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"How do firm characteristics affect the likelihood of M&A deal completion"

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Abstract

Instead of focusing on the post-acquisition value creation like the majority of literatures do, this paper will investigate how different factors, especially firm characteristics influence the probability of closing the deal in Merger and Acquisition (M&A) transaction. Firm characteristics that will be explored are: (i) Acquirer firm size (ii) Target firm size (iii) Acquirer firm profitability (iv) Target firm profitability (v) Acquirer market-to-book ratio. To test the hypothesis, a sample of 26,291 M&A deals is gathered from Zephyr database from 2005-2021 time-period & North America and Western Europe region. A probit model is used to test the hypothesis while total asset and EBITDA are used to measure firm size and profitability.

Overall, there is mixed results for the effect of firm characteristics on the likelihood of deal completion. This paper found that smaller target firm size, lower target firm profitability and higher acquirer market-to-book ratio lead to higher probability of deal completion. On the other hand, the results also shows that both acquirer firm size and profitability do not have significant effect on deal completion due to statistical insignificant. Lastly, robustness check is conducted using different proxies such as total sales and net profit to measure firm size and profitability respectively. The new measurements are in line with the main findings, which indicates a robust and valid result.

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1   Introduction

Mergers and acquisition (M&A) remain a popular means for firms to not only rely on its organic growth, but also expand into new markets and cross-sell its products in different customer base (Chartier et al., 2020). During the first six month of 2021, global mergers and acquisitions deals was valued at $2.6T exceeding the pre-pandemic five-year average of $1.6T from 2015 to 2019 (Guerzoni, 2021). From 2021 onwards, dealmakers tend to be more optimistic about the future economic prospects and they are ready to invest the huge amounts of private capital dry powder that have not been allocated due to pandemic. This is evident as global M&A at the end of 2021 continued to rise with more than 62,000 publicly disclosed deals breaking $5.1T in value for the very first time (PwC, 2022). Despite the Russia-Ukraine conflict that leads to high inflation and energy crisis, the market still believes that M&A will play a crucial role in driving corporate strategies. Global deals industry leader from PwC, Brian Levy stated that "successful dealmakers of tomorrow will be defined as those who boldly execute on their M&A goals today and overcome the current market challenges" (PwC, 2022). He argued that there might be opportunities for investors to generate healthy returns when business valuation come down due to the conflict situation. However, despite the popularity of M&A and its increasing frequency over the last decades, the strategy does not always result in successful deals.

According to Jandik & Makhija (2005), there were over 2000 acquisitions failed in the Security Data Company (SDC) Worldwide M&A Database during 1985-1995 period. Yet, this only captures a glimpse of history of abandoned deals. Since the subprime crisis in 2008, a significant amount of $192 billion deals value were cancelled by April 2015 (Liu, 2019). To give more perspective, a research by Bahreini et al. (2019) shows that in any given year about 10 percent of all mergers and acquisitions deals with are withdrawn before closing. This is quite a significant number considering that each year about 450 such deals are announced. Even after a long due diligence phase, where the buyer feels fully informed regarding the seller's operations and have the confidence to move forward with closing the deal, it does not guarantee the success of deal closing. This makes us wonder why do so many acquisitions ended up in deal failure when investors generally expect announced deals to close. this paper will analyze various factors to understand the motives behind this exit option. This angle is crucial as M&A literatures typically focused on the long-term value creation and synergies of completed deals (Healy et al., 1992; Loukianova et al.,2017; Pereiro,2018) or the short term market reaction

around the bid announcement (Kiymaz & Baker, 2008; Danbolt et al., 2015; Ahmed et al, 2020), yet it understudied the important factors that leads to the deal completion (Friedman et al, 2015 noticing this gap in the M&A studies).

The outcomes of this paper assist decision makers to identify potential deal-breakers early on because there might be two major drawbacks if they fail to do so. First, if firms already announced its M&A deal to the public and eventually got withdrawn, it may harm acquirer's reputation and cause negative returns on target's short-term stock performance. Previous studies that investigate the share price of target firms found that there is a positive return around M&A announcement and after deal completion, yet a negative return after deal cancellation (Jandik & Makhija 2005; Rani et al., 2015; Liu, 2019). Ruhanen (2021) reported a significant negative return on target's share price in the range of 3-5 per cent for varying windows around the cancellation dates. Hence, by analyzing various factors that might lead to potential deal breakers, this paper helps the target firms to minimize risk of losing its wealth if the deal is cancelled after the announcement.

Second, prior to closing an M&A deal, there is a due diligence process of verification and investigation to confirm the credibility of target firms' financial information and all facts that are raised during investment process. The decision-making process in M&A is dynamic since a deal could last for months or even years from the announcement date to the actual deal closing date. Moreover, it involves various stakeholders including accountants, investment bankers, legal advisors and other consulting personnel (CFI, 2022). There is a considerable amount of pre-acquisition costs that can be wasted if the decision makers fail to identify and mitigate the risk of deal cancellation early on such as legal, financing and advisory fees paid to investment banks. According to Wen (2021), legal fees are among the top costs in M&A as law firm usually charge more than $100,000 while accounting firm may charge up to $75,000 to advise an M&A transaction. Having those services is necessary for the acquirers because M&A is such a complex transaction that can go wrong anytime without proper guidance and the cost of having a poor or no guidance is far higher. Thus, by identifying various factors that might lead to deal failure and predict the probability of deal completion, this paper helps to identify the potential red flags and risks before jumping into a deal so that acquirers could avoid wasting time and money to go through pre-acquisition due diligence process.

Given the complexity of M&A due diligence process, identifying the potential deal breakers early on can be challenging, yet some researchers have attempted to identify various

factors that caused deal failure. In general, those factors can be classified into three different categories: deal characteristics, deal perception and firm characteristics. Deal characteristics factors consist of deal proportionality, deal payment method, deal originality and same industry deal. While deal perception factors include deal attitude and perceived price discount. Whereas for firm characteristics, it can be further break down into tangible resources such as firm size, firm profitability & acquirer market-to-book ratio and intangible assets such as CEO characteristics (Junni et al., 2015). One of the categories that are particularly interesting to be explored are those related to firm characteristics. Findings from past studies have identified various firm characteristics that influence the likelihood for firms to be involved in M&A activities (Gorton et al. , 2009; Caprio et al, 2011; Al-Sabri, 2020), yet there is a gap in the literature since no research has looked at the relation between firm characteristic and deal completion.

This paper will try to close the gap of the current literatures by assessing how firm characteristics that is exposed during due diligence process might have effects on the probability of closing the deal. Al-Sabri et al (2020) explored how firm characteristics measured by firm size, firm profitability and market-to-book ratio influence the likelihood for firms to engage in M&A deal. Following the same rationale, this paper will analyze those factors but from different angle of deal completion. My inspiration for doing this research topic came during my internship placement as a research assistant at one of the big consulting firms where I was assigned to look for facts and numbers of M&A deals in the European market. I was surprised to find out that there are more cancelled deals for bigger target size firms compared to the smaller ones after the public announcement. I was expecting the opposite as bigger target size firms typically generate higher profits thus it should be more lucrative to get acquired which lead to higher deal completion. To prove my doubt, I raise the main research question of this paper as:

"How do firm characteristics affect the likelihood of M&A deal completion?"

2 Literature Reviews

2.1 Deal Completion

In general, the whole process of Merger & Acquisition (M&A) can be divided into two main stages, which are the decision-making and integration phase. To understand how deals are closed, this paper will only focus in analyzing the decision-making phase. Boone et al. (2007) sub-divided the decision-making phases into three stages. The first stage is the private takeover process where the target firm hires an investment banker as intermediary to search for potential bidders. The contacted bidders are then required to sign confidentiality agreements that they will receive private information but they keep it to themselves. This private information is used by potential bidders to conduct a brief due diligence process and examine the cultural and organizational fit between the acquirer and target. Then, those bidders who signed the agreements are asked to submit preliminary indications of interest, where the bidders are asked to submit binding sealed offer. At the end, the selling firms could choose to either conduct a private takeover auction with multiple bidders or to negotiate with only one single bidder to determine the winner of the auction.

After the winning bidder has emerged from the private takeover auction, public announcement of the acquisition is held to let the public and shareholders know about the corporate growth strategy. Following the M&A announcement, the second stage of the decision making-phase called the public takeover or due diligence process finally begin (Boone et al., 2007). The due diligence process could last for months or even years from the announcement date to the actual date of closing the deal (CFI, 2022). During this phase, firms negotiate on more specific details of the deal such as legal and compliance (Wen, 2021); the credibility of the target's balance sheet and cash availability; long and short-term risks by picturing the worst-case scenarios and potential outcomes of the stock (Chen, 2022). Finally, the last stage of M&A deal is the resolution stage where the decision makers determine whether the deal is completed or abandoned (Boone et al., 2007).

From the acquirers' perspective, to abandon a deal after its public annoucement could damage its reputation and shareholders' trust. Pozner (2007) found that abandoned deals damages managers' reputation and leads to professional devaluation of individual elites that is responsible for that particular deal failure. Also, abandoning a deal incurs loss from direct procedural costs such as legal advisors, investment banker & auditors and indirect costs when revealing private valuable information to the other firm (Wen, 2021). Furthermore, there is also

a huge termination fees, which approximately costs the acquirer 3-4% of deal value. For instance, Daylight Trust had announced to offer $301 million to acquire Cadence Energy in 2008, but the deal got cancelled after other bidders had made competing offer during the private takeover stage. To compensate Cadence Energy's opportunity loss for other bidders' offer, Daylight Trust had to pay the termination fees of $9 million (Brug et al., 2018). Overall, deal withdrawal implies two potential loss of opportunities for not successfully closing a good deal or not abandoning a bad deal early on.

As mentioned in the introduction section, the majority of the existing M&A literatures focus on post-acquisition deal success or short-term gain around announcement date, but the actual deal process itself has been left unexplored. It is a pressing issue to find a way on how to save time, money and effort by predicting how likely for a deal to get withdrawn. Past literature have identified various factors that have influence on deal completion and it can be classified into three different groups: deal characteristics, deal perception and firm characteristics.

2.2   Deal Characteristics

Deal characteristics refer to the specific features and attributes of the M&A deal.

Deal proportionality is the ratio of deal size to the acquirer's market cap. According to Temi et al. (2018), deals with large proportionality ratios can be difficult to handle leading to higher cancelation risk. Larger deal size add more complexity to legal advisor, auditor and compliance officer as they have to be extra careful in weighing the risk factor with potential synergies. This implies that larger deal size requires more time to go through due diligence process and move from public takeover stage to the deal completion stage, which may leads to renegotiation or termination. Thompson et al. (2020) also argued that when deal completion is being delayed, there are potential synergies losses, which can inflate quickly until they could not be offset by the long-term value creation of M&A forcing the acquirers to withdraw the deal. Thus, we expect that lower deal proportionality leads to higher probability of deal completion.

Deal payment method is the payment method for the deal that is agreed upon during M&A transaction. There are different types of payment method for M&A deal such as cash, stock or the combination of both cash and stock. From the acquirer's perspective, the main benefit of paying the deal with stock is to preserves cash. It is especially beneficial for those

bidders with limited cash reserves on its balance sheet because paying with stock avoids the need to borrow cash to fund the deal. On the other hand, from the target's perspective, stock transaction also means they have to share the synergy risk of the combined firms (Rappaport & Sirower, 2014). For all cash deal, due diligence process is much easier and faster because seller just need to make sure the bidder has enough cash. While for stock deal, the payment process takes longer time as seller has to be sure that the stock value potential outweigh the synergy risk and bidder's business is sustainable in the long-term (Bhasin, 2022). Thus, we expect that using cash only payment leads to higher probability in closing the deal.

Deal Originality is where the target and acquirer company originated. For domestic acquisition, both the target and acquirer firms originate from the same country. While cross-border acquisition means that the target and acquirer company do not originate from the same country. Cross border M&A has shown a significant growth in the last two decades due to increase in globalization and industry consolidation (Wijnant, 2017). Even though the number of cross-border acquisition increases, it still faces great challenges for firms to adjust the difference in economic, regulatory and cultural structures (Erel et al.,2012). This implies that cross-border deal tends to be more complex than domestic ones as it is more costly and risky to execute, which decrease the probability of deal closing.

Same industry deal happens when the target and acquirer involved in the deal activity are operating in the same industry. It is also called horizontal merger with the aim to build economies of scale and decrease market competition. On the other hand, deal that involves target and acquirer in different industry is called conglomerate merger, which can help acquirer firms to increase market share and diversify its business operations. Conglomerate merger is more challenging than vertical merger as it needs to integrate dissimilar companies, raising the risk of culture clashes and efficiency lost due to disrupted business operations (Carlson, 2019). Thus, we expect that integrating firms within the same industry is easier and require less time during due diligence process, thus it leads to higher probability of deal completion compared to conglomerate merger.

2.3 Deal Perception

Deal perception refers to the perception and attitude of the target firm towards the bid offer.

Deal Attitude refers to the acquirer and target firm's reaction towards M&A deal activity. For friendly takeover, it occurs when acquirer and target firm's board of director get to the

agreement to proceed with the transaction. On the contrary, hostile takeover occurs when acquirer attempts to take over target firm without the agreement of the target firm's board of directors (Schnitzer,1996). This happens when the directors of the acquirer and target do not reach an agreement to proceed with the deal but the acquirer insist and offer a tender offer to the target firm's shareholders. As a result, enough shares could be purchased by the acquirer and they can approve the acquisition by appointing its own directors to run the target firm. To overcome this, target's board of director could use anti-takeover defenses such as using debt financing to compete with the hostile acquirer bid or filling up lawsuit, which makes hostile takeover less likely to close (Biryuk, 2022).

Perceived price discount refers to target shareholder's perception towards the bid price. Temi et al. (2018) argued that if the stock price is below the 52-week highs then target's shareholders believe that the firm is worth more than the bid price and their valuation should be higher, which decrease the likelihood of deal completion.

2.4   Firm Characteristics

Firm characteristics refers to the pre-acquisition features of the firm that can influence deal completion. It can be further break down into intangible assets such as CEO characteristics & CEO social ties and tangible resources such as firm size, firm profitability & acquirer market-to-book ratio.

2.4.1   Firm Intangible Assets

CEO characteristics refers to the Chief Executive Officer's traits that influence the choices of corporate strategy. According to the theory of upper echelon (Hambrick & Mason, 1984), personality traits, experiences and demographics of top key management player such as CEO have a great impact on big corporate decisions such as M&A deal. Following the same rationale, we expect CEO characteristics to be one of the firm's intangible assets that affect the probability of deal completion. For instance, younger CEOs are typically more risk-seeking with larger-scale of strategic choices and they more likely to engage in M&A activities (Yim, 2013) thus leads to higher probability of deal completion. From CEO's personality perspective, Malmendier et al. (2008) observed the overconfidence behavior of the CEOs and found that they do fewer acquisitions activities while at the same time tend to engage in lower quality deals. This means CEOs overconfidence leads to lower probability of deal completion. Furthermore, Malhotra et al. (2015) found that extraverted CEOs are more likely to engage in

acquisitions because they are able to influence the behaviors and emotions of others and through their social dispositions create positive social environment around them. Following the rationale, we expect that extraverted CEOs lead to higher deal completion.

CEO social ties refers to the relationship between the bidder and target board of directors. Within the M&A process, the negotiation phase relies heavily on human factors especially mutual trust to complete the deal. Findings from Dyer et.al (2003) concluded that trust could be used to reduce transaction costs as it prevents firms to gather excessive information about their business counterparts. One of the most effective ways to build trust is through CEO social ties. Most often, the board of directors involved in the M&A deals are interconnected in some ways. For instance, they could have shared the same interest such as exclusive members of golf club or simply used to study or work together. If the directors and CEOs of the acquirer and target firms have mutual similarities, it will then increase the trust level (Fracassi & Tate, 2012). From M&A perspective, having social ties makes it easier for the board of directors to obtain valuable information related to firm's pre-acquisition experiences. This would reduce the searching costs during due diligence process and give an advantage for the bidder to execute effective valuation for the target firm, thus increased the likelihood of deal completion.

2.4.2 Firm Tangible Assets

This paper contributes to academic literatures as it shows that among other deal specific characteristics, pre-acquisition firm's characteristics measured by financial ratios can also predict the success of deal completion. From past academic literatures, pre-acquisition financial ratio analysis have been proven effective in predicting the future stock returns (Kogan & Papanikolaou, 2013), credit risk (Bonfim, 2009) and junk-bond default (Hakim et al., 1995). Following the same rationale, we expect firm characteristics to predict the probability of deal withdrawal. The financial ratios used to measure firm characteristics in this paper is based on the arguments from Al-Sabri et al (2020) paper, which divided the firms tangible characteristics into three different types: firm size, firm profitability and acquirer market to book ratio.

Firm size is one of the firm characteristics whose impact on the likelihood to engage in M&A activity and deal success have been well-studied. Stulz al. (2004) obtained a sample of 12,023 acquisitions from 1980 to 2001 recorded by Securities Data Corporation and found a negative relationship between the size of acquirers and M&A returns around acquisition announcements. Stulz argued that bigger acquirers experience lower returns of 2.24 percentage

point than the small ones because they enter acquisitions with negative dollar synergy gains and offers higher acquisition premium. On the other hand, other source like Faccio & Masulis (2005) came to the conclusion that larger acquirers are more diversified in terms of risk and can exploit better economics of scale to decrease operational cost than smaller ones. Thus, bigger acquirers are more likely to engage in M&A activity. Despite mixed findings by past literatures, this paper expects similar finding to Al-Sabri et al. (2020) that there is positive impact of the acquirer firm size on the likelihood to engage in M&A activity, but from different angle of deal completion. Thus, the first hypothesis will be:

Hypothesis 1: Bigger acquirer firm size leads to higher probability of deal completion

From the perspective of target firm size, other authors like Homberg et al. (2008) found that there are more successful acquisitions and higher probability of realized planned synergies when the size of the target firm is small. Moreover, Beitel et al (2004) found that smaller target firms have lower due diligence costs and simpler process of calculating potential synergies than bigger target firms. Thus, we expect smaller target firms to have positive relationship with the probability of closing the deal and the second hypothesis will be:

Hypothesis 2: Smaller target firm size leads to higher probability of deal completion

Firm profitability is another essential factor of firm characteristic that has huge impact on M&A decision. Past literatures found that firms with higher profits are more likely to engage in M&A activities. In general, firms with larger profit is associated with having higher liquidity ratio as they have more retained earnings or cash left to be involved in M&A deal and acquire other firms. Myers (1984) pointed out that firms prefer to use internal finance such as cash or retained earnings over external finance such as bank loans, debt and equity to pay for its business operations and execute growth strategy such as M&A. This is especially true for those acquirer firms that are financially constrained as having extra cash allows them to invest without having to raise new equity or debt. Weisbach et al. (2019) used a sample of 47,615 acquisitions between 1997 to 2014 from 36 different countries and found that more profitable acquirer firms increase the likelihood for firms to engage in M&A activity. Following the same rationale, we expect that more profitable acquirer firms to increase the probability of deal completion, thus the third hypothesis will be:

Hypothesis 3: More profitable acquirer firm leads to higher probability of deal completion

Similarly, from the perspective of target firm profitability, Garzella (2014) argued that target firm with high profitability is considered to be more attractive for the acquirers to gain accounting returns and capture high synergy potential of profitable target firm during the integration process of M&A deal. Thus, we expect that more profitable target firms increase the likelihood of deal completion and the fourth hypothesis will be:

Hypothesis 4: More profitable target firm leads to higher probability of deal completion

Acquirer market to book ratio is also another factor of firm characteristics that has huge influence for firms to engage in M&A deal. It refers to the financial valuation metric used to evaluate firm's current market value relative to its book value. According to Donnelly (2014), market to book ratio is an important tool or benchmark to know the market's perception regarding the firm's stock value. Firms with high average market-to-book ratio derive most of their value from growth opportunities thus it is perceived as overvalued by investors. Overvaluation can be beneficial for acquirer firms that use stock as payment option to acquire target firm and reduce takeover costs (Shleifer et al., 2003). On the other hands, acquirer firms with a low market-to-book ratio is perceived as undervalued and they are less interested to participate in the takeover activities. Overall, past studies argued that acquirer market-to-book ratio has positive impact on M&A likelihood and we expect the same thing in regards to deal completion thus our fifth hypothesis will be:

Hypothesis 5: Higher acquirer market-to-book ratio leads to higher probability of deal completion

3   Methodology

3.1   Sample Selection

To prove the hypothesis, this paper takes into account a large number of deals. Zephyr database, which is designed to analyze event studies and deals like Mergers and Acquisitions (M&A) is used to obtain a reliable data sample. Table 1 below includes all the search filters for constructing M&A deal sample.

Table 1: Search Filters

Category	Search filter
Time period	01/01/2005 to 31/12/2021
Acquirer Region	North America, Western Europe
Target Region	North America, Western Europe
Deal Status	Completed, Withdrawn
Deal Type	Acquisition, Merger
Deal Value	15 million EUR
Percentage of Acquired Stake	Min 50% max 100%

First, the time period of the last 17 years is selected in order to have sufficient data with past and recent M&A deals activities. Second, this paper will focus on analyzing the deals in the developed countries thus North America and Western Europe region are selected for both acquirer and target firms. Third, to analyze deal completion, we are only interested in completed and withdrawn deals. Fourth, there are several deal types but this paper analyzes acquisition and merger only. Fifth, deal value larger than $15m is selected to exclude insignificant small deals that may populate the sample. Lastly, since this paper only focus on the majority acquisitions, the acquired deal stake must be in the range from 50% to 100%.

3.2   Dependent Variable

Probit regression model is used in this paper to model a binary dependent variable, which can only take on two values at each observation. Following the methodology from Tanna et al.(2020), it takes value of 1 when the deal is completed and 0 if the deal is withdrawn as shown in equation (1). To obtain the data, Zephyr database is used to select 'deal status', which shows the current status of the deal whether it is completed or withdrawn.

$$Zi = \int_{0\;for\;withdrawn\;deal}^{1\;for\;completed\;deal} \qquad (1)$$

3.3 Independent Variables

Following Al-Sabri et al (2020) paper, there will be three main independent variables that will be constructed based on firm tangible characteristics: firm size, firm profitability and acquirer market to book ratio. Dang and Li (2015) conducted a survey from 100 research papers and concluded that the most popular proxies for firm size in corporate finance are based on three measurements; total assets, total sales and market value of equity. For this paper, total assets is used to measure acquirer and target firm size. To obtain the data, Zephyr database is used to select both acquirer and target total assets from the last available year before the takeover announcement date.

For firm profitability, past literatures consider earnings before interest, taxes, depreciation and amortization (EBITDA) to analyze and compare profitability among companies and industries. In this paper, EBITDA is used to calculate acquirer and target firm profitability because it is the most accurate method to analyze various M&A deal sample from different industries across countries. By removing taxes and interest payment, EBITDA exclude non-operating factors, which the firm does not have control (Deva, 2021). To obtain the data, Zephyr database is used to select both acquirer and target firm EBITDA from the last available year before the deal announcement date.

Lastly for acquirer market-to-book ratio, it measured by acquirer market capitalization divided by acquirer total book value. Total book value is the net value of firm's asset found on its balance sheet (Seth, 2021). To obtain the data, Zephyr database is used to select acquirer market capitalization and acquirer net asset from the last available year before the deal announcement date, then we manually divide acquirer market cap with net asset.

3.4 Control Variables

To prevent omitted variable bias (OVB), this paper constructs a control variable using various potential factors that might affect deal completion as discussed in the literature review section. Those relevant factors are selected based on data availability in Zephyr database and the following factors are chosen: deal proportionality, deal payment method, cross-border/domestic deal, same industry deal and deal attitude. Table 2 shows how to construct the control variables.

3.5 Variables Description

Table 2: Variables Descriptions

Category	Type	Form	Measurement
Deal Completion	Dependent	Dummy	=1 M&A deal is completed =0 M&A deal is withdrawn
Acquirer size_assets	Independent	Continuous	pre-deal acquirer total assets from the last available year before the takeover announcement date
Target size_assets	Independent	Continuous	pre-deal target total assets from the last available year before the takeover announcement date
Acquirer profitability_EBITDA	Independent	Continuous	pre-deal acquirer EBITDA from the last available year before the takeover announcement date
Target profitability_EBITDA	Independent	Continuous	pre-deal target EBITDA from the last available year before the takeover announcement date
Acquirer Market-To-Book	Independent	Continuous	Acquirer Market cap divided by net asset
Deal Proportionality	Control	Continuous	Ratio of deal value to acquirer size market capitalization at announcement date
Payment method	Control	Dummy	=1 Cash only financing =0 Otherwise
Deal Originality	Control	Dummy	=1 domestic deal (acquirer and target firms operate in the same country) =0 cross-border deal (acquirer and target firms operate in different country)
Same Industry	Control	Dummy	=1 same industry deal (acquirer and target firms operate in the same industry) =0 cross-industry deal (acquirer and target firms operate in different industry)
Deal Attitude	Control	Dummy	=1 friendly deal =0 hostile deal

3.6 Research Method

To test the impact of the independent variables on binary variables such as deal completion, either a probit or logistic model is used. Even though the results of probit and logit models are similar, it is more common for economics journal to use probit model as it takes into account non-constant error variances (Jeremy, 2019). Thus, this paper will use probit model as a more accurate model in examining deal completion. In the equation (2), Y is the dependent variable, which represent the probability of deal completion and Z is the linear regression. The coefficients (β_b) represents the firm characteristics as independent variables, while coefficient (β_c, β_d) indicates deal characteristics and deal perception respectively as control variables.

$$\Pr(Y = 1|(x)|) = Z = \alpha + \beta_b \, FirmC_x + \beta_c \, DealC_x + \beta_d \, DealP_x + \varepsilon_x \quad (2)$$

4 Results

4.1 Descriptive Statistics

Appendix 1 reports the descriptive statistics for variables used in this paper from the year 2005 to 2021. The dependent variable deal completion has a mean of 91%, which indicates the number of completed deals. This means there is only 9% deals that were withdrawn in the population sample recorded in the Zephyr database. This finding is in line with a research by Bahreini et al. (2019) that shows that in any given year about 10% of all mergers and acquisitions deals are withdrawn before closing. Figure 1 shows the deal completion throughout the years with a total of 24,108 deals completed and 2,183 deals cancelled. The number of completed deals from 2005 until 2007 were relatively high compared to the rest of the year. This is due to the economic expansion that began from 2001 until 2007 in the developed countries which caused massive increase in corporate profits (Kogan et al., 2008). As a result, the number of M&A deals increased significantly as more firms had the ability to finance the deals to expand their business operations.

Figure 1: Number of deal completed vs withdrawn (2005-2021)
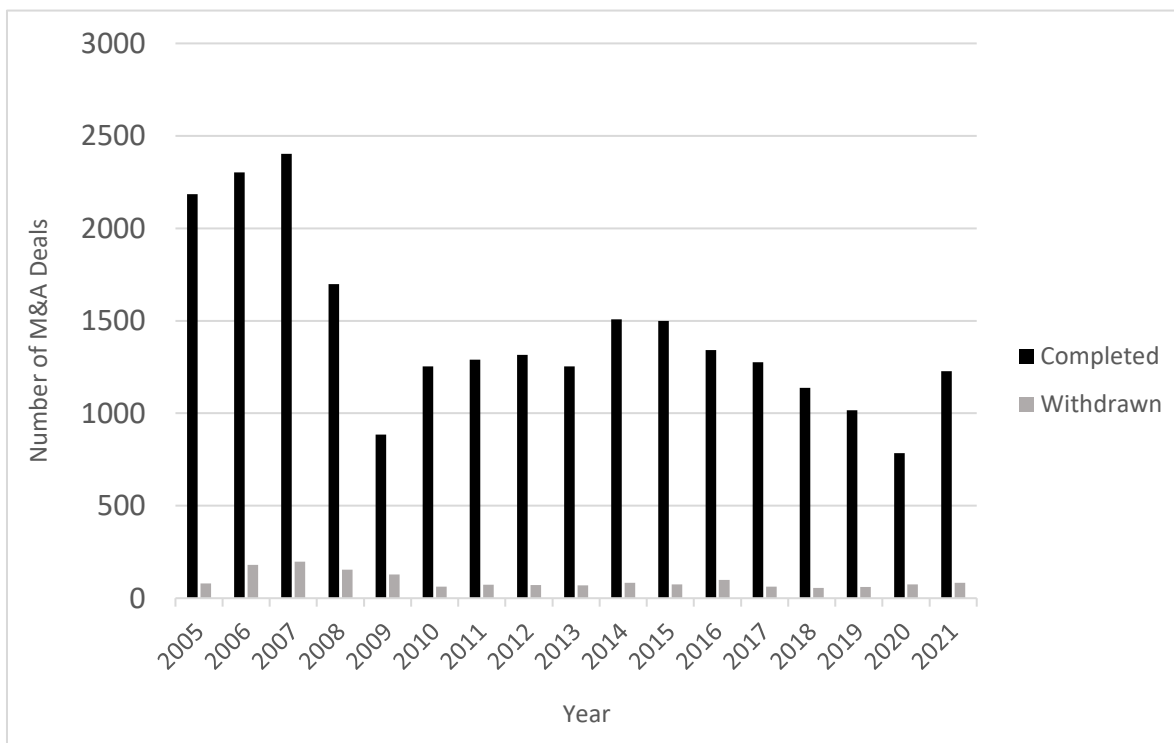
On the other hand, the deals completed also decreased significantly from 2008 to the lowest point in 2009. This can be explain given the US economic crisis in the fourth quarter of 2008, which caused lower corporate earnings and limited access to funds in financing M&A deals (Capaldo et al., 2009). After 2009, when the economy was recovering slowly, there was an increased in the number of deal completion but less than the period of 2005 to 2007. We could observe the declining rate from 2015 until 2020, when the completed deals reached the all-time low due to covid-19 pandemic but then it rebounced back in 2021 after the economy recovers. This findings shows that it is important to use the year fixed effects in the analysis to control for potential bias towards the fluctuations in completed deals across the year due to the macroeconomic situation. In the regression analysis table 5 from the result section, the year fixed effect will drop the year 2005 to act as a reference category.

4.2   Outlier Treatments

From Appendix 1, there are extreme outlier values for all continuous variables indicated by high value for the skewness and kurtosis. According to Hair et al (2010), data is acceptable as normal univariate distribution when skewness range is between -2 to +2 and kurtoses range is between -7 to +7. One of the method to remove outlier is by using winsorization method, which is a way to transform the outlier values with the value of the highest data point that is not considered as outlier (Wicklin, 2017). It aims to modify data to limit the effect of outliers by not removing any observations, which is an effective method to improve statistical efficiency and increase the robustness of the model. In this paper, the top and bottom 5% of the data points is modified for all the continuous variables that have extreme skewness and kurtosis values: acquirer total assets, target total assets, acquirer EBITDA, target EBITDA, acquirer market-to-book and deal proportionality. Yet, even after winsorization treatment, some variables such as total assets, target total assets, acquirer EBITDA and target EBITDA still have high skewness and kurtosis values. Thus, to normalize the data, logarithmic transformation is used instead to remove the outliers from those variables. Finally, after winsorization treatment for acquirer market-to-book ratio & deal proportionality and logarithmic treatments for total assets, target total assets, acquirer EBITDA & target EBITDA, the new skewness and kurtosis values for all the continuous variables are within the acceptable range as shown in the table 3 below.

Table 3: Descriptive Statistics (modified)

Variables	Mean	Std Dev	Median	Min	Max	Skewness	Kurtosis
DealCompletion	0.91	0.24	1.00	0.00	1.00	-3.62	6.13
Log_Acqsize_assets	12.99	2.13	13.00	-1.40	18.92	-0.66	5.77
Log_Tarsize_assets	11.71	1.86	11.63	2.71	17.50	0.02	3.48
Log_Acqprofit_EBITDA	11.43	2.34	11.51	-4.61	18.14	-0.45	4.27
Log_Tarprofit_EBITDA	9.41	2.23	9.25	-3.15	16.23	-0.04	3.66
AcqMarketToBook_winsor	3.20	2.58	2.40	0.52	10.7	1.57	4.91
DealProp_winsor	0.28	0.43	0.09	0.004	1.64	2.11	5.57
PaymentMethod	0.43	0.50	0.00	0.00	1.00	0.26	1.07
DealOriginality	0.81	0.39	1.00	0.00	1.00	-1.60	3.55
SameIndustry	0.68	0.49	1.00	0.00	1.00	-0.45	1.20
DealAttitude	0.92	0.59	1.00	0.00	1.00	-1.81	3.41

In Appendix 2, after the outlier treatments, the descriptive statistics is split further by completed vs withdrawn deals. There is some insights that can be derived from this split deal statistics. First, Deal attitude is a binary variable, which takes a value of 1 when there is friendly deal and 0 when there is hostile deal. The mean of deal attitude under completed deal is 1.00, meaning that all completed deals in the sample are categorized as friendly deal. Due to this perfect predictability, deal attitude has not enough variation to calculate the probability of deal completion and it must be omitted from the probit model. Second, deals originated within the same country are 81% in completed deals but only 59% in withdrawn deals, which could give us preliminary prediction that deals within the same country have higher probability to be completed. Similarly, deals within the same industry are 68% in completed deals higher than 55% in withdrawn deals, which leads to the expectation that it should leads to higher probability of deal completion.

4.3 Multicollinearity Checks

Multicollinearity is a phenomenon in the regression analysis when two or more predictors are highly correlated with each other causing a perfect linear relationship. The main concern is that as the degree of multicollinearity increases, the standard error will be highly inflated and the coefficient estimate become unstable (Daoud, 2017). As a result, some variables become statistically insignificant when they should be significant and estimated coefficients might change randomly when a small change in the correlated variables occurs, reducing the overall quality of the regression model.

First, Variance Inflation Factors (VIF) is computed to check for multicollinearity in the probit regression model. VIF measures the ratio of the overall multivariate model variance to the model that only includes a single variable (Frost, 2020). To interpret VIF, a value greater than 5 indicates a strong correlation with other variables. From Appendix 3, we can observe that acquirer and target total assets have values greater than 5, which indicates a strong correlation with other variables in the model.

Second, correlation matrix is computed to identify which variables are correlated with each other. The range of correlation is measured from 0.1 to 1.0 scale and a strong correlation starts from 0.5 to 1.0 scale (Rekha, 2019). From table 4, we can observe that most of the variables do not have multicollinearity problem except for two set of variables: 90% strong positive correlation between acquirer EBITDA and its total assets and 56% strong positive correlation between target EBITDA and its total assets. There is a strong correlation between firm size and profitability because more profitable firm corresponds to the increase in retain earnings in terms of cash, accounts receivable or inventory, which is part of firm's total asset. Alternatively, profitable firms may also purchase other long-term assets such as machinery to expand their business operations, which leads to the increase in firm's total assets. To avoid multicollinearity problem, firm size measured by total asset and firm profitability measured by EBITDA will be computed in two different probit regression models to prove the hypothesis.

Table 4: Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) DealCompletion	1.00									
(2) Log_Acqsize_assets	0.03	1.00								
(3) Log_Tarsize_assets	-0.06	0.25	1.00							
(4) Log_Acqprofit_EBITDA	0.03	**0.90**	0.23	1.00						
(5) Log_Tarprofit_EBITDA	-0.08	0.38	**0.56**	0.37	1.00					
(6) AcqMarketToBook	0.06	-0.01	-0.03	0.14	-0.04	1.00				
(7) DealProp	-0.14	-0.30	0.12	-0.29	0.20	-0.20	1.00			
(8) PaymentMethod	0.05	0.15	-0.06	0.16	-0.13	0.09	-0.32	1.00		
(9) DealOriginality	0.09	0.04	0.01	0.05	0.05	0.02	0.07	-0.02	1.00	
(10) SameIndustry	0.02	-0.06	0.02	-0.08	0.04	-0.04	0.09	-0.06	0.04	1.00

4.4 Probit Models

To test the hypothesis, sample of 26,291 M&A deals from Zephyr database is transformed into probit models. As mentioned, firm size measured by total asset and firm profitability will be computed in two different regression models to avoid the multicollinearity problem. Moreover, for robustness check, three different type of models are constructed: Independent variables only; Independent & control variables; independent, control & fixed effects. Hence, there are in total six regression models as shown in Table 5 below.

Table 5: Probit Regressions

Deal Completion	(1)	(2)	(3)	(4)	(5)	(6)
Log_Acqsize_assets	0.199*	0.034	0.039			
	(0.105)	(0.111)	(0.112)			
Log_Tarsize_assets	-1.501***	-0.882*	-0.970*			
	(0.523)	(0.533)	(0.567)			
Log_Acqprofit_EBITDA				0.201	-0.074	-0.065
				(0.163)	(0.158)	(0.159)
Log_Tarprofit_EBITDA				-0.878***	-0.482*	-0.458*
				(0.244)	(0.250)	(0.259)
AcqMarketToBook_winsor	0.042**	0.028*	0.031*	0.031**	0.018*	0.019*
	(0.019)	(0.020)	(0.019)	(0.019)	(0.019)	(0.018)
DealProp_winsor		-0.316***	-0.343***		-0.443***	-0.480***
		(0.097)	(0.101)		(0.091)	(0.095)
PaymentMethod		0.026	0.014		0.005	0.006
		(0.096)	(0.098)		(0.089)	(0.091)
DealOriginality		0.429***	0.432***		0.358***	0.366***
		(0.128)	(0.131)		(0.109)	(0.110)
SameIndustry		-0.034	-0.116		-0.052	-0.109
		(0.098)	(0.098)		(0.092)	(0.091)
Constant	23.073***	17.131*	16.362*	10.883***	9.554***	8.960***
	(8.283)	(8.348)	(8.914)	(2.158)	(3.249)	(3.404)
Time Fixed Effects	No	No	Yes	No	No	Yes
Pseudo R^2	0.014	0.094	0.164	0.016	0.097	0.183
Chi^2 probability	0.000	0.000	0.000	0.000	0.000	0.000

Notes: This table shows probit regression for six different models (1), (2), (3), (4), (5), (6) with deal completion as dependent variable. The parenthesis shows the standard error and the star indicates significance relevance of the coefficient based on the p-value of each two-sided t-test (*p<0.10, **p<0.05, ***p<0.01)

To evaluate the overall model fit, Chi-square goodness of fit test determine whether the model with explanatory variables have higher fit than the null with no predictors (Turney,2022). In Table 5, we could observe that all the six models have a low Chi-square probability of 0.000 at 1% significance level, which indicates that the null hypothesis is rejected meaning that all probit models in table 5 improve the overall fit. Also, another method to assess the model fit is by looking at Pseudo R^2 value. Higher pseudo R-squared indicates a better model in predicting the deal completion. From Table 5, we could observe pseudo R^2 increase from 0.014 in model 1 to 0.164 in model (3) and from 0.016 in model 4 to 0.183 in model (6) once the control variable and fixed effects are included. This means model (3) and (6) are the best predictive power hence a good model fit.

Table 6: Marginal Effects of the Probit Regressions (Table 5)

Deal Completion	(1) dy/dx	(2) dy/dx	(3) dy/dx	(4) dy/dx	(5) dy/dx	(6) dy/dx
Log_Acqsize_assets	0.046*	0.008	0.008			
	(0.024)	(0.025)	(0.025)			
Log_Tarsize_assets	-0.344***	-0.199*	-0.212*			
	(0.120)	(0.120)	(0.124)			
Log_Acqprofit_EBITDA				0.041	-0.015	-0.013
				(0.033)	(0.031)	(0.031)
Log_Tarprofit_EBITDA				-0.177***	-0.095*	-0.088*
				(0.050)	(0.049)	(0.050)
AcqMarketToBook_winsor	0.010**	0.006*	0.007*	0.006**	0.003*	0.004*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
DealProp_winsor		-0.071***	-0.075***		-0.081***	-0.083***
		(0.022)	(0.022)		(0.018)	(0.018)
PaymentMethod		0.006	0.003		0.001	0.001
		(0.022)	(0.021)		(0.018)	(0.018)
DealOriginality		0.114***	0.118***		0.093***	0.098***
		(0.039)	(0.028)		(0.024)	(0.021)
SameIndustry		-0.009	-0.025		-0.010	-0.021
		(0.002)	(0.021)		(0.018)	(0.018)
Year fixed effects	No	No	Yes	No	No	Yes

Notes: This table shows the marginal effect (dy/dx) of six different probit models in table 5. The parenthesis shows the standard error and the star indicates significance relevance of the marginal effect based on the p-value of each two-sided t-test (*p<0.10, **p<0.05, ***p<0.01)

To understand and interpret the coefficient of the probit model in the probability scale, we need to use the marginal effects following the method from Attah-Boakye et al. (2020) academic paper. Marginal effects show the change in probability in terms of percentage point (pp) when the predictor variable increases by one unit. In Table 6, the marginal effects of each variables in the probit models from (1) to (6) are computed.

Regarding the independent variables, we could observe from Table 6 that most of the marginal effects are significant except Acquirer EBITDA. First, acquirer size measured by total assets is significant at 10% significance level under model (1). To interpret the marginal effects of the log-transformed total asset, it has to be transformed back into the original form. Thus, positive marginal effect of 0.046 indicates that on average, a 10% increase in acquirer total assets results in an increase in probability of deal completion by 0.19 percentage points ($0.046*\log(1+10\%)*100 = 0.19$). This finding is in line with the first hypothesis that bigger acquirer firm size leads to higher probability of deal completion. However, under model (2) and (3), acquirer total assets lost its significance once the control variable and year fixed effects are included. This indicates that omitted variable bias (OVB) is present in model (1), where acquirer total assets is just a proxy of other explanatory variables that are not included in the model. Thus, the first hypothesis is rejected under model (1) due to OVB as well as under model (2) and (3) due to insignificance relevance of total assets. To conclude, the effect of total assets on deal completion is still inconclusive in line with the mixed results of the impact of firm size on deal success as discussed in the literature review.

Second, target size measured by total assets is significant at 1% significance level under model (1) and at 10% significance level under model (2) and (3). Depending on the model, target total asset has negative marginal effect ranging from -0.199 to -0.344 pp. Model (3) is chosen to be analyzed in this paper as it has the highest predictive power with pseudo-R^2 of 0.164. Again, since the variable target total asset is log-transformed, it has to be computed back to original term. Thus, a negative marginal effect of -0.212 under model (3) indicates that on average, a 10% increase in target total assets results in a decrease in probability of deal completion by 0.88 pp ($0.212*\log(1+10\%)*100 = 0.88$). This finding is in line with the second hypothesis that smaller target firm leads to higher probability of deal completion, thus we accept the second hypothesis. As mentioned in the literature reviews, Beitel et al (2004) found that smaller target firm has lower due diligence costs and simpler process of calculating potential synergies than bigger target firms. For instance, when the target firm is smaller, it is faster and cheaper to go through due diligence phase as legal advisors have to check fewer

legality documents and follow less complex compliance procedures. Moreover, it is also cheaper to pay auditor fees when verifying smaller target firm with fewer cash, inventory and intangible assets than bigger one. To conclude, less complex and cheaper M&A due diligence process of smaller target firm leads to higher probability of deal completion.

Third, acquirer profitability measured by EBITDA shows no significance influence on the deal completion. Moreover, there is no economic relevance since there is no pattern that can be observed when the signs of the marginal effects change ranging from 0.041 to -0.013. Thus, hypothesis 3 is rejected. Fourth, target profitability measured by EBITDA is significant at 1% significance level under model (4) and at 10% significance level under model (5) and (6). Depending on the model, target EBITDA has negative marginal effect ranging from -0.088 to -0.177 pp. This paper chose to analyze model (6) as it has the highest predictive power with pseudo-R^2 of 0.183. Since the variable target EBITDA is log-transformed, it has to be computed back to original term. Thus, a negative marginal effect of -0.088 under model (6) denotes that on average, a 10% increase in target EBITDA results in a decrease in probability of deal completion by 0.36 pp (0.088*log(1+10%) *100= 0.36). This finding contradicts the past literature reviews and fourth hypothesis that more profitable firm leads to higher probability of deal completion, thus we reject the fourth hypothesis. One possible explanation is that there are different motives for acquisition and one of them is for the acquirer to takeover firms with low or negative profit as those firms are usually associated with lower bid price. The acquirers usually have unique information about the possible synergies that could transform the unprofitable firm into a successful business line, while at the same time enjoying the cheaper bid price. According to Lim and Lee (2016), this type of acquisition motives that focus on the long term strategic synergies is more likely to succeed rather than financial motives that focus on acquiring profitable firms to capture short-term profit growth. The huge number of long-term strategic takeover motives in acquiring cheap and unprofitable firms might explain why in our probit model we found that less profitable firm leads to higher probability of deal completion.

Lastly, Acquirer market-to-book ratio is significant at 5% significance level under model (1) & (4) and at 10% significance level under model (2), (3), (5) & (6). Depending on the model, Acquirer market-to-book has positive marginal effect ranging from 0.010 to 0.004 pp. A positive marginal effect of indicates that on average, a 1 unit increase in Acquirer market-to-book ratio results in an increase of 0.010- 0.004 pp on the probability of deal completion. This finding supports hypothesis 5 that the higher acquirer market-to-book ratio leads to higher

probability of deal completion, thus we accept the hypothesis 5. As discussed in the literature review, Shleifer et al. (2003) argued that firms with high average market-to-book ratio are most likely to be involved in the acquisition activity and use stock as their payment option to leverage their overvaluation advantage in acquiring undervalued or cheap stock. On the contrary, firms with low average market-to-book ratio are perceived as undervalued and they are less likely to be involved in takeover activities. Following the same rationale, the probit model proves that acquirer firms with higher market-to-book ratio are more interested in the takeover activities and fight their way to complete the deal, which increase the probability of deal completion.

Regarding the control variables, we could observe from Table 6 that only deal proportionality and deal originality have significance relevance. First, Deal proportionality has significant effect at 1% significance level in all models and has a negative marginal effect ranging from -0.071 to -0.083 depending on the model. Since it is a continuous variable, it can be interpreted that on average, 1 unit increase in deal proportionality results in an decrease of -0.071 to -0.083 pp on the probability of deal completion. This finding is in line with Temi et al. (2018) that found deals with large proportionality ratios is more difficult to handle, which leads to higher deal cancellation risk. For large deal, acquirer expects those who are involved in due diligence process like legal firms and auditor to put extra efforts in calculating the risk factor and potential synergies, thus require more time and higher services fees. As a result, better deals and potential synergy loss during the delay might outperformed the benefits of post M&A performance, forcing the acquirers to withdraw the deal (Thompson et al., 2020).

Second, similar to deal proportionality, deal originality also has significant effect at 1% significance level in all models, but instead has positive marginal effect ranging from 0.114 to 0.093 depending on the model being analyzed. Deal originality is a dummy variable where it takes a value of 1 for domestic deal and 0 for cross-border deal. Depending on the model, a positive marginal effect indicates that the probability of deal completion increases by 0.114 to 0.093 pp, when the deal is domestic compared to cross-border deal. This finding is in line with the expectation of the past literatures discussed in the literature review. In general, there is an increasing trend for cross-border deal for firms to gain access to new market and customer base, yet firms also tend to face higher regulation barrier and huge cultural clashes, which makes cross-border deals to be more complex to execute. Thus, domestic deal have higher probability to be completed than cross-border deal.

Third, payment method has no significant effect on deal completion, yet we can still derive economic relevance by observing the signs pattern of the marginal effects ranging from 0.006 to 0.001. A positive marginal effect pattern suggests that there is a positive relationship between cash only payment method with deal completion as expected from the literature reviews. It is argued that for all-cash deal, the due diligence process is much easier and faster because it involves a direct payment. On the contrary, for stock deal, it takes longer time for the target firm to weigh the benefits of stock potential increase in value and its downside risk. However, since the effect is not significant there is no further conclusion can be drawn.

Lastly, similar to payment method, same industry has no significant effect on deal completion but we can still derive economic relevance by looking at the signs pattern of the marginal effects ranging from -0.009 to -0.025. A negative marginal effect pattern denotes that there is a negative relationship between deals that occur within the same industry and deal completion. This finding is in line with the literature reviews that the integration process of firms within the same industry is easier and require less time during due diligence process, thus increase the probability of deal closing. However, again due to the insignificance effects of same industry variable, we could not derive with further conclusion.

Regarding the constant, it is significant in all the probit models. This means there are other explanatory variables that are not included in the models and might influence the probability of deal completion. Given the complexity of M&A deals, it is expected that the models in this paper could not account for all the factors explored by past literatures that might affect the probability of the deal completion.

4.5 Robustness Checks

In this section, additional analysis will be computed to examine the robustness of the results by defining a new measurement for firm size and profitability. As mentioned before, the most popular proxies for firm size in corporate finance according to the survey of 100 research papers by Dang and Li (2015) are based on three measurements; total asset, total sales and market value of equity. As such, using Zephyr database, the available data for acquirer and target total sales from the last available year before the takeover announcement date is extracted to be the new proxy for firm size. Moreover, for firm's profitability, we also going to use different measurement than EBITDA. According to McGrady (2005), during the due diligence process, decision makers tend to use the bottom line of accounting figures such as net profit to figure out target firm's profitability after income taxes and interest payments. Following the

same rationale, acquirer and target net income from the last available year before the takeover announcement date is extracted from Zephyr database to be the new proxy for firm profitability. Following the methodology of the previous result section, six probit regression models is constructed in <u>Appendix 4</u> along with its marginal effects in <u>Table 7</u>.

Table 7: Marginal Effects of the Probit Regressions (Appendix 4)

Deal Completion	(7) dy/dx	(8) dy/dx	(9) dy/dx	(10) dy/dx	(11) dy/dx	(12) dy/dx
Log_Acqsize_sales	0.010**	0.001	0.001			
	(0.004)	(0.005)	(0.005)			
Log_Tarsize_sales	-0.102***	-0.070***	-0.068***			
	(0.015)	(0.016)	(0.016)			
Log_Acqprofit_netprofit				0.069	-0.081	-0.070
				(0.126)	(0.118)	(0.122)
Log_Tarprofit_netprofit				-0.009	-0.008	-0.009
				(0.012)	(0.011)	(0.011)
AcqMarketToBook_winsor	0.008***	0.005**	0.005**	0.010**	0.007*	0.007*
	(0.003)	(0.002)	(0.002)	(0.005)	(0.004)	(0.004)
DealProp_winsor		-0.063***	-0.068***		-0.082***	-0.085***
		(0.013)	(0.013)		(0.021)	(0.021)
PaymentMethod		0.002	0.003		0.009	0.006
		(0.012)	(0.013)		(0.021)	(0.021)
DealOriginality		0.045**	0.118***		0.115***	0.094***
		(0.020)	(0.028)		(0.039)	(0.029)
SameIndustry		-0.014	-0.019		-0.011	-0.027
		(0.012)	(0.013)		(0.022)	(0.022)
Year fixed effects	No	No	Yes	No	No	Yes

*Notes: This table shows the marginal effect (dy/dx) of six different probit models in Appendix 4. The parenthesis shows the standard error and the star indicates significance relevance of the marginal effect based on the p-value of each two-sided t-test (*p<0.10, **p<0.05, ***p<0.01)*

First, the effect of acquirer size measured by total sales is significant at 5% significance level under model (7), but lost its significance under model (8) and (9) when control variables and time fixed effects are added in <u>Table 7</u>. Thus, similar to the previous finding of model (1), omitted variable bias (OVB) is also present in model (7) where acquirer total sales is just a proxy of other explanatory variables that were not included in the model. To conclude, the first hypothesis that bigger acquirer size leads to higher deal completion is rejected under total asset perspective under model (1), (2), (3) as well as from total sales proxy under model (7), (8), (9) due to OVB and insignificant effect.

Second, the effect of target size measured by total sales is significant at 1% level under model (7), (8) and (9) and has a negative marginal effects ranging from -0.102 to -0.068 pp depending on the model. This finding supports the previous result of total assets under model (1), (2) and (3) and follows the second hypothesis that smaller target firm leads to higher probability of deal completion, thus we do not reject the second hypothesis. The difference lies only with the magnitude of the marginal effects showing that total assets has higher impact with -0.199 to -0.344 pp in Table 6 than total sales in predicting deal completion. This shows that the result of target size measured by total asset is robust and valid.

Third, acquirer profitability measured by net profit shows no significance influence on the deal completion, thus hypothesis 3 that more profitable acquirer firm leads to higher probability of deal completion is rejected. Also, there is no economic relevance that can be derived from the change of marginal effect sign ranging from 0.296 to -0.319 pp. This finding is in line with the previous result of acquirer profitability measured by EBITDA, which also has no significance and economic relevance. Thus, no further conclusion can be derived.

Lastly, in contrast with previous model, target profitability measured by net profit has no significance relevance on deal completion, thus rejecting hypothesis 4 that more profitable firm leads to higher probability. The previous model measured by EBITDA also rejects hypothesis 4, but at least it found a significant negative effect on deal completion and arrive at the conclusion that less profitable firm leads to higher probability of deal completion. On the other hand, the insignificant marginal effect of net profit could not derive any conclusion. One possible explanation is that net profit has such a high degree of variability because it is dependent on external factors like tax rate and interest rate. As a result, net profit values are less consistent and harder to make predictions than EBITDA. By using net profit to measure firm profitability in model (10), (11) & (12), we fail to take into account the different corporate tax rate in different country. For instance, in 2022, Germany has higher corporate tax rate of 29.9% compared to Switzerland with only 19.7% (Bray,2022). As this paper uses sample from Northern America and Western Europe, the huge difference in corporate tax in different European countries alone has significant impact in causing huge variability of firm's net profits causing a low R-squared and insignificant effect under Appendix 4. To conclude, EBITDA is still the best measurement for firm profitability in this sample, hence the previous result of target profitability measured by EBITDA is robust and valid.

5 Conclusion

Merger and Acquisition (M&A) is still a popular means for firms to grow profits and scale-up their business, yet quite large number of the deals are withdrawn even after the public announcement. Most of the researchers in the M&A field only investigate what factors determine the success of M&A deal after the deal is closed, but undermine the possibility of using these factors to predict the success rate of M&A deal completion during the pre-acquisition phase. Therefore, instead of focusing on the post-acquisition value creation like the majority of literatures do, this paper will investigate how different factors, especially firm characteristics influence the probability of closing the deal in M&A transaction. The main goal is to help decision makers to avoid wasting time and money in going through public announcement and due diligence process by pointing out the potential deal-breaker early on. This paper will close the gap in the current literature by analyzing the influence of firm characteristics on deal completion in a new context that never been explored by other researchers. Thus the main research question that will be solved is: **How do firm characteristics affect the likelihood of M&A deal completion?**

Following Al-Sabri et al (2020), firm characteristics that will be analyzed as the main hypothesis in this paper are firm size, firm profitability and acquirer market to book ratio. To test the hypothesis, a sample of 26,291 M&A deals is gathered from Zephyr database by applying some filters such as 2005-2021 time period, North America and Western Europe region & deal value above 15 million. Then, probit regressions are computed to test the hypothesis because the dependent variable, deal completion is a binary variable that takes a value of 1 when the deal is completed and 0 when the deal is withdrawn. To avoid multicollinearity between firm size and firm profitability, two different regression models are computed separately. Moreover, to perform robustness check for the variables, each of them is divided further into three model types: independent variables only; Independent & control variables; independent, control & fixed effects. Lastly, additional model using new proxy of firm size and firm profitability is computed to check the robustness of the independent variables.

Overall, there is mixed results for the effect of firm characteristics on the likelihood of deal completion. The first hypothesis that bigger acquirer firm leads to higher probability of deal completion is rejected due to omitted variable bias and insignificant effect of acquirer total asset in the probit model. This finding helps to explain why there is mixed results from past studies as discussed in the literature review and conclude that there is no impact of acquirer

firm size on deal completion. On the other hand, the second hypothesis that smaller target firm size leads to higher probability of deal completion is accepted due to negative marginal effects and significance relevance of the target total asset. This finding follows the same rationale of past study by Homberg et al (2008) that found more successful acquisitions and long-term synergies when the size of target firm is small. Thus, we can conclude that smaller target firm size not only increase the likelihood of deal success after the deal is closed, but also increase the probability of deal completion during pre-acquisition phase.

From the perspective of firm profitability, the third hypothesis that more profitable acquirer firm leads to higher probability of deal completion is rejected due to insignificant effect of acquirer EBITDA. There is no further conclusion that can be derived due to the sign change in marginal effects, meaning that acquirer firm profitability has no impact on deal completion. Similarly, the fourth hypothesis that more profitable target firm leads to higher probability of deal completion is also rejected, but target EBITDA still shows a negative and significant marginal effect on deal completion. This result is contradictory with past studies discussed in the literature review and it concludes new finding that lower target firm profitability leads to higher probability of deal completion. Lastly, the fifth hypothesis that higher acquirer market-to-book ratio leads to higher probability of deal completion is accepted due to positive and significant marginal effect, which is in line with the literature reviews.

For the last part of this paper, additional analysis is conducted to make sure that the main results are robust and consistent when using different proxies of firm characteristics such as total sales for measuring firm size and net profit for firm profitability. Overall, the results of the new model is similar to the main model, which indicates a robust and valid result. The only difference in the new model is that target profitability measured by net profit shows no significant result on deal completion. One possible explanation is that net profit has such a high degree of variability because it is dependent on external factors like tax rate and interest rate. However, since this paper uses sample from Northern America and Western Europe region, EBITDA is still the best measurement for firm profitability, hence the negative and significant effect of target profitability measured by EBITDA on deal completion is still robust and valid.

6 Limitation

This study has certain limitations, which form a good reason to conduct further research. First, all the probit models have a relatively low pseudo R^2 and significant constant term which implies that there are other explanatory variables that might influence the probability of deal completion but not included in the model. Thus, there is high possibility of omitted variable bias (OVB) present in the current model. The literature reviews already identified some factors that might influence deal completion but could not be included in the model due to the lack of data available in Zephyr database. This includes perceived price discount, CEO characteristics and CEO social ties.

For further research reference, information regarding CEO could be derived from BoardEx database. I personally have attempted to match CEO information with deal sample by using the ISIN code for each acquirer and target firms, but it is currently not possible. If time is not a constraint, the only way to gather the data is to manually match CEO social ties and characteristics with each M&A deal and perform the analysis. While for perceived price discount, it can be derived from the movement of the stock price in 52-week window and use certain bid price benchmark to assess whether it is overvalued or undervalued. Also, there are other external factors that could be taken into account such as acquirer past M&A experiences and country regulation barrier. If more relevant factors can be included in the model, pseudo R^2 value will be higher and there is higher possibilities to eliminate omitted variable bias and achieve more accurate prediction for deal completion.

Second, the scope of this research paper is limited to only developed countries as the sample is filtered based on North America and Western European region. To broaden the study scope, it would be better to conduct further study using samples from developing countries and compare the result with this paper to see the similarities and differences.

Lastly, the sample deals used in this research are extracted based on the publicly announced deals which is completed or withdrawn at the end. This means that the majority of sample deals used in this paper are from the public firms that announced its intention for M&A. This paper fail to take into account M&A deals that are withdrawn but not publicly announced which the majority of private firms do in common.

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8 Appendix

Appendix 1: Descriptive Statistics (original)

Variables	Mean	Std Dev	Median	Min	Max	Skewness	Kurtosis
DealCompletion	0.91	0.24	1.00	0.00	1.00	-3.62	6.13
Acquirer size_assets (EUR m)	2.91	14772.00	0.40	-9.76	165.00	11.25	173.77
Target size_assets (EUR m)	0.61	3251.40	0.09	-22.00	39.60	10.58	149.17
Acquirer profit_EBITDA (EUR m)	0.74	7020.00	0.05	-7.07	76.10	7.61	75.70
Target profit_EBITDA (EUR m)	0.09	2204.16	0.01	-2.63	11.20	6.26	83.73
AcquirerMarketToBook	2.61	114.26	2.40	-193.54	185.22	10.09	189.19
DealProportionality	2.97	22.84	0.10	0.01	8910.71	13.97	274.35
PaymentMethod	0.43	0.50	0.00	0.00	1.00	0.26	1.07
DealOriginality	0.81	0.39	1.00	0.00	1.00	-1.60	3.55
SameIndustry	0.68	0.49	1.00	0.00	1.00	-0.45	1.20
DealAttitude	0.92	0.59	1.00	0.00	1.00	-1.81	3.41

Appendix 2: Description Statistics (Completed vs Withdrawn)

	Mean		Std Dev		Median		Min		Max		Skewness		Kurtosis	
Variables	C	W	C	W	C	W	C	W	C	W	C	W	C	W
DealCompletion	1.00	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	-	-	-	-
Log_Acqsize_assets	12.99	12.89	2.11	2.46	13.01	12.94	-1.40	2.71	18.92	18.75	-0.66	-0.66	5.91	4.18
Log_Tarsize_assets	11.63	12.08	1.84	1.90	11.58	11.96	2.71	6.31	17.50	16.92	-0.05	0.24	3.64	2.64
Log_Acqprofit_EBITDA	11.41	11.75	2.33	2.58	11.49	11.99	-4.61	2.63	18.15	17.66	-0.46	-0.50	4.34	3.28
Log_Tarprofit_EBITDA	9.26	10.64	2.19	2.19	9.09	10.60	-3.15	0.84	16.23	15.84	-0.06	-0.07	3.80	3.02
Acqmarkettobook_winsor	3.22	2.87	2.59	2.32	2.41	2.10	0.52	0.52	10.71	10.71	1.55	1.83	4.85	6.37
DealProp_winsor	0.28	0.60	0.43	0.57	0.09	0.40	0.004	0.04	1.64	1.64	2.11	0.77	5.57	2.14
PaymentMethod	0.43	0.55	0.49	0.50	0.00	1.00	0.00	0.00	1.00	1.00	0.30	-0.20	1.09	1.04
DealOriginality	0.81	0.59	0.39	0.41	1.00	1.00	0.00	0.00	1.00	1.00	-1.61	-1.44	3.59	3.06
SameIndustry	0.68	0.55	0.49	0.48	1.00	1.00	0.00	0.00	1.00	1.00	-0.44	-0.64	1.19	1.40
DealAttitude	1.00	0.72	0.00	0.69	1.00	1.00	1.00	0.00	1.00	1.00	-	-0.69	-	1.36

Appendix 3: VIF Test

Variable	VIF	1/VIF
Log_Acqsize_assets	6.28	0.16
Log_Tarsize_assets	6.20	0.16
Log_Acqprofit_EBITDA	1.81	0.55
Log_Tarprofit_EBITDA	1.48	0.68
AcqMarketToBook_winsor	1.41	0.71
DealProp_winsor	1.20	0.83
PaymentMethod	1.14	0.88
DealOriginality	1.02	0.98
SameIndustry	1.02	0.98
Mean VIF	2.39	

Appendix 4: Probit Regressions (Robustness Check)

Deal Completion	(7)	(8)	(9)	(10)	(11)	(12)
Log_Acqsize_sales	0.061**	0.004	0.007			
	(0.027)	(0.030)	(0.030)			
Log_Tarsize_sales	-0.644***	-0.456***	-0.443***			
	(0.091)	(0.102)	(0.105)			
Log_Acqprofit_netprofit				0.296	-0.357	-0.319
				(0.546)	(0.522)	(0.557)
Log_Tarprofit_netprofit				-0.041	-0.038	-0.042
				(0.052)	(0.049)	(0.050)
AcqMarketToBook_winsor	0.049***	0.034**	0.033**	0.043**	0.030*	0.032*
	(0.016)	(0.016)	(0.016)	(0.020)	(0.020)	(0.020)
DealProp_winsor		-0.409***	-0.444***		-0.363***	-0.389***
		(0.085)	(0.088)		(0.092)	(0.096)
PaymentMethod		0.016	0.021		0.041	0.029
		(0.080)	(0.082)		(0.095)	(0.097)
DealOriginality		0.258**	0.254***		0.432***	0.429***
		(0.103)	(0.105)		(0.128)	(0.131)
SameIndustry		-0.091	-0.127		-0.051	-0.124
		(0.082)	(0.082)		(0.098)	(0.098)

Constant	9.918***	8.051***	7.543***	8.516***	7.474***	6.683***
	(1.218)	(1.307)	(1.372)	(9.304)	(8.901)	(9.565)
Time Fixed Effects	No	No	Yes	No	No	Yes
Pseudo R^2	0.044	0.094	0.156	0.037	0.086	0.132
Chi^2 probability	0.000	0.000	0.000	0.001	0.000	0.000