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The Effect of Ownership Concentration on Deal Probability in Corporate Takeovers

An empirical study of ownership concentration, with new evidence consistent with the Free-Rider Proposition

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Abstract

The main purpose of this thesis is to empirically examine the relationship between the target firm's ownership concentration and deal probability, conditional on a bid having been made. To examine this relationship in a satisfying manner, we apply a traditional prediction model framework with binary outcomes: success or failure. At the same time, we control for some of the most common and proven determinants of deal probability, as well as for different type of owners in the target firm, such as industrial and family owners. In addition, we examine whether there is an interaction effect between bid premium and ownership concentration. With a final sample of 1493 public-to-public takeover bids, covering six continents in the period 2008-2014, we find that an increase in ownership concentration has a positive and significant effect on deal probability in takeovers. Furthermore, we also find that bid premium is a more important determinant of deal probability for low levels of target ownership concentration than for high levels. Apart from industrial owners, ownership types in general are also found to have little impact on deal probability.

Our findings are consistent the *Free Rider Proposition* by Grossman and Hart (1980), as our results show that transfer of control is harder when the target firm's ownership structure is diffuse. The results are also consistent with the notion that shareholders must be offered a higher premium when concentration is low, in order to induce them to sell their shares and not free-ride. Thus, we expand on the current takeover prediction literature while making an empirical contribution to the field of M&A by utilizing extensive ownership data in new ways.

Keywords: Mergers and acquisitions, target ownership concentration, ownership types, bid premium, deal probability, the free rider proposition, corporate finance

Preface

This thesis concludes our Master of Science in Financial Economics at the Norwegian School of Economics (NHH).

This thesis has been an exciting and demanding project, requiring extensive programming in R and STATA in the process of constructing our sample. Correctly matching data from several sources and utilizing these data to create the desired variables turned out to be the most challenging programming tasks. In light of NHH's recent decision to offer several new programming courses, we see this through our own experience as a much-needed step in the right direction to better equip the school's students for the rapidly changing business environment.

We wish to express our gratitude to our supervisor, Professor Karin S. Thorburn. Her advice and guidance in the process of identifying uncovered ground within the literature, as well her constructive and vital input during a demanding process, have been valuable.

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Chapter 1

Introduction

Given its vital role in the economy, the market for corporate control has received a lot of academic attention since the early 1980s. Moreover, with corporate takeovers being the main functioning of this market, identifying and understanding the determinants of takeover success or failure, can be of great value. Giving academic insights into both corporate finance and corporate governance, as well as being a potential source of value for acquirers and risk arbitrageurs. Thus, empirical research on takeover success prediction is as relevant as ever, particularly because there is still uncovered ground to be examined.

Empirical research on takeover success prediction traditionally involves controlling for economically and theoretically well-founded factors such as bid premium, toeholds and terminations fees. We therefore find it puzzling that the roles of ownership concentration and type have been unnoticed or deliberately left out in earlier empirical research. Specifically, Grossman and Hart (1980) make sound theoretical arguments concerning the role of ownership concentration in takeover outcomes, with their proposition labelled the *Free-Rider Proposition*. In short, the proposition entails that transfer of control should be more difficult when the ownership structure of the target firm is diffuse, because small shareholders have an incentive to free-ride. Specifically, if ownership concentration is low, small shareholders believe that their tender decision will not affect the outcome of the takeover attempt. Thus optimally choosing to not tender their shares in order to achieve the same gain as the bidder. However, to the best of our knowledge, there is currently no empirical evidence published that supports this notion. This absence of ownership concentration and types in earlier research is likely due to the lack of ownership data - which is relatively new.

Thus, our motivation behind this thesis is to expand on current M&A literature by empirically examining the relationship between the target's ownership concentration and the likelihood of takeover success, conditional on a bid. This thesis will not only examine uncovered ground within takeover prediction literature, but its findings will also indicate whether free-riding could be a real problem in the market

for corporate control. Furthermore, we examine whether different types of owners, such as industrial, individuals and financial owners, have a significant effect on deal probability. And whether bid premium is a more important determinant of takeover success when the target's ownership structure is diffuse, compared to when it is concentrated. Overall, we provide a comprehensive analysis with new insights on the role of target ownership concentration within the market for corporate control. We do so by utilizing extensive global target ownership data on a deal-by-deal basis, with a final sample of 1493 takeover bids in the period 2008 to 2014.

Our empirical testing strategy in this thesis relies on the following probit regression:

$$P(Y = 1|X) = \phi(\beta_0 + \beta_1 Concentration + \beta_2 Concentration * BidPremium + \beta_3 OwnershipType + \beta_4 BidPremium + \beta_x)$$

The left-hand side of the equation indicates success or failure conditional on a bid, while the right-hand side includes determinants of takeover success. $Concentration$ captures the effect of target ownership concentration, $OwnershipType$ the effect of ownership type and $Concentration * BidPremium$ the interaction effect between concentration and bid premium. X refers to a vector of control variables which varies between different specifications. By applying the model above, we find that target ownership concentration has a positive effect on deal probability; implying that transfer of control is easier when ownership concentration is high. We also find that bid premium seems to be a more important determinant when the ownership structure of the target firm is diffuse, while ownership type in general does not seem to be an important determinant. Lastly, we interpret the significant results concerning target ownership concentration as consistent with the *Free Rider Proposition* by Grossman and Hart (1980).

The structure of this thesis is as follows: Chapter 2 presents the most relevant takeover prediction literature, divided into subsections according to the type of information utilized in the research. We focus mostly on literature utilizing acquirer, deal and target information. Chapter 3 introduces our research questions while Chapter 4 presents the corresponding hypotheses in which we also elaborate on our expectations. Chapter 5 introduces our data sources and the handling and construction of our data set. In chapter 6, we introduce all our variables and provide the theoretical and empirical rationale for including them in this study. In Chapter 7, we present descriptive statistics on our constructed data set. Chapter 8 lays out the econometric methods used in our analysis, while Chapter 9 presents our analysis and interpretation of the results. Chapter 10 addresses the robustness of our results, while Chapter 11 concludes our study.

Chapter 2

Literature Review

What determines the deal probability of an announced takeover? This question has been the subject of heavy scrutiny ever since it first caught the eye of financial academia back in the 1980s. The most recent published academic studies concerning this subject came out in the mid-2000s, with Branch, Wang and Yang (2007) being one of the more recent publications. In general, research on this topic take the form of so-called takeover-success prediction models. These models seek to use publicly available information at the time of announcement to predict the probability that the takeover attempt will succeed [Branch et al., 2007].

The available literature on predicting takeover success can generally be split up into three different categories depending on the type of information they utilize: (1) target, acquirer and deal information, (2) market prices, and (3) arbitrageur information. The first category focuses on factors such as deal size, premium, target attitude, termination fees and payment method, to predict the probability of success. The second focus on trading volumes and price movements following an announcement, while the third explores the relationship between arbitrageurs' trading and the probability of deal success.

Prior to conducting our own research, we performed a thorough review of the literature most relevant to our thesis. Specifically, we mostly inspected published research where takeover prediction itself was the main subject at hand, as this was seen as a necessary limitation. Furthermore, as we are examining the relationship between ownership concentration and deal probability, we focused mainly on research that utilized firm and deal information.

2.1 Research Focusing on Target, Acquirer and Deal Information

One of the earliest studies was performed by Hoffmeister and Dyl (1981) who studied the outcome of 84 cash tender offers made during the period 1976 - 1979. Their motivation was to create predictive models that could help firms contemplating cash tender offers to select targets for which the predicted probability of success was at its highest. In addition to developing four discriminant models which accurately predicted the outcome of cash tender offers, they found that the attitude of target managers was a decisive factor in determining the probability of success, while firm size was the second most decisive factor.

Hoffmeister and Dyl (1981) attribute the effect of attitude to target managers attacking the credibility of the bidder through newsletters to its shareholders and newspaper ads. Takeovers also tended to be unsuccessful when the target firm was large and had a high dividend payout ratio, while target price-earnings ratios were associated with increased probability of success. Interestingly, they also found that bid premium had no effect on probability of success, which is not in line with standard economic theory [Walkling, 1985]. However, this result was later attributed to an incorrect specification of the bid premium. The specification did not recognize announcement effects, as the premium was not in all cases estimated using market prices prior to the earliest announcement. Which in 40 percent of the cases was prior to the SEC filings [Walkling, 1985]. This meant that the bid premium in many cases was underestimated, due to the market reaction and the run-up in the target's stock price.

Walkling (1985) sought to resolve what he referred to as the bid premium anomaly in previous research by Hoffmeister and Dyl (1981). Walkling (1985) argued that if the insignificance of the bid premium in Hoffmeister and Dyl's research was accepted, it would be difficult to explain why bid premiums have such a wide distribution, or more importantly, why bid premiums even exist. He resolved this misspecification by using prices prior to the market's reaction to the bid (two weeks prior to earliest announcement) when estimating the bid premium. Following this new specification, Walkling (1985) showed that in contrast to earlier research, the bid premium was significantly (and positively) related to the probability of success in tender offers.

In addition, Walkling (1985) looked at the effect of solicitation fees and competition from other bidders. He found that fees paid to brokers to solicit with target shareholders had a positive effect on deal probability. This was argued to be the result of offer information reaching a larger number of shareholders, increasing the pool of obtainable shares. Not surprisingly, the presence of competing bidders had a significantly negative effect on deal probability. Consistent with Hoffmeister and

Dyl (1981), Walkling (1985) also found that a hostile target attitude had a negative effect, while initial stakes held by the bidder significantly enhanced deal probability.

Flanagan, Mello and Shaughnessy (1998) added on earlier research by controlling for new variables such as: family ownership, intra-industry, cross-country takeovers, termination fees, two-tier transactions and whether the tender offer was a management buyout. The contribution of Flanagan et.al (1998) showed that the presence of termination fees and whether the tender offer was an intra-industry offer or not, significantly increased the probability of success. Two-tier transactions were on the other hand associated with lower a likelihood for success. Possible explanations for these findings could be that the presence of termination fees (for acquirer and/or target) imposed a cost of walking away from the deal, while intra-industry deals could indicate greater industry-relatedness and consequently less asymmetric information. Consistent with Hoffmeister and Dyl (1981), both hostile bids and target size had a significantly negative effect, while bidder toeholds increased the probability of success. In contrast to their initial expectations, but consistent with Hoffmeister and Dyl (1981), Flanagan.et.al (1998) found that bid premium did not have a significant effect on the probability of success. Lastly, both family ownership and management buyouts were found to have a statistically insignificant effect. Following Flanagan et.al (1998), termination fees has later become a standard control variable in takeover prediction models (e.g. Officer, 2003).

Officer (2003) found results in line with Flanagan et.al's (1998) research concerning the effect of termination fees in M&A. Officer (2003) contributed with a more in-depth focus on the use of termination fees, and argued that the positive effect was a consequence of a more substantial investment made by the bidder in the bidding process. Furthermore, the presence of termination fees made it less costly for the bidder to reveal delicate information such as post-takeover plans, as competing bidders were effectively forced to pay for the information revealed when they submitted a bid. In contrast to the earlier results by Flanagan et.al (1998) and Hoffmeister and Dyl (1981), Officer (2003) found that the bid premium had a positive and significant effect, while the effect of a toehold was no longer a significant determinant of bid success. Officer (2003) measured the bid premium as a so called "combined premium", where the initial offer price was used in the estimation of the premium in cases where the target's pre-bid price 43 days' prior lead to extreme values (outside a range of 0% and 200%); otherwise a pre-bid price 43 days' prior was used to estimate the bid premium. This could to some extent help to explain why Officer ended up with significant results.

Branch and Yang (2003) extended previous literature by exploring the impact of payment method on the probability of success in mergers. Their main motivation behind focusing on the impact of payment method was its role in the wealth effects

literature; which found that payment method was a significant determinant of abnormal returns in both the target's and acquirer's stock [Travlos, 1987]. Asymmetric information is an often-cited explanation for the role payment method plays in wealth effects. The typical argument is that acquirers whose stock is overvalued, will seek to finance a merger with equity rather than cash [Huang and Walking, 1987]. Branch and Yang (2003) argued that uncertainties regarding both the acquirer and target's equity value, should reduce the probability of success in a merger. However, later research has found that the payment method decision is primarily driven by capital structure considerations, external pressure to pay in cash and by the bidder's concern with adverse selection on the target side in the deal, and not bidder opportunism [Eckbo et al., 2017].

Branch and Yang (2003) found that payment method had a significant effect on the probability of success. As cash offers tended to increase the probability that the takeover would be successful, in contrast to stock offers. One possible explanation for these results, was that unlike cash offers which only needs the approval of target shareholders, stock offers requires the approval of both target and acquirer's shareholders (when dilution levels reach 20%). They also found that in stock offers where a collar was introduced, the probability of success increased compared to stock offers where the exchange ratio was fixed. This was because the need for renegotiation concerning the exchange rate was partly offset by the existence of multiple exchange ratios. The authors interpreted these findings as a sign that payment method signals something about the uncertainty regarding both the acquirer and target's equity value.

Consistent with prior research, Branch and Yang (2003) also found that the number of shares sought by the bidder and target managers' hostility had a statistically significant negative effect on takeover success. Interestingly, they also found that the more debt the target initially had, the more likely the takeover attempt was to succeed. This result is not in line with Stultz (1988) hypothesis, who argued that the opposite should be the case, as an increase in the target's debt to equity ratio decreases the bidders gain from gaining control. Like Flanagan et.al (1998) and Hoffmeister and Dyl (1981), Branch and Yang (2003), also ended up with an insignificant bid premium effect.

However, the bid premium specification in Branch and Yang's paper (2003) seems vague in terms of which dates the premium is based upon (not stated explicitly). Hence, it is difficult to assess whether the lack of significance is due to an underestimation of its effect following a run-up in the target share price.

In their 2007 paper titled "A note on takeover success prediction", Branch, Wang and Yang (2007) developed a parsimonious model where they compared the pre-

dictive accuracy of traditional logistic regression used in earlier research, with the artificial neural network technique. Their motivation behind this comparison was that the artificial neural network technique, in contrast to logistic regression, did not require exact pre-specification of the underlying functional relationship between the dependent and independent variables, which in many cases could be difficult to validate [Branch et al., 2007].

Using a sample of 1196 takeover bids in the US market from the period 1991 to 1994 and controlling for the most common determinants of takeover success. Branch et.al (2007) found that while the artificial neural network technique and logistic regression model were equally good at predicting successful takeovers, the artificial neural network technique was superior in predicting failed takeover attempts. The authors argued that the ability to accurately predict failure was likely more important to investors than the ability to predict success. Because of the large losses investors incurred when they invested in failed takeover attempts. Hence, they found the artificial neural network technique to be a superior alternative to logistic regression when predicting takeover outcomes. By using a step-wise selection procedure to create a parsimonious model, they also showed that the most dominating variables in terms of predictive power were target resistance, arbitrage spread, payment method and transaction size.

2.2 Research Focusing on Market Prices

Samuelson and Rosenthal (1986) were the first to examine whether movements in target stock prices during the offer period could predict the probability of takeover success. By examining 109 all-cash tender offers made during the period 1976 to 1981, they inferred implied deal probabilities from target stock prices prior to the conclusion date of the offer. The method used by the authors to infer these prices are consistent with the Bayesian forecaster: using a "fall-back" price as the fail outcome (usually last trading day prior to announcement as proxy), the offer price as the success outcome, and the observed stock price at any given time "d" (announcement d = 0, conclusion date d = D). Samuelson and Rosenthal (1986) argued that daily movements in the target's stock price prior to conclusion represented the overall opinion of the market regarding the outcome of the takeover attempt, which is consistent with the Efficient Market Hypothesis.

These inferred probabilities were then compared to the actual outcomes of the takeover attempts in order to measure the accuracy of the method. Samuelson and Rosenthal (1986) found that movements in target stock prices were indeed informative about the outcome of takeover attempts, as increases in target stock prices were associated with a greater probability of success. They also showed that the

market's predicted probability of success, monotonically improved over time, and that target stock prices prior to the conclusion date measured the expected stock price at conclusion. Brown and Raymond (1986), published a few months later, found evidence supporting Samuelson and Rosenthal's findings, and also concluded that implied deal probability was useful in helping to assess the likelihood of success in takeover attempts.

2.3 Research Focusing on Arbitrageur Information

By examining 131 long positions held by arbitrageurs, categorized as arbitrage by the Insiders Chronicle and disclosed in the Securities and Exchange Commission's (SEC) 13-D filings in the period 1977 to 1983. Larcker and Lys (1987) found that the success rates in takeovers where arbitrageurs held long positions were significantly higher than what was implied by the market. The actual success rate in takeovers where arbitrageurs held long positions in the target was 97 percent, while the average market implied probability was 81 percent [Larcker and Lys, 1987]. The authors argued that these results could indicate that arbitrageurs were able to acquire superior or even private information, which again might suggest that the more long positions they held in the target, the more likely the takeover attempt was to succeed.

The literature review conducted in this chapter, has left us with a better understanding of the appropriate methodology and key issues concerning takeover prediction. Our key takeaways from this review are presented early in the Chapter 3, as these lay the foundation of our research questions and later analysis. The theoretical and empirical background for the Free-Rider Proposition is presented together with our hypotheses in Chapter 4.

Chapter 3

Research Questions

As we in this thesis are focusing on target, acquirer and deal information, the literature presented in section 2.1 is of most relevance to our thesis. During our literature review, we find that overall, there seems to be a consensus concerning the effect of several of the main deal probability determinants. Some of these include: bidder's initial stake, contested bid, payment method, target hostility, termination fees and transaction size. However, we believe that there is an important piece of information missing in earlier research - ownership concentration. In addition, throughout our review, we see inconsistent results concerning the statistical significance of the bid premium, something that we believe demands further examination.

The effect of ownership concentration on deal probability, has to our knowledge, never been examined before now, and we suspect that difficulties in obtaining ownership data and/or matching it correctly to the appropriate transactions, is the main reason for its absence in earlier studies. However, this is not our only motivation for examining this relationship. We also believe there is reason to expect that some of the traditional determinants, such as bid premium, to some degree will depend on target ownership concentration itself. Hence, we seek to contribute to the extant M&A literature, by utilizing extensive ownership data and examining its effect on deal probability. As well as the interactions between ownership concentration and other determinants of deal probability. This brings us to our two guiding empirical research questions for this thesis:

(1) *How do changes in target ownership concentration affect the probability of takeover success?*

(2) *Do changes in target ownership concentration, interact with the effect of bid premium on the probability of takeover success?*

Chapter 4

Hypotheses

In this chapter, we will present our hypotheses on what we expect to find when answering our two research questions, as well as the rationale and theoretical background for these expectations.

H1: *An increase in ownership concentration is associated with an increase in deal probability*

Our hypothesis is consistent with Grossman and Hart's (1980) proposition called the Free-Rider Proposition, from the paper titled "Takeover Bids, The Free-Rider Problem and the Theory of the Corporation". Grossman and Hart (1980) argue that low ownership concentration should decrease the probability of success in corporate takeovers due to the Free-Rider-Problem that can occur in these situations. When target ownership concentration is low, atomistic shareholders expect that their decision on whether to sell/tender their shares or not, will not affect the outcome of the takeover attempt. Hence, if they believe that the acquirer will increase the value of the firm, they will choose not to sell their shares, in an attempt to achieve the same anticipated gain as the acquirer.

Yet, there is currently to our knowledge, little empirical evidence for the Free-Rider-Proposition in M&A. Hirota, Saijo, Hamaguchi and Kawagoe (2000) observed that the Free-Rider-Problem did in fact occur when they set up "laboratory markets" of atomistic shareholders and tested this proposition. This means that there are at least indications for Grossman and Hart's (1980) proposition, but there is no empirical evidence based on a large data sample of actual takeovers.

Lastly, Shleifer and Vishny (1986) argue that the presence of a large shareholder could in fact help overcome the Free Rider Proposition. They show theoretically, that as the proportion of the target's outstanding shares held by the largest shareholder increases, the takeover attempt is more likely to succeed. This is because the large shareholder knows that his or her cooperation is necessary to realize any gains

and for the takeover to succeed. Hence, transfer of control should be easier where the target firm's ownership structure is concentrated. A more practical argument for our hypothesis is that if a large ownership block is present in the target's ownership structure, the acquirer is more likely to solicit with the owner prior to the bid, which again could lead to a higher probability of success.

H2: *The bid premium effect on deal probability is relatively higher for low levels of target ownership concentration, than for high levels of target ownership concentration*

Given that small shareholders have an incentive to free ride, we expect that low target ownership concentration should lead to a higher bid premium, in order to convince small shareholders to sell their shares. This is analogous to Shleifer and Vishny's (1986) proposition that an increased proportion of outstanding shares held by the largest shareholder, should result in a lower bid premium. They argue that this is a consequence of large shareholders being more willing than small shareholders, to facilitate takeovers by splitting the gains on their own shares with bidders. Furthermore, it is possible that large shareholders (typically sophisticated investors) are more likely than smaller shareholders to monitor the performance of the firm, and that they in some cases can find it beneficial to initiate or invite third-party takeovers. Hence, we expect the bid premium to play an important role in takeovers where ownership concentration is low, increasing with a decrease in concentration. While we expect the opposite to be the case when ownership concentration is high. In other words, bid premium should be a more important determinant of deal probability for low levels of target ownership concentration than for high levels.

Chapter 5

Data

In order to conduct this study in a satisfying manner, we required data from several databases. In several cases, directly extracting the variables was not feasible, thus, we had to construct the desired variables. In the subsections below, we will explain the procedures for each data source, how we went about matching the data, the pitfalls to avoid, and how we merged all the data into one complete sample.

5.1 Ownership Data

An essential part of our study was reliable ownership data for target firms. We received raw *Bureau van Dijk* data, containing approximately five million rows. The data included information such as shareholder stakes, ownership type, geographical location and level of ownership independence. The high standard of the BVD-database, which is constructed by utilizing several sources, such as annual reports or direct communication from the companies, is vital for the quality of this thesis [BVD, 2017].

Furthermore, two key elements concerning the ownership data need to be addressed here. First, the data only contains shareholder stakes with voting rights, as non-voting shares have been excluded. This is a common approach in the field of M&A, and naturally suits the purpose of this thesis, as we are interested in examining the effect of ownership concentration on transfer of control. Second, the raw data was available only for the period between 2007 - 2012, which limits the time interval for this thesis.

In cleaning the ownership data we dropped observations where the largest shareholder stake was missing, and the number of ownership stakes for a given company was capped at three, as this was perceived to be sufficient for our purpose [1].

[1] In the process of matching ownership structures from the BVD ownership data to target firms from Zephyr, we obtained shareholder stake information for the two largest shareholders for 88.6% of the target firms, while for the three largest shareholders the number was reduced to 79.2%.

We further had to select an appropriate key in order to line up all corresponding shareholder stakes and information for a specific company. A key in a data set refers to a set of columns that make each observation unique [Friewald, 2017]. Trough programming in STATA, we combined the columns *(BVD ID-number + Announcement Year)* into a string variable (key), and used this to match the information. This process resulted in 71.494 unique ownership structures and 303.280 in total.

Next, we proceeded with extracting M&A data from Zephyr. Note, we made sure that the selected key was a common identifier for both the ownership data and Zephyr, allowing us to match these two sources when constructing our final sample.

5.2 M&A Data

The choice of Zephyr as our database for retrieving M&A deals was necessary in order to correctly match ownership structures and target firms through our defined key. Some desired control variables, such as shares sought and solicitation fees were not attainable in Zephyr. For a deal to be included in our M&A sample, it needed to meet the following selection criteria:

1. Classified as an Acquisition
Acquisition is defined as an outcome where the acquirers final stake is 50 % or higher, independent of the size of the acquired stake. By this criteria we isolate the effect in an acquisition.

2. Announcement date between 01.01.2008 - 31.12.2014
The announcement interval is determined by the ownership data. We allow for a ownership structure to precede a deal up to 2 years.

3. Deal status
The deal status has to be completed, failed, completed-assumed or announced, filtering away rumored deals.

4. ISIN-number for target and acquirer
We utilize this security identification to correctly gather financial and stock data from Datastream and Worldscope.

5. Offer price for the target
Zephyr offers a bid premium variable where the denominator is the targets closing price one day prior to announcement. To control for run-up effects, we will extract the price 4 weeks prior from Datastream.

Note, no geographical or payment method restrictions were enforced. The steps above resulted in a raw M&A sample consisting of 8.386 deals. The strictest criteria concerning sample size was deal offer price, as it trimmed the sample by over 80.000 deals. For this sample all the target companies received two different keys, *(BVD ID-number + Announcement Year-1)* and *(BVD ID-number + Announcement Year-2)*. This was done to allow ownership structures to precede a deal up to two years, as well as preventing the impact of the deal itself.

The process of matching two samples (Ownership sample and M&A sample) trough the created key could potentially lead to double counting a deal. In section 5.4, we explain the logic of the R-code that addresses this particular issue. Prior to matching the samples, we needed to collect financial control variables.

5.3 Financial Data

Stock and financial variables were gathered from the databases Datastream and Worldscope, which covers stock market data and annual and quarterly report data. By connecting the ISIN-numbers from our M&A sample to these databases, we were able to obtain financial control variables. To stay consistent and to avoid post-deal information, all the financial statement variables were extracted at the latest trading day in the year prior to the deal.

The information leakage before acquisitions resulting in pre-bid run up in target's stock price is widely documented, and is the motivation for constructing the 4 weeks prior bid premium by combining data from Zephyr and Datastream. The offer price is extracted directly from Zephyr, while daily stock prices for all target companies between 2008 - 2014 were downloaded from Datastream. All the data was quoted in USD to avoid measurement errors. In R, we wrote a code to correctly match the target stock prices with the corresponding offer price, using the dates as a link. Further, to address the fact that the closing price was not always available 28 days prior to announcement, we allowed the target stock price to range between 28 and 32 days prior. This issue was resolved by implementing a logical argument in our iteration that only returned the first available stock price for each target within the given range.

This process of gathering financial information reduced our M&A sample to 3.459 deals, since deals with missing financial information were dropped. The last step in the data handling process was to correctly match ownership structures to the M&A sample (now including financial data).

5.4 Constructing the Data Set

The main challenge in constructing the final data set was to match the 3.459 target firms from our M&A sample to the 303.280 ownership structures. As mentioned in section 5.2, a potential issue was double counting a specific deal. Since we allow for a ownership structure to precede a deal up to two years, this could then potentially lead to a case where a ownership structure for the same company, but in different years, could be applicable to the same deal. The following example illustrates this issue. A deal announced in 2010 received two keys, *(BVD ID-number + 2009)* and (BVD ID-number + 2008), meaning this deal could be matched to the target ownership structure in both 2009 and 2008.

This matching problem was solved in the programming language R. The code needed to incorporate two elements. First, it needed to correctly match the two samples trough our defined key. Second, in the case of several ownership structures for the same deal to only preserve the most recent in the final output. Running this *for loop* in R returned a final sample consisting of 1493 correctly matched targets and ownership structures. Since we have utilized several sources in the process of constructing our sample, we also need to assess whether the final sample seems representative for further analysis. In table 1 below, we provide a description of our matched sample. A in-depth sample analysis in light of our research questions is presented in chapter 7 (Descriptive Statistics).

Table 1: Yearly composition of the matched sample

	2008	2009	2010	2011	2012	2013	2014	Total
Number of Deals	197	216	259	219	220	179	203	1493
Completion Rate %	83.2	89.8	89.6	93.2	88.2	87.7	87.7	88.6
Cash Offer %	44.7	29.6	51.4	43.4	45.9	43.0	34.5	42.1
Stock Offer %	36.0	51.4	32.4	27.9	35.5	34.1	41.4	36.8
Mixed Offer %	19.3	19.0	16.2	28.8	18.6	22.9	24.1	21.1
Avg. Bid Premium Ann. %	29.6	25.2	23.2	24.7	26.0	23.0	25.5	25.2
Avg. Bid Premium 4 weeks %	31.3	45.9	32.5	32.1	37.0	28.6	26.6	33.6
Cross Border %	19.8	20.8	25.1	21.9	22.3	17.3	24.6	21.9
Intra-Industry %	36.0	27.8	31.3	41.6	39.5	53.6	51.2	39.5
Acquirer Toehold %	29.4	36.1	22.8	27.9	27.3	22.9	22.2	26.9
Rival Bids %	2.5	2.8	1.5	3.2	0.9	1.1	1.5	1.9
Tender Offer %	0	1.9	2.3	2.7	1.8	4.5	1.0	2.0
Attitude of Target Management %	4.1	4.2	2.3	2.3	1.8	2.8	2.0	2.7
Target Region North America %	13.4	12.4	17.4	14.8	14.5	12.5	15.0	52.4
Target Region Europe (EU EFTA) %	15.3	16.1	17.7	11.9	14.1	11.2	13.7	16.7
Target Region Asia %	13.3	20.2	14.9	15.7	16.1	10.1	9.7	16.6
Target Region Oceania %	12.8	14.2	17.0	16.3	14.2	12.8	12.7	9.4
Target Region Africa %	2.9	14.8	20.6	8.9	11.7	23.5	17.6	2.3
Target Region South America %	4.2	16.7	16.6	29.1	16.7	4.2	12.5	1.6
Target Region Europe (Non EU EFTA) %	6.7	0	46.7	6.7	26.7	6.7	6.7	1.0

Note: Numbers in the table are expressed as percent of number of deals for each given year. Bid Premium Ann. refers to the one day prior to announcement premium extracted from Zephyr. Bid Premium 4 weeks represents the constructed premium

Since we do not discriminate between completed and announced deals (criteria 3 in section 5.2), we are strictly speaking of analyzing a sample of bids. This approach is in line with the majority of M&A studies. From table 1 it is interesting to note that the time distribution of number of deals, with an increasing trend until 2010 and the recovery in 2014 reflects the historical M&A activity. Further, we notice that that the relatively even annual distribution of the sample seems to reflect that the ownership data from BVD is unbiased in terms of annual coverage.

The completion rate ranges in an interval between 83.2% and 93.2%, consistent with the findings of Burch et al. (2012) and Gaspar et al. (2005). The method of payment segmentation in the sample is 42.1% cash, 36.8% stock and 21.1% mixed. A complete description of the different payment elements and the classification process with regards to method of payment is located in appendix A.7. As described in section 5.3, to account for the run-up effect, we constructed the 4 weeks prior to announcement bid premium. Based solely on table 1, such an effect is present, as the constructed bid premium is consistently higher. A difference in average of 8.4 percentage points indicates that the target stock prices tend to rally upwards due to leak of information, consequently reducing the bid premium.

In terms of geographical distribution, our sample seems to be biased towards the more economically developed regions. The sample contains a majority of North American ownership structures, constituting a sample share of 52.4%. Aggregated by region, Europe (EU EFTA), Asia and Oceania follows with proportions of 16.7%, 16.6% and 9.4%. From these statistics it appears that the target ownership structures are reasonably distributed, and given their size, it also ensures credible results as it controls for outliers. Note that Africa, South America and Europe (Non EU EFTA), constituting a combined share of 4.9%, are naturally more prone to outliers and their results should be interpreted more carefully.

Based on the sample examination above, it seems that we have been successful in constructing a representative sample, allowing us to proceed with more advanced analysis in the following chapters. Having assessed our constructed sample, we continue with a description of the variables used in the regression analysis.

Chapter 6

Variables

The purpose of constructing our sample is to be able to test our two research questions presented in Chapter 3 (Research Questions). We begin this chapter by providing a brief description of our empirical testing strategy. In section 6.1, we proceed to our main variables of interest. The theoretical and empirical background for proven control variables chosen for this study is presented in section 6.2, while the last section discusses the relevancy of controlling for region and year dummies.

The empirical testing strategy applied in examining the relationship between deal probability, target ownership concentration and its interaction with bid premium, is based on the following probit regression:

$$P(Y = 1|X) = \phi(\beta_0 + \beta_1 Concentration + \beta_2 Concentration * BidPremium + \beta_3 OwnershipType + \beta_4 BidPremium + \beta_x)$$

The left-hand side of the equation indicates success or failure conditional on a bid, while β_1 to β_4 represents our main variables of interest. The variable $Concentration$ captures the effect of target ownership concentration. The choice of variable to represent the ownership concentration is discussed below in section 6.1. $OwnershipType$ refers to a vector of ownership types corresponding to the $Concentration$ variable. $Concentration * BidPremium$ is the interaction effect between concentration and bid premium, while $BidPremium$ refers to the constructed bid premium four weeks prior to announcement. x includes a set of control variables which are introduced in section 6.2. A detailed description of our model and the rationale behind our empirical testing strategy can be found in chapter 8 (Methodology).

6.1 Ownership variables and Bid Premium

The continuous variable ***Three Largest Shareholders*** is arguably the most important variable used in this study. This is because it is key to the main objective of this thesis and enables us to test our first hypothesis. In addition, the variable is used to create the interaction term *Three Largest Shareholders*Bid Premium 4 Weeks* - effectively enabling us to test our second hypothesis.

The variable measures the combined holdings of the three largest shareholders in the target firm and is not a direct measure of the complete target ownership concentration (using the holdings of all shareholders). Using the aggregated stake of the three largest shareholders is a good proxy for the ownership concentration, since we observe that regional differences in the size of this measure fits well with regional differences in ownership concentration that we know to exist [Gaughan, 2015]. Furthermore, we do not have data on the complete ownership structures of the targets available, only the largest blocks of shareholders in each target. In some cases *Bureau van Dijk* does not record the holdings of the second or third largest shareholder in the target, either because the stake is less than one percent or because information is not available [BVD, 2017]. Thus, we make a simplification where we assume that the sum of the three largest stakes is a fair representation of the actual sum of the three largest shareholders; even when information about the second and/or third largest shareholder is not recorded[1]. In such cases we assume that the stake of the largest shareholder is close to the true value of the sum of the three largest shareholders, as the value of the unrecorded stakes are likely to be small.

Thus, we consider that our variable *Three Largest Shareholders* is an accurate measure and good proxy for target ownership concentration. Given the arguments made in Chapter 4 (Hypotheses) concerning the *Free Rider Problem*, we expect that *Three Largest Shareholders* will have a positive effect on deal probability. Since higher target ownership concentration is likely to reduce the likelihood of free-riding by small shareholders.

The variable ***Three Largest Shareholders*Bid Premium 4 Weeks*** is a continuous interaction term, capturing the effect of *Three Largest Shareholders'* interaction with *Bid Premium 4 Weeks*. We construct this variable because we expect that the effect of bid premium itself will depend on ownership concentration. This is consistent with the argument made in Chapter 4 (Hypotheses) that when target ownership concentration is low, the bid premium must be higher to convince small shareholders to sell their shares as they have an incentive to free-ride. Consequently, we expect to see a negative sign on the interaction term *Three Largest Shareholders*Bid Premium 4 Weeks*. That is, bid premium is expected to be a more impor-

[1] Unrecorded stakes are treated as missing values, and set to 0

tant determinant for low level of target ownership concentration than for high levels.

Up to this point our *Concentration* specification propose that bid success is linear in ownership concentration. To address the potential case of a non-linear relationship, we also test our model with an alternative specification for *Concentration*. By ranking the continuous variable *Three Largest Shareholders* in accordance to size, we create three dummy variables. ***Low Concentration*** takes on the value of one if the target concentration is among the bottom one-third, and zero otherwise. ***Medium Concentration*** takes on the value of one if the target concentration is between the bottom and upper one-third, and zero for targets outside this range. ***High Concentration*** takes on the value of one if the target concentration is among the upper one-third, and zero otherwise. This procedure allows us to account for potential non-linearity. We will also test the interaction effect between the alternative specifications for ownership concentration and *Bid Premium 4 Weeks*.

As we are examining the relationship between ownership concentration and deal probability of announced takeovers, we believe that it is vital to control for ownership types. Omitting this information from our analysis could cause biased results. I.e. the preferences regarding corporate control may differ for industrial owners and individuals/families, which could distort the effect of ownership concentration on deal probability. It is also possible that since we are examining deal probability conditional on a bid, ownership type might not have a significant impact. This is because there has already been a selection of target prior to the bid having been made. Meaning that targets controlled by owners with a known preference for control, might not be selected as targets in the first place. Ownership type could also have an impact on method of payment, i.e. private equity firms could have a preference for liquidating their position by getting paid in cash, whilst families and individuals might prefer stock. We also note that apart from one instance where family ownership is controlled for by Flanagan et.al (1998), ownership type in general has not been controlled for in prior studies.

Thus, we create seven ownership type dummies: *Financial Company*, *Industrial Company*, *Mutual Fund*, *Individuals/Families*, *Public/Government*, *Private Equity* and *Employees*. A particular dummy will in this case take the value of one if that specific type is present among the three largest shareholders (i.e. if the second largest shareholder = private equity owner, *Private Equity* equals one). Given that we use data on the three largest shareholders, and each can only be defined as one particular type, the *Dummy Trap* will not occur using this specification, as the number of types is greater than ownership stakes.

By controlling for ownership type, we expect that we will be better able to capture the causal relationship between ownership concentration and deal probabil-

ity. In addition, we expect that institutional owners such as mutual funds and financial companies, will have a positive effect on deal probability. The economic rationale behind this expectation is that institutional investors tend to be more value-focused than i.e. families, and have a weaker preference to stay in control [Kohers and Kohers, 2007]. Eakins (1993) also finds that institutional owners tend to sell their shares in takeovers, even if target management oppose the deal. Similarly, we expect that private equity ownership have a positive effect on deal probability, as these owners could have a stronger preference to liquidate their holdings and realize financial gains.

Consistent with Dyer (1986), we expect that families and individuals will have a negative effect on deal probability. This is because these type of owners are believed to value corporate control more highly than others. Flanagan et.al (1998) also found that in cases where the target firm was family owned, likelihood of success tended to be lower, although not statistically significant. Some of the same arguments could be made concerning the stakes held by employees and managers, where Song and Walkling (1993) found that the holdings of managers were negatively related to takeover success. Lastly, both industrial and public ownership (government/states) are expected to have a negative effect on deal probability, mainly due to their perceived preference for control (as with other non-financial owners).

Bid Premium 4 Weeks is of particular interest in this study, as we hypothesize that there is an interaction effect between bid premium and ownership concentration (*see Chapter 4*). The continuous variable is estimated using market prices from *Datastream* for the target firm four weeks prior to announcement date, as well as using offer prices from *Zephyr*. Note that *Zephyr* only provides a bid premium based on prices one day prior to announcement, which means that we cannot obtain bid premiums from the databases used in this study directly. The main reason for using market prices four weeks prior to announcement, is that the run-up effect (increase) in target share prices prior to announcement, will lead to an underestimation of the actual bid premium. Thus, accounting for the run-up effect when creating this variable is crucial, as we observe that misspecification of the bid premium in earlier studies have led to insignificant bid premium results, i.e. Hoffmeister et.al (1981). The economic rationale for including this variable, is that an increase in bid premium should lead to an increase in the supply of target shares and thus yield a higher deal probability, all else equal [Walkling, 1985]. Hence, we expect to see a positive effect of *Bid Premium 4 Weeks* on deal probability.

Having introduced our main variables of interest, we continue with a description of our control variables. In relation to the probit equation presented above, these variables make up the vector β_x, which varies between the specifications.

6.2 Control Variables

As we examine our research questions within a prediction model framework, we need to control for other proven or likely determinants of deal probability. In the subsections below, we provide a brief description of our control variables, as well as the reasoning for our expectations. The variables below are included to control for acquirer, deal and target characteristics, allowing us to achieve a more correct estimate of our main variables of interest.

6.2.1 Acquirer Characteristics

Acquirer Toehold is a continuous variable measuring the pre-bid initial stake held by the bidder in the target firm. Walkling (1985) argues that a measure of the bidder's initial stake in the target firm can capture the effect of an improvement in bargaining position, voting power and influence on target management. In addition, the variable should also capture the fact that an increased stake in the target firm, reduces the amount of shares necessary for the bidder to gain control. Lastly, an initial stake could serve as a positive signal, in that arbitrageurs could see this as an indication of the bidder's motivation in the takeover. Combining this with target shareholders worrying about becoming an inactive minority, and thus being more likely to tender their shares or sell them in the open market, active arbitrageurs believing in the deal could increase the likelihood of a successful takeover attempt [Walkling, 1985]. We also note that this measure is consistently found to have a positive and significant effect on deal success in other studies, such as Hoffmeister et.al (1981) and Flanagan et.al (1998). Thus, we expect that an increase in *Acquirer Toehold* has a positive effect on deal probability.

Log Acquirer Market to Book is used as an indicator of the acquiring firm's priced-in growth prospects. Acquirers with low growth prospects might be more motivated to do acquisitions as they could have a more difficult time growing than firms with high growth prospects. Thus, we expect that *Log Acquirer Market to Book* has a negative effect on deal probability. Martin (1996) argues that firms with good growth prospects, maximize firm value by paying with stock in an acquisition. In addition, as a greater proportion of the acquiring firm's value stems from future growth prospects, information asymmetry concerning the fair value of the acquirer's stock, could lead to conflicts concerning the true value of the acquirer. Reducing deal probability when the bid is a stock offer. To our knowledge, this variable has not been used previously in prediction literature. However, given the arguments above, we believe that it is reasonable to include this control variable.

We control for the bidder type by using the dummy variable ***Financial Buyer***. This variable is set equal to one when the bidders is a financial buyer and zero

if the bidder is a strategic buyer. We define a bidder as a financial buyer when its *Zephyr* business description includes the the keywords *private equity* or *investment holding company*. Financial buyer is traditionally limited to private equity, but we also choose to include investment holding companies, as their profits stem from dividends, interests and rent. The rational behind controlling for buyer type is that strategic buyers can realize synergies due to complementarities, while financial buyers by definition cannot [Gaughan, 2015]. We also believe that since strategic buyers on average have higher valuations for targets than financial buyers, strategic buyers are likely to go to further lengths in order to complete an announced acquisition [Gorbenko and Malenko, 2014]. Consequently, we expect to see a negative sign on this dummy variable. The variable was first introduced and tested in a Finish master thesis [Noro, 2010], where it was found to have a negative but insignificant effect on takeover success.

6.2.2 Deal Characteristics

We control for the method of payment effect on deal probability by including the dummy variable ***Stock Offer***, which is set equal to one for stock offers and zero for mixed or cash. The theoretical background of controlling for method of payment, is the *Asymmetric Information Hypothesis* and *Pecking Order Hypothesis* [Myers and Majulf, 1984]. A common argument based on the asymmetric information hypotehsis is that acquirers with overvalued shares will prefer to finance an acquisition with stock rather than cash, as this is relatively cheaper. Hansen (1987) argues that since the acquirer has less information about the value of the target compared to the target itself, a stock offer would be chosen to share the risk with the target shareholders. Naturally, the acquirer will also have more information about the value of its stock than the target has. This implies that uncertainties about fair values of both the acquirer and the target's stock, could lead to conflict over exchange ratios, consequently reducing deal probability. Consistent with the *Pecking Order Hypothesis*, cash offers often signal a strong financial position of the acquirer and that these acquirers are able to cope with both unexpected costs and increases in bid premiums, thereby improving deal probability [Branch and Yang, 2003]. Given that Branch and Yang (2003) themselves found stock offers to have a negative and significant effect, as well as the arguments made above, we expect to see a negative sign on this control variable.

Another deal characteristic that should be controlled for is whether a rival bidder challenges the announced acquisition. The dummy variable ***Rival Bids*** is set equal to one if one if *Zephyr* registers that there are two or more companies striving for control of the target company. The rational for including this variable, is that when the demand for target shares exceeds the total number of shares outstanding (sup-

ply) and multiple bidders are competing for control, it is certain that one or more of the bidders will be unsuccessful [Walkling, 1985]. On average, this should manifest itself in a lower likelihood of success.

The ***Intra-Industry*** variable is a dummy variable which is set equal to one if the acquirer is operating in the same industry as the target firm, indicated by their respective three-digit SIC-codes. Flanagan et.al (1998) found that intra-industry acquisitions where more likely to succeed than inter-industry acquisitions. He argued that a possible explanation for this result is that acquirers with in-depth knowledge of the target's business and industry, could be better at structuring an offer for success. This argument is in line with the notion that greater industry relatedness reduces the degree of asymmetric information[Eckbo et al., 2017]. Thus, we expect to see a positive effect on deal probability.

Next, we continue in the steps of Officer (2003) who included the control variable ***Tender Offer*** in his prediction model. We find this to be a relevant control variable as it can indicate whether the acquisition is hostile, as an acquirer usually resorts to a tender offer when a friendly acquisition does not seem to be a viable option. The initiation of a tender offer also often means that the target firm will be taken over [Gaughan, 2015]. Officer (2003) finds that *Tender Offer* has a positive and significant effect on deal probability. Hence, given the arguments above and earlier results, we expect to see the same in our study.

The variable ***Cross Border*** is included in order to capture effects related to cultural differences, as well as regulatory and antitrust issues. This dummy variable takes on the value of one if the parties in the announced acquisition are recorded with different country codes in *Zephyr*. Flanagan et.al (1998) argue that antitrust issues regarding domestic acquisitions, could lead to foreign acquirers being more successful that domestic acquirers, as overlaps are more likely in domestic deals. Flanagan et.al (1998) found that *Cross Border* had a positive and significant effect on deal probability. However, this will likely depend on the size of the parties involved, as small transactions on average are unlikely to trigger any antitrust issues. Hence, the effect may actually be insignificant and/or negative.

6.2.3 Target Characteristics

In previous studies, size has often been found to have a negative and significant effect on deal probability, thus we include the variable ***Log Target Relative Size***. The variable is specified as the logarithm of target's market capitalization divided by the market capitalization of the acquirer. An increase in the relative size between the target and acquirer, could potentially lead to a reduction in deal probability.

This is because a relatively larger target demands a higher investment, which in some cases might lead to difficulties in obtaining necessary financing. Furthermore, as argued by Hansen (1987), the larger the target firm is relative to the acquirer, the more severe the economic implications of asymmetric information will be in terms of valuations and appropriate exchange ratios. Thus, an increase in the relative size between the target and acquirer is expected to have a negative effect on deal probability.

Target Debt to Assets is included to control for target leverage, as increases in the target firm's leverage indicates increased substitution of debt for equity. This reduces voting rights and the bidder's gain of gaining control, implying a reduction in deal probability [Stultz, 1988]. Furthermore, Harris and Ravi (1988) argue that targets can use capital structure as an antitakeover device, in order to increase bargaining power and fend off takeover attempts. Schwert (2000) later found that target debt levels were negatively related to deal probability. Surprisingly, Branch and Yang (2003) on the other hand, found that target debt levels were actually positively and significantly related to deal probability. However, given the economic arguments above, we expect that an increase in target debt levels will have a negative effect on deal probability.

Next, we control for the target firm's growth prospects by including the variable ***Log Target Market to Book***. Martin (1996) argues that if most of the value in the target's stock is based on future growth prospects, information asymmetry concerning the actual value of the target stock will be higher when the target's market to book is high. In addition, acquirers could have a preference of sharing risk with the target by offering stock if information asymmetry is high [Martin, 1996]. Lastly, it is possible that this variable will actually have a positive effect, as the main motivation of an acquisition is often to acquire top-line growth. To our knowledge this variable has not been controlled for in earlier studies, hence it is difficult to have clear-cut expectations about its effect. Regardless, we find that *Log Target Market to Book* is an appropriate control variable.

Attitude of Target Management has consistently been found to have a significant effect on deal probability in prior studies. As argued by Walkling (1985) and Hoffmeister and Dyl (1981), target management can influence shareholders with their reaction to a takeover attempt, either by attacking the credibility of the acquirer or by taking legal action. Particularly if management have a large holding in the target firm, their influence on the outcome is expected to be even greater; either because of voting rights and/or because they have an economic stake in the firm and thus their response bears more credibility among shareholders. We construct this dummy variable by setting it equal to one when *Zephyr* has registered that the board have rejected the offer and recommended shareholders to do likewise

[BVD, 2017]. Given the effect of adverse influence, we expect that a negative reaction by the target's management will have a negative effect on deal probability.

Target Dividends is included as a measure of the target firm's financial condition, as we expect that firms with a good financial position (with dividend capacity) will have sufficient shareholder support to avoid takeovers. In addition, Hoffmeister and Dyl (1981) found that large firms with a high dividend payout ratio were associated with a lower likelihood of takeover success. Lastly, we include the interaction term ***Target Dividends*Bid Premium 4 Weeks***, as it may implicitly capture the effect of the acquiring firm's dividend policy when the bid is a stock offer. This is because the acquirer may pay a higher premium in order to satisfy target shareholders if it expects that its dividends will not be adjusted to the levels of the target firm [Dereeper and Turki, 2012]. We expect that the interaction term will have a positive sign, as increases in bid premium should offset the expected negative effect of *Target Dividends* itself.

6.3 Region and Year Dummies

Given that there may be unobserved region-specific factors that can have a significant effect on deal probability, such as differences in cultural, economic, legal and regulatory conditions. We create seven region dummies according to the target's home region/continent, respectively: North America, Europe (EU EFTA), Asia, Oceania, Africa, South America and Europe (Non EU EFTA). In our regression model, one of these dummies will be omitted. Furthermore, we expect that controlling for these unobserved effects is crucial in isolating the true effect of our main variables on deal probability, as we observe large regional differences with regards to completion rate and concentration in chapter 7 (Descriptive Statistics).

Our sample only includes deals announced between 2008 and 2014, which implies that a substantial part of the deals is around the time of the financial crisis and its aftermath. To avoid that our main variables capture the influence of business trends, we find it necessary to include year dummies. These represent seven dummy variables that take on the value of one if a deal is announced in a specific year. In our regression analysis we will omit one of the year dummies. The economic rational behind this is that in times of financial distress, the risk and consequently yield on corporate bonds increases, which could lead to difficulties in obtaining the necessary financing and/or increase the cost of financing corporate takeovers. Hence, it is necessary to include year dummies in order to properly isolate the true effects of our main variables of interest.

Having introduced all of our control variables and variables of interest for this study, we will now continue with a formal description of our sample in chapter 7.

Chapter 7

Descriptive Statistics

This chapter provides a description of the final sample, which consists of 1493 public-to-public deals. Section 7.1 is meant to give a overview of the geographical distribution of targets and acquirers. In section 7.2, we seek to further explore the sample with regards to ownership concentration and type, as well as bid premium. This section is presented in light of our research questions. Explanatory variables are described in the last section.

7.1 High-level Statistics

The country and continental distribution of targets and acquirers is presented in table 2. We observe that the country distribution of targets and acquirers seem fairly equal. However, a consequence of not imposing any geographical restrictions on our M&A sample (section 5.2) is that it seems biased towards specific regions. The countries and figures presented in table 2 are not unexpected, given our criteria of requiring ownership coverage in order to include a deal in our final sample.

U.S targets and acquirers are the most frequent, with shares of 37.8% and 35.6% respectively. A large proportion of U.S companies reflects that our sample is representative for global M&A activity[1]. Based on target and acquirer frequency, we find Canada in second with shares of 14.5% and 12.8%. Australia follows with proportions of 9.4% and 8.0%, while UK is the largest European contributor with 7.1% of the targets and 6.4% of the acquirers[2]. Furthermore, we note that Japan is the most frequent Asian country with 4.8% of the targets and 6.2% of the acquirers. The absence of Chinese firms from table 2 is a bit surprising, but is probably a consequence of limited availability of Chinese ownership data. Chinese firms are not completely omitted from our sample though, as it includes six targets and acquirers.

[1] Mergermarket (2016) reports that US continues to be the most sought after location M&A deals.

[2] UK firms make up the largest proportion of the European M&A sample used by Faccio & Masulis (2005).

Table 2: Country and continental distribution of targets and acquirers

Target Country	Deals	% of Sample	Acquirer Country	Deals	% of Sample
USA	565	37.8	USA	531	35.6
Canada	217	14.5	Canada	192	12.9
Australia	141	9.4	Australia	120	8.0
United Kingdom	106	7.1	United Kingdom	96	6.4
Japan	71	4.8	Japan	93	6.2
India	45	3.0	India	45	3.0
South Korea	31	2.1	France	39	2.6
France	25	1.7	South Korea	30	2.0
Germany	24	1.6	Malaysia	27	1.8
Taiwan	24	1.6	Germany	25	1.7
Malaysia	23	1.5	Taiwan	25	1.7
Singapore	19	1.3	Switzerland	18	1.2
South Africa	14	0.9	Ireland	17	1.1
Israel	13	0.9	Sweden	17	1.1
Russia	13	0.9	Israel	15	1.0
Other*	162	10.9	Other*	203	13.6

Continental Overview Target		
North America	782	52.4
Europe (EU EFTA)	249	16.7
Asia	248	16.6
Oceania	141	9.4
Africa	34	2.3
South America	24	1.6
Europe (Non EU EFTA)	15	1.0

Note: The category *Other** consists of 40 unique country codes for target countries, and 41 for acquirer countries.

7.2 Ownership Type and Concentration

Table 3 describes the geographical distribution of ownership type for the largest shareholder in target firms. This table will enable us to examine and compare regional characteristics concerning ownership type of the largest shareholders within our sample. The shareholder information is gathered from several possible sources, such as annual reports or privately written communications addressed by the company to Bureau van Dijk [BVD, 2017]. Trough this process BVD assigns each stake within its database to a category. After matching the data into one final sample, we obtained 11 different ownership types, and after grouping by similarities, we ended up with seven different ownership types[3]. The sample is predominantly distributed across the four most frequent ownership types, financial, mutual fund, industrial and individuals, constituting 97.0% of the sample.

[3]Bank, Financial Company and Insurance Companies were aggregated into the category Financial owner, while Private Equity, Venture Capital and Hedge Fund make up the type Private Equity

Table 3: Ownership type distribution of targets (in %)

Target Country	Mutual Fund	Industrial	Financial	Individuals	Public	Private Equity	Employees	Total
USA	37.3	13.1	29.1	14.8	0.3	4.7	0.7	565
Canada	28.5	14.6	39.1	12.7	0.5	4.1	0.5	217
Australia	28.4	43.3	19.8	7.8	-	0.7	-	141
United Kingdom	34.0	21.7	30.1	12.3	-	1.9	-	106
Japan	28.2	42.3	28.1	-	1.4	-	-	71
India	8.9	48.9	24.5	13.3	4.4	-	-	45
South Korea	6.5	54.8	12.9	19.4	3.2	3.2	-	31
France	8.0	48.0	24	12.0	-	8.0	-	25
Germany	12.5	45.8	29.2	12.5	-	-	-	25
Taiwan	20.8	37.5	29.2	8.3	-	4.2	-	24
Malaysia	13.0	65.2	8.8	4.3	8.7	-	-	23
Singapore	15.8	47.4	15.7	21.1	-	-	-	19
South Africa	14.3	35.7	42.9	-	7.1	-	-	14
Israel	23.1	46.2	30.7	-	-	-	-	13
Russia	-	84.6	15.4	-	-	-	-	13
Continental Overview								
North America	34.6	13.3	32.3	14.1	0.4	4.7	0.6	782
Europe (EU EFTA)	34.2	34.0	18.6	10.0	1.2	2.0	-	249
Asia	16.9	47.9	23.5	8.5	2.4	0.8	-	248
Oceania	28.4	43.3	19.8	7.8	-	0.7	-	141
Africa	17.6	41.2	32.4	2.9	5.9	-	-	34
South America	25.0	50.0	20.8	4.2	-	-	-	24
Europe (Non EU EFTA)	-	86.7	13.3	-	-	-	-	15
Total	28.1	27.3	30.1	11.5	0.1	2.6	0.3	1493

Note: The numbers in the table are expressed as percent of the total.

Regional differences in ownership type for the largest shareholders are evident from table 3, and we observe that mutual fund owners are most frequent in both North America and Europe (EU EFTA), with a total sample share of 28.1%. A striking difference between the two mentioned regions is that North America includes a much larger proportion of financial owners compared to industrial, while the opposite is the case in Europe (EU EFTA). For the other regions, industrial owners seem to dominate, with a total sample share of 27.3%. Note also that individual owners appear quite frequently in the sample, with a share of 11.5%. This variable represents the case where one or more known individuals or families is the largest shareholder [BVD, 2017]. The low proportion of private equity owners is expected, given that our sample only includes public-to-public deals.

In table 4 we present mean statistics for the holdings of the largest and the combined holdings of three largest shareholders, as well as bid premium and completion rate. This table provides us with the first statistical description concerning our two research questions presented in chapter 3 (Research Questions). First we note that the total sample mean for the largest and the three largest shareholders is 21.6% and 32.5%. With a majority of the sample being North American ownership structures, these figures are in line with our expectations. The large range for the bid premium is interesting, but is probably largely due to that some of the smaller country sample means are affected by outliers.

Table 4: Ownership concentration, bid premium and completion rate for targets

Target Country	Largest shareholder %	Three largest shareholders %	Bid Premium %	Completion rate %
USA	15.0	26.1	42.5	91.3
Canada	15.7	25.0	38.1	91.2
Australia	21.1	32.4	24.2	77.0
United Kingdom	18.3	34.0	31.7	94.3
Japan	24.7	27.4	22.0	94.7
India	36.6	44.5	33.1	80.0
South Korea	30.2	44.0	4.3	83.9
France	38.6	55.7	36.3	96.0
Germany	45.1	57.8	11.7	83.3
Taiwan	12.3	20.1	21.0	83.3
Malaysia	37.1	47.9	15.7	96.7
Singapore	32.1	44.7	13.8	78.9
South Africa	27.5	43.0	21.7	85.7
Israel	30.9	43.1	23.9	76.9
Russia	45.5	60.2	1.6	92.3
Continental Overview				
North America	15.2	25.8	41.3	91.3
Europe (EU EFTA)	28.6	43.6	27.9	88.8
Asia	30.3	37.8	20.6	89.5
Oceania	21.1	32.4	24.2	76.6
Africa	30.4	44.7	22.6	82.4
South America	39.9	48.9	23.2	66.7
Europe (Non EU EFTA)	50.6	63.4	2.6	93.3
Total	21.6	32.5	33.6	88.6

Note: Largest shareholder refers to the average holdings of the largest shareholder in the target firm prior to announcement of the deal. Three largest shareholders refers to the average of the aggregated holdings of the three largest shareholders in the target firm prior to announcement of the deal. Bid premium refers to the 4 weeks prior to announcement premium.

A country comparison shows that the US has the least dominant shareholders, with an average stake of 15.0% and combined holdings of 26.1%. This is line with the findings of Gadhoum et al (2005), where public U.S firms are characterized by relatively fragmented ownership compared to regions such as Europe and Asia. Canada and UK are the other two countries where the average holdings of the largest shareholder is below 20%, with stakes of 15.7% and 18.3% respectively. For both measures of ownership concentration, we identify a clear difference between North America and Oceania on the hand, and Europe (EU EFTA) and Asia on the other, where the two latter seem to be characterized by more concentrated ownership. Regions such as Africa, South America and Europe (Non EU EFTA), which are smaller, are also characterized by higher ownership concentration.

The inverse connection between ownership concentration and bid premium from table 4 supports our second hypothesis. Countries with more dispersed ownership, such as U.S and Canada, have the highest average bid premiums, 42.5% and 38.1% respectively. Generally, higher bid premiums are more common in countries/regions with low ownership concentration, although this link is not prevalent in every case. Based on the discussion in chapter 4 (Hypotheses) and table 5 below, the connection between ownership concentration and completion rate in table 4 seems inconsistent. This may be due to unobserved effects such as business culture and regulatory environment distorting the results, something that further supports including geographical fixed effects dummies in the regression analysis.

Table 5 provides quartile statistics for different measures of ownership concentration. This table will enable us to further examine the proposed link between ownership concentration, bid premium and completion rate.

Table 5 : Quartile Statistics

Variable	First Quartile	Fourth Quartile
Mean of Largest Shareholder %	4.2	52.8
Largest Shareholder Type	Financial Owner	Industrial Company
Mean of Second Largest Shareholder %	0.50	15.5
Mean of Third Largest Shareholder %	0.41	9.2
Combined Holdings Overview		
Mean %	7.4	66.8
Median %	7.3	63.8
Combined Shareholder Type	Mutual Fund	Industrial Company
Completion Rate %	87.7	90.1
Bid Premium %	30.1	27.9

Note: Shareholder type refers to the most frequent ownership type in the quartiles.

The statistics presented in the combined holdings overview supports our two hypothesis presented in chapter 4 (Hypotehsis). We see that the completion rate is higher in the fourth quartile compared to the first quartile, with figures of 90.1% and 87.7%. As comparison, the sample average was reported at 88.6% in table 1. The inverse connection between ownership concentration and bid premium is consistent with our second hypotehsis, as the average bid premium in the first and fourth quartile is 30.1% and 27.9% respectively.

From table 5 we also observe an interesting pattern between the ownership type of the largest shareholder and ownership concentration. Financial owners are most frequent in the most dispersed ownership structures, while industrial owners appear predominantly in closely held targets. In fact, 34% of financial owners and 55% of industrial owners in our complete sample are located in the first and fourth quartile respectively. For the combined holdings of the three largest shareholders, the same divide seems to exists. These findings might propose that the effect of ownership concentration may be affected by type, as industrial owners with large stakes could have stronger preferences for control compared to institutional owners with smaller stakes. This suggests the need for further analysis of the interaction between ownership concentration and type. In table 8 and 9 in chapter 9 (Results) we will limit our regressions to only variables related to ownership concentration and type, before proceeding to examine our hypotehsis within a prediction of success framework.

We further note from table 5 the large range in average holdings between the two quartiles. In order to further inspect the proportional holdings, we proceed with table 6. Below we provide a geographical distribution of the individual holdings that make up our main variable of interest *Three Largest Shareholders*.

Table 6: Relative Holdings and Ratio Measures

Target Country	1. Shareholder %	2. Shareholder %	3. Shareholder %	1/2	1/3
USA	15.0	6.6	4.4	2.27	3.41
Canada	15.7	5.9	3.3	2.66	4.76
Australia	21.1	6.9	4.4	3.06	4.80
United Kingdom	18.3	9.5	6.1	1.93	3
Japan	24.7	1.9	0.8	13	31
India	36.6	5.2	2.7	6.65	13.56
South Korea	30.2	9.4	4.5	3.2	6.7
France	38.6	12.0	5.1	3.2	7.6
Germany	45.1	8.6	4.2	5.2	10.7
Taiwan	12.3	4.7	3.4	2.6	3.6
Malaysia	37.1	7.4	3.4	5	10.9
Singapore	32.1	10.2	2.4	3.15	13.4
South Africa	27.5	10.1	5.4	2.7	5.1
Israel	30.9	9.3	3.0	3.3	10.3
Russia	45.5	11.2	3.5	4.1	13
Continental Overview					
North America	15.2	6.4	4.1	2.4	4.3
Europe (EU EFTA)	28.6	9.5	5.4	3	5.3
Asia	30.3	5.2	2.3	5.83	13.2
Oceania	21.1	6.9	4.4	3.1	4.8
Africa	30.4	10.1	4.2	3	7.2
South America	39.9	6.4	2.6	6.2	15.3
Europe (Non EU EFTA)	50.6	9.8	3.1	5.2	16.3
Total	21.6	6.9	4.0	3.1	5.4

In the two outer-right columns of table 6 we present two ratio statistics. The ratios are constructed by dividing the average holdings of the largest shareholder by the average of the second and third largest shareholder. These measures will allow us to examine geographical characteristics in relation to relative size of stakes.

We observe that the relative difference in average holdings is smallest in North America. The average holdings of the largest shareholder is 2.4 times larger than the holdings of the second, and 3.41 times larger than the third. Europe (EU EFTA) and Oceania report figures slightly above. For rest of the regions these ratios are much larger, especially when comparing the holdings of the largest to the third largest. A country comparison reveals that Japan has the highest ratios for both measures, with ratios of 13 and 31. The findings in table 6 provides further support for including regional dummies in the regression analysis to capture regional characteristics with regards to relative size between the three largest shareholders.

7.3 Explanatory Variables

Table 7 presents mean and median for the explanatory variables across the two deal status sub-samples. The motivation for constructing this table is to detect significant differences between successful and failed deals by observing the explanatory variables. A descriptive statistics table for the complete sample is placed in Appendix A.1.

Table 7: Statistics on the explanatory variables on sub-samples: *Success* & *Failed*

Explanatory Variables	Success		Failed			
	Mean	Median	Mean	Median	Diff Mean	Diff Median
Largest Shareholder %	21.93	12.77	19.22	12.59	2.71*	0.19
Three Largest Shareholder %	32.90	26.49	29.76	24.94	3.14*	1.55
Bid Premium 4 weeks %	34.92	25.14	23.56	13.55	11.36*	11.59 ***
Acquirer Toehold %	12.56	0	10.03	0	2.53	0
Log Relative Size	-2.10	-1.84	-1.48	-1.32	-0.62***	-0.52***
Target Debt to Assets	0.189	0.126	0.196	0.141	-0.007	-0.015
Log Target Market to Book	0.925	0.585	0.805	0.398	0.120	0.187*
Log Acquirer Market to Book	0.558	0.501	0.659	0.467	-0.101	0.034
Rival Bids	0.011	0	0.088	0	-0.077***	0
Intra-Industry	0.401	0	0.347	0	0.054	0
Cross Border	0.212	0	0.271	0	-0.059	0
Tender Offer	0.017	0	0.047	0	-0.030*	0
Financial Buyer	0.032	0	0.035	0	-0.003	0
Stock Offer	0.360	0	0.435	0	-0.075*	0
Attitude of Target Management	0.01	0	0.20	0	-0.19***	0
Target Dividends	0.31	0	0.31	0	0	0
Target Region North America %	53.9	0	40.0	0	13.9***	0
Target Region Europe (EU EFTA) %	16.7	0	16.5	0	0.2	0
Target Region Asia %	16.8	0	15.3	0	1.5	0
Target Region Oceania %	8.2	0	19.4	0	-11.2***	0
Target Region Africa %	2.1	0	3.5	0	-1.4	0
Target Region South America %	1.2	0	4.7	0	-3.5**	0
Target Region Europe (Non EU EFTA) %	1.1	0	1.0	0	0.1	0

Note: The table reports the test statistic and significance level in the two sided tests for differences in means and medians. The tests consider the difference between Success and Failed. A t-test with unequal variance is used for the mean, while a non parametric Wilcoxon test is used to test the median. Significance levels: ***, ** and * indicate 1, 5 and 10 percent.

Concerning our main variables of interest, there is a statistically significant difference in ownership concentration between successful and failed bids. The average holdings of the three largest shareholders in successful bids is 32.90%, while the equivalent percentage in failed bids is 29.76%. Even though the largest shareholder variable does not independently enter our analysis, but only as part of the aggregated variable three largest shareholders, we have included it in the table to further emphasize the difference in ownership concentration between the two sub-samples. Despite the fact that the table supports our first hypothesis, we are cautious in drawing any conclusions at this stage.

Furthermore, we observe that the average bid premium in successful bids is 34.92%, which is way above the premium at 23.56% in failed bids. Testing for difference in means and medians for this variable returned significant results. This is not surprising, given that an increase in bid premium will generally result in higher deal probability, all else equal [Walkling, 1985].

The Acquirer Toehold variable mean is higher in successful bids (12.56%) compared to failed (10.03%), but the difference in means is not statistically significant. This result is a bit surprising, as one might expect a larger and significant difference in means between the two samples. Previous studies such as Hoffmeister et.al (1981), Flanagan et. al (1998) and Walking (1985) find a threshold to be associated with a higher likelihood of takeover success. As expected, the median is 0 for both subsamples, indicating that the typical deal in our sample does not involve a situation where the acquirer has a toehold in the target.

The average for the Log Relative Size variable is smaller in the success sample compared to failed, reflecting that on average, targets in the success sample are relatively smaller. Testing for difference in means returns highly significant results, which is not unexpected, given the arguments concerning difficulties in financing takeovers and the relative size of target firms [Branch and Yang, 2003].

Further, we note from Table 5 that there are statistically significant differences between the average deal characteristics in the two sub-samples, for the binary variables Rival Bids, Tender Offer and Target Management Attitude. I.e. on average only one percent of successful takeovers involved a hostile target management attitude, whereas 20 percent of failed takeovers involved the same. Not surprising, this difference in means is significant and consistent with earlier research by Hoffmeister et.al (1981) and Walkling (1985). In terms of competition, we observe that only about one percent of successful takeovers involved multiple bidders, while the same figure is eight times higher among failed takeovers. Concerning the region dummies, we find statistical support for Oceania and South America, both indicating a larger proportion in the failed sample.

It is definitely interesting to note that the difference in means test displays results consistent with our initial expectation in chapter 4 and 6, but we should nonetheless be careful to draw any conclusions at this stage, as we have not yet applied our data and variables in a probit model or accounted for interaction effects. However, we expect to see consistent results in our analysis presented in chapter 9, especially concerning the variables displaying the strongest results (i.e. Log Relative Size, Rival Bids and Attitude of Target Management). We continue in chapter 8 by presenting a more advanced statistical model. This model will be used to jointly estimate the effect of our variables on deal success.

Chapter 8

Methodology

In this chapter, we put forward the empirical framework used in the attempt to model the effect of ownership concentration on deal probability and the interaction between ownership concentration and bid premium. In order to study the effects related to our research questions, we need to choose an appropriate model. The choice and description of a statistical model is presented in section 8.1, while the steps and rationale behind deploying our model is explained in section 8.2.

8.1 How We Evaluate Our Hypotheses

As we are interested in testing the following two research questions: **1)** How changes in target ownership concentration affect the probability of takeover success, and **2)** Whether changes in ownership concentration interact with the effect of bid premium on the probability of success, it is clear that we need to evaluate our hypotheses within a prediction of success model.

When testing our first research question, the specific variable of interest is the *Three Largest Shareholders*. This variable represents the combined holdings of the three largest shareholders in the target company prior to announcement, and is used as a proxy for the complete ownership structure[1]. In relation to our second research question, the main variable of interest is the interaction term *Three Largest Shareholders * Bid Premium 4 Weeks*[2].

As our dependent variable is dichotomous, meaning it only has two possible categories (success or fail), we deploy the probit model, as it deals with many of the conceptual and computational issues inherent in the linear probability model, e.g. the problem of negative probability or probability above one.[3]. Note that the Logit

[1] A detailed description of this variable is presented in section 6.1

[2] Details on constructing the bid premium variable is located in section 5.3

[3] See Appendix A.6 for a formal derivation of the Probit Model

models also solve this particular problem, but the probit model is preferred due to preferences for normality assumptions.

The probit model is a nonlinear regression model specifically designed for binary dependent variables, which models the probability of $Y(Success = 1)$, and forces the predicted values to be between 0 and 1 [Stock and Watson, 2015]. This leads to the fact that the magnitude of the coefficients cannot be interpreted directly until converted into marginal effects[4]. The equation below presents the Probit model which is estimated in section 9.2, where the dependent variable indicates success or failure conditional on a bid, while x refers to a vector of control variables which will vary between the specifications.

$$P(Y = 1|X) = \phi(\beta_0 + \beta_1 Concentration + \beta_2 Concentration * BidPremium + \beta_3 OwnershipType + \beta_4 BidPremium + \beta_x)$$

The coefficients (β) obtained after running this model are not actual probabilities, but rather the change in the z-value in the cumulative standard normal distribution and thus the change in the probability of observing $Y = 1$. The probit model also allows the explanatory variables to be either numerical or categorical, which naturally suits our data, as it contains both types.

Literature on prediction models exclusively implement one of the two logistic models, the probit or logit model. The matter of choice is up to the researchers preferences and type of statistical software, but the two models frequently produce similar results [Stock and Watson, 2015]. In a study by Officer (2003), he applies the probit model in estimating the effects of target termination fees on a bid or tender offer resulting in a completed transaction. Similar to our study, his research focuses on the effect of some key variables of interest, using a prediction model framework.

All though this thesis is in line with similar empirical research in using a logistic model in examining the deal probability, a direct comparison of our model can be misleading for several reasons. Most other M&A studies utilize the SDC database, while we use the Zephyr database in order to be able to test our hypotheses. Some of the desired control variables available in SDC were unfortunately not accessible through Zephyr. The ownership data also sets the premise for the short time interval (2008 - 2014). In contrast most other papers examine a longer time period, resulting in that our sample does not capture merger waves.

[4]Marginal effects for specification 5 in table 8 and specification 4 in table 10 are given in Appendix A.3

8.2 How We Deploy Our Model

Before we deploy the model to test our hypotheses, we will first examine the ownership data in table 8 and 9. The first table only includes the variables from our sample that are related to ownership concentration. Here we test two different measures of ownership concentration; holdings of the largest shareholder and the combined holdings of the three largest shareholders. In addition, possible interaction effects between ownership concentration and type are examined, as the effect of ownership concentration might be affected by control preferences. In table 9 we provide an alternative model specification by excluding ownership concentration variables. This is because the two variables might be potentially correlated, as for example when individuals/families are large owners, the may own a lot. This process in section 9.1 allows us only to find the most representative variable for target ownership concentration within our sample. Any conclusions concerning our research questions at this point is premature, as we need to control for other proven or likely determinants of deal probability, such as target, acquirer and deal characteristics.

Based on the findings in chapter 7 (Descriptive Statistics), we find it necessary to include fixed effects concerning regional characteristics. We observed in the previous chapter that countries/regions characterized by more fragmented ownership concentration tended to be associated with higher bid premiums. While the link between completion rate and ownership concentration seemed inconsistent (see table 4); as lower ownership concentration did not always lead to a lower completion rate. A possible cause for these results could be due to unobserved characteristics, such as legislation, regulations, culture, business environment etc. In addition, different owners might have very different preferences concerning corporate control, payment method etc. Controlling for ownership types, as well as including region and year dummies will capture some of the unobserved effects, as well as isolate and provide a more correct estimation of the effect of ownership concentration on bid success.

We will deploy our model with five specifications for x in table 10, in addition to the ownership variables chosen based on the analysis in table 8 and 9. In the first two specifications, x contains the most common control variables used in previous studies. In specification 3 we add the interaction term *Target Dividends * Bid Premium 4 Weeks*, while the interaction term *Three Largest * Bid Premium 4 Weeks* is added in specification 4, which also represents our final model. We include these interaction terms to capture additional effects, not captured by the individual variables independently. Based on financial theory and economic intuition, we expect both to have an effect. A detailed discussion concerning these two interaction terms can be found in section 6.1 and 6.2. In the last specification, we exclude the ownership type dummies to demonstrate the effect on deal probability when ownership concentration is not isolated, but rather incorporates other disturbances, such as

ownership type preferences. This last specification will provide some indication on the robustness of ownership concentration on deal probability.

In table 11 we introduce an alternative specification for ownership concentration. Here the continuous variable *Three Largest Shareholders* is split up into three categories in accordance to size[5]. This approach will allow us to inspect whether bid success is increasing across the three categories, as well as it addresses potential non-linearities between ownership concentration and bid success.

Having described our statistical model and empirical testing strategy, we proceed by testing our hypothesis in the next chapter.

[5]The construction of these dummy variables is discussed in section 6.1

Chapter 9

Results

In this chapter we will present our analysis and the test outcomes concerning our two main hypotheses introduced in chapter 4 (Hypotheses). Firstly, we will introduce our ownership variables in table 8 and examine whether our initial expectations concerning these variables are correct.

In addition, we will also examine whether there are interaction effects between ownership types and concentration, as the effect of concentration might be affected by control preferences. I.e. owners with large ownership stakes might have strong preferences for control, while small stakes could be associated with weaker preferences. This argument seems to be consistent with table 5 (Descriptive Statistics), where we see institutional owners dominating the bottom quartile and industrial owners the upper quartile of concentration. In table 10, we use a prediction model framework to empirically test our ownership variables while controlling for some of the most common determinants of deal probability. Column 4 (table 10) serves as our main model, as it contains the specifications necessary to test our hypotheses and fits the sample quite well.

Given that the purpose of this thesis is to answer our two research questions, we pay most attention to our ownership variables, but also discuss the control variables and compare our results to earlier research when appropriate. Although our data sample is larger and newer that in most earlier research, the signs and significance of our control variables should be consistent and comparable to earlier results. The main reason for this is that many of the control variables capture strong relationships between deal probability and key determinants, which should hold over time and across samples. On the other hand, if we were to assume that the slopes and significance of our coefficients are sensitive and dependent on the sample, a comparison across studies would be less meaningful. We must also stress that several comparable studies only look at tender offers in public takeovers, while we look at a sample of public takeovers in general.

Also, note that our final prediction model (column 4) in table 10 is the result of a process where we consider different model specifications, where one variable has been excluded due to multicollinearity issues. We will elaborate more on this process in chapter 10 (Assessment of Robustness).

9.1 Introducing Ownership Concentration and Types

Table 8: Target ownership data (Probit)

	Dependent variable: Success					
	(1)	(2)	(3)	(4)	(5)	(6)
Largest Shareholder	0.5608**		0.6622***	1.1175***		
	(0.2566)		(0.2591)	(0.3620)		
Three Largest Shareholders		0.4847**			0.6371***	0.4309
		(0.1958)			(0.2154)	(0.4057)
Financial Company			-0.0118	0.1746	-0.0005	-0.0037
			(0.1242)	(0.1756)	(0.0761)	(0.1195)
Industrial Company					-0.1977*	
					(0.1086)	
Mutual Fund			0.1528	0.2726	0.0219	0.0730
			(0.1314)	(0.1901)	(0.0978)	(0.1546)
Individuals/Families			0.1154	0.3825	0.0050	0.0789
			(0.1692)	(0.2679)	(0.1205)	(0.1969)
Public/Government			0.3493	2.0316***	-0.1109	-0.1637
			(0.5402)	(0.5742)	(0.1982)	(0.3037)
Private Equity			-0.2162	0.3813	-0.1668	0.0546
			(0.2592)	(0.4442)	(0.1895)	(0.3325)
Largest/Three Largest Shareholders * Financial Company				-0.7300		0.1487
				(0.5636)		(0.3159)
Largest/Three Largest Shareholders * Mutual Fund				-0.2463		0.0290
				(0.9001)		(0.3928)
Largest/Three Largest Shareholders * Individual/Families				-1.2029		-0.0867
				(1.1205)		(0.4826)
Largest/Three Largest Shareholders * Public/Government				-5.6212 ***		0.2386
				(1.8921)		(0.7792)
Largest/Three Largest Shareholders * Private Equity				-2.3598*		-0.6091
				(1.4095)		(0.8433)
Constant	1.2277***	1.1892***	1.1723***	1.0406***	1.2059***	1.1246***
	(0.1254)	(0.1304)	(0.1665)	(0.1764)	(0.1833)	(0.2109)
Observations	1493	1493	1493	1493	1493	1491
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Region Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Log Likelihood	-504.19	-504.11	-502.19	-498.87	-501.66	-502.76
Pseudo R^2	0.0474	0.0476	0.0512	0.0575	0.0522	0.0501

Note: Robust standard errors in parentheses. Significance levels:*p<0.1; **p<0.05; ***p<0.01

In column 1 and 2 in the table above, we include our ownership concentration variables, while also controlling for fixed effects using region and year dummies. Consistent with our expectations discussed in chapters 4 and 6, we see that both *Largest Shareholder* and *Three Largest Shareholders* have a positive and significant effect on deal probability. The result concerning *Largest Shareholder* is consistent with Shleifer and Vishny (1985) who argued that the presence of a large shareholder should enhance deal probability. However, as the purpose of this study is to examine the relationship between ownership concentration and deal probability, we use the variable *Three Largest Shareholders* going forward. The main reason for this is

that utilizing information about the three largest ownership stakes is likely to better capture the true ownership concentration of the target firm.

So far, we have examined the effect of ownership concentration on deal probability without controlling for ownership types. As discussed in chapter 6 (Variables), given different preferences and characteristics of different ownership types, the effect of target ownership concentration is likely to be affected by ownership type. Hence, we include ownership type dummies in column 3 in order to further isolate the effect of ownership concentration on deal probability. After controlling for ownership types, we observe that both the slope and significance of *Largest Shareholder* increases (*Industrial Company* is dropped due to multicollinearity issues). However, none of the ownership types for *Largest Shareholder* are found significant and their signs seem somewhat arbitrary, hence including them might only introduce noise to the estimates. As discussed earlier in Chapter 7, we believe there is reason to examine potential interaction effects between ownership types and concentration. Thus, it is interesting to see that inclusion of interaction terms in column 4 makes *Public/Government* significant and that two of these interaction terms themselves are significant. These results indicate that for high levels of target ownership concentration, both *Public/Government* and *Private Equity* have a negative effect on deal probability.

Note that we exclude 5 observations where the combined stake of the three largest shareholders included a stake held by managers or employees. This is because all of these deals were successful (perfect prediction). Although mostly insignificant, all included ownership type dummies in column 5, except *Private Equity* and *Financial Company*, have the signs that we initially expected. Only *Industrial Company* generates a coefficient estimate that is significant at the ten percent level (6.9 percent). At the same time, controlling for ownership type greatly improves both the significance and magnitude of *Three Largest Shareholders*, further indicating that ownership concentration has a positive and significant effect on deal probability.

In column 6 we include interaction terms to capture any potential interaction effects between ownership concentration and ownership types. By including these interaction terms, both *Industrial Company* and its interaction term causes multicollinearity and is therefore omitted. We see that introducing interaction terms between *Three Largest Shareholders* and ownership type, only consumes degrees of freedom, reduce explanatory power and lead to insignificant results. Furthermore, none of the interaction terms themselves are significant at any reasonable level. Consequently, we discard the interaction terms and only use the variables in specification 5 going forward, as we find these to be the most suitable ownership variables.

It is possible that a particular type of owner could be correlated with both *Largest*

Shareholder and *Three Largest Shareholders*. I.e., industrial owners are highly correlated with *Largest Shareholder* (see table 18, appendix A.8). We also note in Chapter 7 that industrial owner is the most frequent ownership type in the fourth quartile of ownership concentration. Indicating that when the largest owner in the target firm is an industrial company, the ownership stake held tend to be large. Thus, it could be of interest to examine the relationship between ownership types and deal probability when both *Largest Shareholder* and *Three Largest Shareholders* are excluded. In addition, we want to examine the effect on *Largest Shareholder* and *Three Largest Shareholders* of not controlling for time fixed effects. The results concerning the issues discussed in this paragraph is presented in table 9 below.

Table 9: Target ownership data ex. year dummies and concentration

	Dependent variable: Success					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Largest Shareholder	0.6083***		0.7116***			
	(0.2306)		(0.2591)			
Three Largest Shareholders		0.5083***		0.6581***		
		(0.1951)		(0.2140)		
Financial Company			0.0015	0.0041	-0.1074	0.0084
			(0.1244)	(0.0755)	(0.1149)	(0.0759)
Industrial Company				-0.1920*		-0.0871
				(0.1083)		(0.1015)
Mutual Fund			0.1504	0.0105	0.0329	0.0219
			(0.1308)	(0.0981)	(0.1224)	(0.0978)
Individuals / Families			0.1154	-0.0086	0.0259	0.0329
			(0.1680)	(0.1191)	(0.1629)	(0.1197)
Public / Government			0.3166	-0.1189	0.2643	-0.1288
			(0.5366)	(0.1957)	(0.5222)	(0.1991)
Private Equity			-0.2059	-0.1838	-0.2534	-0.1259
			(0.2586)	(0.1890)	(0.2553)	(0.1876)
Constant	1.2723***	1.2347***	1.2025***	1.2489***	1.3574***	1.3262***
	(0.0711)	(0.0794)	(0.1298)	(0.1497)	(0.1462)	(0.1784)
Observations	1493	1493	1493	1493	1493	1493
Year Dummies	No	No	No	No	Yes	Yes
Region Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Log Likelihood	-509.93	-510.08	-508.10	-507.64	-505.56	-505.97
Pseudo R^2	0.0366	0.0363	0.0400	0.0409	0.0449	0.0441

Note: Robust standard errors in parentheses. Significance levels: *p<0.1; **p<0.05; ***p<0.01

From column 1 to 4 in the table above, we see that not controlling for time fixed effects leads to increases in both the slopes and significance for *Largest Shareholder* and *Three Largest Shareholders*. This seems to indicate that these variables are picking up unobserved effects that vary over time, and that adding year dummies is necessary to isolate the effect of ownership concentration. Ownership types on the other hand do not seem to pick up any unobserved effects that vary across time.

In column 5 and 6 we include year dummies and exclude the variables *Largest Shareholder* and *Three Largest Shareholders* to examine the independent effect of ownership types. Given their correlation with the variables *Largest Shareholder* and *Three Largest Shareholders*, the coefficients of the ownership types change when concentration variables are excluded. We see that independently, ownership types do not have a statistically significant effect on deal probability. Further indicating that type is not an important determinant of deal probability. Given that we are examining deal probability conditional on a bid, this result might not be that surprising. I.e., firms held by owners with a known preference for control might not be selected as targets in the first place, as the bidder could perceive the likelihood of a deal to be too low. We also note that in the absence of concentration variables, the signs of the type dummies is usually not consistent with our expectations. This is likely due to their correlation with the ownership stakes themselves (*Largest Shareholder* and *Three Largest Shareholders*).

Given the results presented in this section, we argue that there is reason to expect that ownership concentration measured by *Three Largest Shareholders*, has a positive and significant effect on deal probability. However, it would be premature of us to draw any conclusions from table 8, as we have not yet controlled for other proven and/or likely determinants of deal probability. In the following section, we will introduce some of these determinants as control variables. This allows us to examine whether our initial results concerning ownership concentration still holds when we apply them in a prediction model framework. As with all specifications in table 8, we will control for unobserved geographic and time fixed effects in all specifications in table 10 as well (following arguments made in chapter 6 and 8).

9.2 The Effect of Ownership Concentration

Table 10: Prediction models

	Dependent variable: Success				
	(1)	(2)	(3)	(4)	(5)
Three Largest Shareholders	0.3790	0.3655	0.3492	0.5353**	0.4072
	(0.2525)	(0.2517)	(0.2498)	(0.2711)	(0.2560)
Financial Company	0.0325				
	(0.0836)				
Industrial Company	-0.2030*	-0.2051*	-0.2117*	0.1913*	
	(0.1197)	(0.1112)	(0.1109)	(0.1109)	
Mutual Fund	-0.0099				
	(0.1108)				
Individual/Families	-0.0247				
	(0.1365)				
Public/Government	-0.0041				
	(0.2292)				
Private Equity	-0.1884				
	(0.2376)				
Log Target Relative Size	-1.0000***	-0.0988***	-0.0982***	-0.0927***	-0.0919***
	(0.0311)	(0.0310)	(0.0314)	(0.0310)	(0.0309)
Target Debt to Assets	-0.2139	-0.2209	-0.2320	-0.1708	-0.1686
	(0.2406)	(0.2417)	(0.2443)	(0.2397)	(0.2420)
Log Target Market to Book	0.0398	0.0396	0.0438	0.0429	0.0463
	(0.0320)	(0.0319)	(0.0319)	(0.0320)	(0.0324)
Attitude of Target Management	-2.3284***	-2.3257***	-2.3123***	-2.3156***	-2.3298 ***
	(0.2622)	(0.2591)	(0.2600)	(0.2611)	(0.2623)
Target Dividends	0.1864*	0.1905*	0.2553**	0.2745**	0.2805**
	(0.1118)	(0.1116)	(0.1281)	(0.1281)	(0.1282)
Log Acquirer Market to Book	-0.0576	-0.0617	-0.0638	-0.0603	-0.0665
	(0.0715)	(0.0714)	(0.0709)	(0.0689)	(0.0684)
Acquirer Toehold	0.4948*	0.4995*	0.5162*	0.5001*	0.4804*
	(0.2730)	(0.2703)	(0.2713)	(0.2718)	(0.2696)
Financial Buyer	-0.0003	-0.0031	-0.0041	-0.0006	-0.0154
	(0.2957)	(0.2900)	(0.2929)	(0.2790)	(0.2965)
Stock Offer	-0.1550	-0.1482	-0.1451	-0.1392	-0.1414
	(0.1124)	(0.1120)	(0.1128)	(0.1144)	(0.1142)
Rival Bids	-1.2949***	-1.2847***	-1.3110***	-1.2587 ***	-1.2626***
	(0.3064)	(0.3019)	(0.3041)	(0.2986)	(0.2985)
Intra-Industry	0.2391*	0.2421**	0.2334**	0.2637**	0.2673**
	(0.1039)	(0.1038)	(0.1042)	(0.1053)	(0.1055)
Tender Offer	-1.0167***	-1.0197***	-1.0404***	-1.0481***	-1.0591***
	(0.2974)	(0.2926)	(0.2903)	(0.2917)	(0.2967)
Cross Border	-0.3236***	-0.3156***	-0.3292***	-0.3448***	-0.3456***
	(0.1168)	(0.1176)	(0.1176)	(0.1178)	(0.1171)
Bid Premium 4 weeks	0.2122	0.2142	0.3255*	0.7260***	0.7438***
	(0.1391)	(0.1384)	(0.1741)	(0.2230)	(0.2231)
Target Dividends * Bid Premium 4 weeks			-0.2795	-0.3848	-0.3801
			(0.2587)	(0.2494)	(0.2497)
Three Largest Shareholders * Bid Premium 4 weeks				-0.9908**	-1.0376**
				(0.4547)	(0.4521)
Constant	1.1236***	1.1241***	1.0924***	1.9871***	1.9615***
	(0.2555)	(0.2014)	(0.2044)	(0.2042)	(0.2036)
Observations	1443	1443	1443	1443	1443
Year Dummies	Yes	Yes	Yes	Yes	Yes
Region Dummies	Yes	Yes	Yes	Yes	Yes
Log Likelihood	-388.09	-388.67	-387.05	-384.66	-385.97
Pseudo R^2	0.2279	0.2268	0.2291	0.2348	0.2322
Correct Predictions % (Total)	90.71	90.58	90.71	90.64	90.51
Correct Predictions % (Successful)	91.03	91.17	91.30	91.24	91.10
Correct Predictions % (Failed)	77.08	74.00	75.00	74.51	73.47

Note: Robust standard errors in parentheses. Significance levels: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

The first two columns in table 10 above include some of the most common control variables used in earlier research, as well as the most relevant ownership variables from table 8. Next, we continue by including interaction terms in column 3 and 4, between *Target Dividends*, *Bid Premium 4 Weeks* and our main variable of interest *Three Largest Shareholders*, respectively. Lastly, column 4 is then used to test our two hypotheses, while column 5 shows the consequences of not controlling for *Industrial Company* in the final model.

In our initial examinations in table 8 and column 1 in table 10, we find that *Industrial Company* is the only significant ownership type. Hence, we exclude all other ownership dummies, as they seem to introduce noise to our estimates. In column 5 we see that omitting *Industrial Company* leads to *Three Largest Shareholders* picking up on some of its effect. Which leads to a situation where *Three Largest Shareholders* is only significant at 11 percent, compared to 4.8 percent in our final model in column 4. Hence, to properly isolate the effect of target ownership concentration, we must control for whether one of the three largest shareholders is an industrial owner. This could be because of some unobserved characteristics of industrial owners that affects *Three Largest Shareholders*.

In terms of goodness of fit and explanatory power, our model seems to perform well with a McFadden Pseudo R-squared of 0.2348 and a log likelihood of -384.66. In addition, the predictive accuracy of our model seems very good with 90.64 percent of the takeover outcomes correctly predicted (comparable models vary between 89-91 percent correct predictions). However, we should be cautious to compare such measures to other similar studies. I.e., as we have seen in our literature review, several other studies only examine tender offers or use data from one country or region. Thus, differences in the measures above may be due to more homogeneous samples used in other studies.

Given the results in column 4, table 10, we find that both of our main variables of interest: *Three Largest Shareholders* and *Three Largest Shareholders*Bid Premium 4 Weeks*, are statistically significant at the 5 percent level, with the expected signs. Hence, these results support our two hypotheses: **H1:** that an increase in target ownership concentration has a positive effect on deal probability and **H2:** that the bid premium effect on deal probability is higher for low levels of target ownership concentration than for high levels of target ownership concentration. Furthermore, we interpret these results as supporting evidence in favor of the *Free Rider Problem* in M&A: namely that transfer of control is harder when target ownership concentration is low, and that the premium paid by the acquirer should be higher in cases where target ownership concentration is low [Grossman and Hart, 1980]. These results will be discussed in more detail below.

Given that our final model in column 4 is a non-linear probit regression which includes interaction terms, we cannot interpret the coefficients of our variables of interest or their respective marginal effects in appendix A.4 directly[1]. However, we can assess the overall direction of our variables of interest when interpreting our results.

The variable *Three Largest Shareholders* is statistically significant at the 5 percent level in our final model. As expected, we see that by controlling for the interaction effect between ownership concentration and bid premium, both the magnitude and significance of *Three Largest Shareholders* increases. With this in mind, we see that the overall effect on deal probability by an increase in *Three Largest Shareholders*, is positive when accounting for its interaction effect with bid premium. This is consistent with our difference-in-means test in table 7 and quartile statistics in table 5, as well as with economic intuition and theory. More specifically, the results are in line with the notion that when the ownership structure of the target firm is diffuse, transfer of control could be difficult. This could be because shareholders have an incentive to not sell their shares, in order to achieve the same gain as the acquirer. Namely because they believe that their decision on whether to sell their shares or not, will not affect the outcome of the takeover attempt itself [Grossman and Hart, 1980].

Having established significance for the effect of ownership concentration on deal probability, we now turn to the interaction effect between ownership concentration and bid premium (*Three Largest Shareholders*Bid Premium 4 Weeks*). In addition to having a negative sign, the interaction term is statistically significant at 2.96 percent. This result is in line with our expectation that bid premium is a relatively more important determinant of deal probability for low levels of target ownership concentration than for high levels. Specifically, a percentage point increase in bid premium will have a larger effect on deal probability when ownership concentration is low, compared to when it is high. This is consistent with the notion that bidders must pay a higher premium to target shareholders when concentration is low, in order to induce them to sell their shares [Grossman and Hart, 1980]. This seems to manifest itself in table 5 (Descriptive Statistics), where the mean bid premium is higher in the first quartile of target ownership concentration than in the fourth. Furthermore, it is interesting to note that *Bid Premium 4 Weeks* becomes significant at any reasonable significance level when we control for its interaction effect with ownership concentration. This result is in line with economic intuition, but not with Branch et.al (2003) and Flanagan et.al (1998), who found that bid premium did not have a significant effect on deal probability.

[1] The effects of the coefficients go through the Z-value in the Probit regression [Ai and Norton, 2003]

Table 11: Dealing with nonlinearities

	Dependent variable: Success				
	(1)	(2)	(3)	(4)	(5)
Low Concentration	-0.1813			-0.0875	
	(0.1209)			(0.1406)	
Medium Concentration		-0.0709			0.0875
		(0.1291)			(0.1407)
High Concentration			0.2894**	0.2269	0.3144**
			(0.1348)	(0.1551)	(0.1466)
Industrial Company	-0.1421	-0.1609	-0.2126**	-0.1808*	-0.1807*
	(0.1089)	(0.1058)	(0.1080)	(0.1099)	(0.1099)
Log Relative Size	-0.0891***	-0.1013***	-0.0943***	-0.0894***	-0.0894***
	(0.0308)	(0.0314)	(0.0311)	(0.0307)	(0.0307)
Target Debt to Assets	-0.1577	-0.2481	-0.2211	-0.1978	-0.1978
	(0.2448)	(0.2445)	(0.2431)	(0.2446)	(0.2446)
Log Target Market to Book	0.0459	0.0487	0.0436	0.0491	0.0491
	(0.0322)	(0.0321)	(0.0317)	(0.0321)	(0.0321)
Attitude of Target Management	-2.3781***	-2.3622***	-2.3018***	-2.3729***	-2.3729***
	(0.2679)	(0.2677)	(0.2617)	(0.2710)	(0.2710)
Target Dividends	0.2313*	0.2396*	0.2706**	0.2229*	0.2229*
	(0.1245)	(0.1261)	(0.1276)	(0.1244)	(0.1244)
Log Acquirer Market to Book	-0.0556	-0.0677	-0.0645	-0.0603	-0.0603
	(0.0668)	(0.0703)	(0.0695)	(0.0666)	(0.0666)
Acquirer Toehold	0.5753**	0.5685**	0.4944*	0.4993*	-0.4993*
	(0.2606)	(0.2646)	(0.2672)	(0.2700)	(0.2700)
Financial Buyer	-0.0082	-0.0137	0.0041	-0.0115	-0.0115
	(0.2938)	(0.2859)	(0.2955)	(0.2942)	(0.2942)
Stock Offer	-0.1560	-0.1664	-0.1397	-0.1528	-0.1529
	(0.1156)	(0.1126)	(0.1129)	(0.1152)	(0.1152)
Rival Bids	-1.3025***	-1.3585***	-1.2947***	-1.3251***	-1.3251***
	(0.2935)	(0.3026)	(0.3025)	(0.2977)	(0.2979)
Intra Industry	0.2621**	0.2301**	0.2563**	0.2632**	0.2632**
	(0.1056)	(0.1045)	(0.1049)	(0.1158)	(0.1058)
Tender Offer		-1.0435***	-0.0464***	-1.0348***	-1.0118***
	(0.2896)	(0.2883)	(0.2895)	(0.2872)	(0.2872)
Cross Border	-0.3531***	-1.3161***	-1.3296***	-0.3402***	-0.3402***
	(0.1185)	(0.1184)	(0.1176)	(0.1189)	(0.1189)
Bid Premium 4 Weeks	0.1170	0.4250*	0.4711***	0.1154	1.0473***
	(0.1527)	(0.2181)	(0.1766)	(0.1838)	(0.2433)
Target Dividends * Bid Premium 4 weeks	-0.1770	-0.1682	-0.3498	-0.1679	-0.1679
	(0.2173)	(0.2308)	(0.2473)	(0.2084)	(0.2084)
Low Concentration * Bid Premium 4 weeks	0.9400***			0.9319***	
	(0.2707)			(0.2909)	
Medium Concentration * Bid Premium 4 weeks		-0.3153			-0.9311***
		(0.2316)			(0.2900)
High Concentration * Bid Premium 4 weeks			-0.2811	0.0244	-0.9075***
			(0.2359)	(0.2256)	(0.2974)
Constant	1.2117***	1.2215***	1.0991***	1.1489***	1.0614***
	(0.2079)	(0.1956)	(0.1961)	(0.2989)	(0.1975)
Observations	1443	1443	1443	1443	1443
Year Dummies	Yes	Yes	Yes	Yes	Yes
Region Dummies	Yes	Yes	Yes	Yes	Yes
Log Likelihood	-381.15	-386.16	-385.66	-371.67	-379.67
Pseudo R^2	0.2418	0.2318	0.2328	0.2447	0.2447

Note: Robust standard errors in parentheses. Significance levels:*p<0.1; **p<0.05; ***p<0.01

Lastly, as deal probability could be nonlinear in target ownership concentration, we present a new specification above where we examine the relationship between *Three Largest Shareholders* and deal probability further. Specifically, we split the combined stakes of the three largest shareholders into three different categories/dummy variables: *Low Concentration*, *Medium Concentration* and *High Concentration*. Furthermore, as the interaction term *Three Largest Shareholders*Bid Premium 4 Weeks*

can be difficult to interpret, we also conduct a formal test using the interaction terms between the dummy variables above and bid premium. This is done to test whether the impact of bid premium on deal probability is higher for *Low Concentration* than for *High Concentration*. This process is shown in table 11 above, and allows us to deal with the potential nonlinearities.

From column 1 to 3 in table 11, we see that the slope of target ownership concentration is increasingly positive across the different dummy variables (or buckets). In addition, *Medium Concentration* has a lower slope coefficient than the other two dummy variables, implying a nonlinear relationship. We also find that *High Concentration* has a positive and significant effect on deal probability, which is in line with our results in table 10 and discussions earlier in this section.

In column 5 we formally test the difference between the interaction terms *Low Concentration*Bid Premium 4 Weeks* and *High Concentration*Bid Premium 4 Weeks*. By looking at *High Concentration*Bid Premium 4 Weeks* we find that the difference between the two interaction terms is statistically significant at any reasonable level of significance. More specifically, the impact of bid premium on deal probability is significantly higher for *Low Concentration* than *High Concentration*, as the beta of *High Concentration* is negative and significant. This result is similar to what we found in table 10, and indicates that bid premium is a more important determinant of deal probability for low levels of target ownership concentration than for high levels.

We believe that the results presented in this section should be of both economic and academic interest. With our main variables of interest being statistically significant[2], supporting both of our hypotheses, we believe that we have established new evidence consistent with the *Free Rider Proposition* by Grossman et.al (1980). However, we must stress that our analysis is of deal probability conditional on a bid having been made. Meaning that there has already been some selection before the bidder makes an offer, and thus our results may not hold unconditionally. I.e., targets with a concentrated ownership structure may be less likely to be acquired in the first place, but conditional on a bid they are more likely to be taken over.

Having presented the results concerning our main variables of interest and hypotheses, we now continue with a brief discussion of our results concerning the control variables.

[2]Please note that the Wald Test conducted in appendix A.4, rejected the null hypothesis of multiple exclusion of our two main variables of interest at 4.42 percent

9.3 Control Variables

9.3.1 Acquirer Characteristics

The variable *Acquirer Toehold* is consistently found to be marginally significant throughout all columns in table 10, with significance levels ranging from 5.7 percent to 7.5 percent. With a positive sign, this variable indicates that an increase in the acquirer's toehold in the target firm is associated with an enhanced likelihood of takeover success. This result is consistent with the results of earlier studies, such as Hoffmeister et.al (1981), Flanagan et.al (1998) and Walkling (1985). From the estimated marginal effects, we see that a one percentage point increase in *Acquirer Toehold* is associated with a 7 percent increase in deal probability.

In line with our expectations in chapter 6, we find that *Log Acquirer Market to Book* have a negative effect on deal probability, but is never close to being statistically significant. This result fails to support the arguments made in chapter 6, concerning bidder motivation based on growth prospects and asymmetric information issues in stock offers. However, this might change if one were to examine this relationship in an all-stock sub-sample; but given that this is not one of our main variables of interest, only a control variable; we do not delve deeper into this issue in this thesis.

Consistent with Noro (2010), we find that *Financial Buyer* has a negative but statistically insignificant impact on deal probability. Hence, we cannot conclude that financial buyers on average are less likely to be successful in takeover attempts than strategic buyers after making a bid.

9.3.2 Deal Characteristics

In terms of method of payment, the dummy variable *Stock Offer* (indicating an all-stock offer) is found to have a negative impact on deal probability, which is consistent with the findings of Branch and Yang (2003). Initially, this could support the arguments made in chapter 6, concerning asymmetric information and conflicts over appropriate exchange ratios. However, we find that this variable is only significant at 11 percent in our final model (column 4, table 10).

Consistent with Walkling (1985) and Flanagan et.al (1998), we find that the presence of competing bidders striving for control of the target firm in play (indicated by the dummy variable *Rival Bids*), is associated with a negative and significant effect on deal probability. The estimated marginal effect of this variable (see appendix A.3), implies that an acquirer who is competing against multiple bidders for control of the target firm, is 34.5 percent less likely to succeed than an acquirer whose takeover attempt is uncontested (no rival bidders present).

Next we find that the dummy variable *Intra-Industry* is positive and significant at 1.2 percent in column 4. Specifically, intra-industry acquisitions are 3.56 percent more likely to succeed than inter-industry acquisitions. This supports the notion that that acquirers with in-depth knowledge of the target's business and industry, could be better at structuring an offer for success [Flanagan, 1998]. It could also indicate that industry-relatedness reduces asymmetric information concerning information such as earnings prospects for both the acquirer and bidder [Eckbo et al., 2017].

Further, we find that acquisitions characterized as *Cross Border* acquisitions, on average have a significantly lower deal probability than domestic ones. Specifically, cross border acquisitions are 5.5 percent less likely to succeed than domestic ones. This is somewhat contrary to the arguments concerning antitrust made by Flanagan et.al (1998), and could indicate that issues concerning asymmetric information are greater in cross border acquisitions than in domestic ones.

Given the arguments made in chapter 6 concerning *Tender Offer* and that Officer (2003) found that tender offers had a positive and significant effect on deal probability, we would initially expect to see the same in this study. However, we find that *Tender Offer* has a negative effect on deal probability, which is significant at any reasonable level of significance in column 4. The estimated marginal effects in appendix A.3, indicate that tender offers have a 26.6 percent lower likelihood of being successful than in acquisitions where this is not the mode of acquisition. One possible explanation for our result could be that an initial hostile reaction by the target's management could influence shareholders enough to reject a tender offer. Again, this result is conditional on a bid having been made, which is the case with all our results.

9.3.3 Target Characteristics

Industrial Company, is found to have a statistically significant effect on deal probability at 8 percent in column 4. Specifically, we find that takeover bids for targets where one of the three largest ownership stakes in the target firm is held by an industrial company, is associated with a three percent lower likelihood of deal success. This result seems to indicate that transfer of control in firms held by industrial owners, is harder to achieve. This is likely due to unobserved characteristics of industrial owners that are correlated with takeover success and *Three Largest Shareholders*.

Log Target Relative Size on the other hand is found to have a highly significant effect on deal probability. This result is consistent with the findings of Branch et.al (2003), and seems to indicate that the bidders in our sample could have a more difficult time financing and completing an acquisition, when the relative target size

increases. Furthermore, it is possible that this result also captures that the larger the target firm is relative to the acquirer, the more severe the economic implications of asymmetric information will be in terms of valuations [Hansen, 1987].

In terms of target leverage, we find that the variable *Target Debt to Assets* does not have a statistically significant effect on deal probability. Hence, even though the coefficient sign of the variable is in line with our expectations, we cannot argue that our model suggests that higher target leverage is associated with a lower deal probability (following substitution of equity for debt, and hence lower takeover gains).

Given that the coefficient sign of *Log Target Market to Book* is positive, the results in our model could indicate that acquirers value future growth prospects of the target firm, which again could lead to a higher deal probability. However, as with *Log Acquirer Market to Book*, *Log Target Market to Book* is never close to being significant at any reasonable level of significance in column 4. Thus, we cannot argue that this is the case in our model.

While being significant at 3.2 percent, the coefficient sign of *Target Dividends* is positive, which is contrary to our expectations in chapter 6 and the findings of Hoffmeister et.al (1981). Thus, paying dividends may not be enough to ensure sufficient support among shareholders to avoid takeovers. One possible explanation for this could be that as a typical dividend paying firm is a mature firm with low growth prospects, shareholders not expecting much capital gain, could be tempted to cash-in on a premium. In addition, we find that the interaction term *Target Dividends*Bid Premium 4 Weeks* has a sign that is contrary to our expectations and is only significant at 12 percent. However, we note that inclusion of both variables improves the model[3].

Given its slope and significance, *Attitude of Target Management* is arguably the most important determinant of deal probability in our model. More specifically, we find that in takeover attempts where the target firm's management have a hostile attitude towards the takeover, the takeover attempt is 72.4 percent less likely to succeed than if the attitude of the management could be characterized as friendly. This is consistent with the findings of Hoffmeister et.al (1981) and Walkling (1985).

Having presented our analysis and discussions, we now proceed by assessing the robustness of our results, before ending our study with concluding remarks.

[3]See Wald Test for multiple exclusion restrictions in appendix A.4

Chapter 10

Assessment of Robustness

Model uncertainty is pervasive in empirical research, indicating the need to assess the validity of the results presented in chapter 9. In the sections below we will discuss the potential factors which could distort the validity of this study, and the process involved in dealing with these issues.

Multicollinearity is present whenever two or more of the explanatory variables are either moderately or highly correlated. The presence of multicollinearity limits the conclusions we can draw from our results, as they may be spurious. Detecting multicollinearity requires use of statistical understanding and inspecting the warning signs. As we strive to correctly measure the true effect of our main variables, we needed to include a sufficient number of control variables, potentially leading to multicollinearity issues concerning some of our variables.

Our final model, specification 4 in table 10 is the product of a process involving consideration of several variable combinations based on financial reasoning. The next step was to assess potential multicollinearity through the VIF-test, which measures how much of the variance of the estimated regression coefficients is inflated due to collinearity [Stock and Watson, 2015]. The region dummy North America had a VIF of 26.66 and a correlation coefficient with Europe (EU EFTA) and Asia of -0.47 and -0.46 respectively. After removing North America, we obtained a VIF mean of 1.56, while the largest VIF score was reduced to 3.55. Following the rule of thumb that standard errors should not be inflated by a factor higher than 2, this assures us that multicollinearity should not disturb our results[1]. Our main variables of interest showed no problems with multicollinearity throughout the process, as the low VIF-scores in appendix A.5 indicate.

Faccio and Masulis (2005) stress the point of controlling for potential censoring problems when utilizing a sample of bids. A sample selection bias results in choosing

[1] Squaring the VIF-score indicates the inflation factor, in our final model the highest inflated standard error was the variable Bid Premium 4 Weeks with a factor of 1.88 (Square root of 3.55)

non-random data, since certain data is excluded due to the enforcement of specific criteria. This leads to distorted results and influences the significance of the tests. As we require ownership coverage for targets in order to include a deal, as well as financial information, our sample could suffer from this problem. In our case, the biggest impact our criteria has, is that we end up with a sample only consisting of public-to-public deals, since ownership data for private firms is rare. Hopefully, as corporate control matters might be applicable to all company types, the results will be of use to all deal types. However, we are fully aware, that pursuing a strict interpretation, the results presented in chapter 9 are only valid for public deals.

Another potential issue related to sampling bias is that some potential bidders do not actually bid because of concerns of facing financial distress or since they perceive the likelihood of success as to low, we may then end up underestimating the importance of one or more of the determinants [Faccio and Masulis, 2005]. A way to investigate this bias is through the Heckman sample selection model. First, we would need to model the probability of a firm actually making a bid. Second, the Inverse Mills Ratio is calculated for each observation, and these values are included in the prediction model. If the variables return significant, then our model is likely affected by censoring problems. Due to the fact that we do no have an appropriate sample to construct such a probability model, we cannot perform the steps described above. The only relevant option in our case is the company population in the ownership data, representing potential bidders. However, such a process would likely also suffer from sample censoring issues, leaving us not better off. Luckily, as mentioned by Faccio & Masulis (2005), this type of censoring problems would most likely underestimate the effect of our main variables, and given their significant results, the censoring problem might not represent a problem with regards to the robustness of our results.

In our analysis the primary focus is on estimating the effect of ownership concentration and its interaction with bid premium on deal probability. Therefore, we need to address possible endogeneity issues due to such a specification. The main *Three Largest Shareholders* should not encounter any endogeneity issues, since we control for ownership types and regional characteristics. In relation to our other main variable, *Three Largest Shareholders* Bid Premium 4 Weeks*, Officer finds that the use of target termination fees is associated with higher takeover premiums. Given that our sample consists only of public-to-public deals between 2008-2014, not including termination fees will not cause any endogeneity issues. As most public-to-public target transactions after the mid-2000s include a termination fee.

The discussion above concerning different threats to validity, indicates that the results presented should be robust given the undertaken procedure and model assumptions.

Chapter 11

Concluding Remarks

In this thesis, we have examined the relationship between target ownership concentration and the likelihood of takeover success, conditional on a bid having been made. Through our literature review, we find that there is currently a gap concerning the role of target ownership concentration in takeover outcomes. This gap is likely a consequence of extensive ownership data having been unavailable to researchers until recently. By empirically examining the role of ownership concentration, we seek to expand on current takeover prediction literature, while making a novel empirical contribution to the field of M&A. Thus, we raised the following research questions:

(1) *How do changes in target ownership concentration affect the probability of takeover success?*

(2) *Do changes in target ownership concentration, interact with the effect of bid premium on the probability of takeover success?*

In order to properly answer these questions, we utilized extensive target ownership data from *Bureau van Dijk* and matched it to the correct announced public to public takeover bids registered in the database *Zephyr*. Next, we created the following two variables necessary to answer our research questions: *Three Largest Shareholders* as a measure and approximation to the ownership concentration in the target firms, and *Three Largest Shareholders*Bid Premium 4 Weeks* to capture the interaction effect between ownership concentration and bid premium. Our first hypothesis was that an increase in target ownership concentration should have a positive effect on deal probability. The second was that the bid premium effect on deal probability is relatively higher for low levels of target ownership concentration, than for high levels of target ownership concentration.

Using a final sample of 1,493 announced public-to-public takeover bids in the period 2008 to 2014, we test the two hypotheses above in a final prediction model where we control for proven and likely determinants of deal probability. These include deal characteristics, as well as target and acquirer characteristics. In addition, we control for region and year fixed effects.

In our final prediction model, we find that target ownership concentration measured by the variable *Three Largest Shareholders*, is positive and statistically significant at 4.86 percent, which supports our first hypothesis. Implying that transfer of control, on average, is harder when the ownership structure of the target firm is diffuse. We interpret this result as evidence consistent with the *Free Rider Proposition* by Grossman and Hart (1980). Indicating that free-riding by target shareholders could be a real problem in the market for corporate control. In addition, we find that just one of the included ownership type dummies is statistically significant at the ten percent level, implying that ownership type in general is not an important determinant of deal probability. As argued earlier, a possible explanation for this is that we are examining deal probability conditional on a bid having been made. This could mean that pre-bid selection of targets by bidders, could remove unlikely targets from consideration. I.e., firms controlled by owners with a known preference for control, might not be selected as targets in the first place.

With our second variable of interest *Three Largest Shareholders*Bid Premium 4 Weeks* statistically significant at 2.96 percent, we find evidence supporting our second hypothesis. Indicating that bid premium is a more important determinant of deal probability for low levels of target ownership concentration, than for high levels. We believe that this is a consequence of small shareholders requiring a larger premium from bidders in order to forego the gain they could achieve by free-riding. We also find that when we control for this interaction effect, we obtain highly significant results concerning the role of bid premium, which is in line with economic intuition.

Dealing with potential nonlinearities in table 11, we obtain results consistent with our initial findings in table 10. Specifically, we find that the dummy variable *High Concentration* has a positive and significant effect on deal probability. In addition, deal probability seems to be nonlinear in ownership concentration. Moreover, the interaction term *High Concentration*Bid Premium 4 Weeks* in column 5 (table 11) is negative, which shows that the bid premium effect on deal probability is lower when concentration is high. This result is significant at any reasonable level of significance and further supports our initial findings in table 10.

Lastly, we must stress that the findings in this thesis are obtained without controlling for the number of shares sought by the bidder or solicitation fees, as there is no common key to correctly match data between *Zephyr* and *SDC*. These variables have been found to have a significant effect on deal probability in earlier studies, hence their absence could represent a weakness in our results. Regardless, we believe that the results should be of interest to scholars, as this thesis is the first study to apply data on ownership concentration in a prediction model framework for corporate takeovers. Furthermore, our results seem to be very consistent with economic theory and the arguments made by both Grossman et.al (1980) and Shleifer et.al (1986).

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Appendix

A.1 - Descriptive Statistics

Table 12: Descriptive statistics for the entire sample

Variable	N	Mean	St. Dev.	Min	Max
Success	1,493	0.886	0.318	0	1
Three Largest Shareholders	1,493	0.325	0.237	0.0002	1
Acquirer Toehold	1,493	0.123	0.247	0.000	0.999
1. Shareholder	1,493	0.216	0.209	0.0002	1.000
2. Shareholder	1,493	0.069	0.065	0.000	0.490
3. Shareholder	1,493	0.040	0.038	0.000	0.250
Bank	1,491	0.384	0.486	0	1
Financial Company	1,491	0.247	0.432	0	1
Insurance Company	1,491	0.099	0.299	0	1
Mutual Fund	1,491	0.610	0.488	0	1
Public/Government	1,491	0.048	0.213	0	1
Individuals/Families	1,491	0.221	0.415	0	1
Private Equity	1,491	0.044	0.206	0	1
Industrial Company	1,491	0.366	0.482	0	1
Venture Capital	1,491	0.008	0.089	0	1
Log Deal Value	1,493	18.563	2.300	9.866	24.924
Cross-Border	1,493	0.219	0.414	0	1
Rival Bids	1,493	0.019	0.138	0	1
Attitude of Target Management	1,493	0.027	0.163	0	1
Tender Offer	1,493	0.020	0.140	0	1
Intra Industry	1,493	0.395	0.489	0	1
Log Relative Size	1,493	−2.029	1.788	−9.436	4.464
Log Target Market to Book	1,464	0.912	1.806	−4.605	11.446
Log Acquirer Market to Book	1,471	0.569	0.831	−3.912	5.659
Bid Premium Announcement	1,493	0.252	0.400	−0.951	4.000
Bid Premium 4 Weeks	1,493	0.336	0.584	−1.000	6.382
Target Debt to Assets	1,493	2.685	54.587	−115.111	1,974.231
Cash Offer	1,493	0.421	0.494	0	1
Stock Offer	1,493	0.368	0.483	0	1
Mixed Offer	1,493	0.211	0.408	0	1
Financial Buyer	1,493	0.032	0.176	0	1
North America	1,493	0.524	0.500	0	1
EU (EU EFTA)	1,493	0.167	0.373	0	1
Asia	1,493	0.166	0.372	0	1
EU (Non EU EFTA)	1,493	0.010	0.100	0	1
South America	1,493	0.016	0.126	0	1
Africa	1,493	0.023	0.149	0	1
Oceania	1,493	0.094	0.293	0	1
Financial Crisis	1,493	0.277	0.447	0	1
Target Dividends	1,493	0.313	0.464	0	1

A.2 - Variable Definitions

Variable	Description	Source
Attitude of Target Management	Dummy variable that takes the value of 1 if the target management has rejected a bid and advised its shareholders to reject it too.	Zephyr
Acquirer Toehold	Continuous variable representing the stake of the acquirer in the target company prior to announcement.	Zephyr
Bid Premium Announcement	Ratio of the offer price divided by the target stock price one day prior to announcement.	Zephyr
Bid Premium 4 Weeks	Ratio of the offer price divided by the target stock price. The target stock price is defined in the interval between 28 to 32 days prior to announcement.	Zephyr / Datastream
Cross-Border	Dummy variable that takes the value of 1 when the parties are recorded with different country codes.	Zephyr
Employees/Manager	Dummy variable that takes the value of 1 if the ownership type employees/manager is present among the three largest shareholders.	Bureau van Dijk
Financial Buyer	Dummy variable that takes the value of 1 if the acquirers business description includes the key words; Private Equity or Investment Holding Company.	Zephyr
Financial Company	Dummy variable that takes the value of 1 if the ownership type financial company, insurance company or bank is present among the three largest shareholders.	Bureau van Dijk
High Concentration	Dummy variable that takes on the value of one if the target concentration is among the upper one-third, and zero otherwise. The ranking is based on the combined holdings of the three largest shareholders.	Bureau van Dijk
Individual/Families	Dummy variable that takes the value of 1 if the ownership type individual/families is present among the three largest shareholders.	Bureau van Dijk
Industrial Company	Dummy variable that takes the value of 1 if the ownership type industrial is present among the three largest shareholders.	Bureau van Dijk
Intra-Industry	Dummy variable that takes the value of 1 when the parties are recorded with the same 3-digit SIC-Code.	Zephyr
Log Acquirer Market to Book	Logarithm of the ratio of the market value of equity plus the book value of interest bearing debt divided by the book value of equity plus the book value of interest bearing debt. Market value of equity represents the closing price times number of shares outstanding converted to U.S dollars using the year end exchange rate.	Worldscope / Datastream
Log Relative Size	Logarithm of the ratio of the market capitalization of Target divided by the market capitalization of Acquirer. Market capitalization represents the current total market value of a company based on current price and current shares outstanding, all variables are year-end prior to announcement.	Worldscope

Variable	Description	Source
Log Target Market to Book	Logarithm of the ratio of the market value of equity plus the book value of interest bearing debt divided by the book value of equity plus the book value of interest bearing debt. Market value of equity represents the closing price times number of shares outstanding converted to U.S dollars using the year end exchange rate.	Worldscope / Datastream
Low Concentration	Dummy variable that takes on the value of one if the target concentration is among the bottom one-third, and zero otherwise. The ranking is based on the combined holdings of the three largest shareholders.	BVD
Medium Concentration	Dummy variable that takes on the value of one if the target concentration is between the bottom and upper one-third, and zero for targets outside this range. The ranking is based on the combined holdings of the three largest shareholders.	BVD
Mutual Fund	Dummy variable that takes the value of 1 if the ownership type mutual fund is present among the three largest shareholders.	Bureau van Dijk
Private Equity	Dummy variable that takes the value of 1 if the ownership type private equity, venture capital or hedge fund is present among the three largest shareholders.	Bureau van Dijk
Public/Government	Dummy variable that takes the value of 1 if the ownership type public/government is present among the three largest shareholders.	Bureau van Dijk
Region Dummies	7 regional dummies, grouped according to the target‘s home continent.	Bureau van Dijk
Rival bids	Dummy variable that takes the value of 1 if the target company has been subject to competing bids by different acquirer company‘s or where the acquirer had withdrawn their original bid and superseded it with either a lower or higher offer.	Zephyr
Target Debt to Asset	Ratio of short and long term interest bearing debt over total book value of assets.	Worldscope
Target Dividends	A dummy that takes the value of 1 if the target payed dividends in the year prior to announcement.	Worldscope
Tender Offer	A dummy variable which takes the value of 1 if the target company shareholders receives a takeover bid in the form of a public invitation to sell their shares.	Zephyr
Three Largest Shareholders	Combined holdings of the three largest shareholders in the target company.	Bureau van Dijk

A.3 - Marginal Effects for Probit Models

Table 13: Marginal Effects

Variables	**Specification (5) Table 8**		**Specification (4) Table 10**	
	Marginal Effect	Standard Error	Marginal Effect	Standard Error
Three Largest Shareholders	0.1148***	(0.0386)	0.0749**	(0.0379)
Financial Company	-0.0001	(0.0137)		
Industrial Company	-0.0368*	(0.0208)	-0.0278*	(0.0166)
Mutual Fund	0.0039	(0.0177)		
Individual/Families	0.0009	(0.0216)		
Public/Government	-0.0213	(0.0403)		
Private Equity	-0.0301	(0.0341)		
Log Target Relative Size			-0.0130***	(0.0044)
Target Debt to Assets			-0.0238	(0.0338)
Log Target Market to Book			0.0060	(0.0045)
Attitude of Target Management			-0.7242***	(0.0738)
Target Dividends			0.0358**	(0.0158)
Log Acquirer Market to Book			-0.0084	(0.0096)
Acquirer Toehold			0.0699*	(0.0471)
Financial Buyer			-0.0001	(0.0419)
Stock Offer			-0.0200	(0.0169)
Rival Bids			-0.3448***	(0.1143)
Intra-Industry			0.0356***	(0.0137)
Tender Offer			-0.2661**	(0.1042)
Cross Border			-0.0554***	(0.0211)
Bid Premium 4 Weeks			0.1016***	(0.0304)
Target Dividends * Bid Premium 4 Weeks			-0.0539	(0.0348)
Three Largest Shareholder * Bid Premium 4 Weeks			-0.1386 **	(0.0629)

Note: The table gives the partial effects dy/dx for the Probit model $Y = P(Success)$. x is one explanatory variable. The partial effects are dependent on the values of all explanatory variables and here we have give the partial effects at the average (PEA). The marginal effect for dummy variables is the change when x goes from 0 to 1.

A.4 - Wald Test for Multiple Exclusion Restrictions

Testing the following hypothesis against against the alternative in our probit model:

$$H_0 : \beta_{ThreeLargestShareholders} = \beta_{ThreeLargestShareholders*BidPremium4Weeks} = 0$$

$$H_A : \text{At least one of the coefficients are different from zero}$$

As our final prediction model uses heteroskedasticity-robust standard errors, the regular F-statistic is no longer valid and we must therefore deploy the Wald test in testing for exclusion restrictions. In table 12.2. below we have reported the test results.

Table 14: Wald test for the Probit Model

Model	$\text{Chi}^2(2)$	Prob $\geq \text{Chi}^2(2)$
Probit	6.24	0.0442

At two degrees of freedom, the chi-square from the Wald test is associated with a p-value of 4.42. This means that that the inclusion of our main variables of interest causes a statistically significant improvement to the probit model at 4.42 percent.

Testing the following hypothesis against against the alternative in our probit model:

$$H_0 : \beta_{TargetDividends} = \beta_{TargetDividends*BidPremium4Weeks} = 0$$

$$H_A : \text{At least one of the coefficients are different from zero}$$

Table 15: Wald test for the Probit Model

Model	$\text{Chi}^2(2)$	Prob $\geq \text{Chi}^2(2)$
Probit	4.91	0.0857

At two degrees of freedom, the chi-square from the Wald test is associated with a p-value of 8.57. Inclusion of the Target Dividends variable and the interaction with Bid Premium 4 Weeks causes a statistically significant improvement to the probit model at 8.57 percent.

A.5 - VIF-Test for Multicollinearity

Table 16: VIF-Test on our final model

Initial Specification		**Final Specification**	
Variables	VIF	Variables	VIF
North America	26.66	Bid Premium 4 Weeks	3.55
EU (Non EU EFTA)	15.06	Three Largest Shareholders * Bid Premium 4 Weeks	3.36
Asia	14.92	Three Largest Shareholders	1.78
Oceania	9.84	Target Dividends * Bid Premium 4 Weeks	1.68
Bid Premium 4 Weeks	3.55	Asia	1.64
Three Largest Shareholders * Bid Premium 4 Weeks	3.36	Acquirer Toehold	1.59
Africa	3.27	Target Dividends	1.45
South America	2.71	Log Target Market to Book	1.42
Three Largest Shareholders	1.78	Industrial Company	1.35
Target Dividends * Bid Premium 4 Weeks	1.68	Europe (EU EFTA)	1.34
Acquirer Toehold	1.59	Stock Offer	1.33
Target Dividends	1.45	Log Relative Size	1.27
Log Target Market to Book	1.42	Oceania	1.23
Industrial Company	1.35	Log Acquirer Market to Book	1.20
Stock Offer	1.32	South America	1.14
Log Relative Size	1.27	Cross Border	1.11
Log Acquirer Market to Book	1.20	Africa	1.10
Cross Border	1.21	Europe (Non EU EFTA)	1.10
Tender	1.09	Tender Offer	1.09
Intra Industry	1.08	Intra Industry	1.08
Financial Buyer	1.08	Financial Buyer	1.08
Target Debt to Assets	1.07	Target Debt to Assets	1.07
Attitude of Target Management	1.06	Attitude of Target Management	1.06
Rival Bids	1.05	Rival Bids	1.05
Mean	**3.72**	**Mean**	**1.56**

Note: Initial specification shows the VIF scores for the alternative specification before target region North America was dropped due to multicolinearity. Final specification shows the VIF scores for our final model, specification 4 in table 10.

A.6 - Derivation of the Probit Model

To address the issues: 1) Nothing to bind the value of Y in the range between (0,1), and 2) That linearity does not make sense conceptually, one needs to abandon the Linear Probability Model and the OLS approach in estimating binary response models.

$$P(Y = 1|x) = G(\beta_2 x2 + ... + \beta_k xk)$$

$$P(Y = 1|x) = G(x\beta)$$

The two equations above represents a class of binary response models, and G is a function which secures that the estimated probabilities are strictly between 0 and 1; $0 < G(z) < 1$, for all real numbers of z.

The first equation is referred as an index model, since $P(Y = 1|x)$ is a function of the vector only trough the index: $x\beta = \beta_1 + \beta_2 x2 + ... + \beta_k xk$, which is simply a scalar.

G is usually a cumulative density function (cdf), monotonically increasing in the index $z(i.ex\beta)$, with following propositions:

$$P(Y = 1|x) \to 1 \; as \; x\beta \to \infty)$$

$$P(Y = 1|x) \to 0 \; as \; x\beta \to \infty)$$

The propositions ensures that G must be a non-linear function, and thereby eliminating the possibility of using OLS. In the probit model, G is the standard normal CDF, expressed as an integral:

$$G(x\beta) = \phi(x\beta) \equiv \int_{-\infty}^{x\beta} \phi(v)dv,$$

The standard normal density is then:

$$\phi(v) = \frac{1}{\sqrt{2\pi}} e^{\frac{-v^2}{2}}$$

The choice of G ensures that the probability of our dependent variable Y(*Success*) is strictly between zero and one for all values of the parameters and the explanatory variables. This last expression ensures that the partial effects of changes in explanatory variables are not constant, addressing the issue with the Linear probability model.

A.7 - Method of Payment Classification

We utilized the Zephyr database in order to gather method of payment information for our complete sample of 1493 deals. When only considering pure cash and/or stock deals, we managed to match 79.84% of our entire sample.

Table 17: First matching process

Cash	Stock	Mixed
465	499	228
31.1%	33.4%	15.3%

Note: This table represents the deals where Cash and/or Stock is the only method of payment. The percentage points indicate the proportion of the complete sample consisting of 1493 deals.

At this point, we had a majority of stock deals. Below we provide a brief description of the different payment methods, as well as the rules applied when classifying the rest of our sample with regards to method of payment.

Method of Payment	Description
Cash	Cash does not refer to actual money, but to payment by cheque or transfer of funds. Only added as a method of payment when Zephyr can confirm that there is an actual cash transaction.
Cash Assumed	Added when the acquirer assumes cash in the target company.
Shares	Added as a method of payment when the consideration contains at least an element of shares.
Loan Notes	Essentially an IOU from the Acquirer to the Vendor, in some cases these loan notes carry interest.
Debt	Included when the consideration includes an element of debt repayment.
Debt Assumed	Included when the acquirer assumes debt in the target company.
Deferred Payment	Included when the acquirer satisfies the consideration over an interval of installments.
Earn-out	Added as a method of payment when the consideration paid includes an "earn-out" component which is an additional payment over-and-above the basic agreed consideration.
Other	Unspecified component, but Zephyr confirms that the element is not an equity component.

Cash: Solely Cash and/or interaction with the other elements, excluding Shares, was classified as cash. **42.1%** of our complete sample is cash deals.

Shares: Solely Shares and/or interaction with Debt and Debt Assumed was classified as shares. **36.8%** of our complete sample is stock deals.

Mixed: Any method of payment combination involving both cash and shares was labeled as mixed. **21.1%** of the complete sample is mixed deals.

A.8 - Correlation Matrices

Table 18 presents the correlation matrix for the largest shareholder and corresponding ownership types. Ownership type in this table refers to dummy variables that takes the value of 1 if the largest shareholder is a specific type. The three highest correlation coefficients are highlighted.

Table 18: Correlation Matrix for The Largest Shareholder and Type

	Largest Shareholder	Private Equity	Financial	Mutual Fund	Industrial	Public	Individual	Employees
Largest Shareholder	1							
Private Equity	0.125	1						
Financial	-0.1388	-0.1101	1					
Mutual Fund	-0.2553	-0.1090	**-0.3953**	1				
Industrial	**0.4542**	-0.1069	**-0.3875**	-0.3837	1			
Public	-0.0114	-0.0170	-0.0615	-0.0609	-0.0597	1		
Individual	-0.0757	-0.0625	-0.2265	-0.2243	-0.2198	-0.0349	1	
Employees	-0.026	-0.0101	-0.0366	-0.0363	-0.0355	-0.0056	-0.0208	1

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Table 19 presents the correlation matrix for the combined holdings of the largest three holders and corresponding ownership types. Ownership type in this table refers to dummy variables that take the value of 1 if a specific type of owner is present among the three largest shareholders. The three highest correlation coefficients are highlighted.

Table 19: Correlation Matrix for The Three Largest Shareholders and Type

	3 Largest Shareholders	Private Equity	Financial	Mutual Fund	Industrial	Public	Individual	Employees
3 Largest Shareholder	1							
Private Equity	-0.0140	1						
Financial	-0.0937	-0.0993	1					
Mutual Fund	-0.1565	0.0080	-0.0783	1				
Industrial	**0.4126**	-0.0557	**-0.2554**	-0.2811	1			
Public	0.0115	-0.0400	-0.0130	-0.0731	0.0332	1		
Individual	0.0039	-0.0650	**-0.2705**	-0.1832	-0.0954	-0.0887	1	
Employees	0.0030	-0.0206	-0.0232	-0.0275	-0.0165	-0.0193	0.0107	1

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