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The association between acquisition premia and target size in the EU setting

Abstract

The aim of this bachelor thesis is to determine the association between target size and acquisition premia in intra-EU corporate takeovers and moreover whether this association holds in the period following the global financial crisis in 2008. Using a data set of 919 intra-EU deals between 2005-2017 and controlling for a wide variety of target-firm and deal characteristics, we demonstrate a robust negative relationship between acquisition premia and target size. We further show that this association holds following the wake of the Global Financial Crisis in 2008. In addition, we find that many previously studied determinants of acquisition premia show significant effects in the EU setting between 2005 and 2017.

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Innehållsförteckning

1. Introduction

In mergers and acquisitions with publically listed targets, a premium is typically paid. According to established financial theory, financial assets should be priced according to the present value of the future cash flows. Previous literature on mergers and acquisitions (Varaiya, 1987; Alberts, 1966; Jensen and Ruback, 1983; Lintner, 1971; Mueller, 1977) suggests that premia are paid due to three main reasons: underpricing, undermanagement and synergies. A control premium captures the advantage of having a controlling stake as opposed to owning one share, and the idea that the acquirer can run the target more efficiently and extract higher present value of future cash flows compared to current management. Premium for synergies mainly applies to strategic buyers and not so much for financial sponsors or retail investors. Synergies can arise from economies of scale effects, cross-selling and cost-cutting from reduction of overhead count etc.

Data shows that the premium differs between transactions, one possible explanatory factor is target size. Recent studies concerning the U.S. stock market, explore that premia are well-correlated with the target value. As the value of the target increases, the premium tends to be lower. The reasons behind this dynamic have many different explanations. Acquirers paying lower premia for larger targets could be a result of the increased complexity in merging together two larger firms as it could lead to higher integration costs (Alexandridis et al., 2013). Moreover, the number of competing bids tend to be fewer for larger targets. The number of competing bids effect on premia has been explored in recent literature. Both Alexandridis et al. (2013) and Flanagan (2003) find that more competing bids have a positive effect on the premia offered.

In contrast to above mentioned, Loderer and Martin (1990) show that acquirers buying larger targets tend to pay too much and mean that it is a result of overconfident top executives who make excessive bids for larger targets as they often gain private benefits from it. Furthermore, Hayward and Hambrick (1997) explore in their article that hubris within top executives is highly correlated with excessive acquisition premia.

It is evident in recent literature that bid premia vary depending on the size of the target firm, but also other factors such as number of competing bids and valuations. However, premia also tend to vary over time. Bouwman et al. (2009) demonstrate that during periods of high market valuation, premia decrease. Walkling and Edmister (1985) show similar findings as they conclude that targets with lower market to book ratios on a relative basis are subject for higher premia. Thus, market

valuations could be an explaining factor both on the broad and the firm specific level of the variation in premia over time. Moreover, economic, regulatory and technological shocks can start so called merger waves (Harford, 2005), which can affect premia. Ashrafi and Haglund (2017) display that Private Equity firms paid higher premia after the financial crisis, which created an economic downturn globally.

The global financial crisis had large implications for the financial markets and the real economy (Acharya et al., 2009). According to Reddy et al. (2014), the composition of deal characteristics and previously researched determinants of premia such as deal size changed following the global financial crisis.

This paper examines a sample of 919 intra EU deals and show that the association between acquisition premia and target size holds in the EU setting. The result holds across multiple regressions and are statistically different from zero at the 1% level. Moreover, we find that factors such as competition and targets relative market to book ratio have high explanatory power for the acquisition premia. In addition to testing the association between acquisition premia and target size in the EU setting, we also show that the association holds true following the global financial crisis.

Our findings contribute to existing research by 1) examining the association between bid premia and target size in a) the EU setting and b) during a recent time period, and 2) shedding light on whether or not this association holds post-crisis. Examining the association between bid premia and target size allows us to test the generalisability in the findings of Alexandridis et. al (2013), which indicate that there is a negative association between bid premia and target size. Given the shock on financial markets and the change in deal value and activity post-GFC (Reddy et al., 2014), the question of whether or not the association between target size and premia i.e. the effect of the size characteristic was affected by the global financial crisis arises. It is possible that acquirers shied away from large targets as a consequence of lower risk appetite and paid lower premia for large targets. As premia lay the foundation of overpayment and has a significant effect on the distribution of shareholder wealth between the target and acquirer shareholders, the area of study is of large interest.

Tests conducted show that certain assumptions which need to hold in order to receive unbiased estimates of coefficients in OLS regressions do not hold, tests indicate a non-trivial departure from normality as well as heteroskedastic variance in residuals. Due to difficulties in identifying reliable

measures of control variables used in previous research, control variables such as hubris and inside ownership have been left out and may instead have been proxied by other variables.

2. Literature review

2.1 The relationship between target size and premia

Recent literature displays compelling empirical evidence that there is a relationship between target size and acquisition premia. Alexandridis et al. (2013) find in their article, where they study 3691 deals in the U.S. over the 1990-2007 period, that there was a significant negative relationship between acquisition premium and target size. As the value of the target increases, the offer premium decreases. Acquirers paying lower premia for larger targets has several different explanations. The higher complexity in merging together two larger firms, which make expected synergies more uncertain as well as higher integration costs, can lead managers to be more cautions when valuing a potential target. Moreover, the competition for larger targets tend to be lower than for smaller (Alexandridis et al., 2010). Flanagan (2003) proposes in his article that multiple bidders increase premia, which is in line with accepted microeconomic theory.

The premium for an acquisition is highly dependent on the characteristics of the deal and can be directly related to a relationship between target size and premia as different characteristic become more frequent and vice versa depending on the value of the target.

The financing of the acquisition can also be an explaining factor of the relationship between target size and premia. Acquisitions that are financed with cash generally lead to higher premia, which is primarily based on that the acquirer's need to compensate the target for immediate tax implications (Savor & Lu, 2009). Eckbo et al. (1990) find that cash transactions are associated with higher premia when looking at a sample of 182 Canadian takeovers. Furthermore, smaller targets are more likely to be acquired by cash (Faccio & Masulis, 2005). All-cash offers have further implications for corporate takeovers. Fishman (1989) find that the competition for the target firm declined when the initial buyer opted for a cash payment.

It can be argued that the association between target size and premia also depends on whether the acquirer is private or public as non-listed firms normally are more constrained in raising capital. Moreover, private acquirers are more frequent when the target size is smaller (Alexandridis et al.,

2013). In connection with this, Bargeron (2008) show that private acquirers pay lower premia than public equivalents as the managerial incentives differs between public and private companies. Moreover, Bargeron (2008) indicates that agency problems within listed firms, due to more diffuse ownership, also could be an explanation of the significant difference in premia paid between private and public acquires.

A softer variable that has been proven to have high impact on acquisition premium is overconfidence within the top management of a firm. Hayward and Hambrick (1997) examine 106 large acquisitions and find that CEO-hubris are highly linked to the premia for acquisitions. They identify two main indicators that can cause CEO hubris - the acquiring company's recent performance and recent media praise for the CEO. Similar to Hayward and Hambrick (1997), Loderer and Martin (1990) investigate CEO overconfidence and its implication for acquiring companies when setting a price on a target firm and find that acquirers buying larger targets tend to overpay due to overconfident top executives. Moreover, acquirers compensating their CEO with higher cash bonuses when the deals are larger, may cause the acquiring firm to overpay due to the private benefits gained by the top executive (Grinstein & Hribar, 2004).

Related to the literature regarding overconfident top executives, is the topic of insider ownership within top management. Demsetz and Lehn (1985) find when examining 511 U.S. corporations, that inside ownership within top management was less common within larger firms compared to smaller. Moreover, Bauguees et al. (2009) argue that firms with less inside ownership are more inclined to accept lower premia compared to firms with high inside ownership. A possible explanation to why firms with higher insider ownership receive higher premia can be that top management are more eager to receive a higher price as they might simply gain from the valuation of the share, and not specific incentive programs. (Stulz, 1988).

Deal premia can also be affected by whether or not a deal is between two firms from different nations. Mescall (2014) finds that when the acquirer finds risk for value destructing transfer pricing taxes to be high, a lower premium was offered. Marr et al. (1993) show that foreign bidders are willing to pay significantly more for access to new markets, thus having a positive effect on the bid premia. Moreover, Ravenscraft and Harris (1991) examine both cross-border and domestic acquisitions and find that the premia was higher when the target firm was overtaken by a foreign firm. Officer (2003) demonstrate that premia increase for mergers where the business of the

acquirer and the target is similar, reasonable due to higher confidence in realising potential synergies.

Hostile takeover is defined as an acquisition where the management of the target firm do not want the deal to go through or one that threatens some of the stakeholder's interest in the target firm. These unsolicited offers are associated with higher acquisition premia as managers for the target firms are more aggressive in their bargaining due to the hostile bid (Schwert, 2000). Moreover, the unsolicited takeovers tend to be more frequent when the value of the target is higher. (Alexandridis et al., 2013).

2.2 Premia variation over time

Mergers and acquisitions tend to come in waves. There are different explanations to why the M&A activity appears to be compressed into periods. Harford (2005) finds in his article that economic, regulatory and technological shocks drive merger waves within different industries. The shocks are however not enough on their own. There must be sufficient capital liquidity in the market. This theory is also referred to as the neoclassical model of M&A activity. Shleifer and Vishny (2003) present another model of merger waves. They find that in periods of market overvaluation, the activity increases as managers of overvalued firms attempt to buy undervalued assets in target firms. Moreover, Rhodes-Kropf and Viswanathan (2004) also find that merger waves tend to appear during high market valuation periods.

Market valuations effect on acquisition premia has been examined in recent literature. Bouwman et al. (2009) find that during periods of high market valuation, premia tend to decrease. Their research finds that 457 acquirers who bought during high market valuation periods offered an average premium of 55.5%, while 258 acquirers during low market valuations offered an average premium of 97.4%. Walkling and Edmister (1985) find in their research that target firms with relative lower market to book ratios receive higher premia. The association between acquisition premia and market valuations was further researched by Laamanen (2007). He also finds that firms with lower market to book ratios on a relative basis command higher premium.

2.3 Global financial crisis and its impact on M&A

The financial crisis that erupted in the U.S. 2007 became the start of an extensive global economic recession. Liquidity in capital markets dried up and financing to the real economy was reduced (Acharya et al., 2009). This radical event that struck the financial markets had implications for

M&A activity. Reddy et al. (2014) examine cross-border M&A activity pre and post the financial crisis by researching the corporate markets in 26 countries worldwide. When comparing pre-crisis (2004-2006) and post-crisis (2008-2010) time periods, they find that both number of deals and deal value decreased following the crisis.

The financial crisis has also been proven to have impacted acquisition premia by Private Equity firms. Ashrafi and Haglund (2017) demonstrate by looking at 758 US PTP transactions, that Private Equity buyers paid higher premia following the crisis and explain that increasing competition and large amount of capital inflow to the sector were the prime factors behind the more generous payments after the crisis.

3. Hypothesis

The literature review and theoretical background above provide a framework for the determinants of bid premia, mainly target size. Previous research in the US setting indicates that target size has a negative effect on the bid premia. Larger deals are in general more complex leading to higher integration costs and more uncertainty surrounding synergies, and thus diminish the value to acquirers and premia (Alexandridis et. al. 2013). On the other hand, there is also reason to believe that larger targets command higher premia due to incentive systems for CEOs (Grinstein & Hribar, 2004). With respect to the above mentioned, we formulate our first hypothesis:

Hypothesis 1:

Target size is negatively associated with acquisition premia in the EU setting.

In addition, the literature review and theoretical background above provide a framework surrounding the effects of the global financial crisis on bid premia, target size and deal activity. Given the overall shock on the macro economy and financial markets, it is reasonable to assume that the composition of determinants of acquisition premia changed. Evidence indicates that average deal value and market-to-book ratios decreased, giving rise to the question of whether or not the association between target size and premia i.e. the effect of the size characteristic was affected by the global financial crisis. At the same time, Alexandridis et al. (2013) find a robust negative relationship on US data between 1990-2007, which indicates that the association may have remained unchanged. Given that an association between bid premia and target size exists, and with respect to the above mentioned, we formulate our second hypothesis:

Hypothesis 2:

The association between target size and premia remains unchanged in the period following the crisis.

4. Methodology and sample selection

4.1 Model development

4.1.1 Premia Expectation Model

Given the literature review and the theoretical framework, we have chosen to examine the following variables. The first column from the left in table 1 displays the name of the variable, followed by the definition, the source from which the data regarding the variable has been extracted, and the expected effect on premium given previous literature and theoretical framework. The definition of the target size variable, and the reason for using the natural logarithm of Market-Relative-Target-Size, lnMRTS, follows previous literature (Alexandridis et. al. 2013). The target size will be defined using a market relative size method, since any relationship between target size and premia are likely tied to the relative size of the deal and not the absolute nominal target size. By doing this we partially adjust for inflation effects. The median market capitalisation has been calculated by pooling the components of the FTSE all-share, OMXS all-share, CAC all-tradeable and CDAX indices each year in USD terms, retrieved from EIKON. Broad indices have been chosen in order to closely resemble the median market cap of all firms in the EU setting, the chosen indices are from the United Kingdom, Germany, France and Sweden where 70% of all the targets in the transaction sample are based out of. The year a transaction belongs to has been determined using the date announced, which is defined as the date involved parties in the transaction makes the first public disclosure of common or unilateral intent to pursue the transaction, no formal agreement is required.

The variable lnTMTB aims to capture the effect of an individual target being highly valued according to a traditional measure, the market to book ratio, natural logarithm in accordance with previous literature (Alexandridis et al., 2013). PRIVATE aims to capture the supposed negative association with bid premia discussed in the literature review. COMP captures the expected positive association of competing bids with bid premia as discussed in the literature review. CASH captures the expected positive association of cash bids with bid premia. HOSTILE captures the expected positive association of hostile takeovers with bid premia. HIVAL captures the conflicting conclusions surrounding the association between highly valued markets across the board and bid premia, the expected association with bid premia is negative. We will use Shiller inflation adjusted PE ("Shiller PE Ratio by Month", 2018). CROSSB captures the expected positive association

between cross-border acquisitions and bid premia. DIVERS aim to capture the expected negative effect of the acquirer being in a different industry from the target on the acquisition premia.

Table 1 – Definitions of independent variables

Independent variable	**Explanation**	**Source**	**Expected effect on premium**
lnMRTS	Natural logarithm of MRTS. MRTS is defined as the target market cap 4 weeks prior to the announcement over the median market cap of selected stock markets in the beginning of the announcement year.	Eikon	-
lnTMTB	Natural logarithm of the target market to book ratio based on book value of equity per share divided by price per share four weeks prior to announcement.	Thomson SDC Platinum	-
PRIVATE	Dummy variable equal to 1 if acquirer is private and 0 if acquirer is public, subsidiary (of public) or Joint Venture.	Thomson SDC Platinum	-
COMP	Dummy variable equal to 1 if there are multiple bidders (>1) and 0 otherwise.	Thomson SDC Platinum	+
CASH	Dummy variable equal to 1 if the method of payment is 100% cash and 0 otherwise.	Thomson SDC Platinum	+
HOSTILE	Dummy variable equal to 1 if the attitude of the bid is defined by SDC as hostile and 0 otherwise.	Thomson SDC Platinum	+
HIVAL	Dummy variable equal to 1 if the transaction is announced within a market where Shiller's PE is higher than 25 and 0 otherwise.	Thomson SDC Platinum	-
CROSSB	Dummy variable equal to 1 if target and acquirer are based in different nations and 0 otherwise.	Thomson SDC Platinum	+
DIVERS	Dummy variable equal to 1 if target and acquirer have different two-digit SIC codes and 0 otherwise.	Thomson SDC Platinum	-

The dependent variable, the bid premia, is measured using the below measures, as presented in table 2. PREM4W, Premium 4 Weeks Prior to Announcement Date, is defined as offer price minus target closing price 4 weeks prior to the original announcement date over target closing price 4 weeks prior to the original announcement date. PREM1D, Premium 1 Day Prior to Announcement Date, is defined as offer price minus target closing price 1 day prior to the original announcement date over target closing price 1 day prior to the original announcement date. Original announcement date is defined as the date when the target company is first publicly disclosed as a possible takeover candidate. Premium is calculated using the target nation currency. This follows the common method of defining acquisitions premia (Laamanen, 2007). We expect PREM4W to be higher than PREM1D since market anticipation ahead of the announcement leads to the market pricing in the probability of a bid that is higher than the current trading price (Laamanen, 2007).

Table 2 – Definition of dependent variables

Dependent variable	**Explanation**	**Source**	**Expected relative value**
PREM4W	Premium 4 weeks prior to announcement date, offer price minus target closing price 4 weeks prior to the original announcement date over target closing price 4 weeks prior to the original announcement date.	Thomson SDC Platinum	Higher
PREM1D	Premium 1 day prior to announcement date, calculated as offer price minus target closing price 1 day prior to the original announcement date over target closing price 1 day prior to the original announcement date.	Thomson SDC Platinum	Lower

The full regression model for estimating premia is presented below. Multiple regressions each with different sets of the independent variables will be used when testing for hypothesis 1 in order to control the LnMRTS variable for other control variables. The regression model used to test hypothesis 2 will be selected from the regression models in hypothesis 1 depending on suitability.

Formula 1. Premia expectation model

$$\begin{aligned} PREM4W = {} & \beta_0 + \beta_1 lnMRTS + \beta_2 lnTMTB + \beta_3 PRIVATE + \beta_4 COMP \\ & + \beta_5 CASH + \beta_6 HOSTILE + \beta_7 HIVAL + \beta_8 CROSSB \\ & + \beta_9 DIVERSE + \Sigma\, Year\ indicator + \Sigma\, Industry\ indicator \\ & + \varepsilon_i \end{aligned}$$

4.1.2 Specification of hypothesis 1

Hypothesis 1 of whether an association between bid premia and target size exists, will be tested by running a linear ordinary least squares (OLS) regression with bid premia measured by PREM4W and PREM1D against lnRMTS and other independent control variables. The independent variables are continuous and dummy variables. Year and industry fixed effects will be controlled for. Transactions have been assigned an industry based on target SIC-code and the Fama French 12 industry definition. All regressions are run with the robust option in STATA with robust standard errors. The regression will test whether coefficients are statistically significant from zero.

4.1.3 Specification of hypothesis 2

Given that an association between bid premia and target size exists, hypothesis 2 will test whether this association changes post-GFC. This will be tested by performing an OLS regression as in hypothesis 1 but during two different periods represented by two subsamples. First, we regress both samples adjusted for fixed effect. The regressions will then be combined using the suest command in STATA which combines the previous estimation results into one parameter vector. The function allows us to run a Wald chi-square test for linear hypotheses such as our intra/cross-model hypothesis using a post estimation test to see whether there is a difference in the coefficients.

Formula 2. Wald chi-square test

$$test\ (lnMRTSPRE = lnMRTSPOST)$$

$$H_{0=\,[PRE\_mean]lnMRTS - [POST\_mean]lnMRTS\,=0}$$

4.1.4 Robustness checks

There are several assumptions that need to hold in order to receive unbiased estimates of our coefficients in the regression. The four assumptions are:

1. A linear relationship between the dependent and the independent variables. An augmented partial residual plot will be used to assess whether there is a linear relationship between the main continuous independent variable lnMRTS and the dependent variable.

2. Normally distributed residuals. This will be tested using plotted distribution of residuals and a Shapiro-Wilk test.

3. Homoskedasticity in variance in residuals. Will be tested using a Breusch-Pagan test. Robust standard errors will be used in all regressions.

4. No multicollinearity. Will be tested using a VIF-test and a correlation matrix of all variables.

4.2 Sample selection

The sample of deals has been retrieved from the Thomson Reuters SDC Platinum database and consists of all completed deals announced in the EU between 2005 and 2017. Given the universal adoption of IFRS as the accounting standard in the EU in 2005, and its increased emphasis on market value, deals announced before 2005 would potentially have distorted market to book ratios thus affecting our LNTMTB variable (Karamanou & Nishiotis, 2005). The year 2017 has been chosen as the last year since it extends the studied time horizon into a period that has not been examined previously. The acquisitions only concern intra-EU transactions which means that both the acquirer and target firm are based in countries which were members of the European Union in Q1 2018. Spin-offs, recapitalizations, self-tenders, repurchases, minority stake purchases, acquisitions of remaining interest, exchanges and privatizations have been left out. These exclusion criteria follow previous literature (Alexandridis et al. 2013). Minority stake purchases and acquisitions of remaining interest have been excluded since neither allow the acquirer to gain control and does not capture the control premium component that commands a premium in completed transactions. Spin-offs cannot be defined with respect to deal characteristics such as PRIVATE and CASH and are more similar to IPO transactions. Self-tenders have been excluded since the target and acquirer is the same entity.

Minimum transaction value is set at 3.5 MUSD. This threshold is based on (Alexandridis et al., 2013) where 1 MUSD is used as the lower limit for transaction size for data with transactions from 1990 to 2007. The NYSE Composite Index (NYA) rose from 1919 to 7089 between January 1990 and January 2005, representing growth of 269%. Applying the same growth to the 1 MUSD number used by (Alexandridis et al., 2013), we arrive at approximately 3.5 MUSD.

The acquirer can be either public or private, while the target is public in order to obtain an observable market price.

We have only included transactions where the acquirer's percentage of shares owned post transaction is more than 50% and less than 10% before, in line with previous literature (Alexandridis et al., 2013) and the minority stake argument of control premia.

Transactions for which PREM4W isn't available i.e. where stock price 4 weeks before announcement or price per share is missing have been removed. All transactions where target market capitalisation 4 weeks prior to acquisition announcement is missing have been removed.

The data has been truncated at 0% in line with Roll (1986), and 200% in accordance with Alexandridis et al. (2013) and Officer (2003). This removes PREM4W below 0% and above 200%. Premia below 0% likely include noise, rather information released within the time window between 4 weeks before announcement to the announcement is likely to affect the bid price. After the above mentioned criteria, we arrive at a sample size of 919, this represents our first sample, s ample 1.

The next criteria revolves around the market to book ratio. All transactions with missing or negative ratios have been removed for the second sample. The natural logarithm function cannot be applied on negative ratios. Our second sample, sample 2, consists of 799 transactions.

Table 3 – Exclusion table

Criteria	Sample size
M&A between 2005-2017	
Target nation in EU	164332
Acquirer nation in EU	130126
Excluding spin-offs, recapitalisations, self-tenders, repurchases, minority stake purchases, acquisitions of remaining interest, exchanges and privatisations.	102059
Deal value >3.5 MUSD	20202
Target status: public	2240
Percent of shares owned after the transaction >50%	1669
Percent of shares owned before acquisition <10%	1315
Missing target market capitalisation 4 weeks before announcement	1187
Missing PREM4W before announcement due to missing bid price	1046
PREM4W <0%	930
PREM4W >200%	919
Sample 1	**919**
Missing TMTB due to missing BV/share	815
Missing lnTMTB due to negative market to book ratio	799
Sample 2	**799**

All sampled deals will be divided into three different terciles based on MRTS – Small, Medium and Large according to their relative size in sample 1 with 919 transactions.

For the purpose of differing between before and after GFC, we identify two key occasions, the fall of Lehman Brothers in September 2008 and the bottoming out of the S&P500 in March 2009. Although these specific events played out in the US, the crisis was global. It is difficult to choose one event or discrete point in time for the purpose of differing between pre- and post-GFC. Moreover, issues would arise when dividing transactions between pre- and post-GFC on a daily level, since any effect of the GFC likely requires time to set in. Therefore, the pre-GFC subsample consists of deals announced within the 2006-01 – 2008-06 time frame and the post-GFC subsample is defined as deals announced within the 2009-07 – 2011-12 time period. This excludes transactions announced during the height of the crisis which would have otherwise been difficult to classify.

4.3. Descriptive statistics

4.3.1 Hypothesis 1

Sample distribution by announcement year and target size. The sample includes completed intra-EU transactions during the period between 2005 and 2017. The deal value is at least 3.5 MUSD. The deals are divided into three different terciles – Small, Medium and Large based on Market Relative Target Size. The terciles are based on the relative size of targets in sample 1 of 919 transactions. N is the total sample size for all deals and for each group. Mean is the average Market-Relative Target Size in the respective groups. Minimum and maximum is the highest and lowest Market-Relative Target Size of the targets in the relative groups.

Table 4 – Descriptive statistics hypothesis 1

MRTS	**All**	**Small**	**Medium**	**Large**
	(1)	(2)	(3)	(4)
Mean	2.2487	0.0598	0.3277	6.3650
Median	0.2766	0.0568	0.2766	2.1603
Min	0.0024	0.0024	0.1344	0.7174
Max	130.7721	0.1342	0.7062	130.7721

Year	**All**	**Small**	**Medium**	**Large**
	(1)	(2)	(3)	(4)
2005	92	17	33	42
2006	115	31	35	49
2007	118	32	39	47
2008	87	34	36	17
2009	53	19	20	14
2010	60	15	25	20
2011	73	27	27	19
2012	66	32	17	17
2013	38	15	12	11
2014	58	27	12	19
2015	56	22	13	21
2016	47	16	20	11
2017	56	19	18	19
N	919	306	307	306

Table 4. The first section of the table denotes Mean, Median, Minimum and Maximum Market-Relative Target Size for all transactions and each tercile. The second section demonstrate the number of deals in our sample for each year for all transactions and each tercile.

The difference in composition between Large and Small with respect to the independent variables and the premium measures is tested using an unpaired two sample one-tailed t-test with unequal variances. In the table below, we can observe a clear difference and pattern in PREM4W with respect to pure size in the respective segments, the smallest tercile of transactions commanded an average premium of 44.5%, the medium tercile 37.5% and the large tercile 33.0%. This negative trend is in line with Alexandridis et al. (2013), with respect to the association between target size and premia. Larger deals usually involve more complexity and higher integration costs with respect to realising synergies, and thus diminish the value to acquirers and premia (Alexandridis et. al. 2013). Moreover, it can be observed that the PREM1D variable on average displays a lower premium, which is likely due to information leaking ahead of the announcement of bids.

The COMP variable represents all deals with multiple bidders. Our data shows that smaller firms are less likely to have multiple bidders compared to larger targets, which is the opposite of what Alexandridis et al. (2013) find in their research. Furthermore, 8.6% of the deals in our data sample had multiple bidders while 29.2% of the deals examined by Alexandridis et al. (2013) had multiple bidders. Several competing bidders has been shown by Flanagan (2003) to have a positive effect on the premium.

Regarding the PRIVATE variable, smaller targets have a higher percentage of private buyers (20.3%) than larger targets (12.1%, 13.4% for medium and large resp.) This is likely due to private buyers being more restrained in terms of raising capital compared to public buyers, thus not being able to finance larger deals (Alexandridis et al., 2013).

Our HIVAL variable display that large targets were more frequently acquired during high valuation markets (59%) compared to 44% for small targets. Moreover, the difference is statistically significant at the 1% level.

We can also observe that cross-border transactions were most frequent within the large segment of target as 56% of the deals were made over nation borders compared to the small segment were the portion was 37%. The difference between the segments is statistically significant at the 1% level. With respect to the composition of the DIVERS variable, the small tercile of targets have a higher portion of deals where the acquirer and target were in different industries, arriving at 62% compared to 59% for the large tercile. However, this difference is not statistically significant.

The percentage of transactions being settled with 100% cash lays in the 58-66% range for the different terciles. There is no clear trend with respect to target size.

Table 5 – Descriptive statistics hypothesis 1

	ALL	**Small**	**Medium**	**Large**	**Difference (L-S)**
	(1)	(2)	(3)	(4)	(5)
N	919				
MRTS	2.2487	0.0598	0.3277	6.3650	6.3052***
PRIVATE	0.1523	0.2026	0.1205	0.1340	-0.0686**
COMP	0.0860	0.0359	0.0717	0.1503	0.1144***
HOSTILE	0.0054	0	0.0065	0.0098	0.0098**
CASH	0.6322	0.6536	0.6547	0.5882	-0.0654**
DIVERS	0.6115	0.6209	0.6254	0.5882	-0.0327
HIVAL	0.5136	0.4379	0.5114	0.5915	0.1536***
CROSSB	0.4766	0.3693	0.5016	0.5588	0.1895***
N	799				
TMTB	2.7494	1.9453	2.7077	3.5140	1.5687***
N	919				
PREM4W	0.3830	0.4447	0.3747	0.3297	-0.1150***
PREM1D	0.3150	0.3796	0.3041	0.2612	-0.1184***

Table 5. The table displays the compositional differences of the dependent and independent variables in terms of means. The first column represents the composition of all transaction in our data set and the following three columns are for each tercile. All numbers except for the variables MRTS, TMTB, PREM4W and PREM1D illustrate the portion of deals that received a 1 in dummy terms. For example, 0.1523 under ALL for the PRIVATE variable mean that 15.23% of all transactions had a private acquirer. The last column shows the difference between the Large and Small terciles and the result of the unpaired two sample one-tailed t-test with unequal variances. MRTS, TMTB, PREM4W and PREM1D are continuous variables. The rest are dummy variables. The stars (*) shows the statistical significance were one star (*) denotes statistical significance at the 10% level, (**) at the 5% level and (***) at the 1% level.

4.3.2 Hypothesis 2

The compositional differences are tested using an unpaired two sample one-tailed t-test with unequal variances. Three tests have been made for the compositional difference in the independent and dependent variables with respect to two aspects, the terciles and time period. The ALLPOST-ALLPRE column displays the compositional change in our independent variables. PREM4W for all sizes increased by 6.62% post-GFC and the difference is statistically significant at the 5% level. This is in line with Bouwman (2009) as we can see that valuations decreased as evident by the direction of compositional development in TMTB and HIVAL. It is also in line with Alexandridis et al. (2013) since the average MRTS decreased between the pre- and post-GFC subsamples.

PREM4W was 7.13% higher for the small tercile compared to the large tercile pre-GFC, the difference is statistically significant at the 10% level. Post-GFC, this difference was larger at 9.45%, statistically significant at the 10% level. The increased difference between small and large targets could be indicative of a change in the effect of the lnMRTS variable, setting an exciting precedent for the test of hypothesis 2. The overall increase in acquisition premia is in line with Ashrafi and Haglund (2017) as they found the same dynamics for private equity firms in the pre and post setting of the global financial crisis.

Our descriptive statistic further demonstrate that M&A activity overall decreased after the crisis as number of deals PRE, were 279 compared to 169 POST, using equal time periods before and after the crisis. The decreased M&A activity is in line with Reddy et al. (2014) as they find that number of deals declined post crisis. Average size of targets in M&A transactions in our sample decreased and the difference is statistically significant at the 1% level. Reddy et al. (2014) demonstrate the same dynamics, displaying that deal value also decrease post crisis.

Table 6 – Descriptive statistics hypothesis 2

									DIFFERENCE		
	ALL PRE (1)	**ALL POST (2)**	**Small PRE (3)**	**Small POST (4)**	**Medium PRE (5)**	**Medium POST (6)**	**Large PRE (7)**	**Large POST (8)**	**ALLPOST-ALLPRE (9)**	**SMALLPRE-LARGEPRE (10)**	**SMALLPOST-LARGEPOST (11)**
N	279	169	78	54	96	63	105	52			
MRTS	3.2754	1.0872	0.0675	0.0647	0.3239	0.3120	8.3568	3.0884	-2.1882***		
PRIVATE	0.1290	0.1538	0.1154	0.2222	0.1250	0.0794	0.1429	0.1731	0.0248		
COMP	0.1075	0.0651	0.0256	0.0185	0.0938	0.0159	0.1810	0.1731	-0.0424*		
HOSTILE	0.0036	0.0118	0.0000	0.0000	0.0000	0.0317	0.0095	0.0000	0.0083		
CASH	0.6487	0.6568	0.6795	0.6667	0.6771	0.6984	0.6000	0.5962	0.0081		
DIVERS	0.6165	0.6213	0.5769	0.6296	0.6771	0.5714	0.5905	0.6731	0.0048		
HIVAL	0.7527	0.0000	0.6795	0.0000	0.7188	0.0000	0.8381	0.0000	-0.7527***		
CROSSB	0.4265	0.4970	0.2564	0.3704	0.4896	0.4762	0.4952	0.6538	0.0705*		
N	248	152	66	44	92	60	90	48			
TMTB	3.9625	1.8538	2.621	1.3047	3.3345	2.0261	5.5936	2.1416	-2.1087***		
N	279	169	78	54	96	63	105	52			
PREM4W	0.3490	0.4152	0.3963	0.4770	0.3370	0.3892	0.3250	0.3825	0.0662**	0.0713*	0.0945*
PREM1D	0.2668	0.3435	0.3110	0.4184	0.2387	0.2996	0.2596	0.3188	0.0767***	0.0514*	0.0997**

Table 6. The table displays the compositional differences of the dependent and independent variables in terms of means, within the terciles and across time. The first column represents the descriptive statistics for all terciles PRE crisis and the following columns all terciles POST crisis. The following six columns denote the composition of the dependent and independent variables for each tercile PRE and POST crisis. MRTS, TMTB, PREM4W and PREM1D are continuous variables. The rest are dummy variables. Column (9), (10) and (11) display the calculated differences between all terciles PRE and POST GFC, the difference between the Small and Large terciles PRE GFC, and the difference between the Small and Large terciles POST GFC. The stars (*) denote the statistical significance of the unpaired two sample one-tailed t-test with unequal variances were one star (*) denotes statistical significance at the 10% level, (**) at the 5% level and (***) at the 1% level.

5. Results

5.1 Regression Hypothesis 1

Controlling for a wide variety of target-firm and deal characteristics, the significance, magnitude, and direction of the lnMRTS coefficient hold at the 1% level across all regressions, indicating robustness in the results. The coefficient of lnMRTS suggests that increased target size has a negative relationship with acquisition premium, statistically different from zero at the 1% level for all specifications. A 100% change in MRTS generates a -0.03 change in PREM4W i.e. the predicted premium decreases by 3 percentage points. Moreover, this confirms our first hypothesis that there is an association between target size and premium in the EU setting. This is in line with recent literature (Alexandridis et al., 2013), and indicates that despite the effect described by Grinstein & Hribar (2003), the overall effect of pure size on acquisition premia is negative.

By analyzing the effect of our control variables, we can also find potential explanations for why premias are lower for larger targets, apart from the pure size association.

Our regression model displays that premia are likely to decrease if the acquirer is private as the effect is negative and statistically significant in all specifications. Bargeron (2008) finds that private acquirers tend to pay lower premium, thus the direction of our coefficient is in accordance with his findings.

Our COMP variable is statistically significant at the 1% level with a positive coefficient in all specifications. Alexandridis et al. (2013) also finds a positive correlation for the premium when the number of bidders are more than one, albeit not significant. This is in line with the findings of Flanagan (2003).

Moreover, the DIVERS variable shows a negative correlation with the acquisition premium, which is in line with recent literature (Officer, 2003). A possible explanation of this logic could be that integration of intra-industry mergers tend to have higher synergies as the operations of the firms are more similar. Thus, the acquiring company's willingness to pay for the target increases, resulting in higher premium.

The coefficient of the HOSTILE variable indicates a positive effect on the bid premia which is in line with recent literature as Schwert (2000) finds the same correlation. However, the variable is

not statistically significant in any of the specifications, which can be explained by the low number of transactions characterized as hostile (5).

All cash offers have a positive effect on bid premia according to Savor and Lu (2009) and Eckbo et al. (1990), thus our coefficients of the CASH variable is in line with recent literature. However, it is only significant in regression (6) with PREM1D and fixed effects adjustments. One possible explanation for the lack of significance can be found in Fishman (1989) where he finds that competition for targets tends to be less intense when the initial bidder opts for payment in cash, however this is not necessarily evident in our correlation matrix (Appendix, table 12). As seen in our regression, competition for the target has a strong positive effect on the bid premia.

The HIVAL variable in our regression is statistically significant for the second and third specification and the coefficient indicates that bid premias are expected to be lower for bids announced in high valuation markets. The results are in line with findings by Bouwman et al. (2009) and Alexandridis et al. (2013). The significance disappears when adjusting for year and industry fixed effects, likely due to the year fixed effect component capturing the effects of valuation.

Our regression displays a positive relationship between bid premia and acquisitions where the acquirer and target is based in different nations. The CROSSB variable is statistically significant within all regressions. Marr et al. (1993) find that foreign bidders were often willing to pay a higher premia as they want to gain access to new markets. Moreover, Ravenscraft and Harris (1991) find that overall, cross-border acquisitions command higher average premia than those between domestic firms.

The variable concerning the market to book ratio of the target firm suggests a negative relationship with acquisition premia and is statistically significant within all regressions. Our result is in line with findings by Walkling and Edmister (1985), that firms with lower market to book ratios on a relative basis tend to receive higher premia. Moreover, the effect of the lnTMTB variable in regression (5) and (6) can be linked to Bouwman et al. (2009) and give further strength to the theory that lower market valuations result in higher premia. In regression where both the HIVAL and lnTMTB variables are included, the lnTMTB variable should capture the effect of firm specific valuation irrespective of overall market valuation.

Our results can further be analysed with assistance of the neoclassical model for merger waves. The theory states that regulatory and technological shocks drive merger waves within different industries, resulting in increased M&A activity (Harford, 2005). In regression (4) and (5) where we adjust for fixed year- and industry effects, variables such as HIVAL, DIVERS and HOSTILE decrease in terms of significance while the COMP variable remains significant. One possible interpretation is that variation in bid premia might to a large extent depend on industry shocks, resulting in increased M&A activity and in turn more competing bidders. Moreover, our regression indicates a high significance for the COMP variable.

Predictably, the intercept shifts downwards when switching to PREM1D in regression (6), likely due to information leaking closer to announcement. The direction of the coefficients holds for all variables except for HOSTILE, which is not significant in any regression.

The R-squared values in our regressions are in line with previous literature. The R-squared for regression (5), 18.15% is comparable to Alexandridis et al. (2013), 23.93% in a year and industry fixed effect adjusted model with 11 explaining variables compared to our 7. Predictably, R-squared increases with the number of explaining variables and in the fixed effect adjusted models. The year fixed effect adjustments may decrease the models usefulness for predicting future premia.

Table 7. – Regression Hypothesis 1

	PREM4W (1)	PREM4W (2)	PREM4W (3)	PREM4W (4)	PREM4W (5)	PREM1D (6)
Intercept	0.350	0.378	0.373	0.358	0.338	0.251
	0.009	0.023	0.026	0.063	0.051	0.053
	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
lnMRTS	-0.030	-0.034	-0.035	-0.030	-0.030	-0.031
	0.006	0.006	0.006	0.007	0.007	0.008
	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
PRIVATE		-0.073	-0.070	-0.065	-0.068	-0.056
		0.028	0.030	0.030	0.030	0.029
		0.008***	0.021**	0.031**	0.022**	0.049**
COMP		0.230	0.208	0.196	0.195	0.208
		0.038	0.042	0.041	0.041	0.042
		0.000***	0.000***	0.000***	0.000***	0.000***
HOSTILE		0.060	0.030	0.060	0.054	-0.019
		0.046	0.068	0.052	0.052	0.048
		0.190	0.657	0.251	0.300	0.698
CASH		0.016	0.024	0.029	0.026	0.034
		0.022	0.022	0.022	0.022	0.021
		0.472	0.279	0.195	0.234	0.100*
DIVERS		-0.017	-0.018	-0.015		
		0.021	0.023	0.023		
		0.406	0.425	0.511		
HIVAL		-0.079	-0.071	-0.016		
		0.020	0.021	0.041		
		0.000***	0.001***	0.694		
CROSSB			0.055	0.036	0.034	0.042
			0.020	0.020	0.020	0.020
			0.007***	0.076*	0.086*	0.041**
lnTMTB			-0.050	-0.056	-0.056	-0.045
			0.016	0.018	0.018	0.016
			0.002***	0.002***	0.002***	0.006***
INDUSTRY FE				YES	YES	YES
YEAR FE				YES	YES	YES
N	919	919	799	799	799	799
R-square	0.0322	0.0985	0.1375	0.1822	0.1815	0.1782

See table comment on next page.

Table 7. Illustrates the results of our regressions in the test of hypothesis 1. The first row for each variable is the coefficient. The second row is the standard deviation and the third row shows the statistical significance were one star (*) denote the p-value at the 10% level, (**) at the 5% level and (***) at the 1% level. Regression (1) estimates the lnMRTS effect on PREM4W in sample 1 without controlling for other variables. Regression (2) estimates the effect of lnMRTS on PREM4W while controlling for variables which have been used in previous literature on sample 1. Regression (3) estimates the effect of LnMRTS on PREM4W while controlling for all available variables, this is done on sample 2. Regression (4) shows the same estimates but controlled for year- and industry fixed effects using announcement year and the Fama French 12 industry definition. Regression (5) eliminates the DIVERS and HIVAL variables since their explanatory power, especially HIVAL, diminishes with the introduction of the fixed effect dummies. It is otherwise identical to Regression (4). Regression (6) acts as a robustness test by switching the measure of premia from 4 weeks before announcement to one day before announcement, PREM1D. It is otherwise identical to Regression (5).

5.2 Regression Hypothesis 2 – Pre and Post GFC

On a general note, we can observe that many coefficients in our model lose significance on the pre- and post-GFC subsamples, likely due to the smaller sample size.

As evident by column 3 in table 8, the difference in the lnMRTS coefficient i.e. the effect of pure size, pre vs. post-GFC is not significantly different from zero. This confirms our second hypothesis of the association between acquisition premia and target size being unchanged pre- and post-GFC. According to Alexandridis et al. (2013), larger acquisitions command lower premia due to increased complexity regarding integration leading to higher integration costs and uncertainty with respect to realising synergies. Our result shows that the discount in acquisition premia stemming from pure size does not seem to have changed, as the direction of the coefficient is the same pre- and post-GFC.

Going back to table 6, we can also conclude that the 6.62% increase in premia post-GFC across all target sizes, and the increased difference in premia between small and large targets post-GFC, from 7.13% to 9.45%, is likely not attributable to a change in the effect of pure size on bid premia. However, it could possibly be explained by a change in the size of deals i.e. composition of MRTS, or the composition and effect of other control variables.

In the MRTS row of table 6, we can observe that the composition of MRTS was roughly constant in the small and medium terciles but smaller in the large tercile following the crisis, column 9 in the same table indicates that the average deal size was smaller across the board. Given the negative

direction of the lnMRTS variable, these changes likely contribute toward the higher premia post-GFC, and the increased difference between the small and large terciles.

Looking at the COMP variable, we can observe that the coefficient decreased in magnitude and lost significance in the post-GFC regression. One possible explanation is that acquirer's willingness to 1) engage in bid contests and 2) pay more than other bidders in auctions decreased post-crisis. This is in line with evidence of the number of transactions in table 8, were we can see that general appetite for acquisitions seems to have decreased in the post-GFC period.

The lnTMTB variable captures the effect of individual targets being highly- or undervalued by measure of market to book ratio. Since we adjust for fixed effects, the effect of broader market valuation should be captured by the year dummies. The coefficient is significant at the 1% level in the post-GFC sample. The magnitude of the coefficient turned more negative post-GFC, which could be indicative of acquirers being even less willing to pay high premia for highly valued targets. This suggest that the effect described by Walkling and Edmister (1985) of below market average valued firms receiving higher premia was strengthened post-GFC.

Table 8. – Regression Hypothesis 2

	PRE (1)	POST (2)	Difference (POST-PRE) (3)
Intercept	0.321	0.351	0.030
	0.060	0.140	
	0.000***	0.012**	0.847
lnMRTS	-0.015	-0.009	0.006
	0.012	0.013	
	0.189	0.469	0.738
PRIVATE	-0.022	-0.042	-0.020
	0.050	0.060	
	0.650	0.479	0.808
COMP	0.195	0.074	-0.121
	0.056	0.085	
	0.000***	0.388	0.230
HOSTILE	-0.022	-0.075	-0.053
	0.086	0.107	
	0.796	0.482	0.707
CASH	0.027	0.065	0.038
	0.037	0.048	
	0.472	0.180	0.522
CROSSB	-0.006	0.032	0.038
	0.032	0.040	
	0.844	0.427	0.472
lnTMTB	-0.027	-0.128	-0.101
	0.019	0.042	
	0.153	0.002***	0.032**
INDUSTRY FE	YES	YES	
YEAR FE	YES	YES	
N	248	152	

Table 8. Displays the combination of the estimation results. Please note that the robust standard errors presented above are slightly smaller than those from the individual models since the number of observations for the combined parameter vector is higher. The first row for each variable displays the coefficient. The second row the standard deviation and the third row the p-value where one star (*) denotes statistical significance at the 10% level, (**) at the 5% level and (***) at the 1% level. The PRE (1) column displays the results on the pre-GFC subsample, the POST (2) column displays the results on the post-GFC subsample, and the third column Difference (3) displays the change in the coefficient defined as POST-PRE and the p-value of the Wald chi-square test of the difference with the zero hypothesis being POST-PRE=0.

5.3 Robustness test

Our augmented partial residual plot displays a relatively strong linear relationship between the dependent (PREM4W) and main independent variable (lnMRTS) in regression (5). We can observe non-trivial departures from linearity in the left and right ends. (Appendix, table 1).

The plotted distribution of the residuals in regression (5) (Appendix, table 2) indicate a non-trivial departure from normality. The residuals are judged to be approximately normally distributed. In Appendix, table 3, which displays a standardized normal probability (P-P) plot and Appendix, table 4, which displays quantiles of a variable against the quantiles of a normal distribution, we can observe that the departure is more severe in the left and right tails. A Shapiro-Wilk test for the normality of residuals in regression (5) rejects the zero hypothesis of normal distribution at the 1% level. (Appendix, table 5.)

The plotted distribution of the residuals in regression PRE (1) (Appendix, table 6) indicate non-trivial departures from normality. Table 7 in Appendix shows the same distribution for the residuals of regression POST (2). The deviation is less prominent in this case. The residuals are judged to be approximately normally distributed. The results of Shapiro-Wilk tests for the normality of residuals in regression PRE (1) (Appendix, table 8), and POST (2) (Appendix, table 9), show that the zero hypothesis of normal distribution is rejected at the 1% level for both regressions.

We conduct a Breusch-Pagan test on regression (5) without the robust standard errors to examine whether the variance in residuals is homoscedastic. The zero hypothesis of equal error variances is rejected and we conclude that the variance in the residuals is heteroskedastic. See appendix table 10. However, this implication has been partially mitigated by using robust standard errors in all regressions.

A VIF-test and a simple collinearity analysis of all variables has been performed to assess if multicollinearity exists. Both tests are indicative of low multicollinearity between our variables. See appendix table 11 and 12.

Overall, we can conclude that our data does not fulfill all necessary assumptions for the regression model. However, a regression model without all assumptions being fulfilled is a normal econometric issue when performing accounting research.

6. Conclusion

This paper has examined the association between acquisition premia and target size in the EU setting and whether or not this association holds in the period post-GFC using a data set of 919 intra-EU deals. Controlling for a wide variety of target-firm and deal characteristics, we demonstrate a robust negative relationship between acquisition premia and target size significantly different from zero at the 1% level in all regressions, i.e. in general, larger deals command lower premia. Similar findings have been conducted in the U.S. setting and we can now conclude that the same association holds in the EU setting.

Additionally, we find that the average acquisition premia as defined by multiple measures increased within all deal sizes and on an aggregate level following the period post GFC. This was accompanied by changes in the composition of a wide variety of determinants of acquisition premia such as target size, valuations metrics and competing bids, following the GFC. However, our results indicate that the direction and association between deal size and premia hold even after the shocks that the GFC imposed on the global economy and the financial system.

7. Limitations

Endogeneity is likely a problem in our research, there are variables used in previous research (Alexandridis et al., 2013) such as M&A activity in industry and acquirer size, which have been omitted in our study. The test for heteroscedasticity (Appendix table 3) also indicates that endogeneity may be an issue. We have attempted to minimize the effect of endogeneity by including multiple control variables and using year and industry fixed effects.

Alexandridis et. al (2013) include an inside variable measuring the percentage ownership of all directors and executives of the target and a hubris variable measuring managerial hubris using unexercised stock options. Since we do not include such variables and given that 1) an inside variable has explanatory power in our sample and 2) the composition of a dummy inside variable is such that the frequency of target companies with inside ownership increases or decreases with size, it is likely that our lnMRTS captures what an inside variable would have captured. There is evidence of this in literature. According to Demsetz and Lehn (1985), large firms tend to have less concentrated managerial ownership. Bauguess et al. (2009) find that insiders with less ownership

are more likely to accept lower premia. Against that backdrop, we can conclude that omitting the inside variable has likely been partially captured by the size variable.

The same reasoning can be made for omitting a hubris variable. According to Hayward and Hambrick (1997) hubris within top executives is highly correlated with excessive acquisition premia. Assuming that hubris is 1) more common in large(small) acquirers, and 2) large acquirers are more likely to acquire larger companies, which is likely to be true if we assume that a company's cash balance and ability to raise financing is a direct product of its size, larger targets are likely to receive higher (lower) bids from their larger acquirers. Given that hubris is more common in large acquirers and the previous assumptions hold true, omitting the hubris variable is likely to have skewed the lnMRTS coefficient to the positive end of the spectrum.

The definition used for the HOSTILE variable leads to a small fraction of the sample being categorised as HOSTILE. It would have been possible to make a variable for offers considered as unsolicited by SDC Platinum, however, previous literature seems to refer mostly to pure hostile takeovers and not unsolicited offers although the terminology around these two terms has not been clearly understood by us.

Our HIVAL variable loses significance when introducing year fixed effects. Our definition of HIVAL is somewhat arbitrary and has three major drawbacks. First, any effect of high valuation markets on acquisition premia is not necessarily sensitive enough to changes in valuations to be measured in monthly increments. Perhaps a quarterly measure would have been more appropriate, however this method approaches the function of year fixed effects. Secondly, the choice of Shiller P/E ratio on the S&P 500, although the US and EU equity markets can be considered to be connected, may not necessarily be the most optimal proxy for market valuations in the EU market. Thirdly, the variable is defined as a dummy variable which differs between deals announced in either high-valuation or not high-valuation markets. Our definition of what is high-valuation market, i.e. P/E above 25, is subject to discussion. The choice to use a dummy variable instead of a continuous variable is motivated by previous literature Alexandridis et al. (2013).

Our research only explicitly considers target size. It is reasonable to assume that small acquirer's do not buy large targets. However, including such a variable could have captured the findings on bargaining power by Walkling and Edmister (1985). The reason for the omittance was mostly due

to data on acquirer market cap 4 weeks prior to announcement missing for a large portion of the sample which would have limited our sample.

For the test of hypothesis, the intercepts are different before and after the crisis. This suggests an unexplained difference in premia pre- and post-GFC. By running tests with a fixed intercept, our coefficients would likely have been different, although the year fixed effect dummies would have likely captured the effect instead.

Fixed effects are supposed to be time invariant, since our industry fixed effect dummies have different coefficients in the test of hypothesis 2, the coefficients are likely biased, which skews our results. See appendix table 14. It is possible that the industry fixed effects changed post-GFC however that goes against the definition. Perhaps we could have used the industry fixed effect coefficients from regression (5) table 7, or used a model not adjusted for industry fixed effects.

Our research only looks at premia, which does not capture overpayment as judged by the market. Looking at returns may have given another perspective and explanations to the premia association, similar to Alexandridis et al. (2013).

8. Future research

The research conducted in this paper could be improved by also including the market reaction and acquirer gains. Doing so would capture aspects such as value creation in mergers and acquisitions, and a more complete picture of the distribution of shareholder wealth between acquirer and target. Although higher premium increases the likelihood of overpayment, given that overpayment is defined as paying more than the value gained from control, underpricing and synergies, premium does not paint a complete picture of overpayment. According to Kaplan (2016), mergers create value on average, which indicates that premia are justified. Thus, including acquirer returns as Alexandridis et al. (2013) does, but in the EU setting would be of interest as it provides a different perspective on the association between premia and target size.

As seen in our regression for the test of the association in acquisition premia before and after the financial crisis, we lose significance in many of the variables. Thus, a possible research area could be to examine both EU and US deals pre and post the financial crisis, as that would increase the sample size and likely result in more statistically significant results. Another approach could be to

choose a longer period before and after the financial crisis, which would also lead to a larger sample size.

On a more general note, more variables could be introduced, the sophistication of current measures could be improved, and the method of testing the hypothesis could all be improved in accordance with the limitation section above.

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Appendix

Table 1: Augmented partial residual plot, PREM4W - lnMRTS, Regression (5)

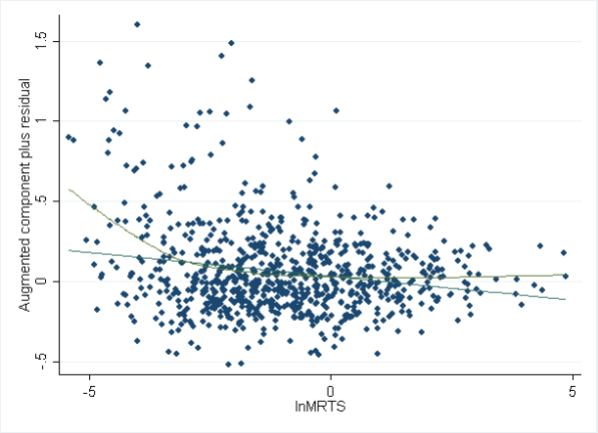

Table 2: Plotted distribution of residuals, regression (5)

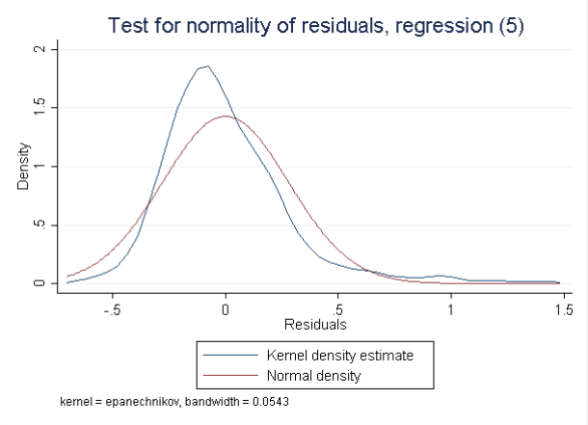

Table 3: Standardized normal probability (P-P) plot

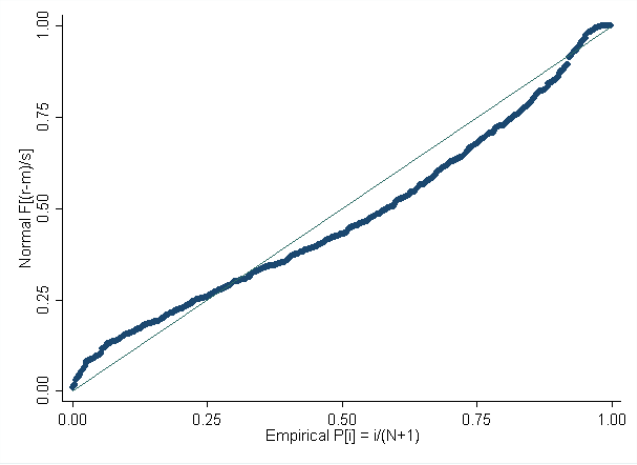

Table 4: Quantiles of variable against quantiles of normal distribution

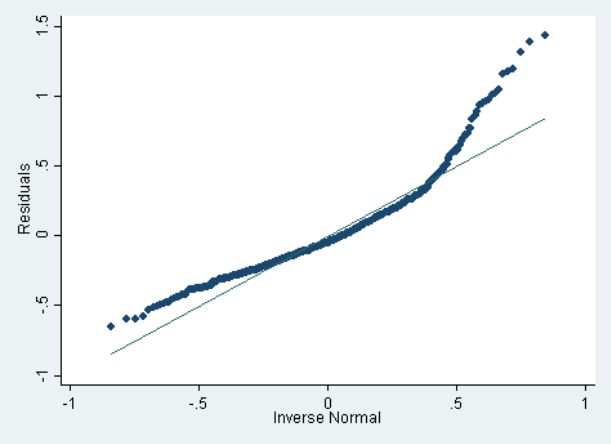

Table 5: Shapiro-WILK test for normal data, Regression (5)

Variable	Obs	W	V	z	Prob>z
r	799	0.906	48.173	9.507	0.0000

Table 6: Distribution of residuals, PRE (1)

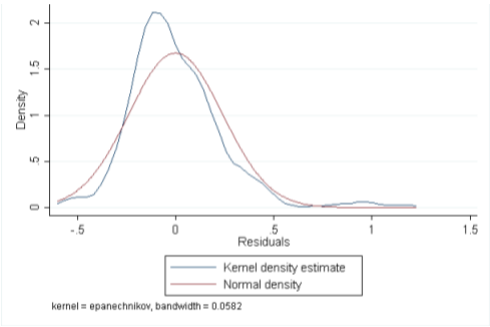

Table 7: Distribution of residuals, POST (2)

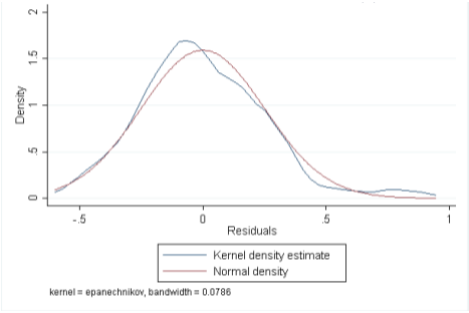

Table 8: Shapiro-WILK test for normal data, PRE (1)

Variable	Obs	W	V	z	Prob>z
r	248	0.911	15.953	6.441	0.0000

Table 9: Shapiro-WILK test for normal data, POST (2)

Variable	Obs	W	V	z	Prob>z
r	152	0.969	3.605	2.909	0.0018

Table 10: Breusch-Pagan test for heteroskedasticity

H_0	Constant variance
Variables	Fitted values of PREM4W
Chi2 (1)	143.8
Prob > chi2	0

Table 11: VIF-test

Variable	VIF	1/VIF
lnMRTS	1.2	0.834
lnTMTB	1.16	0.8612
CASH	1.13	0.8816
CROSSB	1.13	0.8871
DIVERS	1.1	0.9093
PRIVATE	1.07	0.9339
HIVAL	1.06	0.9455
COMP	1.04	0.9605
HOSTILE	1.03	0.9736
Mean VIF	1.1	

Table 12: Correlation matrix

	lnMRTS	PRIVATE	COMP	HOSTILE	CASH	DIVERS	HIVAL	CROSSB	LNTMTB
lnMRTS	1								
PRIVATE	-0.0848	1							
COMP	0.1265	0.056	1						
HOSTILE	0.0876	0.0127	0.0905	1					
CASH	-0.0849	0.0823	0.0288	-0.0368	1				
DIVERS	-0.0175	0.1406	0.0905	0.0627	0.243	1			
HIVAL	0.156	0.0264	0.0131	0.0134	-0.0636	-0.0036	1		
CROSSB	0.1978	-0.1702	-0.0176	0.0196	0.1762	0.0741	0.0228	1	
LNTMTB	0.291	-0.0566	-0.018	-0.0542	0.0913	0.0737	0.1894	0.1399	1

Table 13: Shiller P/E

HIVAL	PE > 25
HIVAL (YES)	73
Total	156

Date	Value	HIVAL	Date	Value	HIVAL	Date	Value	HIVAL	Date	Value	HIVAL
2005-01-01	26.59	YES	2008-04-01	23.36	NO	2011-07-01	22.61	NO	2014-10-01	25.16	YES
2005-02-01	26.74	YES	2008-05-01	23.7	NO	2011-08-01	20.05	NO	2014-11-01	26.61	YES
2005-03-01	26.34	YES	2008-06-01	22.42	NO	2011-09-01	19.7	NO	2014-12-01	26.79	YES
2005-04-01	25.41	YES	2008-07-01	20.91	NO	2011-10-01	20.16	NO	2015-01-01	26.49	YES
2005-05-01	25.65	YES	2008-08-01	21.4	NO	2011-11-01	20.35	NO	2015-02-01	27	YES
2005-06-01	26.07	YES	2008-09-01	20.36	NO	2011-12-01	20.52	NO	2015-03-01	26.73	YES
2005-07-01	26.29	YES	2008-10-01	16.39	NO	2012-01-01	21.21	NO	2015-04-01	26.79	YES
2005-08-01	26.1	YES	2008-11-01	15.26	NO	2012-02-01	21.8	NO	2015-05-01	26.81	YES
2005-09-01	25.73	YES	2008-12-01	15.38	NO	2012-03-01	22.05	NO	2015-06-01	26.5	YES
2005-10-01	24.88	NO	2009-01-01	15.17	NO	2012-04-01	21.78	NO	2015-07-01	26.38	YES
2005-11-01	25.93	YES	2009-02-01	14.12	NO	2012-05-01	20.94	NO	2015-08-01	25.69	YES
2005-12-01	26.44	YES	2009-03-01	13.32	NO	2012-06-01	20.55	NO	2015-09-01	24.5	NO
2006-01-01	26.47	YES	2009-04-01	14.98	NO	2012-07-01	21	NO	2015-10-01	25.49	YES
2006-02-01	26.25	YES	2009-05-01	16	NO	2012-08-01	21.41	NO	2015-11-01	26.23	YES
2006-03-01	26.33	YES	2009-06-01	16.38	NO	2012-09-01	21.78	NO	2015-12-01	25.97	YES
2006-04-01	26.15	YES	2009-07-01	16.69	NO	2012-10-01	21.58	NO	2016-01-01	24.21	NO
2006-05-01	25.65	YES	2009-08-01	18.09	NO	2012-11-01	20.9	NO	2016-02-01	24	NO
2006-06-01	24.75	NO	2009-09-01	18.83	NO	2012-12-01	21.24	NO	2016-03-01	25.37	YES
2006-07-01	24.7	NO	2009-10-01	19.36	NO	2013-01-01	21.9	NO	2016-04-01	25.92	YES
2006-08-01	25.05	YES	2009-11-01	19.81	NO	2013-02-01	22.05	NO	2016-05-01	25.69	YES
2006-09-01	25.64	YES	2009-12-01	20.32	NO	2013-03-01	22.42	NO	2016-06-01	25.84	YES
2006-10-01	26.54	YES	2010-01-01	20.53	NO	2013-04-01	22.6	NO	2016-07-01	26.69	YES
2006-11-01	26.93	YES	2010-02-01	19.92	NO	2013-05-01	23.41	NO	2016-08-01	26.95	YES
2006-12-01	27.28	YES	2010-03-01	21	NO	2013-06-01	22.93	NO	2016-09-01	26.73	YES
2007-01-01	27.21	YES	2010-04-01	21.8	NO	2013-07-01	23.49	NO	2016-10-01	26.53	YES
2007-02-01	27.32	YES	2010-05-01	20.48	NO	2013-08-01	23.36	NO	2016-11-01	26.85	YES
2007-03-01	26.23	YES	2010-06-01	19.74	NO	2013-09-01	23.44	NO	2016-12-01	27.87	YES
2007-04-01	26.98	YES	2010-07-01	19.67	NO	2013-10-01	23.83	NO	2017-01-01	28.06	YES
2007-05-01	27.55	YES	2010-08-01	19.77	NO	2013-11-01	24.64	NO	2017-02-01	28.66	YES
2007-06-01	27.42	YES	2010-09-01	20.38	NO	2013-12-01	24.86	NO	2017-03-01	29.09	YES
2007-07-01	27.41	YES	2010-10-01	21.24	NO	2014-01-01	24.86	NO	2017-04-01	28.9	YES
2007-08-01	26.15	YES	2010-11-01	21.7	NO	2014-02-01	24.59	NO	2017-05-01	29.23	YES
2007-09-01	26.73	YES	2010-12-01	22.4	NO	2014-03-01	24.96	NO	2017-06-01	29.7	YES
2007-10-01	27.32	YES	2011-01-01	22.98	NO	2014-04-01	24.79	NO	2017-07-01	29.72	YES
2007-11-01	25.73	YES	2011-02-01	23.49	NO	2014-05-01	24.94	NO	2017-08-01	30.17	YES
2007-12-01	25.96	YES	2011-03-01	22.9	NO	2014-06-01	25.56	YES	2017-09-01	29.95	YES
2008-01-01	24.02	NO	2011-04-01	23.14	NO	2014-07-01	25.82	YES	2017-10-01	30.49	YES
2008-02-01	23.5	NO	2011-05-01	23.06	NO	2014-08-01	25.62	YES	2017-11-01	31.19	YES
2008-03-01	22.61	NO	2011-06-01	22.1	NO	2014-09-01	25.92	YES	2017-12-01	32	YES

Table 14: Fixed effect coefficients PRE (1) POST (2)

	PRE	POST
YEAR FE	(1)	(2)
2007	0.101	0.179
	0.032	0.051
	0.001*	0.000*
2008	0.256	0.184
	0.058	0.051
	0.000*	0.000*
INDUSTRY FE (Fama French)		
FF 1	-0.321	0.351
	0.060	0.140
FF 2	-0.201	0.050
	0.103	0.148
	0.050*	0.735
FF 3	-0.129	-0.059
	0.067	0.151
	0.054*	0.696
FF 4	-0.088	0.253
	0.104	0.303
	0.397	0.404
FF 5	0.049	0.119
	0.074	0.290
	0.510	0.683
FF 6	-0.023	-0.112
	0.066	0.149
	0.728	0.451
FF 7	-0.199	-0.211
	0.073	0.162
	0.007*	0.193
FF 8	-0.034	-
	0.086	-
	0.691	-
FF 9	-0.212	-0.192
	0.067	0.158
	0.001*	0.223
FF 10	-0.020	0.023
	0.089	0.161
	0.823	0.887
FF 11	-0.066	-0.210
	0.070	0.145
	0.349	0.148
FF 12	-0.121	-0.115
	0.063	0.145
	0.054*	0.427
lnVAR		
_cons	-2.785	-2.633
	0.148	0.124
	0.000*	0.000*
N	248	152