_{4,i}} \quad (4)$$

$$\boldsymbol{ROA_{merged}} = \boldsymbol{\beta_5}\, \boldsymbol{x_{t-1,i}} + \boldsymbol{\gamma_5 z_i} + \boldsymbol{\varepsilon_{5,i}} \quad (5)$$

$$\boldsymbol{ROA_{merged}} = \boldsymbol{\beta_6}\, \boldsymbol{x_{t-1,i}} + \boldsymbol{\gamma_6 z_i} + \boldsymbol{\varepsilon_{6,i}} \quad (6)$$

$$\boldsymbol{ROA_{merged}} = \boldsymbol{\beta_7}\, \boldsymbol{x_{t-1,i}} + \boldsymbol{\gamma_7 z_i} + \boldsymbol{\varepsilon_{7,i}} \quad (7)$$

$$\boldsymbol{ROA_{merged}} = \boldsymbol{\beta_8}\, \boldsymbol{x_{t-1,i}} + \boldsymbol{\gamma_8 z_i} + \boldsymbol{\varepsilon_{8,i}} \quad (8)$$

Model (1) is the starting point for all other models in the study. It is a multiple linear regression model with all accounting-based continuous explanatory variables presented in the data section except for R&D intensity. For $k = 1\ldots4$, $\boldsymbol{x_{t-1,i}}$ represents the vector containing all explanatory variables measured at *t-1*, $\boldsymbol{\beta_k}$ is the vector of estimated parameters and $\boldsymbol{\varepsilon_{k,i}}$ is the estimated residuals.

Model (2) includes all variables from Model (1), but with the addition of two dummy variables (contained in $\boldsymbol{z_i}$) to control for M&A activity between firms that operate in different industry sectors and different countries. $\boldsymbol{\gamma_k}$ is the coefficient for dummy $\boldsymbol{z_i}$. Furthermore, another continuous explanatory variable is added, R&D intensity. For $k = 2\ldots4$, R&D intensity is strictly forced to zero for all sample observations if and only if the corresponding data reports R&D spending as 0 or n.a.

Model (3) sees the addition of 4 interaction variables, which are cross-border and cross-industry multiplied by the continuous variables log revenue and R&D intensity. As for model (4), the

interaction variables are replaced with dummy variables for the specific industry that the acquirer is active in as well as dummies for which European country the acquirer has their headquarters.

For $k = 5…8$, R&D intensity is no longer strictly forced to zero, allowing fewer observations to be tested in the model. For model (5), it is specified the same way as model 2 with the exception of the above mentioned interchanged R&D variable. Model (7) adds the industry and country dummies to model 5. Model (6) and (8) are almost identical to model (6) and (8) respectively, with the exception of removing capital intensity as an explanatory variable.

4.3 Measure of fit

To evaluate how well the independent variables explain the dependent variable in the linear regression models, an R-squared measure is presented in the results. It is measure with the following formula: $R^2 = \frac{\Sigma(\hat{y}_i - \bar{y}_i)^2}{\Sigma(y_i - \bar{y}_i)^2} = \frac{RSS}{TSS}$

Where the numerator is the sum of squares of predicted values less mean values and the denominator is the sum of squares of observed values less mean values (Lewis-Beck & Skalaban, 1990). There is however a necessity to remark that the R-squared measure only relates to the statistical fit of the model given a specific sample and not neces . Therefore, any inference made about real life causation

4.4 Multicollinearity

Some correlation between the explanatory variables in a multiple regression will more than likely be present. A problem however arises when the correlation rate between two or more variables is too high. That is called multicollinearity. To test for multicollinearity a variance inflation factor (VIF) test was conducted as well as a correlation matrix analysis.

The variance inflation factor is strictly dependent on the variable R^2, which is obtained by a linear regression of a single independent variable, as shown in the following formula:

$$VIF_i = \frac{1}{1 - R_i^2}$$

As depicted in table 4.1, none of the presented variables show any sign of having a VIF too high in order for it to be considered a plausible cause of multicollinearity. Craney and Surles (2002) argued that personal bias in choosing cutoff values called for the use of a model-dependent approach to obtain data specific cutoff values. However, Thompson, Kim, Aloe and Becker (2017) noted that previous studies and common rules allow for cutoff values as low as 3 and as high as 10. As our VIF values for models 1 through 4 (depicted on the left side of the table) and 5 through 8 all are below the cutoff value of 3 and with a mean lower than 2; the potential threat of multicollinearity being present in any model is to be considered very low.

Table 4.1. Variance inflation factors

Model 1-4		Model 5-8	
Variable	VIF	Variable	VIF
CA	2.29	CA	2.30
INV	1.49	WC	2.12
WC	1.41	CI	2.11
COGS	1.33	R&D intensity	1.88
PPE	1.30	Inventory	1.50
LTD	1.20	Log rev	1.41
Log rev	1.18	COGS	1.38
R&D intensity (Forced zero)	1.13	PPE	1.36
Cross-industry	1.09	LTD	1.17
Cross-border	1.06	Cross-industry	1.17

CI	1.06	Cross-border	1.13
Mean VIF	1.32	Mean VIF	1.59

While the VIF of our independent variable raised no questions, a visual analysis of presented correlations of all independent variables are still in order. Shown in table 4.2 is the matrix for variables used in model 1 through 4. Current assets (CA) inventory intensity (INV) have the highest correlation with a value of 0.508. As for table 4.3, CA and working capital (WC) had a correlation of 0.655. While both of these can be considered relatively high, none passes the generally applied threshold of 0.7 (Dormann, Elith, Bacher, Buchmann, Carl, Carré, Marquéz, Gruber, Lafourcade, Leitão, Münkemüller, McClean, Osborne, Reineking, Schröder, Skidmore, Zurell and Lautenbach, 2013). This does however only indicate that severe multicollinearity is not present in the data.

Table 4.2. Correlation matrix for models 1-4

	ROA	INV	CI	WC	COGS	PPE	CA	LTD	Log rev	Cross-border	Cross-industry	R&D intensity (Forced zero)
ROA	1.000											
INV	-0.038	1.000										
CI	0.009	-0.068	1.000									
WC	-0.037	0.315	-0.027	1.000								
COGS	0.002	0.340	-0.117	0.104	1.000							
PPE	-0.009	-0.115	-0.045	-0.193	0.011	1.000						
CA	0.142	0.508	0.097	0.505	0.256	-0.430	1.000					
LTD	-0.012	-0.239	-0.024	-0.183	-0.098	0.258	-0.379	1.000				
Log rev	-0.245	-0.049	-0.017	-0.108	0.238	0.072	-0.195	0.131	1.000			
Cross-border	-0.007	-0.044	0.040	0.088	-0.056	-0.007	-0.049	0.017	0.124	1.000		
Cross-industry	0.167	-0.016	-0.005	0.089	-0.011	0.039	-0.005	0.027	0.015	0.120	1.000	
R&D intensity (Forced zero)	0.373	-0.057	0.006	0.103	-0.159	-0.092	0.074	-0.032	-0.106	0.097	0.255	1.000

Table 4.3. Correlation matrix for models 5-8

	ROA	INV	CI	WC	COGS	PPE	CA	LTD	Log rev	Cross-border	Cross-industry	R&D intensity
ROA	1.000											
INV	-0.153	1.000										
CI	0.609	-0.361	1.000									
WC	0.281	0.303	0.121	1.000								
COGS	-0.089	0.243	-0.413	0.100	1.000							
PPE	-0.035	0.098	-0.200	-0.178	0.308	1.000						
CA	0.322	0.348	-0.042	0.655	0.092	-0.301	1.000					
LTD	0.029	-0.113	0.105	-0.207	0.034	0.199	-0.252	1.000				
Log rev	-0.384	-0.138	-0.225	-0.393	0.188	0.197	-0.367	0.260	1.000			
Cross-border	-0.061	0.211	0.037	0.203	-0.004	-0.069	0.065	0.032	-0.009	1.000		
Cross-industry	0.194	-0.041	0.207	0.191	-0.068	0.025	0.027	0.033	-0.017	0.088	1.000	
R&D intensity	-0.626	-0.145	0.604	0.216	-0.320	-0.191	0.1988	-0.059	-0.302	-0.009	0.294	1.000

4.5 Homoscedasticity

To improve the reliability of the OLS regressions, one of the most essential assumptions for an OLS regression must be fulfilled, which is homoscedasticity. That means the error terms of the coefficients have a constant variance. A violation to this assumption means that the error terms are heteroscedastic which implies over- or underrated standard errors of the coefficients. This was tested on every regression by conducting a normality test by D'Agostino, Belanger and D'Agostino (1990). The results from the test for all models is presented in Table 4.4.

Table 4.4. Skewness and kurtosis test

Variable	N	Pr(Skewness)	Pr(Kurtosis)	χ^2	Prob>χ^2
Residuals (Model 1)	566	0.0000	0.0000	501.08	0.0000
Residuals (Model 2)	566	0.0000	0.0000	408.79	0.0000
Residuals (Model 3)	566	0.0000	0.0000	398.37	0.0000
Residuals (Model 4)	566	0.0000	0.0000	139.79	0.0000
Residuals (Model 5)	150	0.0108	0.0000	25.35	0.0000
Residuals (Model 6)	150	0.0000	0.0000	56.45	0.0000
Residuals (Model 7)	150	0.2498	0.0000	16.93	0.0002
Residuals (Model 8)	150	0.0003	0.0000	26.67	0.0000

As shown in the table, all models have heteroscedastic residuals since the chi-squared values are too low for all models on one percent level. The Kurtosis column tells us that the tails of the distribution are different from normal distributed tails for all eight models. That means they all contain extreme values that differ from a normal distribution. Furthermore, all models except for Model 8 are skewed, which implies that the distributions are shifted either to the left or to the right. For graphical display of the residual distribution, see appendix A, figure A.2 and A.3.

In order to counteract the negative effects caused by heteroscedasticity, robust standard errors are used for all deployed models. The heteroscedasticity-consistent errors obtained for all models are based on the work of White (1980) and provide a closer measure to the true standard errors given the presence of heteroscedasticity.

5. Results

5.1 Independent variables and their effect on M&A success with R&D assumption (1)

The first model presented in table 5.1 takes eight different accounting-based measures into account. As shown in the table, capital intensity, cost of goods sold, and long-term debt has no significant effect on post-merger performance. Working capital and property, plants and equipment comes with weak significance and relative low coefficient. The effect of those variables is thus marginal. Both log revenue and inventory have significantly negative coefficients at a level of five percent (log revenue is even significant at a one percent level), which gives a strong indication that they have negative effects on post-merger performance. The largest coefficient in model 1 is from capital intensity, which is also significant at one percent level.

Model 2 features all the variables from the first model while also controlling for the effects from cross-border, cross-industry and R&D intensity (forced to zero). The model fit is noticeably improved with the new control variables as it goes from 0.1076 to 0.2459. This can to a great extent be explained by the R&D variable that captures parts of the variation that was not picked up in model 1. Another consequence that comes with more noise explained is a decrease in robust standard errors for all tested variables. Noticeable is also that the effects of working capital and property, plants and equipment are increased, both in terms of significance and coefficient. Controlling for cross-industry or cross-country deals does not seem to affect the results significantly.

In the third model, interaction variables were added. Four interactions were tested, and the results show significant interactions between cross-border*R&D intensity and cross-industry*Log revenue at one percent level. Cross-border and R&D intensity influences each other's relationship to the dependent variable positively. That means great R&D intensity has a strongly positive effect on post-merger performance, if and only if the target firm is foreign. That is further confirmed by

noticing the changes in results for the R&D intensity variable. All the positive effects R&D has on post-merger performance disappears and are captured by the interaction variable.

Cross-industry and revenue also interact and influence each other's impact on post-merger performance. That relationship is however negative, meaning that firms with great revenue are generally less successful in terms of post-merger performance when the target firm operates in a different industry than the acquiring firm. The effect is smaller than the effect from cross-border*R&D intensity, but significant at one percent level. Furthermore, model 3 provides new information about the cross-industry variable, which now has a strong significant positive effect on the dependent variable. The interpretation is that cross-industry acquisitions are generally successful given that the acquiring firm has a relatively low revenue pre-acquisition. The model fit is slightly improved compared to model 2.

In the next model (4), all interaction variables were removed and dummies for industries and for countries were added. This model provides us with a better model fit than all previous models. It also provides higher significance for both inventory and working capital. However, property, plants and equipment lose significance, which could be caused by the industry dummy absorbing the effects of capital expenditure heavy firms.

Table 5.1 Firm characteristics and their effect on M&A success for models 1-4

	Model 1 Coeff. (Robust std. Errors)	Model 2 Coeff. (Robust std. Errors)	Model 3 Coeff. (Robust std. Errors)	Model 4 Coeff. (Robust std. Errors)
INV	-0.199** (0.085)	-0.156** (0.063)	-0.153** (0.060)	-0.163*** (0.061)
CA	0.202*** (0.076)	0.180*** (0.058)	0.159*** (0.039)	0.147*** (0.039)
CI	-0.000 (0.000)	-0.000 (0.000)		

WC	-0.100* (0.055)	-0.130** (0.053)	-0.132** (0.030)	-0.098*** (0.032)
COGS	0.033 (0.036)	0.068** (0.031)	0.060** (0.026)	0.044* (0.026)
PPE	0.051* (0.030)	0.059** (0.028)	0.049 (0.031)	0.019 (0.031)
LTD	0.046 (0.062)	0.045 (0.058)	0.035 (0.036)	0.057 (0.035)
Log rev	-0.032*** (0.009)	-0.031*** (0.009)	-0.020*** (0.007)	-0.039*** (0.005)
Cross-border		0.002 (0.011)	0.076 (0.063)	0.009 (0.011)
Cross-industry		0.053 (0.038)	0.452*** (0.121)	0.035 (0.024)
R&D intensity (Forced zero)		0.602*** (0.131)	-0.146 (0.247)	0.579*** (0.074)
Cross-border* R&D intensity			0.547*** (0.161)	
Cross-industry* R&D intensity			0.222 (0.227)	
Cross-border* Log rev			-0.013 (0.010)	
Cross-industry* Log rev			-0.063*** (0.019)	
Industry dummies	NO	NO	NO	YES

Acquirer country dummies	NO	NO	NO	YES
Constant	0.114** (0.053)	0.079 (0.050)	0.039 (0.046)	0.325** (0.164)
N	566	566	566	566
R^2	0.1076	0.2459	0.2800	0.4030

*p<0.1, **p<0.05, ***p<0.01

5.2 Independent variables and their effect on M&A success with R&D assumption (2)

When removing the assumption that R&D can be forced to zero when there is no available data on R&D spending, the results and sample size change drastically. Models 5 and 7 are replications of models 2 and 4, with the interchanged R&D variable. Models 6 and 8 are constructed similarly, but with the removal of capital intensity as an explanatory variable.

Models 5 and 6 presents us with a better model fit when compared to model 2. The model fit is measured by the reported R^2 values, which comparatively seems to be increasing drastically to support those fluctuations in the endogenous latent variables can be explained by the new presented model. However, interpreting the value as an absolute measure of how well the model explains out of sample data is incorrect. As the sample size is roughly a fourth compared to model 2, fitting a linear model to a smaller sample intuitively and in practice would allow for a more conclusive in sample fit, but not necessarily be explanatory in a larger sample.

Model 5 also presents us with some notably different results from model 2. As shown in table 5.2, the constant in model 5 goes from being insignificant to significant at the 5% level with a negative coefficient. While this result is rather difficult to interpret in a general case for M&A, it still indicates that the compared models vary fundamentally. Moving on to inventory intensity and current assets, they still impact M&A success in the same way, even though the coefficients have

grown larger. As the variables are ratios, the interpretation of inventory intensity should be as when the acquiring company increases their II ratio by 0.1, the expected average delta ROA of the merged company will be reduced by a tenth of the coefficient value.

When comparing model 5 to model 2, capital intensity interestingly becomes significant at the 1% level and has a rather high coefficient of 0.083. As the capital intensity variable had a rather large variation and an unexpected number of outliers, this raises questions about the reported values in the sample. Recalling that the descriptive statistics showed a full sample mean of roughly 60 and a maximum value of over 60 000, in which the assumed range would be centered around 1, the data cleansing performed might have been too cautious. The actual descriptive statistics for the sub-sample used shows that the maximum value of CI amounted to just below 7, with a mean of 1.46. Since the variable contains such a wide range of values, caution in making inference based on actual coefficients is necessary.

Working capital loses its significance in model 5 as the coefficient trends towards zero and the standard deviation increases. Other changes are found in the cost of goods sold and property, plant and equipment. Both coefficients more than double and go from being significant at the 5% level to being significant at the 1% level. As for the long term debt, log revenue and the industry and cross-border dummies, they remain virtually unchanged, having a relatively small impact on the model with insignificant coefficients.

The new R&D variable has a much smaller coefficient than the variable presented in model 2. While the significance remains the same, the difference would likely stem from the fact that the sample is tailored to only include R&D capable firms and therefore any other similarities between the companies can instead be further explained by other independent variables.

Controlling for industry and acquiring country specific effects, the results from model 5 are fairly similar to the ones presented in model 7. One major difference is that the constant becomes insignificant, likely due to the fact that industry specific dummy variables are able to account for the unexplained part in the previous model. PPE goes from being significant on the 1% level to the 5% level, and the absolute value of the coefficient of log revenue becomes larger. R^2 increases slightly to 0.7187 to indicate a more conclusive model specification.

Model 6 removes the capital intensity variable, which leads to R&D intensity having much more explanatory power in predicting post-merger ROA. This is shown by the coefficient going from 0.361 to 0.606 and remaining significant at the 1% level. The absolute value of inventory intensity also rises in terms of its coefficient, going from -0.325 to -0.572. Long term debt and the dummy variable for cross-border shows positive and significant effect for the first time, at the 5% and 10% levels respectively. The coefficient for log revenue increases, but it loses significance due to the new higher standard deviation, going from 1% to 10%.

When adding control variables to model 6, as done in model 8, the fit naturally increases, leading to R^2 measure going from 0.5545 to 0.6807. Furthermore, PPE loses all significance, indicating that the industry dummy variables contain information about capital intensive and thus high relative PPE spending sectors. Log revenue goes from -0.039 to -0.058 and increases significance to 5%, while also amounting to the minimum coefficient measurement in all of the models. Inventory intensity also grows smaller, amounting to -0.771, which is at first glance a bit odd since the coefficients of the industry dummies supposedly would have explanatory power in inventory intensive industries.

Table 5.2 Firm characteristics and their effect on M&A success for model 5-8

	Model 5 Coeff. (Robust std. Errors)	Model 6 Coeff. (Robust std. Errors)	Model 7 Coeff. (Robust std. Errors)	Model 8 Coeff. (Robust std. Errors)
INV	-0.325** (0.135)	-0.572*** (0.167)	-0.544*** (0.186)	-0.771*** (0.228)
CA	0.385*** (0.078)	0.303** (0.144)	0.396*** (0.099)	0.342** (0.169)
CI	0.083*** (0.013)		0.061*** 0.016)	
WC	-0.099 (0.084)	-0.010 (0.120)	-0.053 (0.109)	0.005 (0.165)

COGS	0.137***	0.083	0.154**	0.132**
	(0.047)	(0.076)	(0.061)	(0.065)
PPE	0.248***	0.214**	0.198**	0.150
	(0.069)	(0.088)	(0.096)	(0.113)
LTD	0.090	0.183**	0.147	0.281***
	(0.082)	(0.073)	(0.111)	(0.100)
Log rev	-0.031***	-0.039*	-0.047***	-0.058**
	(0.010)	(0.021)	(0.013)	(0.029)
Cross-border	0.031	0.042*	0.032	0.041*
	(0.020)	(0.024)	(0.026)	(0.025)
Cross-industry	0.000	0.002	-0.006	-0.009
	(0.260)	(0.029)	(0.034)	(0.041)
R&D intensity	0.361***	0.606***	0.398***	0.516***
	(0.078)	(0.107)	(0.094)	(0.137)
Industry dummies	NO	NO	YES	YES
Acquirer country dummies	NO	NO	YES	YES
Constant	-0.206**	0.011	0.067	0.281*
	(0.082)	(0.127)	(0.190)	(0.159)
N	150	150	150	150
R^2	0.6502	0.5545	0.7187	0.6807

*p<0.1, **p<0.05, ***p<0.01

6. Discussion and conclusion

6.1 Discussion

As far as our measure of M&A success goes, it must be clearly stated that all ulterior motives for acquiring another company are untouched by this study. While the theoretical motives that were increasing market power, management efficiency and the target firm being undervalued all present us with a clear indication that the conjoined firm would ameliorate the performance, that might not be the case for all acquisitions. If firms were to instead opt to acquire another firm to disrupt the target firm's ability to enter into the acquirer's market, no efficiency nor synergy gain is the clear motive. Therefore, asserting market dominance would purely be a strategic measure with a negative impact on ROA, but could from the acquirer's perspective be considered as M&A success. It is however difficult to estimate what portion of our sample has other motives than realizing synergies and deeming all negative ROA acquisitions as having ulterior motives would be negligent.

The effect of vertical acquisitions is supposedly captured by the cross-industry dummy. The results however indicate that there is no real difference in vertical and horizontal M&A. Since the coefficient essentially was zero for all models except one (where the effect was counteracted by its interaction with R&D intensity), the results indicate that there are no notable differences depending on which direction the acquisition is taking. One could on the other hand argue that the cross-industry dummy actually contains information about diversification M&A, since acquiring part of an industrial process (vertical direction) many times would be intra-industry. Irrespective of what way it is interpreted, our results show that for our sample, there are no direct effects on ROA decided by which acquisition direction the acquiring firm opts to transact.

Recalling the theory from the strategic management school, synergy realization was an alternative M&A performance measure. Referring back to figure 3.1, it becomes clear that our results and methodology presents no clear evidence to support the effects of neither employee resistance nor

organizational integration. The effects from relative size are also unobservable for the multiple linear regressions performed, as log revenue can be considered only as a proxy for how large the acquiring company is, and thus excluding any information relating to the target firm. While relative size was considered as a measure of revenue, the dataset forced the preliminary results including that measure to only include two observations, and therefore relative size was excluded as an independent variable. The hypothesized positive effects caused by cross-border acquisitions cannot be confirmed, as there are only two models that indicate a positive significant effect (10% level) on post-acquisition ROA. Further problems arise when looking towards what actually could be included in the coefficient of the dummy variable. Intuitively it is logical for only larger firms to partake in cross-border acquisitions, since they are the ones to likely benefit from the obtainable synergies depending on reaching a different market or streamlining supply chains. This is further suggested by the interaction between cross-industry and R&D intensity, which showed a positive and significant (1% level) coefficient, which indicates there are net positive ROA effects for acquiring firms in different countries if the acquirer has relatively high R&D expenditure. This follows the logic that when acquiring technology, disruptive and innovative solutions are unlikely to have been developed by a firm in the same country.

The performance measure of this study accounts for the average ROA during all the first five years post-acquisition. It can thus be argued that the measure is advantageous for industries or companies with short integration periods. The results from the study did not find any significant industry-specific effects, but it did however show significantly negative coefficients for the revenue variable in all tested models. That implies larger firms perform worse than smaller firms according to our performance measure, which might be partly explained by the fact that larger firms have slower integration processes than smaller firms.

The results from model 3 presents us with previously undiscovered interaction effects of R&D and cross-border acquisitions. It seems that the interaction effect cancels out the initial stand-alone effect of R&D, which might be due to several underlying reasons. One major factor is that R&D insensitive firms will likely have a technological motive for acquiring firms. In terms of simple probability, the likelihood of finding a disruptive technology domestically would undoubtedly be

lower compared to elsewhere. While this might not be the case for innovative and large countries such as the US and a handful of southeast Asian countries, it still is plausible given the sample at hand. Another contributing factor might be that high R&D expenditure is associated with new product launches. In this case, the acquiring firm can get access and more quickly penetrate foreign markets given the target firms already established presence. Lastly, the possibility to transfer R&D departments in order to reduce fixed costs and obtain more efficient distribution channels might be contributing to the increase in post-acquisition ROA that is observed.

6.2 Implications of the results

Since the data sample of this study only covers accounting-based variables for European acquisition deals from 2014, the results cannot prove significant patterns for all M&A activity or control for robustness over time. However, there is a lack of previous research investigating European deals in the same period. Most literature focuses on earlier periods of time, which means the implications of this study can contribute with new information in this area and period. Revenue, Current Assets and R&D intensity stayed significant throughout all tested models. To fully capture the effect from those variables on post-acquisition performance, the variables have to be further investigated.

6.3 Improvements

A larger sample size would give more reliable results and greater precision to the study. One approach to achieve more observations is to investigate longer time periods. That would also help uncover time variations of characteristics and effects of the tested variables. Furthermore, using data from more than one database would probably provide more information to each company in the sample, which would increase the number of observations in the dataset, since a vast number of observations was excluded from the sample due to lack of information.

In order to fully understand the different aspects of firm characteristics and their effect on M&A performance, a combination of approaches would be preferable. Such a study would test different

dependent variables, such as synergy realization, return on sales and revenue growth in addition to return on assets. If implemented correctly, the results would be able to find evidence that supports certain pre-deal characteristics and their effect on profitability, efficiency and growth for the combined firm.

6.4 Conclusion

This paper has explored pre-acquisition firm characteristics of the acquiring firm in order to be able to analyze and find common ground towards what might be predictive of M&A success. As a summation of the presented results, the acquirer's R&D intensity, current assets and cost of goods sold are the main attributes that have a positive impact on post-acquisition return on assets. The negative effects are mainly attributed to firm size (measured with log revenue as a proxy) and inventory intensity. Interesting interactions also indicated that larger acquirers tend to perform worse in cross-industry deals and that high R&D intensity leads to better cross-border post-acquisition performance. Our models concluded that there are clear differences between assuming and not assuming that unreported R&D expenditure means that the firm does not conduct R&D. This calls for further investigation, as the sub-samples used for the respective models were dissimilar in size, which could be the cause of the different results. The presented results are not transferable to regions outside of the EU-15 area and should not be considered conclusive for acquisitions taking place before or after the year of 2014.

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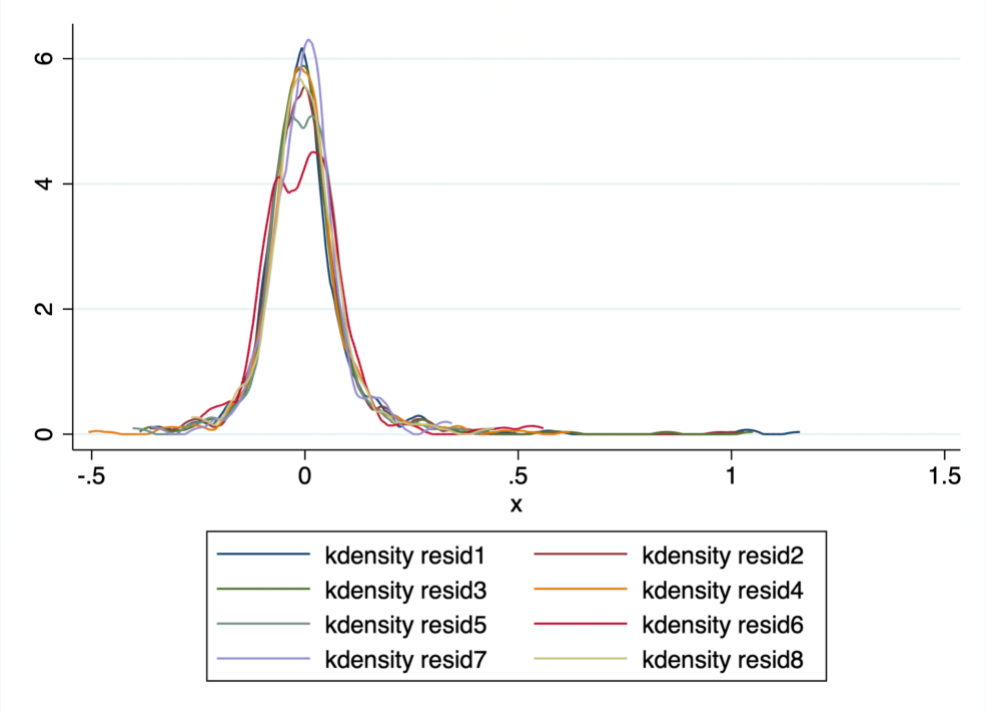
Appendix A.

A.1 Descriptive statistics of the cleansed sample

	N = obs	Mean	Std. Dev.	Min	Max
ROA_{merged}	5149	0.003	0.254	-2.942	2.924
Inventory	640	0.101	0.099	0.000	0.808
CA	4680	0.543	0.299	-0.042	1
CI	3939	60.865	1196.909	0.037	61339.590
WC	4686	0.140	0.492	-11.388	1
COGS	1339	0.556	0.257	0.001	3.129
PPE	808	0.171	0.179	0.000	0.969
LTD	724	0.186	0.154	0.000	1.895
Log rev	3963	4.599	1.366	-3.445	8.447
Cross-border	6824	0.263	0.440	0	1
Cross-industry	6824	0.031	0.173	0	1
R&D intensity	435	0.054	0.181	-0.002	2.854
R&D intensity (forced zero)	6804	0.003	0.0476	-0.002	2.854

A.2 Univariate kernel density estimation



A.3 Residuals, model 6, plotted against the standard normal density function