

# **The toehold as a tool for assessing the acquisition synergies – evidence from Europe.**

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## **Abstract**

The toehold is a non-controlling equity stake purchased by the potential bidder before the final takeover attempt. It provides an opportunity to co-operate with the target and its management to better evaluate the synergies before the possible acquisition. The probability of acquiring the toehold stems from the informational disadvantages. The toehold is the most beneficial when the target is opaque and thus difficult to evaluate. I test this proposition on the European acquisition data using a logistical analysis. We find the equivocal evidence which is discussed in the paper.

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## **1. Introduction**

We live in a time of the rapid global bull market, overvaluation and uncertainty. The S&P500 reached the new milestone in the spring of 2014, when the threshold of 2000 index points was achieved. After the global financial crisis in 2008, the global market regulation and supervision have driven the world's economies into transformation. The Europe again is facing many legislative reforms and its greatest economic might, The Great Britain, voted 2016 in favor of resignation from the European Union. The factors like these, market overvaluation and shocks in the legislative environment, drive merger and acquisition activity across the world (Harford, 2005). The year 2015 was already the record year for the global merger and acquisition activity and it seems like more records are going to be broken in the future. Therefore, the understanding how to evaluate synergies and benefits from takeovers and mergers thus succeeding in them, is emphasized in the current economic situation. The improved tools for assessing the possible co-operation synergies are crucially beneficial for every future decision maker, pondering whether to commit on the takeover contest or not.

In this paper I address the assessing problem of the acquisition synergies with the toehold purchase. Toeholds are the non-controlling equity purchases (less than 50% stake of the target company), which are made before the final takeover bid. This gives a potential buyer an exclusive opportunity to interact with the target and its management. The toeholder may nominate the director to the target company's board or even participate in the development of the new products and services. It is also possible to combine acquirer's and target's operations together. (Povel & Sertsios, 2014.) Thus, the toeholder gets a better knowledge from target's business model and operations, which improve the capability to assess the synergies together.

The previous literature has approached the toehold purchases from many different perspectives. One approach has been the optimum theories, which have studied the optimal size of toehold purchase and the competitive advantage it yields in a takeover

contest (see e.g. Singh, 1998; Goldman & Qian, 2005; Betton, Eckbo, & Thorburn, 2009). The optimal size of pre-bid stake has roused many animosity views in the literature and no premier theory has been settled. The researches however often agree with the view of the toehold's competitive advantage. The toehold works as an activator, which makes the toeholder bid more aggressively and thus increases the probability to win the contest (Goldman & Qian, 2005).

The other parallel approach has studied the possible gains received from the acquisitions and how the potential bidder profits the most from a pre-bid stake (see e.g. Betton et al. 2009; Bris, 2002). The toehold profit research is somewhat overlapping with the implications of the optimal toehold theory, because often researchers empirically optimize the size of the toehold for the maximum profits. The general view is that the toehold is a profitable option. The final takeover bid increases the value of the target company and if the toeholder fails the takeover attempt, they can sell their stake with profit. There are also studies that see the takeover price arbitrage as an investment opportunity and persuades the companies to make a factitious bid to benefit from the price increase. (Bagnoli & Lipman, 1996). As I pointed out, the toeholds have been studied broadly in the former literature, even though the number of single researches are not notable significant.

Despite the broad focus of the toeholds in the literature, the research literature focusing on the informational reasons behind the toehold purchase is somewhat scarce. It feels that the toehold literature has been more interested in a practical back end information, that could be implemented as a guideline for the toeholds bidders in a competitive landscape (questions about the optimal size or the maximum profit). However, it is equally important to understand the front end information about the factors and benefits that lead the potential acquirers to purchase toeholds before the final bid. Most of the previous research is also conducted on the United States market, leaving the information on the international M&As out, including Europe. The Europe is however a globally significant market area, that has a totally different legislation and business culture. The European toehold literature needs its own researches, since the conclusions made on the US does not necessarily apply in Europe. Therefore, it is of interest to study the benefits that the acquirers try to gather with the toehold purchase with European acquisition activity.

This paper provides an all-encompassing test of the toehold purchases as a tool to improve acquirer's capability to evaluate the possible synergies with the target. The paper extends the study by Povel and Sertsios made in 2014 and tests whether the results derived from their toehold study hold on the European market or not. I start with the univariate analysis and extend it to the multivariate logistic regression model. I test the fitness of the logistic model with the analysis of the deviance table and with plotted ROC curve.

The rest of the paper has the following structure. Section 2 presents the hypothesis of the study, propositions behind it and the basic assumption for which the model relies. Section 3 explains the properties of the data and the used methods. Section 4 again presents the results of the regressions and implications behind them. Finally, the section 5 concludes and propose the focusing points for the future.

## **2. Hypothesis**

### **2.1 Basic assumptions behind the hypothesis**

I now present briefly the basic assumptions behind my toehold model.

**Assumption 1.** The toehold is acquired for the purpose of the final takeover.

The main reason for the toehold acquisition should be the synergy advantage for the successful merger. If the acquirers would, for example, purchase a toehold for the profit of the price increase after the takeover attempt, the data would not describe the use of toeholds for the information benefits. The acquirer would not either be interested to cooperate with the target company. The main motive for every pre-bid stake is not of course the advantage for the takeover, but my sample which consist of only the M&As which has resulted in major ownership stake, the assumption of the purpose holds.

**Assumption 2.** The toehold is purchased because it allows the gathering of the synergy information.

The reason behind the toehold is that it allows the acquirer to gather information it would not have access without. This might not be actualized after the initial purchase, but the original motive behind the purchase has to be the access to information. The possible

synergies may stem from cost-cutting of the overlapped operations, cross-selling, access to new distribution channels or the complementary R&D efforts (Povel & Sertsios, 2014).

**Assumption 3.** The acquirer has to co-operate some time with the target company to be able to evaluate the synergies.

This assumption is based on the intuition, that the synergy evaluation is the complex process that requires time and resources. The assumption relies on the truthiness of second assumption. If the toehold is purchased keeping eye on the evaluation purpose, the acquirer certainly takes time to co-operate with the target. Also the former studies shows that the time between toeholds and final bids is notable (see e.g. Betton et al, 2009; Povel & Sertsios, 2014).

## **2.2 The main hypothesis**

In this paragraph I present the hypothesis being tested and the propositions that clarify the measures.

**Hypothesis.** The acquirer has the pre-bid toehold purchased more likely, when the target is young, operates in a different nation or in a different industry.

**Proposition 1.** The toehold is more beneficial, when the target is more difficult to evaluate.

The younger the target company is, the more difficult is it for the outsider to evaluate it and its operations. The young companies have usually less data available for the acquirers to analyze and are often smaller sized, which might reduce the requirements for the financial reporting. The less there are accumulated data from the target, the more difficult it is to evaluate the target only with technical analysis and the more beneficial the toehold becomes.

**Proposition 2.** The toehold is more beneficial when you have more unreliable information from the target compared than your rivals.

The potential acquirer who operates in a different nation or industry than the target, usually has unreliable information about target's business and operation. The cross border acquirer often confronts unfamiliar legislation, norms, market area etc. The acquirer from different industry again has to sacrifice time to combine the unfamiliar business with their own business. The more the two countries are culturally divided (by the means of trust, hierarchy and individualism), the less there are attraction to cross-border acquisition (Ahern, Daminelli & Fracassi, 2015) and the more difficult it is to evaluate the possible gains from acquisition. The not familiarized acquirer benefits more from the toehold purchase than the rival whose information is already reliable.

### **3. Data and Methods**

#### **3.1 Data**

My data is obtained from SDC Platinum database, the leading online source for bond and equity new issues and merger & acquisition information, which has been tracking M&A activity since the 1970s<sup>1</sup>. I complement the acquired data with the information obtained from Thomson Reuters database. I collect the information on European acquisitions from the years between 2000 and 2016. I choose this certain period, because I want the results that explains the current factors and phenomena. The objective of the paper is nevertheless to create new and useful information. The research made from the toeholds are also at least half decade old, which means it is the interest to study the effects in a current economic situation.

The European nations included on the data consist only of the original EU 15 nations<sup>2</sup> and three other economically significant nations: Iceland, Norway and Switzerland. Thus the total number of countries included adds up to the total of 18. The Eastern European countries are excluded from the data. The reason for this is that the countries located in eastern Europe differ economically (and in the means of trust) from the other European countries and it would not be meaningful to generalize the findings to concern whole Europe. The acquisitions also need to be executed between two of the chosen 18 countries

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<sup>1</sup> The information is acquired from the SDC website: <http://thomsonreuters.com>

<sup>2</sup> EU 15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom

to be included, meaning that I only examine the cross acquisitions between these countries.

The rest of the criteria relates in the type or the stake of the ownership. The target company has to be strictly either public or private firm. Other types of the companies are excluded from the data (for example the subsidiaries and the government owned companies). I only choose the companies that purchase a majority ownership in a final bid. The companies cannot own a major ownership before the acquisition. This reduces my data to include only the acquisitions where the acquirer holds less than 50 percent of the target at the time of the acquisition and where the stake after the acquisition exceeds 50 percent.

Finally, I set the last three other criteria, which reduces my sample size significantly. For the logistic regression presented later on the paper, the value of the deal, the founding year and the total assets of the target has to be available for each observation. However, the limited accessibility for the information of the private companies forced me to reduce the great portion of the private targets. The data without the final three criteria would have included over 14 000 single observations. The final data includes 2224 single acquisition observations that satisfy the described criteria above.

### **3.2 Methods**

I test my hypothesis with four different empirical analytical methods. First, I use the univariate analysis to examine the differences between the acquisitions with the pre-bid stake and ones without. The univariate analysis studies only one variable at time so it dismisses the effects the other explanatory variables have on the intercept. I interpret the differences using an unpaired two-sample t-test, assuming the standard deviation varies between groups. The obtained p-value is the probability of two-way test.

Secondly, I test empirically the probability that the acquirer had the toehold before the final acquisition. My dependent variable Toehold is a dummy that gets a value of 1 or 0. This kind of binary dependent is not normally distributed which means the linear

regression do not fit right. Therefore, I use the logistic regression to execute my regression<sup>3</sup>. My variation of the logistical regression tracks the following model:

$$Toehold_i = \alpha + \beta'X_i + \gamma'Z_i + \varepsilon_i \quad (1)$$

where  $i$  is the subscript of the single acquisition,  $X_i$  is a vector of explanatory variables and  $Z_i$  is a vector of control variables.

Thirdly, I interpret the results of logistic regression model by analyzing the table of deviance with ANOVA. The deviance measures how well the chosen logistic model fits to my collected data and how reliably I can trust my findings. In other words, it measures the quality of the fit. I also test how well my model could predict a new set of data by plotting a ROC<sup>4</sup> (receiver operating characteristic) curve and measuring the AUC<sup>5</sup> (area under curve), which are some measures for binary classifier (Fawcett, 2006). They tell if the collected sample and used regression really predict the activity in the real life. The ROC curve is plotted with a method where I train the 2/3 of the observations in my acquisition data to test the fitting for the rest 1/3 of the data. It has to be clarified, that this separation has a minor effect on the results of the AUC. I describe the results of the fitting tests with three separate measures: Accuracy term, McFadden R-squared term and AUC term. The logistic regression, ANOVA and ROC curve is ran using a R programming language and software<sup>6</sup>.

I test the fitting for two different reasons. First, it would be naïve to assume that the results of the regression describe the true reality without testing, especially when my sample size is small ( $N = 2224^7$ ) and some variables give no significant results (see Tables 2 & 3). Second, Deviances and ROC curve makes it possible to utilize and develop this study further in the future researches. Like mentioned in the previous passage, the ROC curve

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<sup>3</sup> Other option would be a probit regression, which results a similar outcome.

<sup>4</sup> Receiver operating characteristic is a technique for visualizing, organizing and selecting classifiers based on their performance (Fawcett, 2006).

<sup>5</sup> Area Under Curve is a single scalar value excepting the performance of the model. It takes values between 1 to 0, where 1 is an excellent and 0 poor performance.

<sup>6</sup> ANOVA and ROC tutorial provided by Alice, M. 2015. Datascience+.  
<http://datascienceplus.com/perform-logistic-regression-in-r/>

<sup>7</sup> Despite the small sample size, it is significant and should give trustworthy results.

makes it possible to test how probably the phenomenon would occur in a real life, and therefore, it is a great tool for a future analysis.

### **3.3 Explanatory variables**

I use total of 5 different variables called *Private*, *Age*, *Cross Border* and *Different Industry* and *Total Assets*. The three variables, *Age*, *Cross Border* and *Different Industry*, are explanatory, that correlate with the possibility that the acquirer holds a toehold prior the acquisition for the information advantages. In other words, the explanatory variables capture the opaqueness of the target. The other two variables, *Private* and *Total Assets*, are control variables. The dependent variable is called *Toehold*.

The dependent variable *Toehold* is a dummy, that gets the value of 1 when the acquirer holds a toehold at the public announcement of the merger and 0 otherwise. I approach the definition of a toehold in a broad perspective. The classical approach usually determinates the size of the toehold purchase to be below 5% because of the legally binding obligation to announce publicly the ownerships that exceeds this threshold<sup>8</sup> (Goldman & Qian, 2005). However, I examine all of the toeholds which has even a smallest ownership before the announcement, but with less than a major ownership rights of 50%. I believe the information advantages is transmitted to results equally well with the larger toehold purchases as with the smaller purchases. It is reasonable to assume that the greater stake makes it easier the co-operate with the target, since the greater stake leads to greater control power.

My three explanatory variables are constructed as dummies. The first variable *Age* represents the youngness of the target company. The measure for the dummy is calculated by subtracting the effective year of the merger from the founding year. Then, the variable is constructed as a dummy. It takes the value of 1 if the company is equal or less than 3 years old at the time of the final acquisition (the major ownership acquisition) and 0 if older. I chose the 3-year threshold intuitively. The classical theory of forecasting defines the short term as the years from 0 to 3. Usually this is the time perspective from where

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<sup>8</sup> The USA: Schedule 13D authorised by SEC (5%). Europe: The Transparency Directive authorised by ESMA and national regulations on notification obligations. Finland: The Securities Markets Act authorised by FIN-FSA (5%, 10% etc.).

the specific and meaningful results can be received. The strict boundaries might make it however more difficult to get the significant results, since the possibility to vary reduces. However, the dummy also dismissed the effect of the outer observations (really old companies), which could distort my data. This makes sense, as the younger target means that the acquirer is not able to gather sufficient information from it and the age does not however limitlessly increase the usefulness of the information. (Povel & Sertsios, 2014.) The age variable captures the difficultness to evaluate the target from the outsider's perspective.

The second explanatory variable Cross Border dummy, takes a value of 1 if the target and the acquirer operate in different nations and 0 otherwise. The cross-border variable captures the acquirers amount of the unreliable information (Povel & Sertsios, 2014). The frequency of the M&A activity in each nation and usually size of the economy leads to slight bias in the distribution of nations. The smaller nations of the chosen 18 nations are unfortunately underrepresented in the data. The Great Britain has the largest representation in my data, while the Iceland and Finland are the examples of the underrepresentation. Even though the nations are not distributed evenly, it would not be meaningful to weight the results based on some criteria. The European market are so divergent that the results cannot be possibly applied to every nation. Now the results describe the toehold activity of the most economically meaningful European countries.

The third explanatory variable Different Industry dummy, takes a value of 1 if the acquirer and the target operate in a different industries and 0 otherwise. I use a so-called strict approach when defining the industries that is I give the value of 0 only when the companies operates precisely in the same main industry. Therefore, the industries that have common elements (for example two manufacturer companies) or supportive functions are seen as different industries and some of the synergies and the business knowledge are ignored. The intuition behind the variable is that the acquirer is able to better analyse the target company when they have an initial knowledge from the business.

I use the variable Private to control the logistic regression. Private is a dummy, that takes a value of 1 when the target is a privately held and 0 when it is a listed and traded public company. The partition between private and public company is a mutually exclusive and targets have to be reckoned as one or the other. Thus, acquisitions where the target

belongs to some other company form (for example joint ventures or subsidiaries) are excluded. The number of subsidiaries were substantial in the original data. However, he subsidiaries are excluded, because their original business purpose is too difficult to evaluate. The subsidiaries have many possible functions, which some could distort the results. In a literature, the subsidiaries have often been classified in to a 4 different types, by examining the activities the subsidiary undertake in its strategy concerning the market scope and the value-adding scope. This means for example that some of the subsidiaries are created in keeping eye of the local host market and some for pursuing international expansion. (Hogenbirk & Kranenburg, 2006.) There are also special subsidiaries, which original function is to provide finance for the parent company (for example captive finance companies) or to be sold right after the foundation. The spectrum and the properties of the subsidiaries are so board that including them in to the data could distort the information and therefore the results.

The last variable Total Assets, is the book value of the target company in current host currency in the year of the merger and works as a control variable for the regression. The companies with the larger assets are usually more capable of acquiring the pre-bid toeholds and thus winning the bidding competition (Povel & Sertsios, 2014). This is important notice because the size of the companies, which the total assets variable describes indirectly, varies a lot in my sample. The variation in the sizes can be seen in the standard deviation column in Table 1.

### **3.4 Summary Statistics**

My acquisition data includes 2224 different acquisition observations on European market between 2000 and 2016. The descriptive statistic of the sample is shown in the Table 1 below.

In the sample, slightly less than 16% of the acquirers purchased a toehold before the major acquisition, which sums up to a total of 354 toeholders. This is notably more than the previous researches has indicated. Bates, Lemmon and Linck (2006) conducted the study where the number of the acquirers holding a toehold was less than 5%. The recent study again displayed a number of 2% (Povel & Sertsios, 2014) There are to possible reason for the difference. The former studies have been focusing only on the USA's M&A

activity as mentioned in the beginning of this paper. European market area is however more divergent compared to the United States, with multiple nations, legislations and languages. Under the main hypothesis (Proposition 2.) the difference could imply that the more divergent European market makes the cross border information more unreliable. The toeholds would be the answer for the target evaluation. Later, when I present the results of the multivariate regression, we see, however, that the effect of the Cross Border variable is not significant.

The other plausible reason for the relatively large number of toeholds might stem from the statistical content of the data. In my data only 41% of the targets are privately held companies, which is notable less than in the previous researches. Toeholds are usually more common in publicly traded companies due the poor liquidity of the private shares. Therefore, it makes a sense that a larger number of public companies results in a larger number of toehold purchases<sup>9</sup>. (Povel & Sertsios, 2014.)

The other surprising takeaway from the summary statistic is the toehold size. The mean size of the toehold is almost 30%, which is relatively high compared to a classical view on the toeholds, where the optimum would be 5% (see e.g. Sertsios & Povel, 2014 and Betton et al. 2009). This is the threshold, after which the acquirer has to publicly announce its intentions behind the purchases. There are also researches that even exceeds the classical view and claim that the optimal would be even less than 5% due the costs of managerial entrenchment if the takeover attempt fails. (Goldman & Qian, 2005.) Hence, the conflict between the optimal toehold theories and my findings is significant.

However, there are also opposite views on the benefits of the toeholds. It is often pointed out, that the initial shareholders gain from the public takeover attempt. The announcement of the takeover builds up the price of the target firms' shares and initial shareholder profits. (Bagnoli & Lipman, 1996.) The theories presented above imply that the bigger mean of the toehold size in the European market might stem from the lower joint costs of

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<sup>9</sup> Povel & Sertsios offer also a contradictory theory for probability of toehold purchases called "opaque effect". Private companies are more opaque implying that the larger number of public companies should decrease the number of toeholds acquired.

failed takeover attempt, lower consequence costs of exceeded threshold purchase or larger possibilities to profit from the rapid price increase.

**Table 1. Summary Statistics.**

This table shows the descriptive statistic of the data collected from 2224 different acquisitions in Europe between 2000 and 2016. The dependent variable Toehold takes a value of 1 if the acquirer has a pre-bid ownership, and 0 otherwise. The control variable Private takes a value of 1 if target is a private firm and 0 if it is a publicly held. The explanatory variable Age takes a value of 1 if the target is younger or equal than 3 years old at a time of the acquisition, otherwise 0. The Cross Border explanatory variable takes a value of 1 if the acquirer and the target operate in different nations, otherwise 0. The Different Industry variable takes a value of 1 if the acquirer and the target come from different industries. The Total Asset variable is the sum of the target's total assets in the year of the acquisition. Final ownership stake presents the acquirer's ownership percent after the acquisition for all 2224 different acquisitions. Final ownership stake preceded by a toehold presents again the same ownership percent, but only for the acquisitions that had pre-bid toehold purchased.

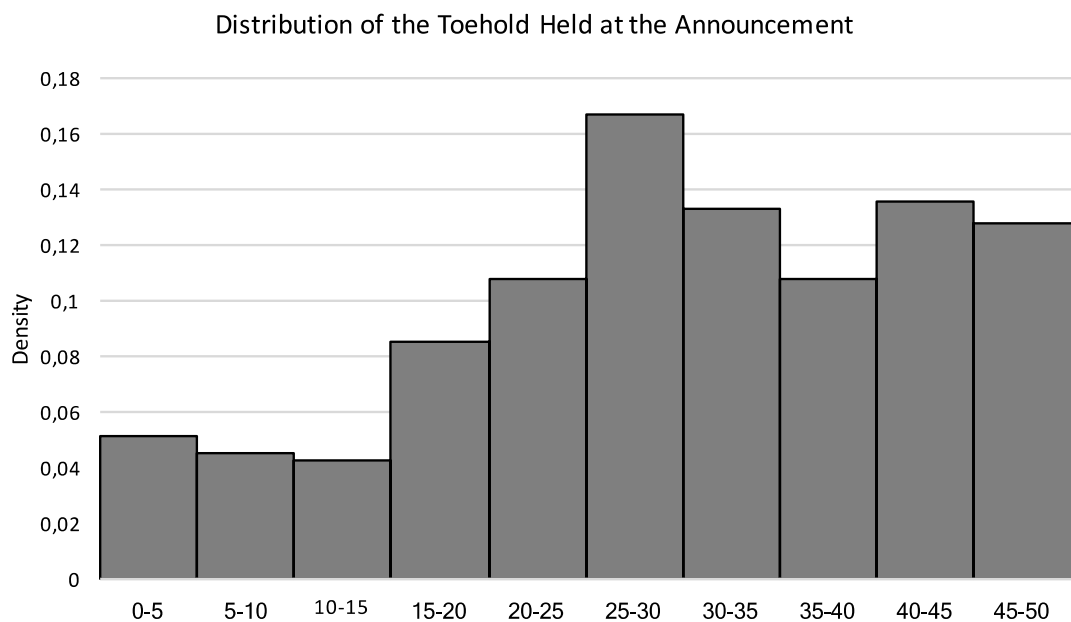
Variable	Mean	Median	Pctile 10	Pctile 90	SD	N
Toehold	0,16	0,00	0,00	1,00	0,37	2224
Private	0,41	0,00	0,00	1,00	0,49	2224
Age	0,10	0,00	0,00	0,00	0,30	2224
Cross Border	0,20	0,00	0,00	1,00	0,40	2224
Different Industry	0,59	1,00	0,00	1,00	0,49	2224
Total Assets	6713,65	58,05	2,70	1 903,4	114109,10	2224
Toehold Size	29,51	30,00	10,10	46,00	12,72	354
Final Ownership Stake	92,19	100,00	63,70	100,00	14,79	2224
Final Ownership Stake Preceded by a Toehold	83,55	92,65	54,40	100,00	18,10	354

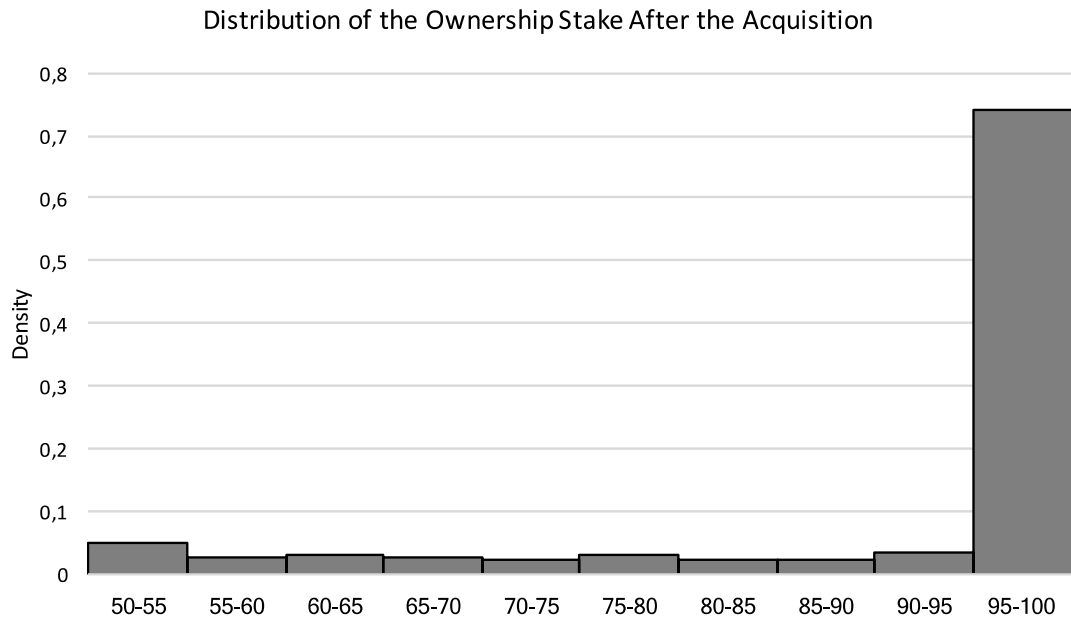
The companies also evidently seek an overall ownership of the target company. The average mean of the final ownership stake preceded by a toehold is almost 84% and even larger when examining all targets. Close to 70% of all the acquirers purchase the full ownership. I find this interesting, because only the 50% is enough to justify a full control right. The Figure 1 below shows the distributions of the pre-bid toehold size and stake of the ownership after the acquisition.

More than half of the acquisitions were fulfilled between different industries but only fifth across the different nations. It seems that the classical theory factors of equity home bias appear also on M&A activity. One reason is that the domestic equities and acquisitions provide great hedge against the home country specific risks, such as domestic inflation (Lewis, 1996). It seems that the different industry is not a concern in the European acquisitions. The initial conclusion stems from the industry separation I chose for the variable as mentioned before. The strict defining of the main industry does not take into account the information the acquirer usually has from the joint industries. For example, many company has reliable information from to both sides of the value chain, even though they might be separated totally into different industry categories. Therefore, the most of the acquirers initiate the cross industry mergers anyway. The other reason would be the large conglomerate companies that uses the acquisitions as growth strategy. Conglomerates are specialised to cross industry (and cross border) mergers and hence are better at evaluating the synergies of the targets. After all the whole business model stems from the released synergies. (Mueller, 1969.)

**Figure 1 & 2. Toehold Size and Acquired Ownership Distribution.**

Panel A figures the size of the toeholds held at the time of the announcement from 0 to 50% in a frequency of 5%. Its sample size is 354 toehold observations. Panel B figures the final ownership distribution for every observation. Its sample size then is the 2224 observations. In both panels, Y-axis shows the density (the portion of the observations) of different classes and X-axis the frequently separated classes.





## 4. Results

### 4.1 Univariate analysis

The results of the univariate analysis are seen on the Table 2, where I compare the means for acquisitions with and without toehold. The results show that the acquirers purchase a toehold more likely when they operate on the different industry than the target company. Therefore, the toehold is purchased when the target industry's business and operations are unfamiliar or unknown and thus information is unreliable. This confirms the main hypothesis (under proposition 1). The effect is significant at 1% level. Also, the control variable Private, is highly significant (p-value of  $2,29e-73$ ).

However, the different operating nations or the age of the company does not have a significant effect on the probability to purchase toehold - like I predicted in the hypothesis. The initial conclusion would be the poor capability of the univariate model to represent the reality. However, the multivariate analysis in the next chapter shows parallel results. I present the speculations of the results later in this section. Despite of the negligible effect, the completely opposite effect of these explanatory variables can be nevertheless dismissed, based on the theory and former studies (Povel & Sertsios, 2014).

## Table 2. Univariate analysis.

This table shows the variables Private, Age, Cross Border, Different Industry and Total Assets to sorted in two groups, acquisitions with and without a toehold. First two columns show the mean of each variable. Third column shows the difference in the means of variables. The fourth column shows the probability value of the T test. The last column presents the significance level at: \*5%, \*\*1% and \*\*\*0,1%.

Variable	Toehold 1 (N=354)	Toehold 0 (N=1870)	Difference (Toehold 1 - Toehold 0)	T Test (p value)	
Private	0,09	0,47	-0,38	0,00	***
Age	0,11	0,10	0,01	0,53	
Cross border	0,19	0,20	-0,01	0,58	
Different Industry	0,65	0,58	0,07	0,01	**
Total Assets	19170,45	4355,52	14814,93	0,16	

## 4. 2 Regression Analysis

In the following passage, I examine the test of my hypothesis in a multivariate setting using a logistic regression. The regression is run using all of the variables with 2224 separated acquisitions. I present the results in the Table 3.

The results of the logistic regression are similar with the results of the univariate analysis presented before. The effect of the Different Industry explanatory variable is significant at the 5% significance level, while the effect of the other explanatory variables cannot be shown to be significant. Despite the fact that the Cross Border effect on toehold purchase has decreased from 1% to 5% significance level, the significance is enough to prove the use of toehold purchases as the mean for the target evaluation. Thus, the multivariate logistic regression confirms the results of the univariate analysis (Table 2). A target company operating in a different industry is more difficult to evaluate (in means of unreliable information) and the acquirer benefits hugely from the synergy information the pre-bid purchase allows.

The other takeaway is the increased effect of the Cross Border variable when compared to univariate regression. The increase is notable, almost 30%, but still not entitle variable for level of significance. This might nevertheless tell that the cross border variable has a greater effect on the benefit of toehold purchase than the univariate analysis presumes. Unfortunately, the multivariate regression decreases the probabilities of every other variable when compared to univariate analysis. In some variables the difference is huge.

For example, the decrease in Age variable is over 20%, which can be seen having no effect at all when examined with logistical analysis. The effect might so also be quite contrary opposite.

**Table 3.** Logistic regression analysis.

This table shows the results of the logistic regression made with R coding language. The first column shows the regression estimate for each variable. Second column shows the variable's standard error. Third column shows the standard score (Z-value) for each variable. The fourth column shows the probability value of the logistic regression. Last column presents the significance level at: \*5%, \*\*1% and \*\*\*0,1%. The N tells the sample size of the data. McFadden R-squared is a substitute coefficient of the determination for logistic regression. Accuracy is a measure of statistical bias of the logistic regression. Area Under Curve is an accuracy measure for the capability of my logistic regression to predict the effects with new set of data. Calculated from the area under a receiver operating characteristic (ROC) curve.

Coefficient	Estimate	Std. Error	Z value	Pr(> Z )	
Private	-2,212	0,194	-11,403	<2e-16	***
Age	0,067	0,197	0,340	0,734	
Cross Border	-0,165	0,154	-1,053	0,293	
Different Industry	0,253	0,126	2,005	0,045	*
Total Assets	0,000	0,000	1,204	0,229	.
Toehold (Intercept)	-1,262	0,111	-11,359	<2e-16	***
N	2224				
McFadden R-squared	0,112				
Accuracy	0,845				
Area Under the Curve	0,735				

### 4.3 Speculation of the results

The effect of the variable Different Industry is significant measured with both the univariate and the multivariate model. However, the explanatory variables Age and Cross Border do not show the significant effect. The first ambiguous reason would be that the Europe could be actually more unified than thought. Even though it is the mix of many

different nations, I feel the economies in the Middle-Europe is quite homogenous. The problem are the border nations that are more diversified. However, the data is slightly biased towards the greater European economies (The Great Britain, Germany etc.), that are similar together. The explanation might hence be the slightly biased data.

The other explanation could be the small sample size of the observations. I had to reduce my data a notably, because the information about the private companies are scarce. Therefore, my observations might have slightly picked the certain properties with random. The advocacy however is that the information obtained are checked through manually and seem to be reliable.

Third point is that the results will not prove the opposite effect either. For example, in the Table 2, the difference of the univariate effect gives a parallel result, even though they are not significant. We cannot say if these effects describe the true reality but we cannot either abrogate them. Therefore, the propositions hold in the light of the former literature.

#### **4. 4 The fitting of the model**

In this section, I briefly present the results of the model's quality-to-fit. The results for the table of deviance derived from ANOVA is presented in a Table 4. The ROC curve again is plotted in Figure 3.

The results show that the logistic model fits mediocly well, when examining the difference between null deviance and residual deviance. The value of deviance decreases from 1949,5 to 1730,7, ergo 218,8 points on 5 degrees of freedom. The quality of fit could be better, but the result is in my opinion manageable. However, single explanatory variables should have bigger deviances. The private variable captures the major part of the fitness, but fortunately also Cross Industry, Cross border and Total Assets variables show the mediocre fit. From these variables private is significant at the 0,1% level and the Cross Industry at the 5% level. Age variable however do not fit to the logistic model at all and should be dismissed.

The other option for evaluating the fitting is the McFadden's R-squared. Its interpretations are however ambiguous, like with every pseudo R-squared measure.

McFadden itself states that the value of 0,11 would mean the good fit for the model (McFadden, 1973).

The ROC curve shows the good predictive ability of the model. The line is distinctively above the fictional linear line, which means the model can somewhat predict the result for the new set of observations. The calculated area under the curve is 0,74, which confirms the results of the plot. However, I want to remind that the results of the ROC and AUC are depending on the separation of the observation data into a train and test part, as mentioned before in the methods section. The portion of these parts affect in the quality of the ROC curve. This challenge is addressed with the manual testing over the different possibilities. Even though there were slight differences in the result, the variation was slight and do not effect on the interpretation of the fitting. I chose the Roc curve in the middle of the possible options to avoid falsifying the presented results.

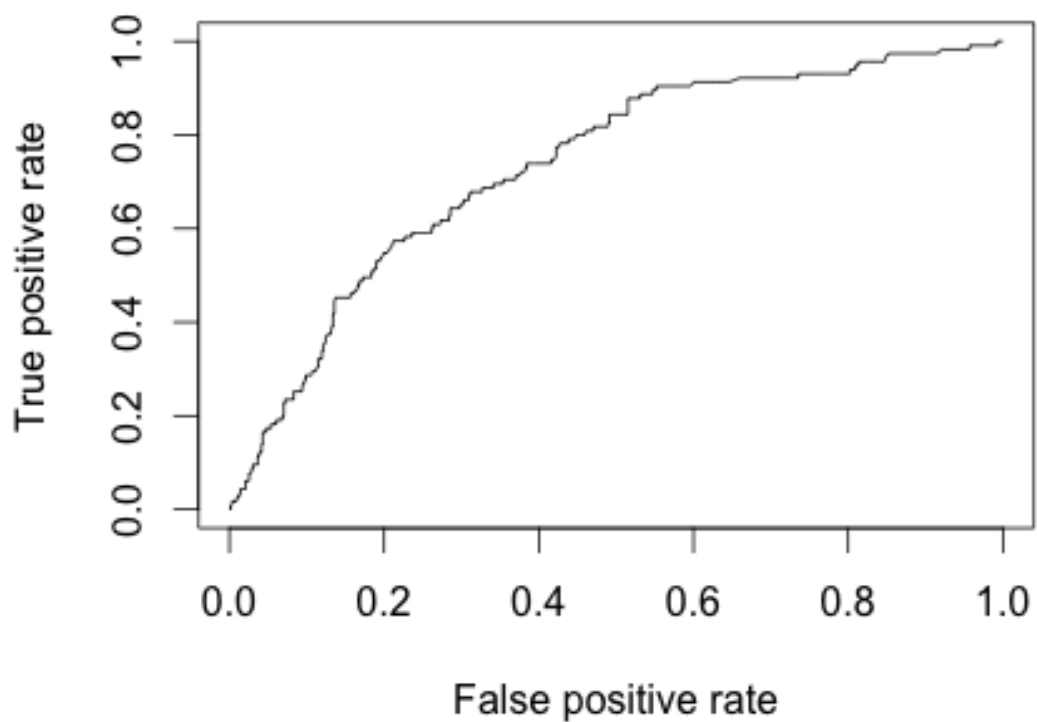
**Table 4.** Analysis of Deviance Table.

This table shows the deviances of the different variables. The first column shows the degrees of freedom for ANOVA. The second column shows the null deviance, which measures how well the explanatory variable is predicted by the model with only the intercept (Toehold) variable. The third column presents the residual degrees of freedom. The fourth column presents the residual deviance, which shows the quality of fit with predictors included. The fifth column is the probability value for the deviance for each variable. Last column presents the significance level of the variable at: \*5%, \*\*1% and \*\*\*0,1%.

	Df	Deviance	Resid. Df	Resid. Dev	Pr(>Chi)	
NULL			2223	1949,5		
Private	1	211,496	2222	1738,0	< 2e-16	***
Age	1	0,059	2221	1738,0	0,8074	
Cross Border	1	1,556	2220	1736,4	0,2122	
Cross Industry	1	4,157	2219	1732,3	0,0415	*
Total Assets	1	1,574	2218	1730,7	0,2097	
Accuracy	0,845					
Area Under the Curve	0,735					

**Figure 3. Receiver Operating Characteristic Curve (ROC)**

This figure presents the ROC curve, which captures the prediction ability of the model. The closer the line is on the left-top corner, the better is the ability. If the line is linear in the middle (line from (0,0) to (1,1)) or close to right-bottom corner the prediction ability is poor and the results derived with the model are random. The area under the curve (AUC) describes the same features quantitatively. The AUC takes a value between 1 to 0, where 1 is a perfect prediction ability and 0 no ability at all.



**5. Conclusion**

In this thesis, I have analyzed the use of the toeholds as the improving tool of the acquirer’s capabilities to better evaluate the possible synergies with the target. The acquirer relies on the toehold, when it is difficult to evaluate the target with the information available on the markets or when the information is unreliable. Toeholds allows the co-operation with the target, which eventually lead more successful takeovers.

I show that the European acquirers rely on the toeholds when the acquisitions are made across the borders of different industries. However, the age of the target or the cross border acquisition do not show the significant results, like predicted in the hypothesis. This might stem from the properties of the unified European market area or from the reduced sample size. I also prove my findings by showing the adequate fitting for the logistical model.

The contribution of the paper is to provide the ground for the toehold research on the European markets. The paper expands the important perspective of the toeholds as the assessment tool for bidders, which is scarce in the academic literature, and encourages the researchers to continue developing more knowledge from the phenomenon. The role of the toeholds will become more significant in the following years due the increased M&A activity driven by the global overvaluation. Therefore, the paper pursues also to generate practical knowledge of the competitive advantages the toehold allows. This knowledge is highly beneficial for every possible acquirer evaluating the possible takeovers.

This paper focuses narrowly on the two different propositions of the synergy benefits, which is measured only with three different explanatory variables. The simple approach is chosen for the more applicable and understandable approach, but it leaves room for the future research. Like I mentioned in the previous chapter, the contribution has been basing a ground for the future research and more encompassing research is required to describe the complex reality.

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