Handelshøyskolen BI

GRA 19703 Master Thesis

Thesis Master of Science 100% - W

Predefinert informasjon

Startdato:	16-01-2022 09:00	**Termin:**	202210
Sluttdato:	01-07-2022 12:00	**Vurderingsform:**	Norsk 6-trinns skala (A-F)
Eksamensform:	T		
Flowkode:	202210||10936||IN00||W||T		
Intern sensor:	(Anonymisert)		

Deltaker

Navn:	Fredrik Svith Fløttum og William Bay Bråthen

Informasjon fra deltaker

Tittel *:	The Effect of Management Control Systems on Acquisition Outcomes: An Empirical Study of Scandinavian Companies
Navn på veileder *:	Gabriel R. G. Benito

Inneholder besvarelsen konfidensielt materiale?:	Nei	**Kan besvarelsen offentliggjøres?:**	Ja

Gruppe

Gruppenavn:	(Anonymisert)
Gruppenummer:	214
Andre medlemmer i gruppen:	

Master Thesis

The Effect of Management Control Systems on Acquisition Outcomes: An Empirical Study of Scandinavian Companies.

William Bay Bråthen
Master of Science in Business, Major in Accounting and Business Control

Fredrik Svith Fløttum
Master of Science in Business, Major in Accounting and Business Control

Supervisor:
Gabriel R. G. Benito

July 01, 2022

Abstract

With our master thesis, we wanted to examine what effect formal management control systems have on acquisition outcomes. To generalise these systems, we used ISO 9001 certification as a proxy, which allowed us to quantify the data for management control systems. We examined the effects for two scenarios, when the target company is certified and when the acquiror is certified. The metrics we used to measure the effects were, change in net income, change in revenue, and change in COGS-to-revenue ratio. We used an average of the results from the three fiscal years before and after the acquisition to calculate these metrics. To test our hypotheses, we used different variations of propensity scores matching models and a nearest neighbour matching model. The results indicate that the effect of the certification is more significant when the acquiror is certified rather than the target. For companies that certified companies acquire, the results indicate a positive increase for all relevant metrics.

Acknowledgements

This master thesis marks the end of our two years of master's education at BI Norwegian Business School. It has been some of the most challenging, yet the most rewarding time in our lives.

We want to thank our supervisor Gabriel R.G. Benito for the great advice and feedback throughout the thesis. When we needed guidance, he would steer us in the right direction. We are highly appreciative of the continuous help we have received.

Family, friends and co-students also deserve appreciation for their patience and support throughout the last two years. As this programme started during the lockdown, their consideration and support have helped us massively.

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1. Introduction

Mergers and acquisitions (M&A) have been extensively studied, with researchers examining the effects of transactions and how the companies perform post-merger or post-acquisition. Although significant potential benefits exist, many M&As are not profitable or viewed as successful by the companies involved. When it comes to how successful a merger or an acquisition has turned out, previous studies have focused on either the perceived success of the senior management, their ability to increase profits or positive returns for shareholders.

A previous study shows that 75 percent of companies that have gone through an M&A process fail to deliver on financial and strategic objectives (Marks & Mirvis, 2001). This is supported by Toby J. Tetenbaum (1999), who reports that 60 to 80 percent fail to deliver increased profits. One major contributing factor is that companies only manage to realise 30 percent of the potential synergies. The success rate is slightly better from the managers' perspective, with a reported success rate of 56 percent (Cartwright & Schoenberg, 2006). In more recent studies, the numbers look far worse. It is estimated that 70 to 90 percent of all mergers and acquisitions turn out to be failures (Christensen et al., 2011).

With our study, we want to examine further the effect formal management, through management control systems, can have on the outcome of acquisitions. We believe that having such control systems in place could lead to better control and facilitate better utilisation of synergies. There have been some studies in recent years which have focused on the role that management practices have on the outcome of M&As. A study published in Harvard Business Review has shown interesting results related to management practices and M&A outcomes. The study was based on data from the "Management and Organizational Practices Survey" conducted by U.S. Census Bureau in 2010. The survey collected data on management practices from over 35.000 U.S. manufacturing plants. The researchers focused on "more-structured" management practices defined by the four criteria: specific, formal, frequent, and explicit. The findings of this study were that "companies with more-structured management practices were more likely to acquire companies with less-structured management practices (Bai et al., 2021). Moreover, they observed that there indeed

was a spillover effect where the target company adopted the more-structured management practices of the acquiror. This did not only result in a higher management score but also increased productivity, value-added per employee, value-added per worker-hour and profit margins. In addition, we find studies indicating that management is among the most critical determinants for M&A success (Delis et al., 2022).

For our study, we will use the global certificate ISO 9001 as a proxy to measure the effect of the management control systems and formal management practices. This certificate is a part of the ISO 9000 family, which is related to quality management systems. We believe this certificate would indicate that a company utilises formal management control systems and sophisticated management practices.

Interestingly, the global volume of transactions is increasing, while the success rates are still low. The year 2021 was a very active year for mergers and acquisitions, with an overall value of a record-high $5.8 trillion globally, exceeding the prior record set in 2007 of $4.55 trillion (Nishant, 2021). While the total volume in dollars has fluctuated since 1985 (Appendix 1), we see a development where the total number of M&A increases relatively evenly over the same period. While these expectations are for the global market, we see no reason why this should not apply to Scandinavian markets.

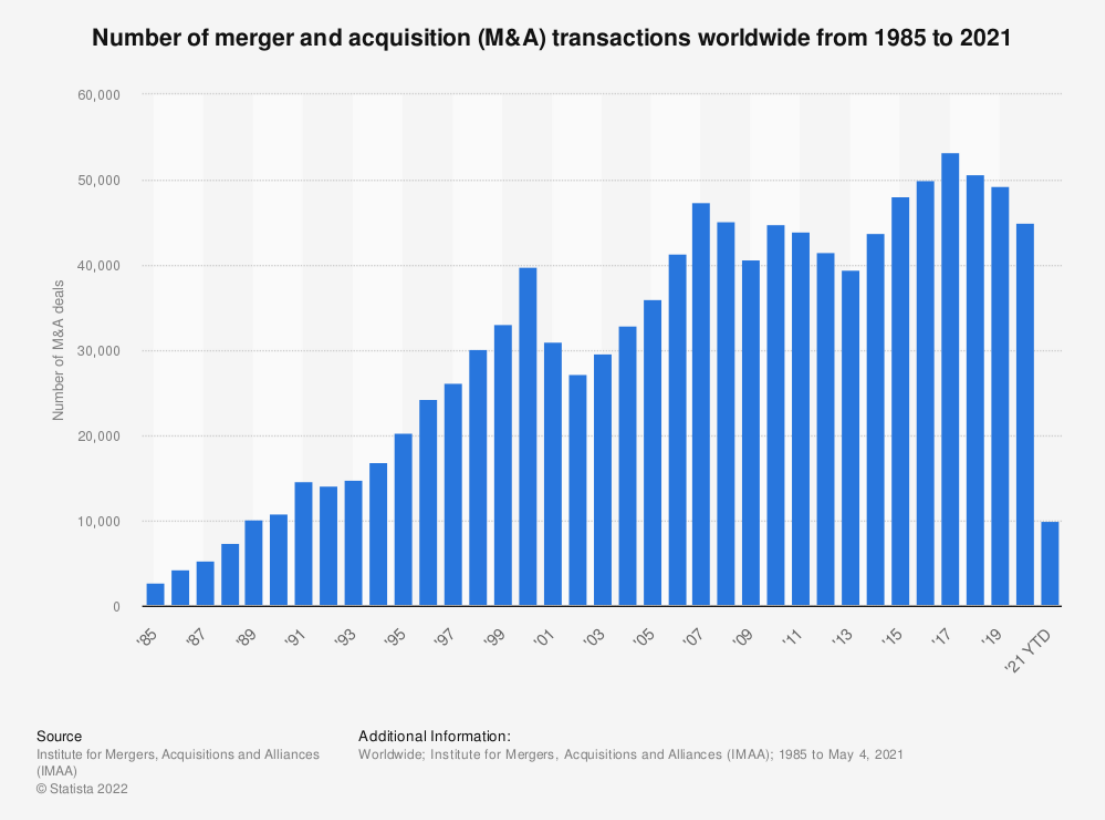

Figure 1 Number of merger and acquisition (M&A) transactions worldwide from 1985 to 2021

The fact that the global market for M&As is increasing, besides the low success rates, lays the foundation for why we believe that the field needs more studies that could bring new perspectives to the existing literature.

With our thesis, we want to examine the effect formal management control systems could have on acquisition outcomes with a quantitative study, which we believe could bring value to the existing literature.

We have derived the following research question: *Does ISO 9001 certification affect acquisition outcomes?*

2. Theory, Previous Research and Hypotheses

This section aims to clarify further and identify the critical aspects of our research. To do this, we have chosen to show how former studies have approached these topics, what impact they have had and what was proven relevant to what we want to aim our research at. The following section aims to provide a literature review on the topics we deem most relevant to our research. We have therefore chosen to look at the theoretical background of M&As, the effect of management control systems, and the effect ISO 9001 has on companies. We provide a brief reasoning behind how we believe that this study will contribute to current literature. Lastly, we present our hypotheses.

2.1 Mergers and Acquisitions

M&As have long been of interest in economic and financial research, yet we do not have all the tools to say for sure or predict the outcome of such a processes (Meglio & Risberg, 2010). The motives behind M&As vary, and the research is in response to this just as vast. However, the objective tends to lean toward presenting a conceptual model which states the values of the findings (Arindam & Sheeba, 2012). DePamphilis (2009) describes the previous studies as having little consensus regarding the determinants of why companies do M&As. He further explains that one of the main reasons is synergy, which can be divided into two. Financial synergy, where companies do M&As to reduce the cost of capital and operational synergy, where economies of scale, economies of scope, and complementary technological assets or skills are the main forces. This theory is supported by an empirical study suggesting that synergies are often the primary motive behind an M&A (Berkovitch & Narayanan, 1993).

When discussing the topic of mergers and acquisitions, it is essential to distinguish the two as they are often used to describe the joining of two companies. A merger is where two companies merge into one to gain entry to new markets, reduce costs, increase revenues, etc. On the other hand, an acquisition is where one company acquires another, usually not equal in structure, and they continue under the larger

companies name (CFI, n.d.). Our study will focus on acquisitions without consolidating the two companies.

As mentioned in the introduction, many mergers and acquisitions fail. Bruner (2005) suggests six factors that contribute to failure: (1) the deal and/or the company was too complicated and people did not understand, (2) there was little flexibility, and the problems in certain business systems could affect other, (3) poor choices from management increased the risk exposure, (4) biased decision making from over-optimism, pride, recent success, etc., (5) the business environment departed from the usual causing errors, and lastly (6) the operational procedures broke down the following stress on routines and increased pressure on the operational team leading up to the crisis. Shrivastava (1986) also mentions operational integration as a key factor, especially in the integration phase. Here he points to the importance of focusing on the existing synergies between the companies and working closely on the operational plan with the current managers.

2.2 Management Control Systems

The term management control system is not the easiest to grasp due to the inconsistency and lack of clear definition. Some define management control systems as passive tools used to support the manager's decision-making, while others see them as an active tool to enhance and align employee behaviour and achieve goal congruence (Chenhall, 2003; Emmanuel et al., 1990; Merchant & Van der Stede, 2007). Jerold L. Zimmerman presents one misconception of the term in his book 1997. He advocates that there is a distinction between control and decision-making. Managers may employ a system to support their decision-making without mechanisms that either "…monitor subordinate managers' goal congruence and behaviour, then the system is a decision-support or information system, rather than a control system" (Zimmerman, 2011). This definition will be a basis for our interpretation of management control systems.

There are several management control systems, and focusing on a specific system would not be optimal. This is due to problems related to the isolation of the effects and the fact that few management control systems show any effect alone (Malmi &

Brown, 2008). Implementing a new control system may seem to generate the impact the company sought, but the interaction with the existing systems could realise the effects. Malmi & Brown suggest that one should instead study these systems as a package; empirical data show this in practice. A cross-sectional and longitudinal study of a firm operating in Italy revealed that implementing and using multiple management control systems positively affected firms' financial performance (Koufteros et al., 2014). Existing literature indicates that management control systems may enhance a company's financial performance. We are interested to see whether this hold for companies involved in an acquisition.

The relationship between management control systems and M&As is a field that is relatively understudied. Schönreiter (2018) conducted a literature review on this topic where she concluded that there is a lack of literature exploring the methodology for process standardisation in post-merger integration. One of the potential reasons for this could be the challenge of quantifying the data of the post-merger effects directly. Some studies have tried this, with the study conducted by Länsiluoto et al. (2015), who examined the impact of management control systems development in a post-business transfer phase. In contrast to their study, we aim to explore the effects of management control systems when they are implemented before the M&A rather than when they are implemented during the integration.

With our thesis, we want to see if the financial performance of companies that have been through an M&A process will be affected by what level of complexity of control systems before the acquisition. To analyse this on a larger scale, we have used the ISO 9001 certification as a proxy to test for quality control processes. The reason that we have specifically chosen ISO1 9001 is due to the problem of categorising what control systems are of importance. The ISO 9001 framework allows us to apply an international standard to the topic, rather than including potential biases of a case-study approach, as it is a set of standardised criteria for control systems within a company.

2.3 ISO 9001 Certification

Since its introduction in 1987, the ISO 9001 certification has become the most adopted standardisation on a global scale (Heras-Saizarbitoria & Boiral, 2013). With over one million certified companies in all sizes and operating fields, the ISO 9001 is a set of criteria for a quality management system (ISO, n.d.). From an empirical point of view, previous studies show that implementing quality management systems (QMS) positively affects firm performance (Hendricks & Singhal, 1997; Powell, 1995; Terziovski & Samson, 1999). As ISO 9001 can be defined as the requirements for the quality management systems (ASQ, n.d.), we will use this as a proxy to analyse the effects of these systems and how they affect company performance.

To understand the validity of ISO 9001, it is essential to understand why companies go through the process of obtaining the certificate. It is necessary to note that the reasons vary due to firm size. Larger companies seek ISO 9001 certification due to improved internal controls, while smaller companies are more concerned about reputation (Bravi & Murmura, 2021). This is also seen in the difficulty of obtaining the certification, where larger companies (in terms of employees) tend to have a more manageable process than smaller companies due to resources available (Bhuiyan & Alam, 2004). The motivation for implementing ISO 9001 was also researched, and here they looked at the topic through categorising. What was found was that the main reason companies wanted to get certified due to quality improvement, followed by an improved corporate image and marketing advantages (Santos & Milan, 2013).

Some studies highlight the effects ISO 9001 can have on financial performance. One of the larger datasets used for ISO 9001 performance research is an empirical analysis of 800 Basque companies in Spain. It was shown that the 400 certified companies had better financial performance than the 400 non-certified companies (Heras et al., 2002). Chatzoglou et al. (2015) looked at this through a quantitative study which included 168 companies from the Greek market. They concluded that when companies adopt ISO, it will significantly increase their chances of economic success. A similar study was conducted, where they obtained a dataset of 399 companies (Casadesús & Karapetrovic, 2005). Here they also have findings that support the conclusion of the Greek study, as they find that ISO 9001 generally has a positive

effect on financial performance. This is also further supported by more recent studies in several countries: an analysis of the Malaysian market showed that out of the 201 companies in the research, those with ISO 9001 certification had significantly better benefits and financial performance when compared to those without (Mazharul Islam et al., 2016). Improvements were also shown in the New Zealand market (Lee & Palmer, 1999), the Spanish market (Cataluña) (Martínez-Costa & Martínez-Lorente, 2003), the Japanese market (Arauz & Suzuki, 2004), the Singaporean market (Chow-Chua et al., 2003) and the U.S. market (Simmons & White, 1999). A recent Indonesian study also showed that upon the announcement of ISO 9001 certification, there were positive responses from the stock market. The study's results also showed that the returns on the company reacted positively on the day after the announcement of the certification (Kiryanto et al., 2021).

Following this, it is important to analyse why these companies experience this improved financial performance. The ISO themselves point out the increased efficiency through alignment internally, expanding to other markets and identifying internal risks (ISO, 2019). This is supported by previous literature, as it has been shown that ISO significantly improves internal efficiency and operational performance, further enhancing the financial performance (Aba et al., 2016). This was, in turn, proved in a literature review done by Tari et al. (2012), where they examined 82 studies on the effects of ISO, and the category that had been shown most frequently was the increase of efficiency. In general, the study shows that implementing the ISO 9001 standard benefits the firm both internally and externally.

2.4 Research Gap

The topic of mergers and acquisitions has been extensively studied, varying from research with thousands of observations to smaller case studies about a single deal. We believe that there still is a lack of studies on the effects of formal management control systems, in particular, the ISO 9001 certification. As we see from existing literature, both M&A studies and control systems have a place in research as they optimise synergies and increase internal efficiency. Therefore, we believe that looking further into the relationship between ISO 9001 certification and the outcome of an M&A is a relevant topic. Our thesis could potentially complement the studies

conducted by Bai et al. (2021) and Delis et al. (2022). It is ultimately aimed at extending the existing literature.

2.5 Hypotheses

As we have mentioned in the sections above, there are studies which indicates that both management control systems and ISO 9001-certification can have positive impact on the financial and operational performance of a company (Aba et al., 2016; Heras et al., 2002; Koufteros et al., 2014). Few studies have linked this to acquisition outcomes, which is what we aim to do with our study. To further study the effect that formal management control systems, through the proxy ISO 9001-certification, have on acquisition outcomes, we have derived the following hypotheses.

When the target company is the ISO-certified company

H1: *There is a statistically significant relationship between financial performance and ISO 9001 for the target company when the target company is certified.*

H2: *There is a statistically significant relationship between operational performance and ISO 9001 for the target company when the target company is certified.*

When the acquiring company is the ISO certified company

H3: *There is a statistically significant relationship between financial performance and ISO 9001 for the target company when the acquiring company is certified.*

H4: *There is a statistically significant relationship between operational performance and ISO 9001 for the target company when the acquiring company is certified.*

3. Data and Methods

This study aims to investigate if ISO 9001 certification can have any effect on the performance of target firms after being acquired. To isolate the effect of ISO 9001 certification, we will apply a propensity score matching model, which will be explained in detail below. By doing this, we can control for external effects from the covariates while measure the treatment effect that ISO 9001 will have on the outcome

variables. For our study, we will focus exclusively on Scandinavian transactions. In this section, we will explain and elaborate on the data collection process, the data filtering, the variables, and the models used to examine the effects mentioned above.

3.1. Data Collection

Our primary data consists of transaction data, ISO certifications, and financial data. We chose to use the Refinitiv database Eikon to collect business transaction data. We contacted the largest certifiers in the relevant countries with the hope of receiving lists or datasets of the companies that they had certified. Due to low response, we collected the ISO-related data manually, where we had to look up every company in the dataset and find their certification online. Further, we used the databases of both Eikon and Bloomberg to collect the financial data we needed for the study.

3.2. Data Filtering

The initial dataset that we collected from Eikon consisted of 9.400 transactions involving Scandinavian companies between 1969 and 2022. The following steps were then applied to make a consistent dataset:

1. Deals completed before 2010 and after 2017 are removed.
2. Deals with a size below 10.000.000 in the native currency are removed.
3. Deals including companies from outside Denmark, Norway and Sweden are removed.
4. Deals consisting of assets only and/or operations are removed.
5. Deals involving governmental ownership are removed.
6. Deals including target companies resold within the first three fiscal years post-deal are removed.
7. Deals including target companies that are holding companies are removed.
8. Deals including companies that consolidate their accounts post-deal are removed.
9. Deals which included companies that were certified within the three years after the transaction are removed.

Firstly, we had to define which time horizon was most relevant for our study, and as we wanted the study to be relevant to our current surroundings, we chose only to include deals between 2010 and 2017. The lower boundary was set to meet our requirement for relevance. We knew that we wanted to use accounting information three years before and after the deal, so with the latest annual reports available being 2020, we had to choose 2017 as the upper boundary. By applying **filter 1**, we excluded all deals that did not meet this requirement.

To further increase our study's relevance, we set a lower boundary for deal size for our dataset. We applied **filter 2**, which excluded all deals with a deal size lower than 10.000.000 in the native currency. As mentioned in the literature review, smaller companies tend to implement ISO 9001 for reputational motives rather than operational. This is the main argument for excluding smaller companies.

One requirement for the dataset was that one of the involved parts was Scandinavian, which also resulted in transactions involving companies from outside of Scandinavia. To control for this, we applied **filter 3**, excluding all deals involving companies outside Denmark, Norway and Sweden. We excluded companies from Finland due to the language barrier that arose when manually gathering information regarding ISO certification.

In addition to pure business transactions, the dataset consisted of transactions of assets, such as buildings, and specific business areas/operations, such as bulk fuels business in the energy industry. We wanted to exclude these kinds of transactions since accounts are reported on a consolidated level, and this was done by applying **filter 4.** This excluded the real estate industry, which consisted exclusively of transactions related to property portfolios.

The dataset also included transactions where one of the parts ultimately was owned by the government through municipal companies. Since these types of companies are outside the scope of our study, we applied **filter 5** to exclude those transactions from the dataset.

We decided that we had to examine companies' development over three years to analyse the effects. We also had to exclude companies, both target and acquirors, that were sold within the three years after the transaction. This was done by applying **filter 6**.

We wanted to examine operational and financial effects, so we had to exclude deals where the target company was a holding company. Since these companies do not produce or sell products or services, we applied **filter 7** to exclude them.

Mergers and transactions with consolidated accounts reported posed a risk related to the analysis of the effect of each transaction since we would not be able to isolate the effect of ISO 9001 certification post-deal due to annual reports being reported consolidated accounts for both the target and acquiring firm. To handle this risk, we chose to apply **filter 8**.

We identified several transactions where the target company or the acquiror were certified with ISO 9001 after the transaction but within the three-year period that we analysed. Since these companies did not have certification before the transaction, we chose to exclude them by applying **filter 9**. Transactions that included companies who were certified after the deal and after the three-year period were classified as 0 for ISO certification and included in the study.

3.3. Variables

Here we will present and explain the treatment variables, outcome variables and covariates used in our models. Outcome variables and covariates are collected from Eikon and Bloomberg databases, while treatment variables are collected manually.

3.3.1. Treatment Variables

The input is collected manually through annual reports and ISO certification publications for both ISO variables. It is also important to note that the certification date has been considered. Observations, where a firm was certified after the deal and within the 3-year post-deal period, were excluded. For ISO, the output would either

be “yes” or “no”, and it will therefore be defined as a dichotomous variable and take the value 1 if the firm is ISO 9001 certified and 0 if not.

ISO_Target: This represents whether the target firm has ISO or not and will represent the main findings connected to the direct effect of ISO 9001 certification.

ISO_Acquiror: Represents whether the acquiring firm has ISO or not and will represent the effect that may arise when a target is acquired by an ISO-certified company.

3.3.2. Covariates

Deal_year: This covariate represents the year the deal was completed and will also be a control for the financial data. As the data consists of financial data stretching from 2007- to 2020, the deal-year variable will be a proxy for the yearly effects.

Deal_value: Represents the amount paid by the acquiring company at the deal closing. The deal_value is presented in millions ranging from 10M and above. The value is reported in native currency, which the country dummies will negate as the deal value will be used along with nationality when computing the propensity scores. This variable will also be used to control for company size. Initially, we wanted to use the number of employees, but the data collection was unreliable, and we opted against it.

Country dummies: Although Denmark, Norway, and Sweden are similar in language and culture, it is essential to account for the firm nationality. The dummies are further classified into Target and Acquiror nations, implying that crossborder transactions are tested for in our model. These will take the values 1 or 0.

Industry dummies: The model aims to measure firms' financial performance in the context of ISO 9001. The firm dummies will consider the differences between each industry, and the effect of the treated group will not include the industry-specific fluctuations. The 11 industries follow the Global Industry Classification Standard

(GICS), created and maintained jointly by MSCI and S&P Dow Jones Indices (Refinitiv, n.d.).

The dummies will include the following list for both the target and the acquiring firm per deal:

1. *Consumer Products and Services*
2. *Consumer Staples*
3. *Energy and Power*
4. *Financials*
5. *Healthcare*
6. *High Technology*
7. *Industrials*
8. *Materials*
9. *Media and Entertainment*
10. *Retail*
11. *Telecommunications*

3.3.3. Outcome Variables

When choosing the outcome variables for the statistical analysis, the main objective was to have values representing a particular purpose. As discussed earlier in this thesis, ISO 9001 is an operational certification, and it was necessary to include operational, and financial measurements. To account for the total effect of the firm (i.e., checking for effects beyond the operational side), we also wanted to include a bottom-line income statement metric. Here the measurements are in 3-year intervals to allow for the effect of ISO to come into action, but short enough to not include other noncontrollable influences (Harrison et al., 1991). We, therefore, ended up including the following three variables, where all the underlying data was collected from the databases of Eikon Refinitiv and Bloomberg:

Net income: The first outcome variable will check for the total effect on the firm, with a timeframe of three years before the deal and three years after. Here the aim is

to look at the complete financial outcome of the firm rather than specific elements of the operation.

$$Change\ in\ Net\ Income = \frac{3 - year\ post\ deal\ average}{3 - year\ pre\ deal\ average}$$

Change in revenue: The change in revenue follows the net income variable in terms of observed years and calculations. However, this variable will represent the growth and operational side of the firm.

$$Change\ in\ Revenue = \frac{3 - year\ post\ deal\ average}{3 - year\ pre\ deal\ average}$$

Change in COGS to revenue ratio: This variable uses the change in revenue and cost of goods sold (COGS) to calculate a ratio that follows the operational costs relative to the revenue. A lower ratio would indicate that the cost per unit would decrease and that the COGS are handled appropriately. COGS will not be used as a standalone variable, as it does not add value to the analysis of whether cost alone has increased.

$$Change\ in\ COGS - to - Revenue - Ratio = \frac{Change\ in\ COGS}{Change\ in\ Revenue}$$

The change in COGS metric is here calculated on the same principle as the change in revenue:

$$Change\ in\ COGS = \frac{3 - year\ post\ deal\ average}{3 - year\ pre\ deal\ average}$$

3.4. Models

This section of our paper will explain which models we have chosen for our thesis, how they work, and why we chose them. Early on, it became clear that a standard linear model would not be a good fit for our dataset. Our primary model is the Logistic Propensity Score Matching, and we have applied two-sample t-tests as well as standardised mean differences to test whether the model is a good fit for our data. Robustness checks include PSM with a probit model and nearest neighbour matching (NNM).

3.4.1 Propensity Score Matching

Statistical matching techniques are an effective way to measure the isolated effect of treatment within a population, which is done by evaluating the effect of the treatment by comparing treated to nontreated participants. In a study where the number of nontreated is larger than the number of treated observations, matching with propensity scores can create a control group where the covariates are similar to the distribution in the treated group (Rosenbaum & Rubin, 1983)**.**

Matching by propensity scores can control for confounding, which provides an advantage over traditional matching techniques (Benedetto et al., 2018). This benefits our study since the number of nontreated observations outweighs the number of treated observations. Another positive characteristic of propensity score matching is its ability to minimise selection bias through equating observations based on the covariates. Matching propensity scores will give an unbiased estimate of the treatment effect. Like pharmaceutical studies where they will analyse the effect of a new drug or treatment, we want to use PSM to analyse the effect that ISO 9001 certification can have on companies that have completed an acquisition. Our two treatment variables will be ISO certification for the target company (1) and certification for the acquiror (2).

The treatment variables, ISO_Target and ISO_Acquiror, are dichotomous variables which are well suited for either a logistic or probit model, the two most used estimation models for PSM. Both models yield similar results, but since a logistic model is used to measure the odds of success as a function of the covariates, we

believe that this model would be the best fit for our study. We have chosen to use this as the main estimation model for the propensity scores (Caliendo & Kopeinig, 2008), with the probit estimation model as a robustness check.

In addition to choosing an estimation model, we must decide how we want the effect of the ISO 9001 certification to be measured. One could either choose the average treatment effect on the population (ATE) or the average treatment effect on the treated (ATT). ATE measures the difference in expected outcome after treatment or nontreatment, which means that it measures the effect of the treatment if the participants were randomly assigned to the treatment. ATT measures the explicit effect on those who are treated and is the difference between the outcome of those who are treated versus those who are not treated. We have chosen to use ATT as our main model since this will measure the actual effect of the treatment for those who are treated, and we will use a logistic PSM with ATE as a robust check to complement the main model.

For our matching algorithm, we chose to use the nearest neighbour matching of propensity scores, where the algorithm matches a treated and a non-treated with the closest propensity scores. By allowing replacement, we can increase the quality of the match as well as reduce bias (Caliendo & Kopeinig, 2008). Replacement means that a matched observation can be used several times and is not limited to one single match. We will use both exact matching, which is 1:1 matching, and kernel matching, where we match the treated observation with more than one from the control group. Exact matching is the best way to conduct a PSM, but there are few situations where that is possible, and in those cases, we chose to use a kernel match. The issue related to exact match when using kernel matching has been much discussed through Rosenbaum and Rubin's articles over the years. They have concluded that one cannot simply achieve exact matching for all variables (Rosenbaum & Rubin, 1983). This will be specified when reporting the results for each outcome variable later in the paper.

One important aspect when we apply propensity score matching is that we avoid comparing observations that cannot be compared, which will weaken the analysis (Heckman et al., 1997). To combat the risk of evaluation bias, we will check for overlap between the treated and the control group by conducting t-tests and calculating standardised mean differences for the propensity scores, in line with what Rosenbaum and Rubin suggest (Rosenbaum & Rubin, 1985). We expect that there will be differences in standardised means before matching, but if our matching is done adequately, we should see no significant difference.

To calculate the propensity scores and match the treated to the non-treated, we chose to use Stata. This software provides two different commands for propensity score matching. The first command introduced for propensity score matching is *psmatch2* written by Edward Leuven and Barbara Sianesi (University of Wisconsin-Madison, 2015)**.** The other command is called *teffects psmatch,* which is the command we will use to estimate the effect of the treatment. The reason why we choose this is that this command takes into account that the propensity scores as estimated. We will use *psmatch2* to conduct t-tests and calculate SMD to check for overlap.

3.4.2 Nearest Neighbour Matching Model

One of our robustness checks will be the Nearest Neighbour Matching Model (NNM). This must not be confused with the nearest neighbour matching estimator related to Propensity Score Matching. Instead of finding similarities in propensity scores, a Nearest Neighbour Matching Model establishes similarities between observations through a weighted function of the covariates. This differs from the main model, where matches are made based on the similarities in propensity scores. There are different distance metrics that one can choose while using the nearest neighbour matching model, and we have decided to use the most common one, the Mahalanobis distance metric. We chose this because it takes into account the correlations within the dataset, unlike other distance metrics such as the Euclidean. We will use such a model to provide a robustness check to the main model. One reason we chose not to use this as our main model is that such a model requires a larger number of observations to provide a satisfactory result.

4. Results

In this section, we will firstly present the overview of the descriptive statistics for the data that we have gathered and used for our treatment variables, covariates, and outcome variables. Secondly, we will present how we estimated the propensity scores and the description of these within each treatment variable. Thirdly, we will present our main analysis's results with two-sample t-tests and standardised mean differences as robustness checks. Lastly, we will present the results from our robustness check.

4.1 Descriptive Statistics

We will here present the descriptive statistics regarding the data that has been used in the primary model. First, we review the control variables and how the ISO certifications are spread between the deal years, industries, and countries. Lastly, we present the general descriptive statistics for the outcome variables, treatment variables and covariates.

TABLE 1 - ISO Frequency per Year

	ISO-Target			ISO-Acquiror		
Deal years	Number of firms	ISO certified	% certified	Number of firms	ISO certified	% certified
2010	12	1	8,33%	12	4	33,33%
2011	15	1	6,67%	15	6	40,00%
2012	22	4	18,18%	22	5	22,73%
2013	16	4	25,00%	16	2	12,50%
2014	14	3	21,43%	14	6	42,86%
2015	29	8	27,59%	29	4	13,79%
2016	23	3	13,04%	23	6	26,09%
2017	27	7	25,93%	27	12	44,44%
Total	158	31		158	45	

Table 1 implies that the certified firms account for around 24 percent of the 316 firms in this dataset. There is also no single peak that particularly stands out among the certified companies, although 2015 stands out for the target firms and 2017 for the acquirors. There are, in total, 31 firms in the target group and 45 in the acquiror group that are ISO 9001 certified. The respective rates are 19,6 percent and 28,5 percent out of their total pool of firms. The firms are also slightly weighted towards later years, especially after 2015, which makes sense as the newest iteration of the standard was released this year.

TABLE 2 - ISO Frequency per Industry

	ISO-Target			ISO-Acquiror		
Industries	Number of firms	ISO certified	% certified	Number of firms	ISO certified	% certified
Consumer products and services	25	7	28,00%	16	10	62,50%
Consumer staples	6	3	50,00%	5	1	20,00%
Energy and Power	10	4	40,00%	8	1	12,50%
Financials	10	0	0,00%	36	2	5,56%
Healthcare	8	0	0,00%	12	6	50,00%
High Technology	28	4	14,29%	25	6	24,00%
Industrials	24	6	25,00%	24	8	33,33%
Materials	17	7	41,18%	11	3	27,27%
Media and Entertainment	11	0	0,00%	7	1	14,29%
Retail	8	0	0,00%	4	2	50,00%
Telecommunications	11	0	0,00%	10	5	50,00%
Total	158	31		158	45	

The ISO frequency within the industries shows fewer certified firms in the target pool (table 2). Here we see that the firms are more grouped toward specific industries. This is expected as the sample size is small, and we know that there is at least one firm in each industry for the acquiring group. This is 1) due to some groups having a larger sample size and 2) could imply that specific industries have a bigger focus on certification (production-related firms). We also see that some industries lack certified companies within the ISO-Target variable. This is mainly due to a smaller sample and will affect the later matching analysis as these industries will be excluded from the match when calculating the propensity scores.

TABLE 3 - ISO Frequency per Country

	ISO-Target			ISO-Acquiror		
Country	Number of firms	ISO certified	% certified	Number of firms	ISO certified	% certified
Denmark	20	5	25,00%	11	2	18,18%
Norway	54	12	22,22%	45	9	20,00%
Sweden	84	14	16,67%	102	34	33,33%
Total	158	31		158	45	

Table 3 (the country-specific statistics) is skewed toward the Swedish market. This is primarily due to the original dataset sharing a similar weighting. The number of firms is similar across both sides of the deal to the Swedish acquirors, who are slightly higher, which will be controlled through the matching models. Denmark has the

smallest pool with 31 total firms due to substantially fewer relevant deals in this country. Furthermore, we also see that the crossborder element is present. As the Swedish pool is more prominent on the acquiring side, most crossborder-deals come from a Swedish acquiror.

TABLE 4 - Descriptive Statistics

Variable name	N	Min	Max	Mean	Std. Dev.
Change in Net income	158	-2.723	2.838	.215	1.069
Change in Revenue	158	-.989	2.099	.210	.598
Change in COGS/Revenue	158	-.975	3.112	.069	.454
Deal year	158	2010	2017	2014.019	2.230
Deal value	158	12	13800	503.472	1360.633
ISO Target	158	0	1	.196	.398
ISO Acquiror	158	0	1	.285	.453

Table 4 show descriptive statistics for the outcome variables, treatment variables and the remaining covariates. The outcome variables are percentages ranging from -272.3 percent to 283,8 percent. The means are also all positive, indicating that the overall outcome of the variables skews toward an increase in the post-deal averages. The deal year variable shows a balanced overall dataset, with the mean being 2014.019. The deal value variable indicates that there are few "very large" deals as the mean is 503.472, with the max value being 13 800. Lastly, the ISO variables show much of the same that was presented in the previous tables, with a mean closer to zero, indicating fewer certified firms in the dataset than those uncertified.

4.2 Logistic Propensity Score Match

We must first estimate the propensity scores to analyse the effects, which we will do by using the Stata command *pscore*. In addition to estimating the propensity scores, this will automatically perform a balancing check by performing a t-test of the propensity scores for the treated, the control group and the covariates.

Table 5 - Estimated Propensity Score				
	Target		Acquiror	
	Percentiles	Smallest	Percentiles	Smallest
1%	.0103859	.0050094	.0660020	.0522996
5%	.0229966	.0103859	.0866742	.0660020
10%	.0302595	.0110952	.1223602	.0668922
25%	.0654128	.0113139	.1940320	.0675646
50%	.1378947		.2657830	
		Largest		Largest
75%	.2935552	.6779652	.4015378	.4795909
90%	.4250298	.6968380	.4342685	.4809708
95%	.6071799	.7518246	.4552587	.4998861
99%	.7518246	.7807937	.4998861	.5012213
Mean	.1962025		.2848101	
Std. Dev.	.1709629		.1199743	
Variance	.0292283		.0143938	
Skewness	1.368456		.0544077	
Kurtosis	4.447074		1.846554	

In Table 5, we see the description of propensity score when the treatment is ISO_Target, denoted as *Target* and ISO_Acquiror, denoted as *Acquiror*.
The distribution for the treatment variables is skewed differently, with ISO_Target being heavily skewed to the left and ISO_Acquiror being moderately left-skewed. Further, we see that the distribution for Target has larger spread for the propensity scores relative to Acquiror. By having a more extensive spread, one would expect that it would be harder to find matches when the treatment variable is ISO_Target. At the same time, a denser distribution for ISO_Acquiror will most likely lead to more accessible and higher quality matches. Boxplots in Appendix 2 highlight the density.

Table 6 - Blocks of Propensity Score

		ISO-Target			ISO-Acquiror		
Block	Inferior	0	1	Total	0	1	Total
1	0	90	9	99	33	7	40
2	.2	30	12	42	58	17	75
3	.4	6	3	9	22	21	43
4	.6	1	7	8			
Total		127	31	158	113	45	158

From table 6 we can see the distribution of treated and controls across the different blocks and their inferior bounds. Within these blocks, the balancing checks are being conducted using the t-test to test that the mean is not different for the treated and the control group. The observations are assigned to the other blocks based on the similarity within the propensity scores and whether there are any potential matches. As we can see for the treatment variable ISO_Target, the observations are divided into four different blocks, where both blocks 3 and 4 have a low number of observations, and 70 percent of the control group is assigned to block 1. For ISO_Acquiror, we see that the propensity scores are divided into three blocks, with a more even distribution than ISO_Target. This substantiates that the treatment variable ISO_Acquiror will provide higher quality matches relative to ISO_Target. The balancing property is satisfied for both ISO_Target and ISO_Acquiror. We chose to perform a t-test for both unmatched and matched observations and calculate the standardised mean differences to evaluate whether the covariates were applicable for matching and we will now elaborate on these results.

Table 7 - T-Test Target

	Unmatched		Matched	
	t	p > – | t |	t	p > – | t |
Dealyear	1.28	0.171	0.00	0.997
Dealvalue	-0.50	0.620	0.06	0.953
Target_Denmark	0.64	0.520	-0.05	0.962
Target_Sweden	-0.99	0.322	0.17	0.868
Acquiror_Denmark	2.26	0.025	0.01	0.995
Acquiror_Sweden	-1.68	0.094	0.12	0.906
Target_Consumer_Staples	1.92	0.057	-0.75	0.458
Target_Energy	1.68	0.095	0.65	0.520
Target_Tech	-0.78	0.436	-0.06	0.950
Target_Industrials	0.72	0.474	-0.58	0.566
Target_Materials	2.40	0.018	0.71	0.481
Acquiror_Consumer_Staples	2.34	0.021	-0.72	0.475
Acquiror_Energy	1.31	0.194	0.68	0.502
Acquiror_Tech	-2.16	0.032	-0.25	0.801
Acquiror_Industrials	1.28	0.203	0.33	0.743
Acquiror_Materials	1.45	0.149	0.23	0.816

Table 7 presents the two-sample t-test performed when the treatment variable is ISO_Target. We see vastly different results from the unmatched and the matched sample, with the results after matching indicating that there is no difference between the means for most covariates. For some covariates, we see that the t-value shifts from negative to positive and vice versa. In a medical study, where the effects of treatment and placebo are tested, a negative t-value would indicate that the placebo has a larger effect than the treatment for that exact covariate (Faraone, 2008). Our study will indicate that the effect of not being certified with ISO 9001 would be more efficacious than being certified. For ISO_Target, this applies to the following covariates, Target_Denmark, Target_Consumer_Staples, Target_Tech, Target_Industrials, Acquiror_Consumer_Staples and Acquiror_Tech. This will be further highlighted when calculating the standardised mean differences. Overall, we can say that there are no differences in the means based on the t-test.

Table 8 - Standardised Mean Differences - Target

	Unmatched			Matched			
	Treated	Control	SMD	Treated	Control	SMD	%-reduction |bias|
Dealyear	2014.5	2013.9	28.7	2014.3	2014.3	0.1	99.6
Dealvalue	394.31	530.12	-11.1	377.64	362.88	1.2	89.1
Target_Denmark	.16129	.11811	12.3	.14286	.14743	-1.3	89.4
Target_Sweden	.45161	.55118	-19.8	.46429	.44171	4.5	77.3
Acquiror_Denmark	.16129	.04724	37.5	.14286	.14227	0.2	99.5
Acquiror_Sweden	.51613	.67717	-32.9	.51957	.51957	3.3	90.0
Target_Consumer_Staples	.09677	.02362	30.7	.03571	.08362	-20.1	34.5
Target_Energy	.12903	.04724	28.8	.14286	.08689	19.7	31.6
Target_Tech	.12903	.18898	-16.3	.14286	.1489	-1.6	89.9
Target_Industrials	.19355	.14173	13.8	.21429	.28188	-17.9	-30.5
Target_Materials	.22581	.07874	41.3	.21429	.14079	20.6	50.0
Acquiror_Consumer_Staples	.09677	.01575	35.2	.03571	.08152	-19.9	43.5
Acquiror_Energy	.09677	.03937	22.7	.10714	.05688	19.8	12.4
Acquiror_Tech	.03226	.18898	-51.3	.03571	.04966	-4.6	91.1
Acquiror_Industrials	.22581	.13386	23.8	.25	.21218	9.8	58.9
Acquiror_Materials	.12903	.05512	25.5	.10714	.08823	6.5	74.4

Sample	Ps R2	LR chi2	P>chi2	MeanBias	MedBias
Unmatched	0.175	27.42	0.037	27.0	27.1
Matched	0.030	2.33	1.000	9.5	5.5

From table 8, we see that the standard mean difference has been reduced for almost every covariate, except Target_Industrials, which experienced an increase in SMD. Overall, there was a great reduction in bias for the covariates, with the highest bias reduction of 99.6 percent. Like the t-test, we see that the same covariates mentioned above report negative SMDs, which further solidifies that the effect of not being certified with ISO 9001 would be more efficacious than being certified for those covariates. Most importantly, we see that there has been a decrease in the overall SMD for all covariates, which decreased from 27 to 9.5; this indicates that matching is a good solution for the data related to the treatment variable ISO_Target.

Table 9 - T-Test Acquiror

	Unmatched		Matched	
	t	p > – | t |	t	p > – | t |
Dealyear	0.40	0.688	-0.10	0.922
Dealvalue	0.26	0.798	0.33	0.743
Target_Denmark	-1.43	0.155	-0.48	0.631
Target_Sweden	1.44	0.152	-0.09	0.928
Acquiror_Denmark	-0.78	0.436	0.11	0.916
Acquiror_Sweden	1.83	0.069	-0.32	0.748
Target_Consumer_Staples	-0.65	0.516	-0.20	0.841
Target_Energy	-1.34	0.183	-0.07	0.940
Target_Tech	-0.91	0.365	-0.09	0.932
Target_Industrials	0.57	0.570	0.51	0.609
Target_Materials	-1.04	0.298	0.04	0.968
Acquiror_Consumer_Staples	-0.42	0.672	-0.05	0.958
Acquiror_Energy	-1.02	0.307	0.36	0.723
Acquiror_Tech	0.54	0.591	-0.26	0.796
Acquiror_Industrials	0.57	0.570	0.45	0.656
Acquiror_Materials	-0.09	0.927	0.15	0.879

Table 9 presents the two-sample t-test performed when the treatment variable is ISO_Acquiror. The results are similar to Table 8, but there are an increased number of negative t-values for this treatment variable. When the treatment variable is ISO_Acquiror, over half of the covariates report negative t-values. We see that the p-values are greater in this t-test, indicating no differences in means for this sample of observations.

Table 10 - Standardised Mean Differences - Acquiror

	Unmatched			Matched			
	Treated	Control	SMD	Treated	Control	SMD	%-reduction |bias|
Dealyear	2014.1	2014.0	6.9	2014.1	2014.2	-2.1	69.5
Dealvalue	547.57	485.91	4.9	547.57	472.0	6.0	-22.6
Target_Denmark	.06667	.15044	-27.0	.06667	.09463	-9.0	66.6
Target_Sweden	.62222	.49558	25.5	.62222	.63157	-1.9	92.6
Acquiror_Denmark	.04444	.07965	-14.5	.04444	.03991	1.9	87.1
Acquiror_Sweden	.75556	.68177	33.1	.75556	.78449	-6.2	81.2
Target_Consumer_Staples	.02222	.04425	-12.2	.02222	.02899	-3.8	69.3
Target_Energy	.02222	.07965	-26.2	.02222	.02464	-1.1	95.8
Target_Tech	.13333	.19469	-16.5	.13333	.13959	-1.7	89.8
Target_Industrials	.17778	.14159	9.8	.17778	.1379	10.8	-10.2
Target_Materials	.06667	.12389	-19.4	.06667	.06453	0.7	96.3
Acquiror_Consumer_Staples	.02222	.0354	-7.8	.02222	.02391	-1.0	87.2
Acquiror_Energy	.02222	.06195	-19.8	.02222	.01236	4.9	75.2
Acquiror_Tech	.13333	.16814	-9.7	.13333	.15264	-5.4	44.5
Acquiror_Industrials	.17778	.14159	9.8	.17778	.14284	9.5	3.4
Acquiror_Materials	.06667	.0708	-1.6	.06667	.0588	3.1	-90.5

Sample	Ps R2	LR chi2	P>chi2	MeanBias	MedBias
Unmatched	0.061	11.60	0.771	15.3	13.4
Matched	0.010	1.23	1.000	4.3	3.4

In table 10 we see that the treatment variable ISO_Acquiror yields similar results as we saw for ISO_Target in table 8. Most covariates experience a great reduction in bias, but covariates such as Dealyear, Target_Industrials and Acquiror_Materials experience an increase in bias. The overall SMD is reduced from 15.3 to 4.3. The t-tests and the SMDs only further solidify our choice of model.

To analyse the effects of the two different treatments, we used the Stata command *teffects psmatch*, which uses the estimated propensity scores to find matches. Table 7 reports the logistic propensity score matching results, further used to investigate the hypotheses. We have used the change in key accounting metrics such as "change in net income" and "change in revenue". In addition to this, we used the efficiency metric "cogs-to-revenue-ratio". Everything is seen from the perspective of the target firm and its performance.

The main model is presented in two brackets: (1) ISO-Target, reporting the results when the target firm has ISO 9001 certification, and (2) ISO-Acquiror, where we report the results when the acquiring firm is certified. The table further shows the reported coefficients and the standard errors in parenthesis.

TABLE 11 - Main Model

Logistic Propensity Score Match, ATT

	(1) ISO-Target	(2) ISO-Acquiror
Change in Net Income	-.075	.276***
	(.311)	(.055)
Change in Revenue	.017	.075***
	(.150)	(.011)
Change in COGS/Revenue	.086**	-.033*
	(.038)	(.019)
Number of observations		
Raw	158	158
Matched	62	90
Treated observations		
Raw	31	45
Matched	31	45
Control observations		
Raw	127	113
Matched	31	45

Notes: Standard erros in parantheses, *p < 0.10, **p < 0.05 and ***p < 0.01

When the Target company is the ISO certified company, the model is based on the ISO_Target variable and checks for the differences between the outcome of the target firms when the target firms themselves are certified versus not.

H1: *There is a statistically significant relationship between financial performance and ISO 9001 for the target company when the target company is certified.*

The reported coefficient of -.075 indicates a negative effect of ISO certification compared to non-certified firms. However, the variable is not statistically significant, with a standard error of .311, which further underlines that the reported coefficient can not be further concluded as it can take both positive and negative values. The

reported p-value here is .81, and we can not say that the hypothesis holds at any given confidence interval and is therefore rejected.

H2: *There is a statistically significant relationship between operational performance and ISO 9001 for the target company when the target company is certified.*

The revenue variable shows similar results to net income, with a reported coefficient of .017 and a standard error of .150, which leads to a less robust output. The exact p-value is here .906, and the hypothesis is therefore rejected for the revenue metric.

Interestingly, the coefficient for cost efficiency reports .081, indicating that deals where the target company is certified do better than non-certified companies when it comes to cost-efficiency. The exact p-value is here .023 and holds for the 5 percent level, and the hypothesis holds for the cost efficiency metric.

When the acquiring company is the ISO certified company, the model is based on the ISO_Acquiror variable, but the outcome still measures the difference in the outcome of the target firm.

H3: *There is a statistically significant relationship between financial performance and ISO 9001 for the target company when the acquiring company is certified.*

Here we see that the reported coefficient is .276, which tells us that the target companies acquired by ISO-certified companies can tend to report a larger growth in net income relative to those acquired by non-certified companies. As the standard error is at .055, we can also confidently see that the variable is positive. The reported p-value is here at .000, which tells us that there is a significant relationship between certified acquirors and the net income of target companies at the 1 percent level.

H4: *There is a statistically significant relationship between operational performance and ISO 9001 for the target company when the acquiring company is certified.*

The reported coefficient for revenue when the acquiror is certified is .075, which is lower than the net income variable. However, the standard error is .011, which again shows that it is within a positive range and indicates that the target firms acquired by certified companies increase their revenue more than those acquired by non-certified companies. Here the p-value is again .000, indicating a significant relationship at the 1 percent level between the acquiring companies' certification and the target companies' revenue.

Lastly is the reported coefficient for the COGS to revenue ratio. Here we see that it is negative at -.033 with a standard error of .019. This indicates a slightly better cost efficiency for the target companies acquired by certified companies than those acquired by non-certified companies. The exact p-value is here .086, indicating that the hypothesis is significant at the 10 percent level and there is a significant relationship between cost efficiency for the target company, and ISO certified acquirors.

4.3 Robustness Check

The models presented in this section represent an additional robustness check to the main model. The matching levels applied to these models are the same as those in the main model (see Appendix 6). The first model is also a logistic propensity score matching model, but instead of estimating the average effect on the treated, we estimate the average effect on the population. The second one is a propensity score match using a probit model, and like the main model, we estimate the average effect on the treated. The third one is the nearest neighbour matching model using the Mahalanobis distance metric. As the main model, the model outputs are coefficients, standard error, and p-values.

TABLE 12 - Robustness Check

In order: Logit Propensity Score Match with ATE, Propit Propensity Score Match with ATT and Nearest Neighbour Match with Mahalanobis distance

	(1)			(2)		
	ISO_Target			ISO_Acquiror		
	Logit ATE	Probit ATT	NNM	Logit ATE	Probit ATT	NNM
Change in Net Income	-.422***	-.085	.032	.143	.264*	.107
	(.098)	(.255)	(.355)	(.280)	(.161)	(.214)
Change in Revenue	.053	.074	.036	.193	.098***	.054
	(.169)	(.101)	(.184)	(.126)	(.012)	(.126)
Change in COGS/Revenue	.179	.056	.115	-.136**	-.026	-.077
	(.237)	(.110)	(.104)	(.069)	(.062)	(.084)
Number of observations						
Raw	158	158	158	158	158	158
Matched	316	62	62	316	90	90
Treated observations						
Raw	31	31	31	45	45	45
Matched	158	31	31	158	45	45
Control observations						
Raw	127	127	127	113	113	113
Matched	158	31	31	158	45	45

Notes: Standard erros in parantheses, *p < 0.10, **p < 0.05 and ***p < 0.01

4.3.1 ISO_Target as the Treatment Variable

As seen in Table 12, the results for secondary models where the treatment effect is ISO certification for target companies, the results are ambiguous for change in net income. For the two models using propensity scores, we see that they yield similar results as the main model, but the results are different when applying a nearest neighbour matching model. For the logistic model with ATE, we see that the effects are greater than when applying ATT, and the results are statistically significant, in contrast to the main model. A p-value of 0.000 indicates that this result is highly significant and holds for the 1 percent level. A coefficient of -0.442 suggests that there is a trend toward uncertified target companies having a better development in net income post-deal than those who are certified. We see results closer to the main model for the model using probit ATT, with similar coefficients, standard errors, and significance. The p-value is 0.740, which indicates that this result is not statistically significant. Lastly, we have the nearest neighbour matching model that differs from the trends seen in the other three models and indicates that companies with ISO 9001

certification have a greater increase in net income post-deal than those not certified. This result should not be emphasised because the high p-value of 0.928 shows no statistical significance.

The results for change in revenue show that the coefficients for all three models are similar to the main model. For the logit ATE model, we see a coefficient of 0.053, with a p-value of 0.753. For the probit ATT model, a coefficient of 0.074 is reported, with a p-value of 0.465. Lastly, we have the nearest neighbour matching model, which reports a coefficient of 0.036 and a p-value of 0.884. Common for all three models is that none of the results is statistically significant, making it impossible to conclude what these results indicate.

The results we saw for change in cogs-to-revenue ratio in the main model were statistically significant at the 5 percent level, which is not the case for the three secondary models used for robustness check. For the logit ATE model, we report a coefficient of 0.179, with a p-value of 0.450. The results of the probit ATT model show a coefficient of 0.056 and a p-value of 0.613. For the NNM, we report a coefficient of 0.179 with a p-value of 0.269. Even though these results are not statistically significant, all the coefficients indicate the same trend as the main model.

4.3.2 ISO_Acquiror as the Treatment Variable

For the models where the treatment effect is ISO 9001 certification among the acquiror, we see that coefficients share the same sign as the main model for all outcome variables. For change in net income, the logit ATE model reports a coefficient of 0.143 with a p-value of 0.608, which shows no statistical significance. For the probit ATT model, we see a coefficient of 0.264 being reported, with a p-value of 0.100, a statistically significant result at the 10 percent level. The nearest neighbour matching model reports a coefficient of 0.107 and a p-value of 0.618.

For change in revenue, we see that the coefficient for the logit ATE model is reported as 0.193, with a p-value of 0.128. This indicates that the result is statistically significant at the 15 percent level. For the probit ATT model, the coefficient is 0.098 with a p-value of 0.000, being statistically significant at the 1 percent level. The

nearest neighbour matching model reports a coefficient of 0.54 and a p-value of 0.671. Similar to the main model, all three secondary models indicate that target companies acquired by an ISO 9001 certified company improve their cost-efficiency post-acquisition.

The logit ATE reports a coefficient of -0.136 and a p-value of 0.049, making it statistically significant at the 5 percent level. For the probit ATT model, the coefficient reported is -0.028, but the p-value of 0.676 indicates no statistically significant relationship related to this result. For the nearest neighbour matching model, the coefficient reported is -0.077, but the p-value of 0.363 indicates no statistical significance.

5. Discussion

This thesis aims to investigate the relationship between formal management and the outcome of an acquisition in the Scandinavian market. By comparing the outcome of certified and non-certified target companies, we wanted to examine the effect of ISO 9001. We aim to extend the current literature, rather than testing the theory that already exists. The results of our study share similarities with existing literature, although our thesis concerns the Scandinavian market. From the analysis, we found statistical relationships between the financial outcome variables and whether the firms are classified. We also found differences regarding whether the target or acquiring is the certified firm, which we will further elaborate on in detail below. Here we will both generalise and contextualise what the results mean and view the analysis in the context of our research question. We will also discuss how these results have general implications and mention the limitations within this thesis.

5.1 Unrealised Potential in Target Firms

Both the main and secondary models provide interesting results for target ISO-certified companies. As we initially believed that target companies certified by ISO 9001 would be a better buy than those not certified, our findings indicate the opposite. The results in Table 11 and Table 12 shows how the growth in different metrics is for the treated relative to the untreated, which is a good indicator for the

overall growth post-deal. As presented in Table 11, target companies that are ISO-certified experience an increase in the cogs-to-revenue ratio relative to uncertified companies post-deal. This trend is also visible in Table 12, where the three secondary models all indicate the same trend. This does not mean that ISO-certified companies experience an overall increase in this metric. Still, it indicates that companies who are not certified will experience a greater effect on cost efficiency post-deal. As mentioned earlier in the paper, previous studies imply that implementing quality management systems positively affects firms' financial performance, which should indicate that certified companies deliver better results than those not certified. Our study suggests a better development in cost efficiency for uncertified companies, which could be explained through realised potential. Certified companies may have realised more of the potential cost efficiency before the acquisition since certified companies generally focus more on control measurements. In addition to cost efficiency, Table 11 and Table 12 present results that indicate a larger growth in net income for uncertified companies relative to the certified companies. This further highlight that there could be a higher unrealised potential in companies that are not certified.

5.2 Spillover Effect

When we analyse the results related to certified acquirors, the results are more in line with our initial hypothesis and are in line with previous literature regarding this topic. As presented in Table 11, we have statistically significant results reporting an increase in net income, revenue and cost efficiency for target companies acquired by certified companies relative to uncertified acquirors. This indicates a greater spillover effect on the financial metrics when the acquiring firm is certified, but the spillover effect on the operational metrics is also apparent. Earlier in the paper, we referred to an article by Bai et al. (2021). Their study concluded that there is a spillover effect when a company with more formal management practices acquires a company with less focus on such practices.

This spillover effect is also mentioned in the theory presented earlier in this thesis. Harrison et al. (1991) argue that more value is created when resource flows between the target and the acquiror. As net income and revenue hold positive coefficients

while the cost-to-revenue ratio coefficient is negative, this could imply that operational synergies are achieved more efficiently when the acquiring company is certified. The ISO emphasises increased customer focus, improving leadership structures, engagement, process approaches and decision-making in their quality management principles (ISO, 2015). If we see this in the context of the results, the effect is more prominent when the acquiror is certified. A potential explanation for this might be that some of the companies that are being bought operate with a lack of these principles. When the acquiring company obtains the ownership, these principles are utilised and might further unlock the potential within the acquired firm.

The findings put into the context of the ISO's quality management principles might also suggest that certified acquirors provide a better foundation for the problems that Bruner (2005) proposes regarding an M&A. He here points to the lack of proper decision making and a lack of alignment within the business systems as some of the reasons behind why M&A's fail. From this thesis, we do not necessarily look at the internal synergies. Still, from a financial point of view, the results indicate that the operational alignment is better for certified companies.

5.3 Practical Implications

From the analysis, we find that the evidence leans towards the acquiring side, which further underlines that the practical implications will be aimed in the same direction. Firstly, we see that the spillover effect is apparent, which might indicate that from a practical point of view, it will affect the target firm when introducing them to certified control systems. The findings might incentivise managers on the acquiring side to increase focus on the control systems tied to achieving operational synergy between the companies. This thesis does not necessarily incentivise seeking ISO 9001 certification as the results for the target companies are inconclusive. However, the study highlights the potential synergies and operational improvements certified acquirors could bring. We believe that the results could be used to highlight the importance of the systems that could further explore the untapped potential within those target firms that are not certified.

From the main model (table 11) we also see the effects in terms of average percentages. When the target firm is certified, we see that they on average deliver growth in COGS-to-revenue ratio that is 8,6 percent higher than the uncertified firm. This implies that uncertified firms achieve a higher increase in cost efficiency relative to the certified firms. The effects of certification are shown to a greater extent when the certified company is the acquiror. Here we see that the effects indicate better performance for all the tested performance metrics. If a company is acquired by a certified company they would, relative to the companies acquired by uncertified firms, perform 27,6 percent better on net income and 7,5 percent better in revenue. In addition to this, we see that the increase in cost efficiency is 3,3 percent greater than firms acquired by uncertified firms.

5.4 Limitations

Although our model has significant results, we acknowledge that the data used suffers limitations. The sample size can be considered limited as it only includes 158 observations from a ten-year period. Although we considered it satisfactory for this study, having a more extensive dataset would likely have increased the number of certified firms and the likelihood of statistical relationships. As a result, the number of certified companies is around a quarter of the total, which can be considered on the lower side. We had limited resources to collect this data, which was collected on a per-company basis, making the process time-consuming. Furthermore, this manual process excluded Finland from the pool of companies due to the language barrier.

This study does not consider the firms that practice the same quality management system guidelines as ISO 9001 without being certified. To quantify formal control, we had to use a standardisation that applies to all and is based on the same guidelines regardless of country. The firms that have been given a zero in the ISO variables might have all the prerequisites to qualify for a certificate but choose not to for various reasons. This effect is not accounted for in this study as it is generally not disclosed whether a company purposefully do not seek certification.

That ISO-data collection was a manual task could also be considered a limitation. As mentioned earlier, there were few public databases containing data available, with

only one of the larger certifiers providing us with a list of their certifications. This meant that we had to collect all data manually and limited our study to Denmark, Norway and Sweden due to a language barrier making it difficult to collect data from Finland. A manual collection such as this is time-consuming and increases the risk of human error, which could affect our data.

The choice of deal value as a variable to control for company size can also be discussed. As we did not manage to gather data surrounding the number of employees of each company, we opted to go for deal value as a control variable. Had we chosen the number of employees as a control variable, our dataset would decrease significantly. Since we already had a limited number of observations, we decided to use deal value as a control variable. One potential problem related to this choice is that we cannot guarantee that deal value is affected by whether a company is certified or not. This may affect our matching due to the insecurity surrounding company size as a covariate.

5.5 Future Research

A common limitation for earlier studies regarding ISO 9001 is the lack of observations leading to small datasets. As a result, there are few quantitative studies on this topic (Aba et al., 2016). From our thesis, we agree that this would be essential to further improve the current state of ISO literature. This could be done through collaboration with accreditors or researching markets with more openly sourced data regarding certification. Although this study has limitations, we see the value in using matching models to negate these effects and therefore encourage future researchers to use similar methods when conducting research on this topic.

6. Conclusion

In our study, we have examined the effect of ISO 9001 certification as a proxy for management control systems when companies complete an acquisition. Existing literature indicates that there is a low success rate for acquisitions. At the same time, formal management and management control systems have a positive effect on both the financial and operational aspects of companies. Our approach was that the ISO 9001 certification would be a good denominator for success due to the focus on control systems and formal management practices. The enhanced focus on control would provide a better foundation for increased growth for the target company, which could lead to a more successful acquisition. We chose to examine the effects on the Scandinavian market due to the cultural, political, and economic similarities. This also led to easier access to the manually collected data related to ISO certification. To test our hypothesises, we chose to use a logistic propensity score matching model to isolate the effects of ISO 9001 certification while controlling for relevant covariates. We compared the delta for the financial metrics net income and revenue and the operational metric cogs-to-revenue ratio for the target company. The treatment variables were certification for the target company (1) and when the acquiring company is certified (2).

There were ambiguous results for the first treatment variable, but there were indications that certification could positively affect the operational aspect. For the transactions where the acquiring firm is certified, we found signs that the spillover effect from acquiring to target firm was greater and that there were positive results for both the financial and operational metrics. This is in line with existing literature, which indicates a positive spillover effect from acquiring firms with formal management practices. Our secondary models, which included propensity score matching with a probit estimation model and nearest-neighbour matching model, indicate the same results, although these had a lower statistically significance. Our study was mainly limited due to the small sample size, which resulted in a lower quality of matches, especially for the nearest-neighbour matching model. Despite this, our study indicates a higher potential in uncertified target firms and that certified acquiring firms are better suited to further develop the target firm.

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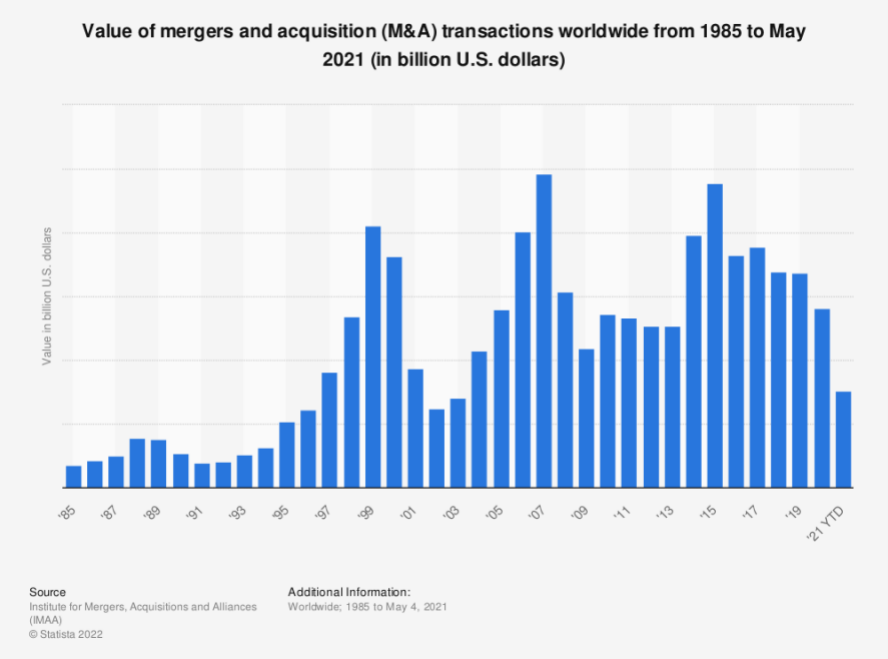
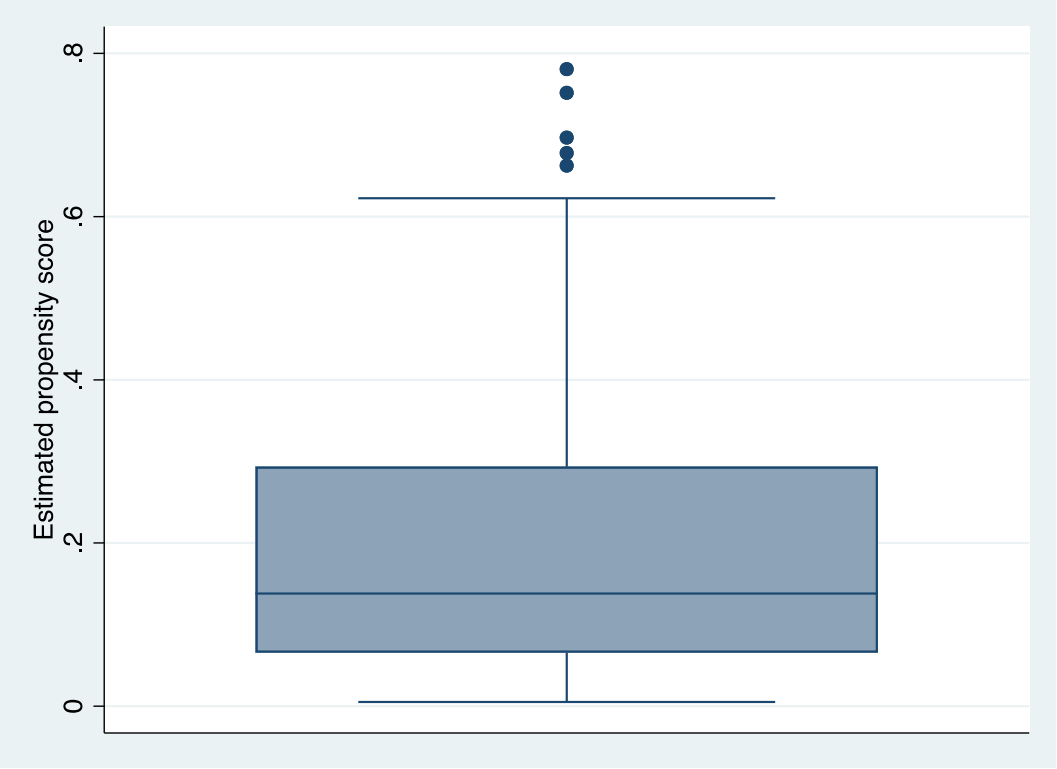
Appendices

Appendix 1 – Worldwide value of M&A transactions 1985 - 2021

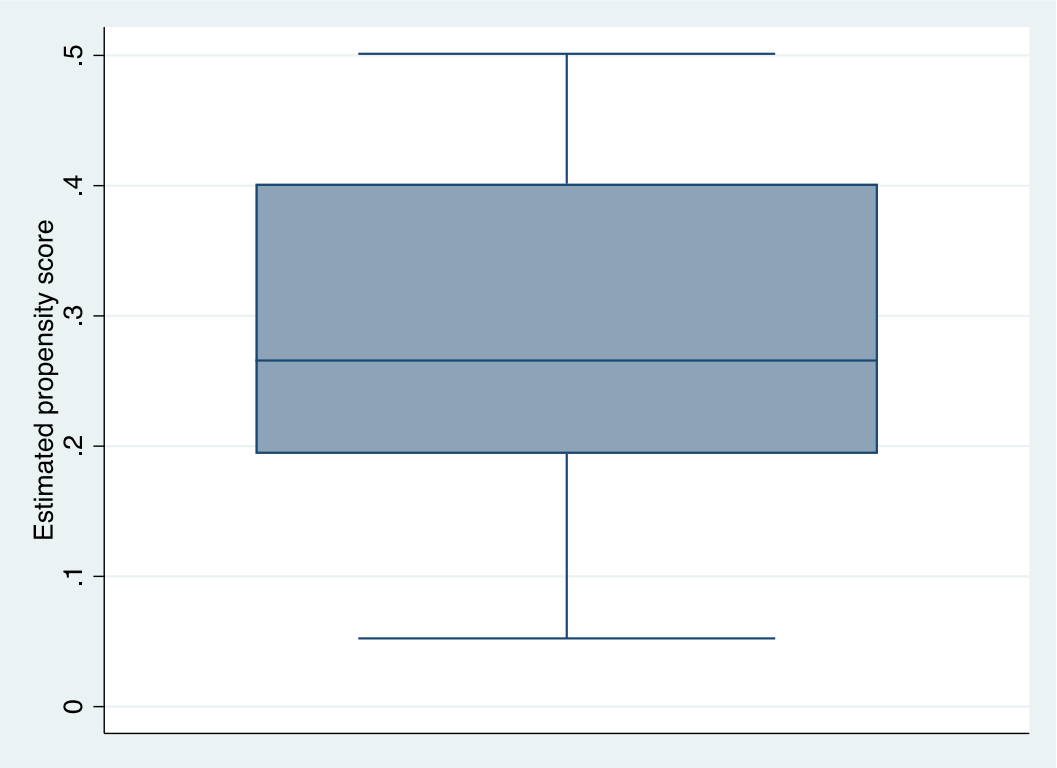


Appendix 2 – Density of propensity scores

Density of propensity scores unmatched



Density of propensity scores matched



Appendix 3 – Estimation of propensity scores

Estimation of propensity scores for Target

Estimation of the propensity score

```
Iteration 0:   log likelihood = -78.224652
Iteration 1:   log likelihood =  -66.09185
Iteration 2:   log likelihood = -64.524636
Iteration 3:   log likelihood = -64.454289
Iteration 4:   log likelihood = -64.453522
Iteration 5:   log likelihood = -64.453522

Logistic regression                             Number of obs   =        158
                                                LR chi2(16)     =      27.54
                                                Prob > chi2     =     0.0358
Log likelihood = -64.453522                     Pseudo R2       =     0.1760
```

ISOTarget	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Dealyear	.1677521	.1061361	1.58	0.114	-.0402708	.3757751
RankValuei~g	-.0001362	.0002047	-0.67	0.506	-.0005374	.0002649
Target_Den~k	-1.320259	1.2942	-1.02	0.308	-3.856845	1.216327
Target_Swe~n	-.2380242	.6470471	-0.37	0.713	-1.506213	1.030165
Acquiror_D~k	2.281565	1.400044	1.63	0.103	-.4624707	5.0256
Acquiror_S~n	.0662474	.6925332	0.10	0.924	-1.291093	1.423587
Target_Con~s	1.273882	1.616121	0.79	0.431	-1.893658	4.441421
Target_Ene~y	1.550465	.9335094	1.66	0.097	-.2791798	3.38011
Target_Tech	1.139055	.7532414	1.51	0.130	-.3372714	2.615381
Target_Ind~s	.8482646	.7128054	1.19	0.234	-.5488083	2.245338
Target_Mat~s	1.646668	.7618764	2.16	0.031	.1534177	3.139918
Acquiror_C~s	1.825589	1.666338	1.10	0.273	-1.440374	5.091552
Acquiror_E~y	.4249378	1.061788	0.40	0.689	-1.656129	2.506005
Acquiror_T~h	-1.657408	1.161057	-1.43	0.153	-3.933038	.6182223
Acquiror_I~s	.2789649	.6400938	0.44	0.663	-.975596	1.533526
Acquiror_M~s	-.1260202	.8849348	-0.14	0.887	-1.860461	1.60842
_cons	-339.9913	213.7418	-1.59	0.112	-758.9176	78.935

Estimation of propensity scores for Acquiror

Estimation of the propensity score

```
Iteration 0:   log likelihood =  -94.39538
Iteration 1:   log likelihood = -88.725626
Iteration 2:   log likelihood = -88.527958
Iteration 3:   log likelihood = -88.525497
Iteration 4:   log likelihood = -88.525495
Iteration 5:   log likelihood = -88.525495

Logistic regression                               Number of obs   =        158
                                                  LR chi2(16)     =      11.74
                                                  Prob > chi2     =     0.7617
Log likelihood = -88.525495                       Pseudo R2       =     0.0622
```

ISOAcquiror	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Dealyear	.0299652	.0835235	0.36	0.720	-.1337377	.1936682
RankValuei~g	-.0000177	.0001456	-0.12	0.903	-.0003031	.0002677
Target_Den~k	-.8118539	.8817297	-0.92	0.357	-2.540012	.9163045
Target_Swe~n	-.0728644	.4823135	-0.15	0.880	-1.018181	.8724526
Acquiror_D~k	.5204532	1.166986	0.45	0.656	-1.766797	2.807704
Acquiror_S~n	.8159483	.5459374	1.49	0.135	-.2540694	1.885966
Target_Con~s	-1.033039	1.598034	-0.65	0.518	-4.165128	2.09905
Target_Ene~y	-1.460932	1.193118	-1.22	0.221	-3.799401	.8775368
Target_Tech	-.7390127	.5634488	-1.31	0.190	-1.843352	.3653267
Target_Ind~s	-.2345859	.6109687	-0.38	0.701	-1.432063	.9628908
Target_Mat~s	-1.151727	.7772033	-1.48	0.138	-2.675018	.3715631
Acquiror_C~s	.3489053	1.662788	0.21	0.834	-2.910099	3.607909
Acquiror_E~y	.0013083	1.271411	0.00	0.999	-2.490611	2.493227
Acquiror_T~h	-.1479625	.5912575	-0.25	0.802	-1.306806	1.010881
Acquiror_I~s	.3367342	.5835998	0.58	0.564	-.8071003	1.480569
Acquiror_M~s	.486114	.8837939	0.55	0.582	-1.24609	2.218318
_cons	-61.43251	168.1927	-0.37	0.715	-391.0842	268.2191

Appendix 4 – Descriptive statistics for propensity scores

Description of estimated propensity scores for Target

Description of the estimated propensity score

Estimated propensity score

	Percentiles	Smallest		
1%	.0103859	.0050094		
5%	.0229966	.0103859		
10%	.0302595	.0110952	Obs	158
25%	.0654128	.0113139	Sum of Wgt.	158
50%	.1378947		Mean	.1962025
		Largest	Std. Dev.	.1709629
75%	.2935552	.6779652		
90%	.4250298	.696838	Variance	.0292283
95%	.6071799	.7518246	Skewness	1.368456
99%	.7518246	.7807937	Kurtosis	4.447074

Description of estimated propensity scores for Acquiror

Description of the estimated propensity score

Estimated propensity score

	Percentiles	Smallest		
1%	.066002	.0522996		
5%	.0866742	.066002		
10%	.1223602	.0668922	Obs	158
25%	.194032	.0675646	Sum of Wgt.	158
50%	.265783		Mean	.2848101
		Largest	Std. Dev.	.1199743
75%	.4015378	.4795909		
90%	.4342685	.4809708	Variance	.0143938
95%	.4552587	.4998861	Skewness	-.0544077
99%	.4998861	.5012213	Kurtosis	1.846554

Distribution of treated and controls Target

Distribution of treated and controls across blocks

Blocks of the pscore for treatment ISOTarget	ISO Target 0	1	Total
1	**90**	**9**	**99**
2	**30**	**12**	**42**
3	**6**	**3**	**9**
4	**1**	**7**	**8**
Total	**127**	**31**	**158**

Distribution of treated and controls Acquiror

Distribution of treated and controls across blocks

Blocks of the pscore for treatment ISOAcquiror	ISO Acquiror 0	1	Total
1	**33**	**7**	**40**
2	**58**	**17**	**75**
3	**22**	**21**	**43**
Total	**113**	**45**	**158**

Test that the mean propensity score is not different for treated and controls

Satisfied balancing properties and inferior bounds for Target

```
The balancing property is satisfied


This table shows the inferior bound, the number of treated
and the number of controls for each block
```

Inferior of block of pscore	ISO Target 0	1	Total
0	**90**	**9**	**99**
.2	**30**	**12**	**42**
.4	**6**	**3**	**9**
.6	**1**	**7**	**8**
Total	**127**	**31**	**158**

```
*******************************************
End of the algorithm to estimate the pscore
*******************************************
```

Satisfied balancing properties and inferior bounds for Acquiror

```
The balancing property is satisfied


This table shows the inferior bound, the number of treated
and the number of controls for each block
```

Inferior of block of pscore	ISO Acquiror 0	1	Total
0	**33**	**7**	**40**
.2	**58**	**17**	**75**
.4	**22**	**21**	**43**
Total	**113**	**45**	**158**

```
*******************************************
End of the algorithm to estimate the pscore
*******************************************
```

Appendix 5 - Two-sample t-tests before matching

Two-sample t-test for block 1 Target

Test that the mean propensity score is not different for treated and controls

Test in block 1

Observations in block 1
obs: 99, control: 90, treated: 9

Test for block 1

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	90	.0874748	.0052944	.0502271	.076955	.0979947
1	9	.1090816	.0140879	.0422636	.0765949	.1415683
combined	99	.0894391	.0050009	.0497581	.079515	.0993631
diff		-.0216068	.0173468		-.0560355	.0128218

diff = mean(0) - mean(1) t = -1.2456
Ho: diff = 0 degrees of freedom = 97

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.1080 Pr(|T| > |t|) = 0.2159 Pr(T > t) = 0.8920

The mean propensity score is not different for treated and controls in block 1

Two-sample t-test for block 2 Target

Test in block 2

Observations in block 2
obs: 42, control: 30, treated: 12

Test for block 2

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	30	.2967503	.0096427	.0528153	.2770288	.3164719
1	12	.2821757	.0192529	.066694	.2398004	.324551
combined	42	.2925862	.0087435	.0566642	.2749284	.3102439
diff		.0145747	.019459		-.0247533	.0539027

diff = mean(0) - mean(1) t = 0.7490
Ho: diff = 0 degrees of freedom = 40

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.7709 Pr(|T| > |t|) = 0.4582 Pr(T > t) = 0.2291

The mean propensity score is not different for treated and controls in block 2

Two-sample t-test for block 3 Target

Test in block 3

Observations in block 3
obs: 9, control: 6, treated: 3

Test for block 3

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	6	.4748282	.0185761	.0455019	.4270769	.5225796
1	3	.532612	.0350583	.0607227	.3817685	.6834555
combined	9	.4940895	.0184107	.055232	.4516345	.5365445
diff		-.0577838	.0355835		-.1419255	.0263579

diff = mean(0) - mean(1) t = -1.6239
Ho: diff = 0 degrees of freedom = 7

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0742 Pr(|T| > |t|) = 0.1484 Pr(T > t) = 0.9258

The mean propensity score is not different for treated and controls in block 3

Two-sample t-test for block 4 Target

```
Test in block 4

Observations in block 4
 obs: 8,  control: 1,  treated: 7


Test for block 4

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	1	.610372	.	.	.	.
1	7	.6856766	.024045	.0636171	.6268406	.7445127
combined	8	.6762636	.	.	.	.
diff		-.0753046	.		.	.

```
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =        6

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .


The mean propensity score is not different for
treated and controls in block 4
```

Two-sample t-test for block 1 Acquiror

```
Test that the mean propensity score is not different for treated and controls



Test in block 1

Observations in block 1
 obs: 40,  control: 33,  treated: 7


Test for block 1

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	33	.1289796	.0075653	.0434595	.1135696	.1443897
1	7	.1367774	.0103348	.0273434	.111489	.1620658
combined	40	.1303442	.0064687	.0409115	.1172601	.1434284
diff		-.0077978	.0172004		-.0426182	.0270227

```
    diff = mean(0) - mean(1)                                      t =  -0.4533
Ho: diff = 0                                     degrees of freedom =       38

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.3264         Pr(|T| > |t|) = 0.6529          Pr(T > t) = 0.6736


The mean propensity score is not different for
treated and controls in block 1
```

Two-sample t-test for block 2 Acquiror

```
Test in block 2

Observations in block 2
 obs: 75,  control: 58,  treated: 17


Test for block 2

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	58	.2770674	.0076467	.0582358	.261755	.2923797
1	17	.2993668	.0151835	.0626033	.2671792	.3315545
combined	75	.2821219	.006878	.0595653	.2684172	.2958266
diff		-.0222995	.016333		-.054851	.0102521

```
    diff = mean(0) - mean(1)                                      t =  -1.3653
Ho: diff = 0                                     degrees of freedom =       73

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0882         Pr(|T| > |t|) = 0.1763          Pr(T > t) = 0.9118


The mean propensity score is not different for
treated and controls in block 2
```

Two-sample t-test for block 3 Acquiror

```
Test in block 3

Observations in block 3
 obs: 43,  control: 22,  treated: 21


Test for block 3

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	22	.4323693	.0053246	.0249746	.4212962	.4434424
1	21	.4340459	.0064091	.0293704	.4206766	.4474151
combined	43	.4331881	.0041015	.0268953	.4249109	.4414652
diff		-.0016766	.0083005		-.0184398	.0150867

```
    diff = mean(0) - mean(1)                                      t =  -0.2020
Ho: diff = 0                                     degrees of freedom =       41

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.4205         Pr(|T| > |t|) = 0.8409          Pr(T > t) = 0.5795


The mean propensity score is not different for
treated and controls in block 3
```

Appendix 6 – Results from the main analysis

When the treatment is Target

Change in net income

```
Treatment-effects estimation                    Number of obs      =        158
Estimator      : propensity-score matching      Matches: requested =          1
Outcome model  : matching                                      min =          1
Treatment model: logit                                         max =          1
```

ChangeinNe~e	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOTarget (1 vs 0)	-.074965	.3113752	-0.24	0.810	-.6852493	.5353192

Change in revenue

```
Treatment-effects estimation                    Number of obs      =        158
Estimator      : propensity-score matching      Matches: requested =          1
Outcome model  : matching                                      min =          1
Treatment model: logit                                         max =          1
```

ChangeinRe~e	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOTarget (1 vs 0)	.0177132	.1501918	0.12	0.906	-.2766573	.3120837

Change in cogs-to-revenue-ratio

```
Treatment-effects estimation                    Number of obs      =        158
Estimator      : propensity-score matching      Matches: requested =         10
Outcome model  : matching                                      min =         10
Treatment model: logit                                         max =         10
```

ChangeinCo~o	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOTarget (1 vs 0)	.0864566	.0381398	2.27	0.023	.0117039	.1612092

Covariate balance for Logit ATT, when Target is treatment

Covariate balance summary

	Raw	Matched
Number of obs =	158	62
Treated obs =	31	31
Control obs =	127	31

When the treatment is Acquiror

Change in net income

Treatment-effects estimation — Number of obs = 158
Estimator : propensity-score matching — Matches: requested = 15
Outcome model : matching — min = 15
Treatment model: logit — max = 15

ChangeinNe~e	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOAcquiror (1 vs 0)	.275448	.0549059	5.02	0.000	.1678344	.3830617

Change in revenue

Treatment-effects estimation — Number of obs = 158
Estimator : propensity-score matching — Matches: requested = 23
Outcome model : matching — min = 23
Treatment model: logit — max = 23

ChangeinRe~e	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOAcquiror (1 vs 0)	.0748778	.0107317	6.98	0.000	.053844	.0959116

Change in cogs-to-revenue-ratio

Treatment-effects estimation — Number of obs = 158
Estimator : propensity-score matching — Matches: requested = 5
Outcome model : matching — min = 5
Treatment model: logit — max = 5

ChangeinCo~o	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOAcquiror (1 vs 0)	-.0330776	.0192471	-1.72	0.086	-.0708013	.004646

Covariate balance for Logit ATT, when Acquiror is treatment

Covariate balance summary

	Raw	Matched
Number of obs =	158	90
Treated obs =	45	45
Control obs =	113	45

Appendix 7 - Results from the secondary models

When the treatment is Target

Change in net income, Logit ATE

Treatment-effects estimation — Number of obs = 158
Estimator : propensity-score matching — Matches: requested = 1
Outcome model : matching — min = 1
Treatment model: logit — max = 1

ChangeinNe~e	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATE						
ISOTarget (1 vs 0)	-.4216622	.097867	-4.31	0.000	-.6134779	-.2298464

Change in revenue, Logit ATE

Treatment-effects estimation — Number of obs = 158
Estimator : propensity-score matching — Matches: requested = 1
Outcome model : matching — min = 1
Treatment model: logit — max = 1

ChangeinRe~e	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATE						
ISOTarget (1 vs 0)	.0530568	.1688636	0.31	0.753	-.2779099	.3840234

Change in cogs-to-revenue ratio, Logit ATE

Treatment-effects estimation — Number of obs = 158
Estimator : propensity-score matching — Matches: requested = 10
Outcome model : matching — min = 10
Treatment model: logit — max = 10

ChangeinCo~o	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATE						
ISOTarget (1 vs 0)	.178861	.2367739	0.76	0.450	-.2852072	.6429293

Change in net income, Probit ATT

Treatment-effects estimation — Number of obs = 158
Estimator : propensity-score matching — Matches: requested = 1
Outcome model : matching — min = 1
Treatment model: probit — max = 1

ChangeinNe~e	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOTarget (1 vs 0)	-.0846911	.2548126	-0.33	0.740	-.5841146	.4147324

Change in revenue, Probit ATT

Treatment-effects estimation — Number of obs = 158
Estimator : propensity-score matching — Matches: requested = 1
Outcome model : matching — min = 1
Treatment model: probit — max = 1

ChangeinRe~e	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOTarget (1 vs 0)	.0743635	.1018499	0.73	0.465	-.1252587	.2739857

Change in cogs-to-revenue ratio, Probit ATT

```
Treatment-effects estimation                    Number of obs      =        158
Estimator      : propensity-score matching      Matches: requested =         10
Outcome model  : matching                                      min =         10
Treatment model: probit                                        max =         10
```

ChangeinCo~o	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOTarget (1 vs 0)	**.0557347**	**.1101961**	**0.51**	**0.613**	**-.1602457**	**.271715**

Change in net income, Nearest-neighbour matching

```
Treatment-effects estimation                    Number of obs      =        158
Estimator      : nearest-neighbor matching      Matches: requested =          1
Outcome model  : matching                                      min =          1
Distance metric: Mahalanobis                                   max =          1
```

ChangeinNe~e	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOTarget (1 vs 0)	**.031921**	**.3547367**	**0.09**	**0.928**	**-.6633502**	**.7271922**

Change in revenue, Nearest-neighbour matching

```
Treatment-effects estimation                    Number of obs      =        158
Estimator      : nearest-neighbor matching      Matches: requested =          1
Outcome model  : matching                                      min =          1
Distance metric: Mahalanobis                                   max =          1
```

ChangeinRe~e	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOTarget (1 vs 0)	**.0362292**	**.1839575**	**0.20**	**0.844**	**-.3243209**	**.3967792**

Change in cogs-to-revenue ratio, Nearest-neighbour matching

```
Treatment-effects estimation                    Number of obs      =        158
Estimator      : nearest-neighbor matching      Matches: requested =         10
Outcome model  : matching                                      min =         10
Distance metric: Mahalanobis                                   max =         10
```

ChangeinCo~o	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOTarget (1 vs 0)	**.1148188**	**.1039114**	**1.10**	**0.269**	**-.0888437**	**.3184814**

Covariate Balance Summary for Logit ATE

Covariate balance summary

	Raw	Matched
Number of obs =	158	316
Treated obs =	31	158
Control obs =	127	158

Covariate Balance Summary for Probit ATT

Covariate balance summary

	Raw	Matched
Number of obs =	158	62
Treated obs =	31	31
Control obs =	127	31

Covariate Balance Summary for Nearest-Neighbour ATT

Covariate balance summary

	Raw	Matched
Number of obs =	158	62
Treated obs =	31	31
Control obs =	127	31

When the treatment is Acquiror

Change in net income, logit ATE

Treatment-effects estimation — Number of obs = 158
Estimator : **propensity-score matching** — Matches: requested = 15
Outcome model : **matching** — min = 15
Treatment model: **logit** — max = 15

ChangeinNe~e	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATE						
ISOAcquiror (1 vs 0)	.1433752	.2796701	0.51	0.608	-.4047681	.6915185

Change in revenue, logit ATE

```
Treatment-effects estimation                   Number of obs      =        158
Estimator      : propensity-score matching     Matches: requested =         23
Outcome model  : matching                                  min =         23
Treatment model: logit                                     max =         23
```

ChangeinRe~e	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATE						
ISOAcquiror (1 vs 0)	.1925118	.1264236	1.52	0.128	-.0552739	.4402976

Change in cogs-to-revenue ratio, logit ATE

```
Treatment-effects estimation                   Number of obs      =        158
Estimator      : propensity-score matching     Matches: requested =          5
Outcome model  : matching                                  min =          5
Treatment model: logit                                     max =          5
```

ChangeinCo~o	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATE						
ISOAcquiror (1 vs 0)	-.136282	.0690984	-1.97	0.049	-.2717125	-.0008516

Change in net income, probit ATT

```
Treatment-effects estimation                   Number of obs      =        158
Estimator      : propensity-score matching     Matches: requested =         15
Outcome model  : matching                                  min =         15
Treatment model: probit                                    max =         15
```

ChangeinNe~e	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOAcquiror (1 vs 0)	.2640595	.1605297	1.64	0.100	-.050573	.578692

Change in revenue, probit ATT

```
Treatment-effects estimation                    Number of obs      =        158
Estimator      : propensity-score matching      Matches: requested =         23
Outcome model  : matching                                      min =         23
Treatment model: probit                                        max =         23
```

ChangeinRe~e	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOAcquiror (1 vs 0)	.0974276	.0116029	8.40	0.000	.0746864	.1201688

Change in cogs-to-revenue-ratio, probit ATT

```
Treatment-effects estimation                    Number of obs      =        158
Estimator      : propensity-score matching      Matches: requested =          5
Outcome model  : matching                                      min =          5
Treatment model: probit                                        max =          5
```

ChangeinCo~o	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOAcquiror (1 vs 0)	-.0257078	.061611	-0.42	0.676	-.1464632	.0950476

Change in net income, nearest-neighbour matching

```
Treatment-effects estimation                    Number of obs      =        158
Estimator      : nearest-neighbor matching      Matches: requested =         15
Outcome model  : matching                                      min =         15
Distance metric: Mahalanobis                                   max =         15
```

ChangeinNe~e	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOAcquiror (1 vs 0)	.1069094	.2142796	0.50	0.618	-.3130708	.5268897

Change in revenue, nearest-neighbour matching

```
Treatment-effects estimation                    Number of obs      =        158
Estimator      : nearest-neighbor matching      Matches: requested =         23
Outcome model  : matching                                      min =         23
Distance metric: Mahalanobis                                   max =         23
```

ChangeinRe~e	Coef.	AI Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOAcquiror (1 vs 0)	.0535956	.1263561	0.42	0.671	-.1940577	.301249

Change in cogs-to-revenue ratio, nearest-neighbour matching

```
Treatment-effects estimation                   Number of obs      =        158
Estimator      : nearest-neighbor matching     Matches: requested =          5
Outcome model  : matching                                     min =          5
Distance metric: Mahalanobis                                  max =          5
```

ChangeinCo~o	AI Robust Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ATET						
ISOAcquiror (1 vs 0)	**-.0766236**	**.0842756**	**-0.91**	**0.363**	**-.2418008**	**.0885536**

Covariate Balance Summary for Logit ATE

```
Covariate balance summary
```

	Raw	Matched
Number of obs =	**158**	**316**
Treated obs =	**45**	**158**
Control obs =	**113**	**158**

Covariate Balance Summary for Probit ATT

```
Covariate balance summary
```

	Raw	Matched
Number of obs =	**158**	**90**
Treated obs =	**45**	**45**
Control obs =	**113**	**45**

Covariate Balance Summary for Nearest-Neighbour ATT

```
Covariate balance summary
```

	Raw	Matched
Number of obs =	**158**	**90**
Treated obs =	**45**	**45**
Control obs =	**113**	**45**

Appendix 8 – Standardised mean differences and t-test after matching

Standardised mean differences and t-test after matching Target

Variable	Unmatched / Matched	Mean Treated	Mean Control	%bias	%reduct |bias|	t-test t	t-test p>|t|	V(T)/ V(C)
Dealyear	U	2014.5	2013.9	28.7		1.38	0.171	0.76
	M	2014.3	2014.3	0.1	99.6	0.00	0.997	0.59
RankValueincNetDebtofTarg	U	394.31	530.12	-11.1		-0.50	0.620	0.45*
	M	377.64	362.88	1.2	89.1	0.06	0.953	1.37
Target_Denmark	U	.16129	.11811	12.3		0.64	0.520	.
	M	.14286	.14743	-1.3	89.4	-0.05	0.962	.
Target_Sweden	U	.45161	.55118	-19.8		-0.99	0.322	.
	M	.46429	.44171	4.5	77.3	0.17	0.868	.
Acquiror_Denmark	U	.16129	.04724	37.5		2.26	0.025	.
	M	.14286	.14227	0.2	99.5	0.01	0.995	.
Acquiror_Sweden	U	.51613	.67717	-32.9		-1.68	0.094	.
	M	.53571	.51957	3.3	90.0	0.12	0.906	.
Target_Consumer_Staples	U	.09677	.02362	30.7		1.92	0.057	.
	M	.03571	.08362	-20.1	34.5	-0.75	0.458	.
Target_Energy	U	.12903	.04724	28.8		1.68	0.095	.
	M	.14286	.08689	19.7	31.6	0.65	0.520	.
Target_Tech	U	.12903	.18898	-16.3		-0.78	0.436	.
	M	.14286	.1489	-1.6	89.9	-0.06	0.950	.
Target_Industrials	U	.19355	.14173	13.8		0.72	0.474	.
	M	.21429	.28188	-17.9	-30.5	-0.58	0.566	.
Target_Materials	U	.22581	.07874	41.3		2.40	0.018	.
	M	.21429	.14079	20.6	50.0	0.71	0.481	.
Acquiror_Consumer_Staples	U	.09677	.01575	35.2		2.34	0.021	.
	M	.03571	.08152	-19.9	43.5	-0.72	0.475	.
Acquiror_Energy	U	.09677	.03937	22.7		1.31	0.194	.
	M	.10714	.05688	19.8	12.4	0.68	0.502	.
Acquiror_Tech	U	.03226	.18898	-51.3		-2.16	0.032	.
	M	.03571	.04966	-4.6	91.1	-0.25	0.801	.
Acquiror_Industrials	U	.22581	.13386	23.8		1.28	0.203	.
	M	.25	.21218	9.8	58.9	0.33	0.743	.
Acquiror_Materials	U	.12903	.05512	25.5		1.45	0.149	.
	M	.10714	.08823	6.5	74.4	0.23	0.816	.

* if variance ratio outside [0.48; 2.07] for U and [0.46; 2.16] for M

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.175	27.42	0.037	27.0	27.1	107.0*	1.12	50
Matched	0.030	2.33	1.000	9.5	5.5	40.6*	0.57	0

* if B>25%, R outside [0.5; 2]

Standardised mean differences and t-test after matching Acquiror

Variable	Unmatched / Matched	Mean Treated	Mean Control	%bias	%reduct |bias|	t-test t	t-test p>|t|	V(T)/ V(C)
Dealyear	U	2014.1	2014	6.9		0.40	0.688	1.35
	M	2014.1	2014.2	-2.1	69.5	-0.10	0.922	1.29
RankValueincNetDebtofTarg	U	547.57	485.91	4.9		0.26	0.798	0.40*
	M	547.57	472	6.0	-22.6	0.33	0.743	0.61
Target_Denmark	U	.06667	.15044	-27.0		-1.43	0.155	.
	M	.06667	.09463	-9.0	66.6	-0.48	0.631	.
Target_Sweden	U	.62222	.49558	25.5		1.44	0.152	.
	M	.62222	.63157	-1.9	92.6	-0.09	0.928	.
Acquiror_Denmark	U	.04444	.07965	-14.5		-0.78	0.436	.
	M	.04444	.03991	1.9	87.1	0.11	0.916	.
Acquiror_Sweden	U	.75556	.60177	33.1		1.83	0.069	.
	M	.75556	.78449	-6.2	81.2	-0.32	0.748	.
Target_Consumer_Staples	U	.02222	.04425	-12.2		-0.65	0.516	.
	M	.02222	.02899	-3.8	69.3	-0.20	0.841	.
Target_Energy	U	.02222	.07965	-26.2		-1.34	0.183	.
	M	.02222	.02464	-1.1	95.8	-0.07	0.940	.
Target_Tech	U	.13333	.19469	-16.5		-0.91	0.365	.
	M	.13333	.13959	-1.7	89.8	-0.09	0.932	.
Target_Industrials	U	.17778	.14159	9.8		0.57	0.570	.
	M	.17778	.1379	10.8	-10.2	0.51	0.609	.
Target_Materials	U	.06667	.12389	-19.4		-1.04	0.298	.
	M	.06667	.06453	0.7	96.3	0.04	0.968	.
Acquiror_Consumer_Staples	U	.02222	.0354	-7.8		-0.42	0.672	.
	M	.02222	.02391	-1.0	87.2	-0.05	0.958	.
Acquiror_Energy	U	.02222	.06195	-19.8		-1.02	0.307	.
	M	.02222	.01236	4.9	75.2	0.36	0.723	.
Acquiror_Tech	U	.13333	.16814	-9.7		-0.54	0.591	.
	M	.13333	.15264	-5.4	44.5	-0.26	0.796	.
Acquiror_Industrials	U	.17778	.14159	9.8		0.57	0.570	.
	M	.17778	.14284	9.5	3.4	0.45	0.656	.
Acquiror_Materials	U	.06667	.0708	-1.6		-0.09	0.927	.
	M	.06667	.0588	3.1	-90.5	0.15	0.879	.

* if variance ratio outside [0.55; 1.82] for U and [0.55; 1.82] for M

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.061	11.60	0.771	15.3	13.4	61.3*	0.72	50
Matched	0.010	1.23	1.000	4.3	3.4	23.1	0.49*	0

* if B>25%, R outside [0.5; 2]