

The Determinant of Capital Structure and Impact on Takeover Contest

Lin Tuo

Durham Business School

Michael Guo

Durham Business School

Li Ding

Durham Business School

Abstract

This paper examines the interaction between firms' capital structure and the probability of success in mergers & acquisitions (M&A). We use the sample of M&A deals recorded in the SDC database from 1977 to 2010, and apply the logistic model to identify factors which may influence the process and outcome of takeover contests.

The empirical evidence indicates that firms' financial leverage ratio does have significant and negative impact on the probability of success in takeover activities. In single-bidder takeover deals, the financial leverage ratio should be considered as one of the most important variables that affect the possibility of success. However, in multiple-bidder takeover deals, this relation turns out to be weaker. We also find that managerial resistance, bid premium and toehold size also play crucial roles in M&A deals.

Keywords: Takeover Contest, Capital Structure, Logistic Model

1. Introduction

Mergers & acquisitions (M&A) is a popular area in financial research. However, although most of the major issues in this field have been covered, a few dimensions of M&A activities still lack proper understanding. Various papers have tended to associate the takeover incentive with capital structure motives, based on the theories of wealth transfer, tax shield or financial slack. Existing models provide sufficient explanatory power and robust empirical evidence to verify these theories. However, the links between leverage ratio and the process and outcome of bidding competitions have been ignored. This paper examines the relation between capital structure and the outcome of takeovers, especially in takeover contests that involve multiple bidders.

In M&A, where more than one bidder makes an offer for the same target, we define this as a takeover contest. However, although takeover contests usually relate to big deals and attract attention from financial markets and media, they have not yet been subject to much investigation. Therefore, our research sheds light on the impact of bidders' financial leverage ratio on the process and outcome of takeover contests.

In recent years, some papers have examined the connection between capital structure and M&A. Lewellen (1971) proposed that merger activities might be driven by increasing debt capacity. Bruner (1988) showed that changes in capital structure provide a motive for M&A. He examined the financial leverage of both bidder and target firms in takeover deals, and found that bidders' financial slack is significantly higher than for a general control sample of firms. Bruner also found that the leverage ratios of target companies are significantly lower than those for the control sample and for bidding firms. Ghosh and Jain (2000) also find that bidders have low debt ratios. In addition, they investigate the leverage movement of combined firms. By testing 239 completed merger deals, they get robust evidence to support the view that the financial leverage of combined firms increases significantly. They further suggest that the permanent increase in financial leverage results from an increase in debt capacity for the combined firms.

Extending previous research, Uysal (2006) introduces the new variable 'target leverage ratio'. Traditional capital structure literature assumes that firms have their target capital structures. As Graham and Harvey (2001) report, 81% of firms have their own target debt ratios. Fama and French (2002) further show that firms move toward their target debt ratios. Consequently, Uysal (2006) investigates whether leverage deficit, defined as the difference between the firm's actual leverage ratio and their target ratio, affects one of their major investment decisions: M&A activity. By using a two-stage approach, he finds empirical evidence that under-leveraged firms are more likely to make an acquisition. Moreover, these firms make more takeover deals and acquire significantly larger targets than other firms.

Researchers have also produced a large body of evidence on takeover contests with reference to different deal characteristics. James and Wier (1987) examine the effect of bidding competition on the returns for acquirers in the banking industry. They find robust evidence that the gains to acquirer shareholders are negatively related to the number of other potential bidders, but positively related to the number of alternative target firms available in the market. De, Fedenia and Triantis (1996) re-estimate the effect of competition on bidder's return using a more extensive database and a new methodology that accounts for limited dependent variables. They find a higher level of negative returns for successful bidders in multiple-bidder contests than in single-bidder deals. Consistent with previous literature, these findings indicate that compared to single-bidder cases, success in bidding competitions is usually more costly to the acquirers. The authors conclude that actual as well as potential bidding competitions have negative impacts on the bidder's stock return.

Contrary to previous studies, Dittmar, Li and Nain (2009) investigate the more positive side of bidder competition. They distinguish between corporate bidders and financial bidders, and argue that competing with financial bidders might be a value-enhancing choice relative to competing against corporate buyers. The bid premiums for winners competing with financial rivals are significantly lower than when competing against

corporate rivals.

Rather than examining whether takeover contests are value-destroying or value-enhancing, a large body of research has studied numerous factors which may have impact on the takeover contests. In takeover deals, the bidders commonly own a toehold in the target company prior to the takeover announcement. Ettinger (2009) examines the deterrent effect of toeholds in takeover contests. He sets a two-bidder model to argue that the bidders with toehold might completely deter their rivals without toehold from making competing offers, even where the participating costs are extremely low. This is consistent with Bulow, Huang and Klemperer (1999), who found that toeholds could help the bidder to win in an auction with a lower price. The potential explanation for this finding is that bidders with toeholds will be extremely aggressive in order to reduce the expected profit of non-toeholders. Unless they have a significantly higher valuation for their target, non-toeholders will not make an investment decision. As Burkart (1995) has shown, the bidder with the highest percentage of toehold will adopt an overbidding strategy to beat other competitors.

The existing debt of bidders also plays a strategic role in takeover contests. Debt is an important option for financing takeovers. Ghowdhry and Nanda (1993) show that the strategic use of debt financing would help initial bidders attain substantial advantages over potential competing bidders. By constructing a five-date model with two potential bidders, they provide a testable empirical implication that the probability of the bidder facing no competition is positively related with the level of the first bidder's existing debt.

In general, researchers consider takeover contests with multiple bidders as traditional ascending auctions. Bulow and Klemperer (1996) discuss the most profitable way to sell a firm: an auction with multiple bidders or a negotiation with one bidder. The result shows that the value of additional competition is significantly high relative to the value of negotiating skills. Thus, auction should be the preferred option for target firms in cases where they are facing takeovers. Since a takeover contest is similar to an auction, Clayton

and Ravid (2002) explore the effect of leverage on bidding behaviour in typical auctions. Using the 1994–1995 FCC spectrum auction data, they empirically research the impact of capital structure on bidding behaviour and the outcome of auctions. They observe that firms with higher financial leverage are more likely to lose in the auctions, and that their participation lowers the final deal price. Morellec and Zhdanov (2008) also build a theoretical model to analyze the interaction between financial leverage and takeover activity. In their dynamic model, in which the financing strategy of bidding firms and the terms and timing of takeover are jointly determined, capital structure plays the role of commitment device to affect the outcome of the takeover contest. A main prediction generated by this model is that the bidder with the lowest leverage ratio will win the takeover contest.

Therefore, we believe that acquirer's debt ratio is correlated to the terms and timing of the takeover deal and the result of the bidding competition. As a result, in contrast to previous literature which focuses on successful takeover deals, this paper will include both successful and failed deals. We download all of the M&A deals in the US market from 1977 to 2010 to analyze the interactions between bidders' leverage ratio and the probability of success in M&A. Furthermore, by using the specific criteria, the deals with multiple bidders are identified from the whole sample and examined separately. The logistic model will be adopted in empirical analysis.

Our main empirical results indicate that firms' financial leverage ratio does have significant and negative impact on the probability of success in M&A. In single-bidder takeover deals, the financial leverage ratio should be considered as one of the most important variables that affect the probability of success. However, in multiple-bidder takeover deals, this impact turns out to be a little weaker. We also identify several additional factors which may influence the process and outcome of bidding competition. There is strong evidence to suggest that managerial resistance, bid premium, toehold size and the existence of competing bids also contribute to the probability of success in takeovers.

These findings could help us to better understand the interaction between firms' capital structure and takeover activities. Previous literature which links the capital structure with M&A focuses on examining the debt ratio of the acquirers in successful deals. Those studies all reach a similar conclusion, that acquirers' debt ratio is lower than the benchmark. So far, existing papers have only built relative theoretical models to investigate the interactions of financial leverage and the process and outcome of takeover contests. Little empirical evidence has been proposed to prove this dynamic relation. In Morellec and Zhdanov's (2008) paper, they develop a dynamic model to explore these issues. Their theoretical model predicts that the bidder with the lowest leverage ratio has the highest possibility of winning in the takeover contest. Our paper provides sufficient and robust empirical results to cover this important gap and to validate Morellec and Zhdanov's (2008) main predictions. Our research might also generate implications for further studies in this topic.

We also propose potential explanations for the dynamic relation between firms' financial leverage ratio and bidding competition. Explanations are constructed separately for different methods of payment. They offer reasonable evidence that firms with low levels of financial leverage ratio could enjoy advantages in both cash and stock offers. In further studies, it might be necessary to examine these explanations.

This paper is organized as follows. The next section presents an overview of our research topic and states the hypothesis. Then, section 3 describes the data and sample. Section 4 sets out the main methodology and empirical results. Finally, main conclusions and a plan for further research are presented.

2. Overview and Hypothesis

The financial leverage ratio is a key element in this research. First we need to understand which factors induce leverage changes. Welch (2004) suggests that changes in capital structure, represented by firms' financial leverage ratio, could be explained by two factors. The first of these is stock price dynamics, whereby the movements of stock returns may explain 40 percent of capital structure dynamics. The second is the firm's total issuing activity, which explains about 60-70 percent of leverage changes.

The first research question of this study concerns bidders with relatively low leverage ratios. Following Welch's theory, low leverage ratio could be attributed to a high level of positive stock returns or a low level of debt issues. Low leverage ratio caused by insufficient debt issue would offer a substantial level of debt capacity for potential acquirers. As Ghowdhry and Nanda (1993) have shown, in cash merger deals bidding firms commonly tend to issue additional debt as the form of external financing. For firms with high debt capacity, high credit ratings allow them to use additional debt issue with greater convenience and at significantly less issuing cost than would be the case for firms with less debt capacity. The consequent advantage in takeover financing would have a positive impact on the merger valuation, thus prompting the bidding firms to make considerably higher offers to beat their rivals or deter potential competing bidders.

Low debt ratio is an advantage not only in cash takeover deals, but also in stock mergers. As previous literature has indicated, overvalued stock price could also induce low leverage ratio. Shleifer and Vishny (2003) propose that firms with overvalued equity have a great incentive to engage in M&A markets using stocks. This argument is supported by Rhodes-Kropf and Viswanathan (2004) and Rhodes-Kropf, Robinson and Viswanathan (2005). Based on the information asymmetry hypothesis, the management of overvalued firms show a strong tendency to use their high valued stock as the medium of payment. Therefore, in bidding competitions, acquirers with low leverage ratio which can be attributed to overvalued stock would desire to offer stock tender with high premium in order to take over their targets and dilute the level of overvalued equity.

In general in bidding competitions, we should observe a higher offer premium from firms with low debt ratio. This could explain the high probability of success by low leverage firms in both cash and stock mergers.

Thus the main hypothesis in this paper is as follows:

Hypothesis:

There is a negative relation between a firm's financial leverage ratio and the probability of success in a takeover contest.

I expect to find empirical evidence to indicate that firms with lower leverage have more opportunity to win the bids.

3. Data and Sample Description

We obtain the universal data on mergers & acquisitions from Securities Data Company (SDC); the time horizon for deal announced day is from 01/01/1977 to 01/01/2010. Because the US is the most active M&A market in the world, we focus mainly on takeover deals in which the acquirers are located in the US. We exclude small and noisy deals in which deal values were lower than 5 million dollars. This leaves us 86496 deals. We also use the SDC variable 'Deal Attitude' to exclude transactions classified as buyback. The M&A deals in which the initial bidder had a stake greater than 50% before the acquisition are also deleted from the whole sample. Owing to limited availability of accounting data in the Compustat database, our sample only includes deals with public or subsidiary acquirers. These restrictions bring the sample down to 48006 deals. As our research relates to capital structure theories, we exclude all the deals in which the bidder or its ultimate parent company does not have basic accounting information from the Compustat database. Compared to previous studies, the main difference with this sample is that it also contains the unsuccessful takeover deals. The final sample has 16932 deals.

Our analysis also includes an extremely important subsample of deals in which more than one bidder attempts to acquire the same target; we call this the competing sample. We introduce additional restrictions into the original sample to determine which deals are competing deals. Similar to Dittmar, Li and Nain (2009), the following criteria are adopted to identify competing deals:

- (1) One of the two bids is completed with more than 50 percent of the target's shares acquired, or if both bids are completed, one completed bid is a majority acquisition and the other completed bid is a minority acquisition.
- (2) The announcement dates of the two bids are no more than 12 months apart, unless SDC specifically flags the two as competing bids using the competing bid flag as "YES".
- (3) The first bid is not completed before the second bid is announced.
- (4) Neither bid is a divestiture, because it is hard to identify whether firms are bidding on the same assets.

After applying these criteria, 1742 deals remain. Because many deals are made by private acquirers, their basic accounting information is not recorded in the Compustat database. Ultimately there are only 407 deals that could be used for our research.

All of the M&A related variables are downloaded from the Thomson One Banker Financial Database, and the accounting variables are obtained from the Compustat Database. We get additional stock price data from CRSP.

4. Methodology and Empirical Results

4.1 Whole Sample Analysis

4.1.1 Descriptive Statistics

Table 1 summarizes the descriptive statistics of firms in our sample. Since this paper concerns the probability of success in M&A, this table not only provides the company characteristics of the full sample, but also divides them into two groups: Successful Bidder Group (SBG) and Failed Bidder Group (FBG). We also examine the significance of the difference between the two groups. First, the log sale of SBG is significantly higher than that of failed bidders. Conversely, the differences between market to book ratio and book leverage are insignificant. However, the average market leverage of SBG significantly exceeds that of FBG. Similarly, the means of R&D/TA, EBITDA/TA and Tangible Asset/TA ratio are extremely different between the two groups.

Table 2 describes the deal characteristics. We can see that the average deal value and relative size of successful deals are significantly lower than for failed deals. There is no difference between the premium paid by bidding firms in SBG and FBG. In contrast, the toehold size and percentage of hostile and friendly takeovers in each group are quite distinct. The successful bidders commonly own larger stakes than do failed bidders. There are significantly more hostile deals and fewer friendly deals in the failed bidder group.

4.1.2 Target Leverage Estimation

The methodology is in three main stages. The first stage is the estimation of financial leverage ratio; this ratio is the dominant variable in this research and hence its measurement is crucial. I use two measurements, market leverage and the leverage deficit.

Market leverage is defined as the book debt divided by the market value of total asset.

This variable has been commonly used in capital structure literature.

Another measurement of leverage deficit is the difference between the firm's actual leverage and its target leverage ratio. Following the standard procedure of previous target capital structure studies (Rajan and Zingales, 1995; Hovakimian et al., 2004), the firm's book leverage is regressed on a group of determinants in capital structure (X_i) (see equation [1]). The fitted value of this regression is defined as the target leverage ratio.

$$Book_leverage_i = \gamma X_i + \varepsilon_i \quad (1)$$

The reason we use book leverage instead of market leverage in the regression is that there is a mechanical relationship between market leverage and profitability (Uysal, 2006). In addition, the test result of the pecking order hypothesis might be biased in a regression based on market leverage (Fama and French, 2002).

The group of determinants in the regression controls for firm size, growth opportunities, product uniqueness, profitability and tangibility. The natural logarithm of sales is the proxy for firm size. Previous literature has pointed out that large firms' cash flows are less volatile because they are well diversified. Therefore, large firms face less financial distress, and consequently their target leverage ratio is higher.

The proxy for growth opportunity is market to book ratio. As Myers (1977) and Goyal et al. (2002) have shown, growth opportunity is an indispensable indicator for target capital structure. Those authors believed that growth opportunity and financial leverage ratio are inversely related.

We use the ratio of R&D expense to book value of total asset as the proxy for product uniqueness. Firms' financial distress will be pushed by product uniqueness, so there is a negative relation between target leverage ratio and product uniqueness. Because most of a firm's R&D expense data is not recorded in the Compustat database, we add a R&D missing dummy variable into the regression. If there is no R&D data, the dummy value

should be 1.

Similar to growth opportunity, firms with high profitability have more free cash flows. They prefer to use internal financing rather than debt financing. Therefore, profitability and financial leverage are negatively related. In our research, profitability is represented by the ratio of EBITDA over total asset.

The tangibility of the firm's asset is another crucial variable for target leverage ratio. More liquid assets are related to low bankruptcy cost, which results in higher financial leverage.

Table 3 presents the coefficient estimate of target leverage ratio. Consistent with our predictions, the sales variable has a positive and 1% significant level coefficient of 0.0423. The estimations for profitability and tangibility are both significant at the 1% level. In contrast, the impacts of market to book ratio and R&D/TA are both insignificant. In order to obtain the leverage deficit, we calculate the difference of the firm's actual leverage ratio and the fitted value of this regression.

Since we have the leverage deficit for each bidding company, we divide them into four quartiles according to the level of leverage deficit. Table 4 reports the company and deal characteristics of each quartile, and the t-statistic test between first and last quartile. We can easily observe that most of the variables are greatly diversified in each quartile. For instance, there is a remarkable decreasing trend in market to book ratio and average deal value. Conversely, firms' book and market leverage, tangibility ratio and premium size all present a noticeable ascending direction, although the differences of premium size between first and fourth quartile are insignificant.

4.1.3 Logistic Model Analysis

The next step of the empirical work is to examine the effect of capital structure on the probability of success in takeover. We adopt the logistic model to analyze the role of firms'

financial leverage ratio as a determinant of M&A. The deal status will be regressed on the leverage measurements, estimated from the previous stage, and a group of determinant variables on the probability of success in takeover, Z_i . See equation (2).

$$P(\text{success} = 1) = \Phi(\beta_0 + \beta_1 \cdot \text{LeverageMeasure} + \beta_2 Z_i) \quad (2)$$

The variable Z_i includes a group of determinants which may have potential impact on M&A. In this model it controls for bid premium size, managerial resistance, percentage of shares owned by the bidder, relative size, bidding firm size, poison pill, tender offer and competing bids.

Walkling (1985) demonstrates that the bid premium size should directly relate to the probability of tender offer success. In our analysis, the bid premiums were calculated by comparing the bid price with the stock price of the target companies at one-day, one-week and four-weeks prior to the bid. The previous literature has indicated that the four-week prior bidding premium is a more suitable measurement than the one-day or one-week premium. Therefore, in this study, the four-week premium will be used in the model, and the one-day and one-week premium will each be examined in the robustness test. Because a large proportion of targets are private firms or subsidiaries, the offer premium is difficult to evaluate, and hence a dummy variable for missing premium data should be added into the regression.

Previous papers have shown that managerial opposition by the target firm is the most important deterrent to takeover success. A dummy variable, *Manresist*, will be included into the control variables. The dummy value will be 1 for a hostile takeover, or 0 otherwise. We expect to find a significant and negative relation between managerial resistance and the probability of success in takeover.

The percentage of shares owned by the bidder before the takeover announcement, referred to as *toehold*, is another indispensable factor. As we discussed in the literature review, *toehold* is generally considered to be positively related to the success of the

tender offer.

The existence of competing bids is also important. It should have a negative impact on the possibility of a successful deal. Therefore, this study includes a competing dummy variable to control this effect. If there is a competing bid for the sample target, the dummy value is 1.

Relative size, which is defined as the total value of the deal over market value of the bidding firm, may also influence the takeover result. From the descriptive statistics we find that the mean of relative size of failed bidders is significantly higher than that of successful bidders, so it may represent a negative impact. Firm size, represented by the natural logarithm of sales, should have a positive influence on M&A. The board of the target company has more incentive to accept a takeover offer from a larger firm.

In numerous studies, the poison pill approach has been shown to be an effective way for target managers to defend their companies from being taken over. Similarly, the tender offer has been widely used by bidding firms to complete their takeover activities. Therefore, dummy variables for poison pill and tender offer are included in the regression. If the target managers adopt the poison pill strategy, the dummy value of poison pill will be 1; if the bidder uses tender offer, the dummy value of tender offer will be 1.

The dependent variable in this logistic model is defined as follows:

If the deal is completed, it will be set to 1.

If the deal is withdrawn or fails, it will be set to 0.

Table 5 presents the estimation results for the logistic model. In the first three models, we adopt the leverage deficit as the measurement of capital structure. In the remaining models, the market leverage is the proxy for capital structure.

The independent variables of the first model include only some of the determinants which

were identified in the previous chapter. Consistent with our predictions, we observe a negative and strongly significant coefficient for leverage deficit. This finding is consistent with the other five models when we use the market leverage measurement. The managerial resistance variable also has a negative estimate at the 1% significance level. In three of the five models, the parameter for premium size is significant at the 5% level. This implies that the effect of premium size on takeover is a very important factor. The estimates of the compete dummy variable in all of these models are negative and significant at the 1% level, which is also in accordance with our expectations. Analogously, the toehold size variable is also significant at the 1% or 5% level in all the models.

In the second model, we add relative size and sales into the regression as the control variables. These two variables represent a highly significant level in the model. The coefficient for relative size is negative and at the 1% significance level. Conversely, the variable of log sales has a positive impact on the probability of success in takeover.

The poison pill and tender offer dummy variables were also included into the research. Consistent with our expectation, the poison pill variable is inversely related to the possibility of success in takeover. Furthermore, the tender offer dummy is positively related to M&A; this relation is significant at the 1% level.

4.2 Competing Sample Analysis

4.2.1 Descriptive Statistics

Our analysis is mainly concerned with the relation between firms' capital structure and the probability of success in takeover. We do not focus only on takeover deals with a single bidder. Therefore, we generate a major subsample from the whole sample, in which multiple bidders compete for the same target. This is named the competing sample.

Tables 6 and 7 present the company and takeover deal characteristics of firms in the

competing sample. In Table 6, in contrast to the result for the full sample, only the sales and EBITDA/TA ratios are significantly different between the successful bidder group and failed bidder group. In the full sample, the difference in market leverage between the two groups is significant at the 1% level, but in the competing sample, it is reduced to the 10% level. Similarly, the differences of product uniqueness and tangibility of bidding firms between the two groups are insignificant in the competing sample.

By contrast, the deal characteristics of the two groups are distinctly different. The premium size, toehold size, percentage of friendly takeovers and tender offer of the successful bidder group greatly exceed those of the failed bidder group. Conversely, the percentage of hostile takeovers and pure stock exchange payment of the SBG is much lower than that of the FBG, which is consistent with the results of the full sample.

4.2.2 Target Leverage Estimation

As with the full sample, the empirical work comprises three stages. First, we estimate target leverage ratio. We regress firm book leverage on a group of capital structure determinants. Table 8 shows the result of regression. The firm size proxy is still positive and significant at the 1% level. Surprisingly, the estimate of market to book ratio is negative and strongly significant in this regression, which is different from the full sample regression. Moreover, the effect of tangibility on capital structure is insignificant in the competing sample. The leverage deficit still differs between firms' actual leverage and target ratio.

The next stage is examining the firm and deal characteristics by four quartiles, according to the leverage deficit level (Table 9). The decreasing trend of market to book ratio between four quartiles is still significant at the 1% level. The book leverage and market leverage present a trend of continuing increase from the first quartile to the last. This implies that the firms with high leverage ratio deviate more from their target ratios. The difference of tangibility between these quartiles is also significant. However, when we turn

to the deal characteristic variables, the differences between them are slight and insignificant.

4.2.3 Logistic Model Analysis

The final stage of our analysis is logistic model regression. The control variables in this stage are similar with the regression based on the full sample. Because this is the competing sample, it is not necessary to include the compete dummy into the regression, so this dummy variable is excluded. Most of the deals have bid premium data recorded in the SDC database or calculated from the stock price, so the dummy variable for missing bid premium data should also be excluded. Therefore, the deal status will be regressed on the leverage deficit or market leverage, dummy variable for managerial resistance, four-week premium size, toehold size, log sale and dummy variables for poison pill and tender offer.

The results presented in Table 10 are completely different from those for the full sample. Although the estimated coefficient for leverage deficit is negative, this relation is insignificant. When we use market leverage instead of leverage deficit as the capital structure proxy, the coefficient is negative and significant at the 10% level. The weak relation indicates that the firm's leverage deficit does not play a dominant role in takeover competitions. As with the full sample test, managerial resistance is strongly negatively related to the possibility of success in bidding competition. Therefore, when a target company confronts more than one bid at the same time, the attitude of management is the key factor. The effect of premium size is also very important. The estimates of premium size in regression are significant at the 10% level in half of six regressions.

Our analysis also put log sales, poison pill dummy and tender offer dummy into the regression models. The coefficients for the sales variable are extraordinarily significant and positive in each model. The significance levels of the tender offer dummy and poison pill dummy are 1% and 10% respectively. These results demonstrate that in bidding

competitions, the difference of bidding firms' financial leverage ratios and offer premium have only subordinate functions. The main determinants are the attitude and response of target managements and the firm size and acquisition strategy of the acquiring firms. The effect of toehold in bidding competition is insignificant, which is inconsistent with previous research. One explanation for this could be that the high level of toehold owned by acquirers may prevent potential bidders from making an offer. Therefore, a competing bidder will only make an offer where the toehold size of the primary bidder is not substantially high.

5. Conclusion

This paper has examined the connection between firms' capital structure and the outcome of takeover activities. The empirical results of the whole sample suggest that in mergers & acquisitions, the deviation from a firm's target leverage ratio has a negative and significant impact on the probability of success in takeover. A bidding firm with a lower leverage ratio could have more possibility of becoming the successful acquirer. The bid premium size, toehold size and bidder's firm size are positively related to the outcome of takeover. Conversely, managerial resistance, which includes the use of poison pill strategy, the existence of competing bids, and relative size should have a negative and highly significant influence on the results of takeover deals.

In the competing sample, the effect of leverage ratio is still negative but weaker. Where multiple bidders attempt to take over the same target, low leverage ratio and high offer premium could provide only limited help for acquirers to defeat their competitors. The dominant factors are the attitude and response of target management. The existence of managerial resistance and their use of poison pill could effectively force one of the bidding firms out of the takeover contest. The bidder's firm size also plays an important role. The shareholders of target companies will prefer to accept an offer from a larger rather than smaller company. The relation between toehold and the outcome of the bidding competition is insignificant.

We therefore conclude that firms' capital structure, which is represented by financial leverage ratio, does have a significant and negative impact on the probability of success in mergers & acquisitions. In single-bidder takeover deals, the financial leverage ratio should be considered as one of most important dominant variables that affect the probability of success. However, in multiple-bidder takeover deals, this relation is weaker.

Our study leaves many areas for improvement. There may be other factors that affect the outcome of the bidding competition. In the process of our study, it has been interesting to find several firms involved in more than one takeover deal. Not all of their takeovers were completed successfully. This suggests that it might be necessary to trace the change of financial leverage ratios of these companies. It will also be useful to explore the reasons why these firms were engaged in mergers & acquisitions, and exactly why they were successful in some deals and unsuccessful in others.

References

- Barber, B. and Lyon, J., 1996. Detecting abnormal performance: The empirical power and specification of test statistics. *Journal of Financial Economics* 11, 359-400.
- Bargeron, L., Schlingemann, F.P., Stulz, R.M. and Zutter, C.J., 2007. Why do private acquirers pay so little compared to public acquirers? *Journal of Financial Economics* 89(3), 375-390.
- Bruner, R. F., 1988. The use of excess cash and debt capacity as a motive for merger. *Journal of Financial and Quantitative Analysis* 23, 199-217.
- Bulow, J. and Klemperer, P., 1996. Auctions versus negotiations. *American Economic Review* 86, 180-194.
- Bulow, J., Huang, M. and Klemperer, P., 1999. Toeholds and takeovers. *Journal of Political Economy* 107, 427-454.
- Burkart, M., 1995. Initial shareholding and overbidding in takeover contests. *Journal of Finance* 50, 1491-1515.
- Che, Y. and Lewis, T. R., 2007. The role of lockups in takeover contests. *RAND Journal of Economics* 38, 648-669.
- Clayton, M. and Ravid, A., 2002. The effect of leverage on bidding behavior: theory and evidence from FCC auctions. *Review of Financial Studies* 15, 723-750.
- De, S., Fedenia, M. and Triantis, A., 1996. Effects of competition on bidder returns. *Journal of Corporate Finance* 2, 227-259.
- Dittmar, A., Li, D. and Nain, A., 2009. The Bright Side of Bidder Competition. Working Paper series.
- Ettinger, D., 2009. Auctions and shareholdings, forthcoming in *Annales d'Economie et de Statistiques*.
- Fama, E.F., 1998. Market efficiency, long-term returns, and behavioral finance. *Journal of Financial Economics* 49, 283-306.
- Fama, E.F. and French, K. R., 2002. Testing trade-off and pecking order predictions about dividends and debt. *Review of Financial Studies* 15, 1-33.
- Ghosh, A. and Jain, P., 2000. Financial leverage changes associated with corporate mergers. *Journal of Corporate Finance* 6, 377-402.

Ghoshdy, B. and Nanda, V., 1993. The strategic role of debt in takeover contests. *Journal of Finance* 48, 731-745.

Goyal, V.K., Lehn, K. and Racic, S., 2002. Growth opportunities and corporate debt policy: The case of the U.S. defense industry. *Journal of Financial Economics* 64, 35-59.

Graham, J. R. and Harvey, C. R., 2001. The theory and practice of corporate finance: evidence from the field. *Journal of Financial Economics* 60, 187-243.

Hovakimian, A., Hovakimian, G. and Tehranian, H., 2004. Determinants of target capital structure: The case of dual debt and equity issues *Journal of Financial Economics* 71, 517-540.

Hovakimian, A., Opler, T. and Titman, S., 2001. The debt-equity choice. *Journal of Financial and Quantitative Analysis* 36, 1-24.

Ikenberry, D., Lakonishok, J. and Vermaelen, T., 1995. Market under-reaction to open market share repurchases. *Journal of Financial Economics* 39, 181–208.

James, C. M. and Wier, P., 1987. Returns to acquirers and competition in the acquisition market: The case of banking. *Journal of Political Economy* 95, 355-370.

Kothari, S. P. and Warner, J. B., 1997. Measuring long-horizon security price performance. *Journal of Financial Economics* 43, 301–340.

Lewellen, W.G., 1971. A pure financial rationale for the conglomerate merger. *Journal of Finance* 26, 521–537.

Loughran, T. and Vijh, A., 1997. Do long-term shareholders benefit from corporate acquisitions? *Journal of Finance* 52, 1765–1790.

Mitchell, M. and Stafford, E., 2000. Managerial decisions and long term stock price performance. *Journal of Business* 73, 287–329.

Moeller, S.B., Schlingemann, F. P. and Stulz, R., 2004. Firm size and the gains from acquisitions. *Journal of Financial Economics* 73, 201-228.

Morellec, E. and Zhdanov, A., 2008. Financing and takeovers. *Journal of Financial Economics* 87, 556-581.

Myers, S. C., 1977, Determinants of corporate borrowing, *Journal of Financial Economics*, 5, 147-175.

- Press, S. J. and Wilson, S., 1978. Choosing between logistic regression and discriminant analysis. *Journal of the American Statistical Association* 73, 699-705.
- Rajan, R.G. and Zingales, L., 1995. What do we know about capital structure? Some evidence from international data. *Journal of Finance* 50, 1421-1460.
- Rau, R. and Vermaelen, T., 1998. Glamour, value, and the post-acquisition performance of acquiring firms. *Journal of Financial Economics* 49, 223–254.
- Rhodes-Kropf, M. and Viswanathan, S., 2004. Market valuation and merger waves. *Journal of Finance* 59, 2685–2718.
- Rhodes-Kropf, M., Robinson, D. T. and Viswanathan, S., 2005. Valuation waves and merger activity: The empirical evidence. *Journal of Financial Economics* 77, 561–603.
- Savor, P. G. and Lu, Q., 2009. Do stock mergers create value for acquirers? *Journal of Finance* 64, 1061-1097.
- Shleifer, A. and Vishny, R. W., 2003. Stock market driven acquisitions. *Journal of Financial Economics* 70, 295–311.
- Uysal, V. B., 2006. Deviation from the target capital structure and acquisition choices, *AFA 2007 Chicago Meeting Paper*
- Walking, R. A., 1985. Predicting tender offer success: A logistic analysis. *Journal of Financial and Quantitative Analysis* 20, 461-478.
- Welch, I., 2004. Capital structure and stock returns. *Journal of Political Economy* 112, 106–131.

Table 1 Descriptive Statistics for Company Characteristics for Whole Sample

This table presents company characteristics for the acquiring firms from 1980 to 2007. It includes the descriptive statistics for the full sample and two subsamples which are classified by deal status. Variable Sales is the natural logarithm of sales. Market to Book ratio is Market Value divided by book value of total asset. Book Leverage is book debt over total asset. Market Leverage is book debt divided by market value. R&D/TA is R&D expense over total asset. EBITDA/TA is EBITDA over total asset. Tangible asset/TA is defined as new property, plant and equipment over total asset. This table also describes the t test results for the difference between successful and failed acquirers. Superscripts ^{***}, ^{**} and ^{*} denote significance at the 1%, 5% and 10% levels respectively.

Bidding Company Characteristics													
	Full Sample				Successful Bidder				Failed Bidder				Difference
	N	Mean	Median	Stdev	N	Mean	Median	Stdev	N	Mean	Median	Stdev	Successful – Failed
Sales	16805	6.218	6.159	2.181	15766	6.238	6.166	2.163	1039	5.910	6.067	2.426	0.328 ^{***}
Market to Book	16264	4.807	1.553	228.8	15235	3.150	1.562	62.70	1029	29.34	1.436	877.1	-26.19
Book Leverage	16932	0.563	0.503	2.897	15870	0.545	0.501	2.442	1062	0.829	0.532	6.677	-0.284
Market Leverage	16264	0.338	0.311	0.224	15235	0.335	0.308	0.224	1029	0.386	0.367	0.229	-0.051 ^{***}
R&D/TA	16932	0.13%	0.00%	0.017	15870	0.14%	0.00%	0.018	1062	0.04%	0.00%	0.005	0.1% ^{**}
EBITDA/TA	15871	0.109	0.137	0.689	14841	0.112	0.137	0.681	1030	0.061	0.126	0.795	0.051 ^{**}
Tangible Asset/TA	15895	0.287	0.218	0.237	14856	0.285	0.216	0.237	1039	0.313	0.250	0.238	-0.027 ^{***}

Table 2 Descriptive Statistics for Deal Characteristics for Whole Sample

This table reports the characteristics of Mergers & Acquisitions deals. Deal Value, obtained from SDC, is the total amount paid by the acquirer. Relative Size is deal value divided by market value of assets of the acquiring firm. 1D Premium is the premium paid by the acquirer compared to the target stock price one day prior to the announcement. 1W Premium is compared to the price one week prior. 4W Premium is compared to the price four weeks prior. Toehold size is the percentage of target shares owned by the bidding firm prior to the announcement. Hostile Deals is the percentage of hostile takeovers in each sample. Friendly Deals is the percentage of friendly mergers. Tender offer is the percentage of stock owned by the bidder prior to the takeover announcement. Pure Cash is the percentage of deals paid by 100% cash in each sample. Pure Stock is the percentage of deals paid by 100% stock exchange in each sample.

	Deal Characteristic												
	Full Sample				Successful Bidder				Failed Bidder				Difference
	N	Mean	Median	Stdev	N	Mean	Median	Stdev	N	Mean	Median	Stdev	Successful – Failed
Deal Value	16131	102.8	38.00	158.7	15206	99.85	36.97	155.0	925	151.2	58.93	204.1	-51.33***
Relative Size	15475	0.192	0.042	1.610	14581	0.166	0.040	1.475	894	0.606	0.140	3.036	-0.439***
1D Premium	2689	34.87%	25.92%	98.21	2228	34.72%	25.48%	103.1	461	35.57%	29.03%	69.87	-0.844%
1W Premium	2907	39.04%	31.11%	103.7	2407	39.42%	30.68%	109.7	500	37.24%	32.51%	67.81	2.180%
4W Premium	2909	46.51%	36.82%	120.5	2402	47.66%	36.60%	128.4	507	41.09%	37.59%	72.51	6.560%
Toehold Size	655	24.60%	20.00%	17.53	563	26.70%	24.22%	17.40	92	11.71%	8.525%	11.97	14.99%***
Hostile Deals	191		1.13%		71		0.45%		120		11.7%		-11.35%***
Friendly Deals	15870		93.93%		15390		96.98%		780		76.02%		20.96%***
Tender Offer	915		5.404%		795		5.010%		120		11.70%		-6.69%***
Pure Cash	4716		27.85%		4438		27.96%		268		26.12%		1.84%
Pure Stock	2110		12.46%		1892		11.92%		217		21.15%		-9.23%***

Table 3 Regression Estimates of Target Leverage Ratio for Whole Sample

This table presents the OLS estimates of target leverage ratio over key financial measures for the full sample. The dependent variable is Book Leverage. Independent variable Sales is the natural logarithm of sales. Market to Book ratio is Market Value divided by book value of total asset. R&D/TA is R&D expense over total asset. RD Missing is the dummy variable, which is 1 when R&D expense data is missing or 0 otherwise. EBITDA/TA is EBITDA over total asset. Tangible asset/TA is defined as new property, plant and equipment over total asset.

$$BookLeverage_{it} = \beta_0 + \beta_1 Sales + \beta_2 MarkettoBook + \beta_3 RD / TA + \beta_4 RDMiss + \beta_5 EBITDA / TA + \beta_6 TangibleAsset / TA + \varepsilon$$

Variables	Book Leverage
Intercept	0.1848*** (0.0203)
Sales	0.0423*** (0.0016)
Market to Book	0.0008 (0.0009)
R&D/TA	0.1942 (0.2354)
RD Missing	0.1295*** (0.0161)
EBITDA/TA	-1.0291*** (0.0211)
Tangible asset/TA	0.1698*** (0.0139)
R ²	0.1505
Adjusted R ²	0.1502
Observations	15067

Table 4 Descriptive Statistics by Leverage Deficit Quartiles for Whole Sample

This table demonstrates mean and median values of key variables for four quartiles of full samples grouped by leverage deficit. The t-test is for the difference of means from the first to the fourth quartile. ***, **and * stand for statistical significance at the 1%, 5% and 10% levels, respectively. Variable Sales is the natural logarithm of sales. Market to Book ratio is Market Value divided by book value of total asset. Book Leverage is book debt over total asset. Market Leverage is book debt divided by market value. R&D/TA is R&D expense over total asset. EBITDA/TA is EBITDA over total asset. Tangible asset/TA is defined as new property, plant and equipment over total asset. Deal Value, obtained from SDC, is the total amount paid by the acquirer. Relative Size is deal value divided by market value of assets of the acquiring firm. Toehold size is the percentage of target shares owned by the bidding firm prior to the announcement.

	Leverage Deficit								Q1 – Q4
	Q1 (Lowest)		Q2		Q3		Q4 (Highest)		
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	
Sales	6.225	6.250	6.599	6.492	6.441	6.462	6.099	6.038	0.126**
Market to Book	4.082	2.644	2.381	1.897	1.843	1.466	1.279	1.113	2.803***
Book Leverage	0.349	0.301	0.424	0.421	0.514	0.517	0.692	0.670	-0.343***
Market Leverage	0.134	0.115	0.229	0.226	0.346	0.363	0.589	0.584	-0.456***
Leverage Deficit	-0.412	-0.363	-0.241	-0.240	-0.126	-0.129	0.099	0.066	-0.511***
R&D/TA	0.152%	0.00%	0.194%	0.00%	0.153%	0.00%	0.046%	0.00%	0.11%***
EBITDA/TA	0.067	0.120	0.162	0.165	0.158	0.148	0.126	0.116	-0.059***
Tangible Asset/TA	0.250	0.174	0.297	0.223	0.319	0.253	0.293	0.233	-0.043***
Deal Value	108.8	40.00	110.2	42.00	106.1	39.80	90.82	32.50	17.98***
Relative Size	0.158	0.028	0.149	0.036	0.171	0.049	0.230	0.067	-0.073**
Toehold Size	20.37%	17.62%	19.58%	19.60%	17.31%	14.00%	18.07%	11.63%	2.299%
1D Premium	27.65%	26.34%	32.75%	27.17%	44.46%	30.18%	35.98%	23.95%	-8.327%
1W Premium	32.63%	30.28%	38.61%	33.02%	48.19%	35.42%	36.45%	26.72%	-3.825%
4W Premium	42.21%	38.30%	43.43%	38.01%	55.13%	41.36%	45.36%	33.33%	-3.146%

Table 5 Empirical Results of Logistic Model Analysis for Whole Sample

This table presents the effect of key variables on the probability of success in M&A. These regressions are based on the full sample. Variable Leverage Deficit is firm's actual leverage minus its target ratio. Market Leverage is the book debt over market value of total asset. Managerial Resistance is a dummy variable in which hostile takeover is 1 and friendly is 0. 4W Premium is the premium paid by the bidder compared to the price of target companies four weeks prior to the announcement. Premium Missing is the dummy variable for the premium data. Compete is a dummy variable which is 1 where there is a competing bid, or 0 otherwise. Toehold Size is the percentage of target shares owned by the bidding firm prior to the takeover announcement. Relative Size is the value of deals divided by market value of total asset of bidding firm. Variable Sales is the natural logarithm of sales. Poison Pill is a dummy variable for whether the management of the target company uses the poison pill. Tender offer is a dummy variable for whether the bidding firm adopts tender offer to acquire the target.

$$P(\text{Success} = 1) = \beta_0 + \beta_1 \text{LeverageDeficit} + \beta_2 \text{Manresist} + \beta_3 \text{4Wpremium} + \beta_4 \text{premiumMiss} \\ + \beta_5 \text{Compete} + \beta_6 \text{ToeholdSize} + \beta_7 \text{RelativeSize} + \beta_8 \text{Sales} + \beta_9 \text{PoisonPill} + \beta_{10} \text{TenderOffer} + \varepsilon$$

P (Success = 1)												
Variables	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Intercept	1.7789***	(0.0725)	0.6055***	(0.1391)	0.5076***	(0.1396)	2.1515***	(0.0863)	1.0549***	(0.1380)	0.9642***	(0.1381)
Leverage Deficit	-0.6675***	(0.1726)	-0.6485***	(0.1668)	-0.6572***	(0.1680)						
Market Leverage							-0.7659***	(0.1521)	-1.1370***	(0.1633)	-1.1335***	(0.1636)
Managerial Resistance	-2.4062***	(0.1806)	-2.3573***	(0.2161)	-2.9154***	(0.2548)	-2.4424***	(0.1782)	-2.3768***	(0.2147)	-2.9481***	(0.2539)
4W Premium	0.0015**	(0.0007)	0.0016**	(0.0007)	0.0010	(0.0006)	0.0015**	(0.0006)	0.0016**	(0.0006)	0.0010	(0.0006)
Premium Missing	1.3204***	(0.0802)	1.5337***	(0.0879)	1.6916***	(0.0893)	1.3519***	(0.0780)	1.5921***	(0.0863)	1.7440***	(0.0876)
Compete	-1.9574***	(0.1354)	-1.9652***	(0.1604)	-2.1964***	(0.1688)	-1.9326***	(0.1339)	-1.9402***	(0.1594)	-2.1751***	(0.1680)
Toehold Size	0.0217***	(0.0081)	0.0196**	(0.0086)	0.0191**	(0.0086)	0.0210***	(0.0076)	0.0226***	(0.0085)	0.0220***	(0.0085)
Relative Size			-0.0576***	(0.0199)	-0.0587***	(0.0203)			-0.0629***	(0.1594)	-0.0647***	(0.0209)
Sales			0.1824***	(0.0184)	0.1713***	(0.0185)			0.1907***	(0.0183)	0.1794***	(0.0184)
Poison Pill					-1.2502**	(0.0185)					-1.2511**	(0.5330)
Tender Offer					1.2581***	(0.1876)					1.2675***	(0.1872)
Observations	14748		14027		14027		15929		15068		15068	

Table 6 Descriptive Statistics for Company Characteristics for Competing Sample

This table presents company characteristics for the acquiring firms from 1980 to 2007. It includes the descriptive statistics for the full sample and two subsamples, which are classified by deal status. Variable Sales is the natural logarithm of sales. Market to Book ratio is Market Value divided by book value of total asset. Book Leverage is book debt over total asset. Market Leverage is book debt divided by market value. R&D/TA is R&D expense over total asset. EBITDA/TA is EBITDA over total asset. Tangible asset/TA is defined as new property, plant and equipment over total asset. This table also describes the t test results for the difference between successful and failed acquirers. Superscripts ^{***}, ^{**} and ^{*} denote significance at the 1%, 5% and 10% levels respectively.

	Bidding Company Characteristics												
	Full Sample				Successful Bidder				Failed Bidder				Difference
	N	Mean	Median	Stdev	N	Mean	Median	Stdev	N	Mean	Median	Stdev	Successful - Failed
Sales	405	6.963	7.109	2.185	205	7.291	7.349	2.092	200	6.628	6.773	2.232	0.663 ^{***}
Market to Book	395	1.771	1.393	1.302	199	1.852	1.405	1.424	196	1.689	1.362	1.165	0.163
Book Leverage	407	0.549	0.534	0.243	206	0.533	0.511	0.255	201	0.565	0.569	0.229	-0.031
Market Leverage	395	0.393	0.381	0.214	199	0.374	0.371	0.211	196	0.411	0.398	0.215	-0.037 [*]
R&D/TA	407	0.039%	0.00%	0.004	206	0.027%	0.00%	0.002	201	0.053%	0.00%	0.005	0.026%
EBITDA/TA	393	0.125	0.128	0.138	201	0.141	0.133	0.093	192	0.108	0.125	0.172	0.033 ^{**}
Tangible Asset/TA	397	0.341	0.268	0.251	202	0.343	0.278	0.247	195	0.339	0.257	0.257	0.005

Table 7 Descriptive Statistics for Deal Characteristics for Competing Sample

This table reports the characteristics of Mergers & Acquisitions deals. Deal Value, obtained from SDC, is the total amount paid by the acquirer. Relative Size is deal value divided by market value of assets of the acquiring firm. 1D Premium is the premium paid by acquirer compared to the target stock price one day prior to the announcement. 1W Premium is compared to the price one week prior. 4W Premium is compared to the price four weeks prior. Toehold size is the percentage of target shares owned by the bidding firm prior to the announcement. Hostile Deals is the percentage of hostile takeovers in each sample. Friendly Deals is the percentage of friendly mergers. Tender offer is the percentage of stock owned by the bidder prior to the takeover announcement. Pure Cash is the percentage of deals paid by 100% cash in each sample. Pure Stock is the percentage of deals paid by 100% stock exchange in each sample.

	Deal Characteristic												Difference Successful - Failed
	Full Sample				Successful Bidder				Failed Bidder				
	N	Mean	Median	Stdev	N	Mean	Median	Stdev	N	Mean	Median	Stdev	
Deal Value	305	247.4	153.0	243.2	162	247.0	146.2	234.7	143	247.9	154.1	253.3	-0.829
Relative Size	295	0.679	0.101	5.026	157	0.181	0.076	0.262	138	1.245	0.178	7.316	-1.064*
1D Premium	277	57.47%	37.93%	92.62	138	71.57%	41.65%	113.5	139	43.43%	33.51%	63.01	28.14%**
1W Premium	279	61.26%	42.86%	96.72	140	73.04%	48.68%	115.72	139	49.39%	35.46%	71.22	23.65%**
4W Premium	277	73.03%	52.28%	114.7	136	88.61%	57.17%	139.8	141	58.00%	46.80%	81.45	30.61%**
Toehold Size	49	8.527%	6.510%	7.397	16	11.23%	8.705%	8.889	33	7.217%	5.750%	6.292	4.011%*
Hostile Deals	63		15.48%		16		7.767%		47		23.38%		-15.61%***
Friendly Deals	295		72.48%		185		89.81%		110		54.73%		35.08%***
Tender Offer	141		34.64%		95		46.12%		46		22.89%		23.23%***
Pure Cash	166		40.79%		83		40.29%		83		41.29%		-1.00%*
Pure Stock	45		11.06%		16		7.767%		29		14.43%		-6.66%**

Table 8 Regression Estimates of Target Leverage Ratio for Competing Sample

This table presents the OLS estimates of target leverage ratio over key financial measures for the full sample. The dependent variable is Book Leverage. Independent variable Sales is the natural logarithm of sales. Market to Book ratio is Market Value divided by book value of total asset. R&D/TA is R&D expense over total asset. RD Missing is a dummy variable which is 1 when R&D expense data is missing or 0 otherwise. EBITDA/TA is EBITDA over total asset. Tangible asset/TA is defined as new property, plant and equipment over total asset.

$$BookLeverage_{it} = \beta_0 + \beta_1 Sales + \beta_2 MarkettoBook + \beta_3 RD / TA + \beta_4 RDMiss + \beta_5 EBITDA / TA + \beta_6 TangibleAsset / TA + \varepsilon$$

Variables	Book Leverage
Intercept	0.3533*** (0.0738)
Sales	0.0258*** (0.0048)
Market to Book	-0.0381*** (0.0076)
R&D/TA	-3.4789 (2.7086)
RD Missing	0.1383** (0.0622)
EBITDA/TA	-0.4197*** (0.0739)
Tangible Asset/TA	-0.0508 (0.0392)
R ²	0.2018
Adjusted R ²	0.1889
Observations	379

Table 9 Descriptive Statistics by Leverage Deficit Quartiles for Competing Sample

This table demonstrates mean and median values of key variables for four quartiles of full samples grouped by leverage deficit. The t-test is for the difference of means from the first to the fourth quartile. ***, **and * stand for statistical significance at the 1%, 5% and 10% levels, respectively. Variable Sales is the natural logarithm of sales. Market to Book ratio is Market Value divided by book value of total asset. Book Leverage is book debt over total asset. Market Leverage is book debt divided by market value. R&D/TA is R&D expense over total asset. EBITDA/TA is EBITDA over total asset. Tangible asset/TA is defined as new property, plant and equipment over total asset. Deal Value, obtained from SDC, is the total amount paid by the acquirer. Relative Size is deal value divided by market value of assets of the acquiring firm. Toehold size is the percentage of target shares owned by bidding firm prior to the announcement.

	Leverage Deficit								
	Q1 (Lowest)		Q2		Q3		Q4 (Highest)		Q1 – Q4
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean
Sales	6.915	7.062	7.273	7.604	7.189	7.488	6.627	6.506	0.288
Market to Book	2.438	2.066	2.022	1.700	1.512	1.236	1.214	1.049	1.224***
Book Leverage	0.337	0.341	0.509	0.499	0.575	0.564	0.685	0.672	-0.348***
Market Leverage	0.161	0.150	0.297	0.309	0.443	0.449	0.639	0.630	-0.479***
Leverage Deficit	-0.349	-0.334	-0.219	-0.216	-0.098	-0.101	0.089	0.051	-0.438***
R&D/TA	0.140%	0.00%	0.023%	0.00%	0.004%	0.00%	0.006%	0.00%	0.134%
EBITDA/TA	0.122	0.165	0.152	0.153	0.130	0.127	0.105	0.099	0.017
Tangible Asset/TA	0.267	0.218	0.337	0.304	0.422	0.384	0.372	0.298	-0.106***
Deal Value	235.8	138.7	261.4	165.0	248.3	148.9	219.3	140.8	16.53
Relative Size	1.054	0.069	0.240	0.116	0.238	0.085	1.118	0.198	-0.06
Toehold Size	8.363%	5.750%	9.589%	5.605%	7.364%	4.555%	8.556%	7.975%	-0.193%
1D Premium	50.81%	35.40%	84.01%	47.67%	56.84%	38.67%	44.14%	29.87%	6.668%
1W Premium	53.62%	42.69%	87.18%	49.23%	60.17%	44.83%	53.01%	35.73%	0.619%
4W Premium	68.19%	54.03%	107.8%	56.12%	66.95%	50.22%	59.54%	45.29%	8.646%

Table 10 Empirical Results of Logistic Model Analysis for Competing Sample

This table presents the effect of key variables on the probability of success in Merger & Acquisitions. These regressions are based on the competing deal sample. Variable Leverage Deficit is firm actual leverage minus its target ratio. Market Leverage is the book debt over market value of total asset. Managerial Resistance is a dummy variable in which hostile takeover is 1 and friendly is 0. 4W Premium is the premium paid by bidder compared to the price of the target company four weeks prior to the announcement. Premium Missing is the dummy variable for the premium data. Compete is a dummy variable which is 1 where there is a competing bid, or 0 otherwise. Toehold Size is the percentage of target shares owned by the bidding firm prior to the takeover announcement. Relative Size is the value of deals divided by market value of total asset of bidding firm. Variable Sales is the natural logarithm of sales. Poison Pill is a dummy variable for whether the management of the target company uses the poison pill. Tender offer is a dummy variable for whether the bidding firm adopts tender offer to acquire the target.

$$P(\text{Success} = 1) = \beta_0 + \beta_1 \text{LeverageDeficit} + \beta_2 \text{Manresist} + \beta_3 \text{4Wpremium} + \beta_4 \text{ToeholdSize} + \beta_5 \text{Sales} + \beta_6 \text{PoisonPill} + \beta_7 \text{TenderOffer} + \varepsilon$$

P (Success = 1)												
Variables	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err	Estimate	Std Err
Intercept	0.0523	(0.1546)	-1.1444***	(0.3976)	-1.1873***	(0.4109)	0.2873	(0.2296)	-0.7322*	(0.3925)	-0.7878*	(0.4047)
Leverage Deficit	-0.3004	(0.6218)	-0.2044	(0.6335)	-0.1791	(0.6598)						
Market Leverage							-0.5507	(0.4895)	-0.9029*	(0.5119)	-0.8900*	(0.5356)
Managerial Resistance	-1.3794***	(0.3486)	-1.3517***	(0.3508)	-1.7475***	(0.4123)	-1.3737***	(0.3457)	-1.3171***	(0.3485)	-1.7571***	(0.4134)
4W Premium	0.0023*	(0.0013)	0.0025*	(0.0014)	0.0009	(0.0013)	0.0023*	(0.0013)	0.0024	(0.0013)	0.0007	(0.0013)
Toehold Size	0.0182	(0.0303)	0.0121	(0.0303)	-0.0042	(0.0311)	0.0205	(0.0302)	0.0144	(0.0303)	-0.0029	(0.0312)
Sales			0.1716***	(0.0522)	0.1331**	(0.0540)			0.1642***	(0.0515)	0.1259**	(0.0537)
Poison Pill Dummy					-1.9551*	(1.0891)					-1.9323*	(1.0907)
Tender Offer Dummy					1.5516***	(0.2863)					1.6104***	(0.2854)
Observations	377		377		377		393		391		391	