Abnormal Returns to Rival Firms of Initial Takeover Target

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Abstract

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In this paper I study the abnormal returns of different subsample of rival firms of takeover targets at their takeover announcement. Using latest data from 1990 to 2013, I confirm that rival firms earn positive and significant returns over target announcement period. Furthermore, after dividing the rivals into large rival portfolio and small rival portfolio, results show that the positive abnormal return is primarily earned by large rivals rather than small rivals. It is consistent with the hypothesis that large rival firms in the industry are expected to benefit more in the event of initial takeover, and large rivals are expected to become more competitive after initial merger, compared to relatively smaller rivals.

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1. Introduction

Various studies have found empirical evidences that rival firms of an acquisition target earn positive abnormal returns on the target's announcement, but few studies distinguish between rival firm characteristics and how they affect the rival firm's abnormal return. In this paper I find that different rival firms do not necessarily obtain the same level of abnormal return. According to my results, rival abnormal returns on the day of initial takeover announcement are mostly earned by large rivals rather than small rivals, as large rivals are expected to benefit more from the information of initial takeover announcement, and are expected to become more competitive than small rivals.

Previous researches observe that rival firms earn significant abnormal returns on initial target's takeover announcement day. Eckbo (1983) observes significant positive abnormal returns on rival firms of horizontal merger targets. Mitchell and Mulherin (1996) also find positive returns on rival firms. Several hypothesis have been developed to explain the abnormal returns on rival firms. The collusion hypothesis suggest collusion between merging firm and rivals in the industry, but the hypothesis has been rejected by Eckbo (1983, 1985). Song and Walkling (1999) develop the acquisition probability hypothesis, which explains rival abnormal return with increased probability of becoming a target. Furthermore, the market power hypothesis by Chatterjee (1986) states that rivals earn abnormal return because they are expected to benefit from the increased market power brought into the industry by merging firms, and the rivals gain positive return only if they become more cost-efficient.

In this paper, I also find positive and significant abnormal returns on rival firms when the target announces a takeover, using data from 1990 to 2013. Furthermore, I divide the portfolio of rival firms into a portfolio of large rivals and a portfolio of

small rivals, and I discover that the positive abnormal return is primarily earned by the large rivals. Based on the market power hypothesis, I posit that the market has higher expectations that large firms will benefit from the increase of market power induced by the merging firms. In addition, I also distinguish the initial merger between horizontal merger and non-horizontal merger, and discover minor differences between their rival return.

Section 2 reviews the relevant studies and posit my hypothesis. Section 3 describes the data used for analysis in this paper. Section 4 discusses the methodology of forming rival portfolio and calculating target and rival abnormal return using market model. Section 5 presents results of event study of both target and rivals' abnormal returns in selected event windows during announcement period, and cross sectional regressions results of rival CAR on target CAR and other control variables. Section 6 further develops the robustness tests, and the last section reaches the conclusion.

2. Literature review and hypothesis

2.1 literature review

Previous studies have observed that target firms gain positive abnormal return during takeover announcement period. Jensen and Ruback (1983) demonstrate that mergers in general create economic value. The studies of Lubatkin (1984) and Singh (1984) use the cumulative abnormal returns (CAR) to measure the abnormal return acquired during announcement period, and indicate that mergers create economic value. Moreover, it has also been discovered that rivals of the target firm also react to target firms' merger announcements. Eckbo (1983) reports rivals of merging firms benefit from the news of horizontal merger announcement. According to his research, rivals of horizontal mergers that are challenged because of collusion earn on average a

significant positive abnormal return of 2.45% within a month around the original merger announcement period.

Researches have tried to find the source explaining rival firms' abnormal returns on target announcement day. Eckbo (1983) tests the collusion theory, which states that rival firms gain abnormal return in horizontal mergers because they benefit from monopolistic collusion among each other. Song and walkling (1999) suggest the acquisition probability hypothesis that rivals earn abnormal return on target takeover announcement because of their increased probability of becoming targets themselves. Chatterjee (1986) talk about the market efficiency theory that rivals gain abnormal returns because of market's expectation that the rivals will benefit from increased market efficiency after the initial merger in the industry.

The collusion theory holds that rival firms earn abnormal returns because of collusion within the industry allows rival firms to earn monopoly rent and monopsony rent. As Eckbo (1983, 1985) explains, horizontal mergers, especially the ones that receive antitrust challenges, promote tacit or explicit cooperation among rivals in the same industry, and rivals gain abnormal returns because of increased possibility of collusion among each other as well as with target firms. However, this theory has been rejected by Eckbo (1983). According to the hypothesis of collusion theory, both target and rivals should earn positive abnormal returns on target merger announcement, while target and rivals should earn negative returns when an announcement of antitrust challenge is issued. Eckbo tests rivals' abnormal returns on horizontal merger announcements as well as antitrust announcements, and discovers that rivals actually gain positive abnormal returns on both merger announcement and antitrust announcement, which contradicts the collusion hypothesis. Moreover, Asch (1976) finds that collusive behavior is negatively related to firm's profitability.

The takeover probability hypothesis suggests that rival firms gain positive abnormal returns during target merger announcement period because their probability of being taken over has increased. Papelu (1985) claims that targets of acquisition can

be predicted with public data. Song and Walkling (1999) believe that the takeover announcement issued on the original target might cause a revaluation of the target's industry, and the probability of other firms in that industry becoming targets in next takeover would increase. Furthermore, Song and Walkling (1999) find that the rival firms that actually became targets within one year after the initial target's takeover announcement have significant larger CARs than the rival firms that do not become targets later. Also rival CAR is positively and significantly related to predicted probability of rivals becoming target.

Chatterjee (1986) introduces two effects that may influence rival return: the product/factor-price effect and the information effect. The factor-price effect suggests that target firms become more cost effective after merger. Nevertheless, unless rivals firms are able to adopt the same cost-effective strategy as the target firms after merger, they will reduce in market value if they cannot become as competitive as the targets. The information effect argues that merger announcements pass on information about available technological improvements, which will increase the efficiency in the industry, therefore rival firms enjoy positive returns because of market expectation that they will also benefit from technological improvements. According to this hypothesis,

Increase (or decrease) in market value = factor-price effect (loss) + information effect (gain)

The factor-price effect captures the negative effect, as it describes the effect when rivals do not become as competitive as targets after merger and reduce in market value. The information effect is supposed to be positive if target and rivals are expected to benefit from technology. Therefore, rivals earn positive return if the sum of factor-price effect and information effect is positive: rivals gain positive abnormal return when information effect dominates, which can offset the negative factor-price effect.

As documented in various literature, firm return could be affected by the size of the firm. As firm size is a firm specific variable which is known before any event is announced (Bamber 1987), it is a variable that can help the traders, analysts and the market make predictions, which further affect the firm's reaction to the event announcement. According to Collins, Kothari and Rayburn (1986), firm size is a proxy for the amount of information available for traders and professional analysts to make prediction. Larger firms in general have better disclosure conditions for analysis. Moreover, they discover that predicted size-adjusted returns for large firms exceed small firms using various models. Different size of firms also respond differently to signals in the industry. Previous studies prove that large firms and small firms respond differently to tech innovations. According to Acs and Audretsch (1988), big and small firms respond differently to different stimuli. Factors affecting technological innovation affect big firms and small firms differently. Feldman (1994) states that small firm innovation appears to benefit from the presence of external institutions and resource. Also according to Steiner (1975), large firms have cheaper access to capital than small firms, so that it's easier for large firms to adapt to the change in industry and improve their own competitiveness. Moreover, firm size itself affect the firm's earnings according to empirical results. Studies have focused on size effect of the firm. Banz (1980) discovers that small firms have higher risk-adjusted returns than larger firms. The size effect also works for acquirers, according to Moeller, Schlingemann and Stulz (2003). They find that smaller acquiring firms gain higher announcement returns than larger acquirers. However, Chen(1981) argues that the size effect is captured by some other factors using an Arbitrage pricing model. His studies show that portfolios of firms of different sizes do not present significant difference in returns after adjusting for risk factor, so that risk explains the size effect, and the market is efficient. Later Chan, Chen and Hsieh (1985) further note that the higher returns of small firms compared to big firms are induced by additional risks in an efficient market. Several studies also link the size effect to collusion and monopoly

rent. Asch (1976) finds that firm size as a control variable is positively and significantly related to firm profit, while the degree of collusion negatively and significantly affect profit. Barla (2000) find that if the firm sizes in the industry becomes more asymmetric, collusion is more difficult to maintain.

Apart from the size effect that influence market expectation on rival performance, which further affect rival return, studies show that the characteristics of the initial merger itself also affect rival return. Chatterjee (1986) states that rivals of unrelated mergers gain higher returns than related mergers. However, conglomerate mergers not only directly affect rival returns, but also offer strong influence on market power which may affect the whole industry. Mueller (1969) find that conglomerate mergers take place when they increase in market power, especially when the merging firms from different industry produce technological improvements or managerial economy of scale. Weston (1970) states that conglomerate mergers permit the extension of market power from one industry into other industries. Therefore, a conglomerate merger transmit market power from the industry of acquiring firm to target firm, therefore affecting rival firms in the same industry of the target.

2.2 Hypothesis

Based on the three major hypothesis of previous studies mentioned before, the rival's positive abnormal return could be driven up by several market expectations: the expectation of intra-industry collusion, the expectation that the rival will become a future target of takeover, and the expectation of taking advantage of technology or managerial innovations. All these three expectations can signal the market expectation that rival firm benefit from the information of target takeover announcement, and it could be that these expectations have collective effects on rival abnormal returns. Nevertheless, it is hard to distinguish among these three expectations' effect on rival abnormal returns. Firstly, if the market projects potential collusion between the merging new firm and rival firms, or between two or more rival firms, the rivals

increase in market value and gain positive abnormal returns, according to Eckbo (1983)'s hypothesis. Eckbo's results rejects this hypothesis, which makes the collusion effect less possible, but it should still be noted that the data used in his research were in 1980s, and it still remains unclear whether the data I used in this paper from 1990 to 2013 support the same result as Eckbo. However, previous studies have not distinguished whether the collusion probability is higher among large rivals or among small rivals. Therefore the market expectation of intra-industry collusion could fall on both large and small rivals, but may differ in degree.

The second sort of market expectation is that rivals increase in value because they are expected to have increased probability to become future targets. in order to reduce the effect of future takeover probability which might also contribute to positive abnormal return on rivals, I clear out the rival firms that actually became a merger target within one year, based on the studies of Song and Walkling (1999)'s takeover probability hypothesis. According to Song and Walkling (1999), rivals that actually became targets within the following year gain significantly higher abnormal return than rivals that do not become targets. By deleting the firms that became target within a year, I try to reduce the influence of takeover probability. However, as the market cannot precisely predict which firm will become a target of future takeover, all rivals are still exposed to probability of becoming a target of takeover. Therefore, by excluding the rivals that became targets from my sample, I can reduce to the maximum level but still cannot eliminate the influence of takeover probability hypothesis.

The third expectation that drives up rival abnormal return lies in that rival firm will become more cost-efficient, which is stimulated by the increased competitiveness of merging firms. This hypothesis is based on the theory of Chatterjee (1986). Rival firms earn positive return if they are expected to become more cost-efficient, while rivals earn negative returns if they are expected to lose competitiveness compared to merging firms and other rivals in the industry. More studies discover the relationship

between competitiveness and firm's performances. Hunt (1997) find that firms with advantageous competitiveness have better financial performances. Also, Salop and Scheffman (1983) suggest that it is relatively less expensive for dominating firms to raise their rivals' costs and improve their own competitiveness. However, I suggest that larger rivals and small rivals are not equal in the level of increased competitiveness and cost-effectiveness, as previous studies provided empirical evidence that large firms find it easier to react to information, and are usually expected to earn higher returns. Therefore, I suggest a hypothesis that during the announcement period of the initial takeover, large rivals of the target and small rivals of the target are expected to benefit from the information of takeover announcement, but the abnormal returns acquired by rival firms may differ in degree. Large rivals are expected to become more competitive while small rivals are expected to be less competitive after the initial merger.

In addition, as conglomerate mergers bring in market power from the acquiring firm's industry in terms of technological innovation or managerial improvement, which affect the market power of target's industry, I also add to the hypothesis that rivals may gain higher returns if the initial merger is a conglomerate rather than a horizontal merger, as the market expects conglomerate mergers to bring more market power into the industry.

In general, my hypothesis could be illustrated in the following points:

1. Larger rival firms of the target obtain more positive effect from the initial target takeover announcement than small rival firms, as the market expects large rivals of the original target to benefit more from the information release of the initial takeover announcement, and become more competitive because they become more cost-efficient. Small rivals are less affected by the announcement of the initial takeover, as the market expect less improvement and competitiveness from small rival firms.

2. Rivals of non-horizontal merger targets could benefit more from the initial non-horizontal mergers, as non-horizontal mergers bring in information and innovation from outside the industry.

If the hypotheses hold, large rivals should earn more positive abnormal returns on target announcement, while small rivals earn little significant abnormal returns. Rivals of non-horizontal mergers should also earn more positive abnormal returns on target announcement, compared to rivals of horizontal mergers.

3. Data

3.1 Selection of mergers

The sample of mergers from January 1, 1990 to December 31, 2013 is drawn from Securities Data Company (SDC) database. The sample is limited to US mergers and acquisitions where acquirers are public firms. After collecting other data and satisfying for target and rival selection criteria, the sample left for event study has been narrowed down to 1726 mergers.

The status of merger in SDC database is classified into Completed, Intended, Partly completed, Pending and Withdrawn. I identify successful mergers as the ones with reported status of "Completed", and unsuccessful mergers as the ones with status of "Withdrawn". The unsuccessful mergers could be either intentionally cancelled or naturally expired. Completed mergers are the majority of all mergers: a total of 1509 completed mergers and 204 withdrawn mergers in the sample.

The SDC database also provide information about target and acquirer firms' industry identification by 4-digit SIC codes. I reclassify target and acquirer's industries into a more general industry identification by using 3-digit SIC codes. Therefore, I identify the merger as a horizontal merger if target's 3-digit SIC code is the same as its acquirer's 3-digit SIC code. The merger is identified as a non-

horizontal merger if the target's 3-digit SIC code is different from its acquirer's 3-digit SIC code. From 1990 to 2013, there are 994 horizontal mergers and 732 non-horizontal mergers in this sample after cleaning data for further steps.

3.2 Selection of rivals

The rivals of a certain merger target are chosen as the horizontal rival firms in the same industry as the target. To obtain the rival firms, I take all firms in CRSP which have the same SIC codes as the target in each industry. All other firms excluding the target itself are identified as rivals of that target. Of all the merger targets, there are a total of 330 industries identified by 330 3-digit SIC codes. All firms excluding targets in these 330 industries consist of the initial sample of rival firms. For each merger event, the rivals are grouped into an equally weighted or value weighted portfolio to match the target.

The number of firms in each industry vary largely. The industry with the largest number of firms is Investment Offices (SIC code 672), with 2649 firms in total, followed by Computer Programming, Data Processing, And Other Computer Related Services (SIC code 737), with 1557 firms. As some industry groups contain too few firms for analysis, I deleted the industries with less than 10 firms, so that for the target firm in each merger event, there are at least 9 horizontal rival firms.

Furthermore, for each merger announcement, I create a portfolio of large rivals which only consists of rivals that are bigger than industry median market value, and a portfolio of small rivals which consists rivals that are smaller than industry median market value. Therefore, apart from the rival portfolio consisting of all other firms in the industry with the same 3 digit SIC code as the target firm, one target in a merger event is matched to two additional rival portfolios: the big rival portfolio and the small rival portfolio. I use the market value as a proxy for firm size, and the data to calculate market value are collected from CRSP.

3.3 Selection of targets

As an acquisition of firms with a tiny market value are expected to have little influence on the whole industry, I want my merger samples to be major merger and acquisitions in the industry, which can possibly exert an influence on the abnormal returns of other firms in the industry. Therefore, I only keep the mergers in which the target's market value is larger than the industry median market value.

3.4 Eliminating the influence of acquisition probability

According to Song and Walkling (1999), the probability of becoming a target contribute to positive abnormal returns to the rival firms. Their research observes significant larger abnormal returns on rivals that became target of another merger event within one year after the original merger. Therefore, in order to eliminate the positive effect on abnormal returns earned by rivals due to future probability of becoming a target, I delete the rival firms that became a merger target within one year (12 months) after the original merger event. Therefore the degree of abnormal return on rival portfolio should be aroused by the increased cost-effectiveness created by the combination of two firms.

A total number of 1726 mergers are left in the sample from 1990 to 2013, with 994 horizontal mergers and 732 non-horizontal mergers. The distribution of all mergers are described in table 1:

TABLE 1: descriptive statistics

This table presents the descriptive statistics for initial merger announcements. The merger announcements included in this sample are obtained from US mergers in SDC database, from January 1, 1990 to December 31, 2013. Although SDC reports announcements to the latest date, this paper only use data up to the end of 2013 as CRSP only reports data until the year of 2013. The number of rivals are the number of firms in the target's industry except for target itself. Value of transaction is the value paid by acquirers of initial merger, and the data is collected from SDC. Successful mergers are identified by SDC as "completed" status, and unsuccessful mergers are identified by SDC as "withdrawn" status. Note that the withdrawn status in SDC could either be withdrawn or naturally expired. Horizontal mergers are the ones where acquirers are also in the same industry as the target, while non-horizontal mergers are the opposite.

	no of mergers	number of rivals			value of transaction(million)			
		mean	median	range	mean	median	max	min
all mergers	1726	236.23261	200	9-1870	2038.24	624.827	89167.72	3.2
successful vs unsuccessful								
completed	1509	239.01818	209	9-1870	2060.1133	634.545	89167.72	3.2
withdrawn	204	215.84912	77.5	9-1125	1962.3167	420	43711.6	7.939
horizontal vs nonhorizontal								
horizontal	994	272.03197	226	9-1870	2263.4933	579.56	89167.72	3.2
nonhorizontal	732	189.75866	95.5	9-1528	1751.0133	684.4845	49278.87	5.033

The first to fourth columns of table 1 counts the numbers of merger events in the sample, as well as calculating descriptive statistics for rival portfolio of each merger event. Most of the mergers are successful mergers, while withdrawn mergers consist only of a small portion. Besides, in each sample, the number of horizontal and non-horizontal mergers are similar. The number of rival firms for each merger event varies from 9 to 1870, with an average and median of around 200 rival firms per merger. The industries with less than 10 firms, which provide the target with less than 9 rivals, are deleted from the sample.

The fifth to ninth columns describe statistics on the value of transaction on each merger event. The data is extracted from SDC, recorded in million dollars. The value of transaction for each merger event varies from a small amount of 3.2 million to 89167.72 million in all samples, with an average of around 2000 million.

4   Methodology

4.1 Constructing rival portfolio for target firm in each merger event

For each merger event, the target is matched to a portfolio of rival firms in order to run group event study and cross sectional regression analysis. All other firms that have the same 3 digit SIC code as the target firm are identified as rivals. The rival portfolio is constructed with all other firms in the target firm's industry, excluding itself. For each merger event, which is signified by a target identifier (PERMNO or CUSIP) and an event date, one corresponding rival portfolio is constructed.

In order to take the size effect into consideration, the rival portfolios are constructed in both equal weighted and value weighted methods. In equal weighted portfolios, all rivals in the portfolio have same weighted regardless of their market value. The value weighted portfolios are weighted by the market value of each rival firm. The difference in CAR of value weighted portfolio and equal weighted portfolio indicate

that the size of rival firm contribute to difference in rival CAR at original target's merger announcement.

In order to further test the size effect of rival firms, I divide each rival portfolio into two parallel portfolios. One portfolio consists of rivals that are larger than (or equal to) the median market value of the industry, and the other portfolio consist of rivals that are smaller than the industry's median firm size. Market value is calculated as number of common shares outstanding multiplied by average price over the year. Therefore, each merger event has two subsamples of rival portfolios: one with large rivals and one with small rivals. The rest of the paper will focus on their difference in CAR, and their relation to target CAR.

4.2 Estimating rival and target CAR

Firstly, I employ event study methodology to measure abnormal return and cumulative abnormal returns of target firms and their rival firms during the period of a merger announcement. Using the daily return from Center for Research in Security Prices (CRSP), I estimate the daily abnormal returns for each target and rival firm from 30 days before merger announcement day and 30 days after the merger announcement day. I select 5 event windows: the period before announcement day [-30, -2]; the period around the announcement day [-1, 1], the exact announcement day [0], one week after announcement [2, 7] and one month after announcement [2, 30]. Day -1, one day before announcement day, is included in the second window for estimation on announcement-period returns, because early information leaks are expected to affect the abnormal return. The estimation period starts from 300 days before the merger announcement date and ends at 46 days before announcement. During the estimation period, the parameters are estimated with market model:

$$R_{it} = \alpha + \beta R_{mt} + \varepsilon$$

Where R_{it} is the return to firm i or portfolio i at time t during the estimation period, and Rm is the value weighted CRSP index returns.

The abnormal return for each rival portfolio is the difference between real return on each day in the event window and the estimated return estimated according to the market model, which is computed as $AR_{it} = R_{it} - \hat{\alpha} - \hat{\beta}R_{mt}$. Then I aggregate the abnormal returns for each target firm as well as for each rival portfolio in all event windows to get the cumulative abnormal return (CAR), which is computed as CAR=$\sum_{i=1}^{T} AR_{it}$, where T is the length of each event window. Table 2 reports the descriptive statistics of cumulative abnormal returns of target firms and corresponding rival portfolios in the 5 selected event windows. If firm size is supposed to have an impact in the firm's abnormal return, the CARs are expected to be different between equal weighted rival portfolios and value weighted rival portfolios. Therefore, a paired t test is conducted to compare the two sets of portfolio CARs.

TABLE 2: target and rival portfolio CAR

The CARs are the cumulative abnormal return which aggregates the daily abnormal returns in each event windows. The abnormal return is calculated with the market model. Although in event study I used 5 event windows, here I take only 3 event windows presenting the period before announcement, on announcement day, and after announcement. These three windows' CAR are further used for cross sectional regressions later in the discussion.

	(-30,-2)			(-1,1)			(2,30)		
	mean	median	stdev	mean	median	stdev	mean	median	stdev
full sample(N=1729)									
target	0.0526	0.0332	0.1979	0.2186	0.1760	0.2580	-0.0050	-0.0071	0.1429
equal weighted rivals	0.0035	-0.0001	0.0692	0.0020	0.0012	0.0167	0.0002	-0.0015	0.0761
value weighted rivals	-0.0020	-0.0016	0.0613	0.0012	0.0006	0.0189	-0.0041	-0.0034	0.0610
paired t test	4.79***			2.01**			3.27***		
horizontal(N=994)									
target	0.0493	0.0410	0.2131	0.2376	0.1547	0.2379	-0.0026	0.0007	0.1992
equal weighted rivals	0.0053	0.0006	0.0698	0.0018	0.0013	0.0156	0.0000	-0.0010	0.0763
value weighted rivals	-0.0023	-0.0028	0.0588	0.0008	0.0003	0.0174	-0.0043	-0.0039	0.0582
paired t test	5.18***			2.38**			2.58**		
Non-horizontal(N=732)									
target	0.0529	0.0457	0.1924	0.2468	0.1896	0.2107	-0.0015	-0.0039	0.1685
equal weighted rivals	0.0013	-0.0009	0.0686	0.0022	0.0010	0.0182	0.0005	-0.0018	0.0760
value weighted rivals	-0.0018	-0.0002	0.0633	0.0017	0.0012	0.0208	-0.0040	-0.0020	0.0645
paired t test	1.8*			1.03			2.37**		

*** denotes significance at 1% level.

** denotes significance at 5% level.

* denotes significance at 10% level.

According to table 2, it is obvious that there is a significant difference between CARs calculated by equal weighted portfolio and value weighted portfolio in all 3

event windows during announcement period, as well as before and after announcement.

In window (-1, 1), which includes one day before to one day after the merger announcement, the target and rivals have positive returns on average. However, the paired t test show a significant difference between equal weighted rival portfolios and value weighted rival portfolios for the horizontal mergers, while the rival portfolios for non-horizontal mergers don't display any significance in the difference between equal weighted and value weighted. In the window before and after announcement, the difference between equal and value weight is significant. The mean and median abnormal return for targets are generally much larger than rival firms, indicating that targets are the most influenced among all firms in the industry on merger announcement. Moreover, on average, target firms have negative abnormal returns in the period after merger announcement.

Then I substitute the full rival portfolio samples for the two subsamples of rival portfolios in order to calculate CARs for both big rival portfolios and small rival portfolios. The descriptive statistics are presented in the following table:

TABLE 3: CAR of larger and small rival portfolio

This table presents descriptive statistics for both large and small rival portfolios. The large rival portfolio contains rival firms whose market size are bigger than industry median, and small rival portfolio consists of rivals whose size are smaller than industry median. The paired t test presents if there is a significant difference between large rival CAR and small rival CAR.

	(-30,-2)			(-1,1)			(2,30)		
	mean	median	stdev	mean	median	stdev	mean	median	stdev
full sample(N=1726)									
big	-0.0007	-0.0015	0.0733	0.0025	0.0010	0.0219	-0.0036	-0.0037	0.0797
small	0.0019	-0.0014	0.0734	0.0013	0.0009	0.0198	-0.0020	-0.0033	0.0808
t stat	-6.61***			2.44**			-5.44***		
horizontal(N=994)									
big	-0.0033	-0.0050	0.0614	0.0031	0.0008	0.0173	-0.0018	-0.0007	0.0641
small	0.0128	0.0071	0.0646	0.0024	0.0015	0.0172	0.0087	0.0037	0.0742
t stat	-6.03***			0.87			-3.75***		
Non-horizontal(N=732)									
big	-0.0023	-0.0027	0.0548	0.0030	0.0009	0.0208	-0.0019	-0.0031	0.0644
small	0.0069	0.0029	0.0649	0.0013	0.0011	0.0206	0.0121	0.0060	0.0801
t stat	-3.09***			1.68*			-3.91***		

*** denotes significance at 1% level.

** denotes significance at 5% level.

* denotes significance at 10% level.

Large rival portfolios shows an average of negative but insignificant CAR before and after the merger announcement, presented in the window (-30, -2) and (2, 30). In the period before announcement, small rival portfolios have on average positive but insignificant CARs. During window (-1,1) around takeover announcement, both large and small rival portfolios have positive cumulative abnormal returns. Moreover, according to the paired t test, there is significant difference between large rival CAR and small rival CAR, and the significance mostly comes from non-horizontal mergers, as the rivals of non-horizontal mergers show significant difference between large and

small rival CARs, while large and small rivals of horizontal mergers do not show significant difference.

5 Results

5.1 Event study

To analyze whether the target and rival obtain cumulative abnormal returns over selected periods around, before and after the merger announcement, I use event study to estimate daily abnormal return from 30 days before the merger announcement to 30 days after the merger announcement. Then I aggregate daily abnormal returns in each event window to calculate the cumulative abnormal returns. The mean and median CARs for all five event windows in each subsample are listed in the following table:

Table 4: event study

Event study uses market model to estimate abnormal returns of both target and rival portfolio. The estimation period lasts for 225 calendar days, from 300 days before announcement to 46 days before announcement. If the event date reported in SDC happens to fall on weekends or holidays, the return data automatically postpones to the next trading day. I select 5 event windows around the merger announcement: (-30,-2), (-1,1), (0), (2,7) and (2,30), among which day 0 is the announcement day. Later I use the CAR in (-1,1) to proxy for the announcement period in cross sectional studies because usually there are information leak before official announcement, and the market already starts to react a little before the day that the firm issues an official announcement. The test statistics below each CAR uses generalized sign z test, which tests whether the number of stocks or portfolios with positive CAR in the event window significantly exceeds the number of stocks of portfolios in the estimation window. The calculation of test statistics is based on the study of Cowan (1992). Test statistics is calculated as $Z_G = \frac{\omega - n\hat{p}}{\sqrt{n\hat{p}(1-\hat{p})}}$
, where ω is the number of stock or portfolios with positive abnormal return in the event window, and $\hat{p}$ is the fraction of fraction of positive abnormal returns in the estimation window.

		(-30,-2)	(-1,1)	0	(2,7)	(2,30)
panel A: full sample (N=1726)						
target	median	0.0332	0.176	0.0809	-0.0028	-0.007
	mean	0.0526***	0.2186***	0.1468***	*-0.0021	-0.005
	test stat of mean	14.71	40.676	30.396	-1.442	-0.822
rival	median	-0.000113	0.0012118	0.0004545	2.929E-05	-0.001458
	mean	*-0.0038	0.0013*	0.0008	***-0.0011	-0.0022
	test stat of mean	-1.47	1.585	0.872	-2.379	0.356
large vs small (N=1726)						
large rivals	median	-0.0015	0.002	0.0059	-0.001	-0.0037
	mean	***-0.0007	0.0025***	0.0016**	***-0.0003	***-0.0036
	test stat of mean	-2.566	2.668	1.835	-3.835	-4.509
small rivals	median	-0.0014	0.0009	0.0001	-0.001	-0.0033
	mean	0.0019***	0.0013	0.0006	0***	***-0.002
	test stat of mean	-3.251	1.231	-0.911	-3.885	-4.996

		(-30,-2)	(-1,1)	0	(2,7)	(2,30)
panel B: successful vs unsuccessful						
successful (N=1509)						
target	median	0.0357	0.1985	0.0935	-0.0024	-0.0043
	mean	0.0522***	0.2457***	0.1649***	*-0.0019	-0.0007
	test stat of mean	11.809	32.376	24.18	-1.335	0.211
rival	median	-4.19E-05	0.0016	0.0006	1.409E-05	-0.0008
	mean	0.0039***	0.0028***	0.0014**	0.0008***	0.0012***
	test stat of mean	-2.483	2.809	1.742	-2.355	-2.867
unsuccessful (N=204)						
target	median	0.0304	0.1742	0.0574	-0.0009	-0.0123
	mean	0.0449***	0.2148***	0.1341***	0.0029	-0.0146
	test stat of mean	3.229	10.94	7.575	0.425	-0.977
rival	median	-0.0001	0.0014	0.0015	0.0019	0.0038
	mean	0.0116	0.0064	0.0035**	0.0021	0.0058
	test stat of mean	-0.621	0.028	2.302	-0.296	0.028
panel C: horizontal vs nonhorizontal						
horizontal (N=994)						
target	median	0.0282	0.1897	0.0816	-0.0014	-0.0042
	mean	0.0493***	0.2376***	0.1574***	-0.0014	-0.0026
	test stat of mean	8.45	25.409	19.438	-0.095	0.159
rival	median	-0.0027	0.0002	0.0002	-0.0017	-0.0038
	mean	**-0.0023	0.0008	0.0003	***-0.0007	***-0.0043
	test stat of mean	-2.159	0.655	0.709	-2.849	-2.796
non-horizontal (N=732)						
target	median	0.0419	0.2058	0.0940	-0.0026	-0.0069
	mean	5.29***	24.68***	16.52***	*-0.0012	-0.0015
	test stat of mean	8.801	22.935	16.201	-1.559	-0.449
rival	median	-0.0002	0.0012	0.0001	-0.0015	-0.0019
	mean	-0.0018	0.0017**	0.0007	***-0.0017	**-0.004
	test stat of mean	-0.705	1.916	-0.586	***-2.552	-1.659

*** denotes significance at 1% level.

** denotes significance at 5% level.

* denotes significance at 10% level.

Previous findings have proved takeover targets gain positive return on announcement day of the takeover. Jensen and Ruback (1983) find that takeovers generate positive gains and target firm shareholders should benefit. My results are consistent with previous findings that target firms gain positive and significant cumulative abnormal returns during announcement period of the initial merger as expected. On announcement denoted in event window (0), target CAR are significantly positive. The event window (-1,1) also have positive and significant abnormal returns, which allows for some information leak one trading day before the announcement day, and some reactions one day after the announcement day. Moreover, Target CAR during the run-up period also show a very significantly positive pattern. This run-up trend before announcement day has been discovered and explained in other studies. Jarrell and Poulsen (1989) find that illegal insider trading positively related to price run-up prior to announcement. In the period after announcement, target CAR are negative and significant in event window (2,7), but becomes insignificant in a longer period (2,30). Schwert (1996) finds that the post announcement period returns are unrelated to pre-announcement stock price run-ups.

Panel A shows results for full sample event study. For full sample of rival portfolios, there is significant positive returns on announcement period, consistent with the finding of Eckbo (1983) and Mitchell and Mulherin (1996). During the event window (-1,1), rival portfolios earn on average a positive and significant return of 0.0013, while on event day (0), rivals gain 0.0008 return, but not significant. Before announcement, rivals have positive and significant abnormal returns, and slightly negative abnormal returns in the period following announcement, similar to target sample.

Then I split the rival portfolio into large rival portfolio consisting of only large rivals bigger than industry median and small rival portfolio containing rivals smaller than industry median size, and conduct the event study on the two portfolios separately. It is obvious that large rivals earn significantly positive abnormal returns on announcement periods, both during (-1,1) and (0) event window. On the contrary, small rivals don't show significant abnormal returns during announcement period.

Large rivals have negative returns before and after announcement, while small rivals have positive returns before announcement and negative returns after announcement.

Panel B divides the full sample of all mergers into successful mergers and unsuccessful mergers. The results show that whether a merger is successful or not does not make significant influence on the abnormal return of rival firms. The rival firms in both successful mergers and unsuccessful mergers acquire positive and significant CAR on merger announcement day. This result is consistent with the findings of Paul (1982), who find that the market makes no distinction between successful and unsuccessful mergers on the day of the merger announcement. Rather, the market predicts whether a merger announcement will succeed or will be cancelled in a short period after the announcement. Consistent with the finding, the successful mergers in my sample have significantly positive abnormal returns in all event windows, while withdrawn rivals are only significant on announcement day. It indicates that as the market distinguishes successful and unsuccessful mergers in the period after announcement, rivals of successful mergers gain more significant abnormal return than rivals of unsuccessful mergers. Nevertheless, it should be noted that the sample of unsuccessful mergers is relatively small, as there are only 204 withdrawn mergers, either naturally expired or cancelled, compared to 1509 successful mergers. Therefore, the sample of unsuccessful merger does not have as the explanatory power as the successful sample of mergers.

The subsamples in Panel C distinguishes the abnormal returns between horizontal mergers and non-horizontal mergers. According to the results, rivals in horizontal mergers have positive but insignificant CAR of 0.0008 on announcement period of (-1,1), while the rival CAR of non-horizontal mergers are significantly positive of 0.0017. This is consistent with the hypothesis that non-horizontal rivals are expected to benefit more from initial target takeover announcement, as innovations are brought in from outside the industry. Horizontal rivals have significant positive return during the run-up period and negative returns after announcement, while non-horizontal rivals do not present much significance in these two periods.

In general, the results are consistent with previous findings that rival firms gain abnormal returns on announcement day of original merger. In addition, the results indicate that rivals of non-horizontal mergers seem to enjoy more significant positive abnormal returns around the day of announcement, and big rivals have significantly more positive CAR than small rivals. The results are consistent with the hypothesis.

5.2 Cross sectional regression

To further analyze the relation between the abnormal return of rival firms and other factors, I employ the cross sectional regressions to detect the factors that may contribute to rival abnormal return, especially target abnormal returns. The regression reveals how rival CARs are related to target CARs, as well as other control variables, grouped into firm-specific variables, industry specific variables and merger-specific variables. Firm-specific variables include relative firm size of rival to target, and leverage and Tobin's Q of both target firm and rival portfolio. The relative size of target firm and rival firm is calculated as:

Relative size = average market value of rival portfolio/market value of target

Which adjusts for the size of rival firms. Since the sample contains only major mergers in the industry, the target firm sizes are larger than the industry median size. If the average market value of rival portfolio is larger than the target size, the relative size variable is larger than 1; else the value of this variable is smaller than 1.

Both target and rival firms' leverage are computed as the firm's asset divided by equity. Tobin's Q is calculated as:

Tobin's Q = (share price * common shares outstanding + liability)/asset

Where share price uses the year end price collected from Compustat, and the number of shares outstanding, as well as total liability and total asset are also from Compustat. The Tobin's Q variable proxies for the firm's performance.

Industry characteristic is represented by Herfindahl-Hershman index, calculated as

$$\text{HHI} = S_1^2 + S_2^2 + S_3^2 + \cdots + S_n^2$$

where Sn is the market share of the *i*th firm, and the market share is computed as the *i*th firm's market value divided by aggregated market value of all the firms in that industry. The industry includes all firms with the same 3 digit SIC code as the *i*th firm, using the same criteria as the previous method when identifying industry rivals. The Herfindahl Hirschman index adjusts for the influence of industry concentration.

Merger-specific variables are transaction value and horizontal dummy. Transaction value takes the log value of the merger transaction. multibidder dummy is a dummy variable identifying whether the merger has only one acquirer or more than one bidder. If there is only one acquirer, the dummy variable equals 0. On the contrary, if there are more than one acquirer bidding the target, the dummy variable equals 1. The cross sectional regressions are firstly conducted on full rival samples, which are rival portfolios without distinguishing large and small rivals. Table 5 presents the result of this cross sectional regression:

Table 5: cross sectional regression

This table presents results of cross sectional regression. The dependent variable is the CAR of rival portfolios, and main independent variable is the corresponding target CAR. I also include the relative size variable which is calculated as rival market size over target market size. I also include Tobin's Q and leverage of both target and rival firms as control variable to control for firm specific characteristics. I use HHI index to adjust for industry concentration, and I also add characteristics of initial merger, which include initial transaction value and a dummy variable indicating whether the original merger has more than one bidders.

Panel A: full sample

	full sample		
	(-30,-2)	(-1,1)	(2,30)
Intercept	0.01575***	0.00188	0.00666
	3.4	1.54	1.23
targetCAR	0.03273***	0.00553***	0.02375**
	4.69	4.18	2.2
sizeR/T	2.9E-06	-1.23E-06	-7.1E-06
	0.65	-1.07	-1.35
Target TobinQ	0.00114*	0.000117	0.00196***
	1.87	0.74	2.73
Target Leverage	-0.00024	2.57E-05	-0.00028
	-1.19	0.49	-1.14
Rival TobinQ	0.000234	*-0.00009419	**-0.00051839
	1.14	-1.78	-2.15
Rival Leverage	-1.3E-05	0.00003253*	-7.9E-06
	-0.2	1.96	-0.1
Herfindahl Index	6.91E-07	-6.88E-08	-9.1E-07
	0.75	-0.29	-0.84
Transaction Value	***-0.00096	-8.24E-05	-0.00027
	-4.18	-1.39	-1
Multibidder Dummy	0.00102	0.00222	-0.00182
	0.18	1.52	-0.27
R square	0.0322	0.0167	0.0125
N	1726	1726	1726

*** denotes significance at 1% level.

** denotes significance at 5% level.

* denotes significance at 10% level.

Panel B: horizontal and non-horizontal subsamples

	horizontal			non-horizontal		
	(-30,-2)	(-1,1)	(2,30)	(-30,-2)	(-1,1)	(2,30)
Intercept	0.02327***	-0.00732	-0.00687	0.01657**	0.00188	0.02517***
	3.29	-1.5	-0.85	2.33	0.88	2.94
targetCAR	0.03732***	0.00742*	0.05815***	0.02302**	0.00954***	-0.01736
	4.16	1.95	4.05	2.07	4.24	-1.06
sizeR/T	-0.00014	-7.2E-05	5.88E-05	3.18E-06	-1.13E-06	-7.4E-06
	-0.87	-0.47	0.31	0.73	-0.9	-1.41
Target TobinQ	0.0027***	-1E-05	0.00386***	*-0.00174	3.51E-05	-0.0005
	3.35	-0.04	4.09	-1.79	0.12	-0.42
Target Leverage	-0.00165	*-0.0005086	0.000276	-0.00019	4.13E-05	-0.00019
	-1.51	-1.67	0.22	-0.92	0.7	-0.75
Rival TobinQ	-0.00077	9.11E-06	-0.00076	0.000324	-6.7E-05	**-0.0005289
	-1.23	0.03	-1.04	1.54	-1.09	-2.08
Rival Leverage	-0.00012	-3.04E-06	2.89E-05	2.51E-05	0.00004894**	-2.1E-05
	-0.99	-0.08	0.2	0.34	2.29	-0.23
Herfindahl Index	-1.1E-06	-5.8E-07	-1.7E-06	0.00000225**	6.7E-08	-1E-06
	-0.74	-0.97	-1.01	1.9	0.2	-0.73
Transaction Value	***-0.00107	0.00155**	0.000382	***-0.00102	*-0.00018897	**-0.00107
	-3.22	2.41	0.99	-2.96	-1.88	-2.56
Multibidder Dummy	-0.00385	-0.00093	-0.0066	0.00864	0.00264	0.00565
	-0.53	-0.26	-0.78	0.97	1.02	0.52
R square	0.0551	0.0424	0.0299	0.0332	0.0356	0.0199
N	994	994	994	732	732	732

*** denotes significance at 1% level.

** denotes significance at 5% level.

* denotes significance at 10% level.

In window (-1,1), rival CARs are positively and significantly related to target CARs. The results strongly support the previous assumption that rival firms in the same industry experience significant abnormal returns on the announcement of a target's merger announcement, as rivals follow target firms to acquirer abnormal returns. Moreover, rival CARs are also significantly related to target CARs during event window (-1,1) for both horizontal and non-horizontal mergers, and the estimated parameter of target CAR in non-horizontal mergers is larger than the parameter of target CAR in horizontal mergers. This indicates higher rival CAR prediction in non-horizontal mergers than in non-horizontal mergers.

The main variable, target CAR, in the (-30, -2) period before target announcement is positive and significant for both horizontal and non-horizontal mergers. According to event study results, target firms have significant and positive returns before merger announcement, and the cross-sectional results show that rivals also have a run-up period before the merger announcement. According to Jarrell and Poulsen (1989), insider trading pull up the target price before announcement, and Jegadeesh, Yang (2011) also argue that insider information leakage also leads to a price run-up prior to announcement day. Here the positive and significant relation between rival CAR and target CAR during the pre-announcement period indicate that the market also put expectation on rival firms before takeover announcement once there appears certain information leak or insider trading on market that drives up target return before announcement.

During the (2,30) period after announcement, the target CAR of horizontal mergers are significantly and positively related to target CAR, which means that rivals of horizontal mergers follow the trend of target firm performance, while rivals of non-horizontal mergers do not follow targets' trend. From the previous event study results, target firms have negative but insignificant abnormal returns in the period after merger announcement. Horizontal mergers have significantly negative returns in that period, while non-horizontal mergers present insignificantly negative results.

In terms of control variables, target firm Tobin's Q significantly affect rival CAR in horizontal mergers before and after the announcement of original merger. Tobin's Q of rival firms also affect rival CAR in the period after merger. As Tobin's Q is a proxy for firm performance, it shows that rival abnormal return follow target firm performance, and are closely related to rivals' own performance after merger, as well as the run-up period. In addition, for horizontal mergers, rival CAR is negatively and significantly related to transaction value in the period before announcement, and also negatively and significantly related to on announcement day, indicating that rivals gain bigger CAR on announcement when the acquirer of the initial merger pays less amount to the target. For non-horizontal mergers, transaction value is negative and significant during all periods before and after merger announcement. This is

consistent with the finding of Alexandridis, Fuller, Terhaar and Travlos (2011) that overpayment destroy value for acquiring firms.

In general, the results show that rival firms are positively and significantly influenced by target CAR during merger announcement. Moreover, rival CARs are affected by target in the periods before and after the announcement. This result is consistent with previous studies that rivals gain abnormal returns on target merger announcement. It also proves that market have expectations on rival firms in the period before merger announcement when targets have a run-up. Moreover, rival return are related to target return and performance after merger announcement.

5.3 Seemingly unrelated regression (SUR) of large and small rivals

The previous regression on full rival sample provide evidence supporting that rivals are affected by target return and gain abnormal returns on original target's merger announcement, as well as before and after announcement. According to the hypothesis, larger rival firms should benefit more from the market efficiency created from the original merger rather than small rival firms. If the hypothesis holds, the rival portfolio that only contain rival firms that are larger than industry median size should react more actively than the portfolio that only contain rivals smaller than industry median. Therefore, I conduct regressions on both large rival and small rival. CAR of large rival portfolio and small rival portfolio are separately regressed on target CAR, and other control variables which are the same as previous regression: relative size of rival and target, rival and target leverage and Tobin's Q, industry HHI, transaction value of merger, and a multi bidder dummy variable.

As the large rival portfolio and small rival portfolio are derived from the same rival sample, and are matched to the same target sample, they are both supposed to be related to target CAR. Both large rival portfolio and small rival portfolio share the same independent variable target CAR, and the errors of the paired regressions are assumed to be contemporaneously interrelated. Therefore, assuming the interrelation between the paired models, I employ the seemingly unrelated regression instead of

ordinary least squares to regress large and small rival portfolio CAR on target CAR and other control variables at the same time.

The paired models for seemingly unrelated regressions are as follows:

Large rival CAR = target CAR + firm specific variables + industry specific variables + merger specific variables;

Small rival CAR = target CAR + firm specific variables + industry specific variables + merger specific variables;

Where the firm specific variables are rival to target firm relative size, rival firm and target firm leverage, rival firm and target firm's Tobin's Q; industry specific variable is the industry's Herfindahl index; and merger specific variables are the log value of transaction and a dummy variable indicating whether there are more than one bidders in the merger.

The cross-model correlation matrix and covariance matrix are presented in the following table:

TABLE 6: cross model correlation matrix of seemingly unrelated regressions

This table presents the cross model correlation between large and small rival CAR in seemingly unrelated regressions. The seemingly unrelated regressions model large or small rival CAR on target CAR. As both large rival portfolio and small rival portfolio share the same independent variable target CAR, the errors of the large and small rival CAR regressions are assumed to be contemporaneously interrelated. The correlation matrix presents the correlations between the paired models of large and small CAR as dependent variable. In the table, t stats of cross model correlation is calculated as $t = r/s_r$. r is the correlation of large rival CAR and small rival CAR given in the table, and s_r is the standard deviation where $s_r = \sqrt{\frac{1-r^2}{n-2}}$. n is the sample size of each regression.

	(-30,-2)	(-1,1)	(2,30)
full sample (N=1726)			
correlation	0.1909***	0.18547***	0.21937***
t stat	8.0749	7.8369	9.3359
horizontal (N=994)			
correlation	0.21886***	0.16491***	0.28299***
t stat	7.0645	5.2661	9.2929
non-horizontal (N=732)			
correlation	0.15925***	0.19772***	0.14007***
t stat	4.3583	5.4497	3.8222

*** denotes significance at 1% level.

** denotes significance at 5% level.

* denotes significance at 10% level.

According to t tests, all correlations in the table are significantly large, indicating a strong correlation between the dependent variables of seemingly unrelated regressions because the interrelated large and small rival CARs are affected by the same independent variable. In the full merger sample, the cross model correlation between large and small rival CAR is 0.19 for window (-20,-2), 0.19 for window (-1,1), and 0.22 for window (2,30). The correlation between large and small rivals of horizontal mergers vary from 0.16 in window (-1,1), 0.22 in window (-30,-2) and up to 0.28 in window (2,30). The correlation between large and small rivals of non-horizontal mergers show similar patterns, but are slightly lower, as the cross-model correlations are 0.16 in (-30, -2), 0.20 in (-1,1) and 0.14 in (2,30). The results indicate a correlation between large and small rival CAR, the dependent variables of the

models. Therefore, a seemingly unrelated regression is needed to adjust for the interrelation between the paired models.

The results of seemingly unrelated regressions are presented in the following table:

TABLE 7: seemingly unrelated regressions (SUR)

Following the previous regression results, the seemingly unrelated regression further tests the relation between rival CAR and target CAR. As large rival portfolio and small rival portfolio share the same independent variable in the regression, the seemingly unrelated regression is used to deal with the interrelation. The independent variables are CAR of larger rival portfolio and CAR of small rival portfolio. The main independent variable remains target CAR. I also include the relative size variable which is calculated as rival market size over target market size, while the rival size is either the average size of large rival portfolio or small rival portfolio. Other control variables concerning the rival firms are also calculated according to large rival sample or small rival sample instead of full sample. I also include Tobin's Q and leverage of both target and rival firms as control variable to control for firm specific characteristics. I use HHI index to adjust for industry concentration, and I also add characteristics of initial merger, which includes initial transaction value and a dummy variable indicating whether the original merger has more than one bidders.

Panel A: CAR in event window (-1,1)

	all mergers		horizontal mergers		Non-horizontal mergers	
	big	small	big	small	big	small
intercept	0.005058***	0.000616	0.005961**	0.001919	0.00378	0.001724
	3.2	0.38	2.53	0.81	1.35	0.59
targetCAR	0.010209***	0.002506	0.005033**	0.000508	0.018119***	0.004999*
	6.24	1.49	2.56	0.26	6.44	1.7
sizeR/T	-1.1E-07	-3.8E-06	-6.8E-06	-0.00027	-7.8E-08	-3.5E-06
	-0.28	-0.53	-0.72	-1.59	-0.19	-0.45
Target TobinQ	0.000082	0.000116	0.000224	0.000239	-0.00005	-0.00036
	0.48	0.66	1.16	1.22	-0.14	-0.94
Target Leverage	-0.00007	0.000162**	0.000227	-0.00045	-0.00008	0.000174**
	-1.14	2.41	0.53	-1.04	-1.12	2.33
Rival TobinQ	-0.00001	-2.2E-07	-0.00023	-0.00017	-2.2E-06	3.95E-06
	-0.2	0	-0.88	-0.64	-0.03	0.05
Rival Leverage	0.000037	-6.6E-06	0.000037	-7.4E-06	0.000082	-0.00008
	1.41	-0.25	1.53	-0.3	0.38	-0.35
Herfindahl Index	5.65E-07	1.33E-07	3.07E-07	5.33E-07	7.48E-07	9.6E-08
	1.57	0.36	0.52	0.89	1.51	0.19
Transaction Value	-0.00035***	-1.5E-06	-0.00029***	-4.1E-08	-0.0004***	-0.00009
	-4.58	-0.02	-2.83	0	-3.17	-0.67
Multibidder Dummy	0.002717	0.002178	0.00381	0.00241	0.001132	0.002051
	1.43	1.12	1.61	1.01	0.36	0.63
R square	0.0237		0.0183		0.0439	
N	1726		994		732	

*** denotes significance at 1% level.

** denotes significance at 5% level.

* denotes significance at 10% level.

Panel B: CAR in event window (-30, -2)

	all mergers		horizontal mergers		Non-horizontal mergers	
	big	small	big	small	big	small
intercept	0.002884	0.016402***	0.016508**	0.016072*	-0.00425	0.012573
	0.59	3.03	2.01	1.85	-0.58	1.43
targetCAR	0.060795***	0.032111***	0.054921***	0.036124***	0.066505***	0.02384*
	8.52	4.04	5.76	3.59	6.12	1.83
sizeR/T	-8.4E-08	0.00003	1.26E-06	0.000383	-2.8E-08	0.000031
	-0.07	1.22	0.04	0.63	-0.02	1.25
Target TobinQ	-0.00055	0.001441**	-0.00034	0.002077***	-0.0018*	-0.0001
	-1.03	2.42	-0.5	2.89	-1.83	-0.08
Target Leverage	0.000216	-0.00022	-0.00304**	0.001693	0.000263	-0.00027
	1.06	-0.97	-2.02	1.06	1.35	-1.14
Rival TobinQ	-0.00031	0.000348	-0.00011	0.000229	-0.00034	0.000365
	-1.44	1.44	-0.12	0.24	-1.62	1.44
Rival Leverage	-0.00003	-0.00005	-0.00002	-0.00005	-0.00008	-0.00026
	-0.36	-0.51	-0.27	-0.59	-0.15	-0.38
Herfindahl Index	-3.2E-07	1.26E-06	-0.00000411**	3.06E-06	1.72E-06	1.25E-06
	-0.28	1.01	-2	1.41	1.28	0.78
Transaction Value	-0.00042*	-0.00085***	-0.00101***	-0.00089**	-0.00003	-0.00063
	-1.77	-3.23	-2.79	-2.32	-0.07	-1.53
Multibidder Dummy	0.003261	0.000898	0.004227	-0.00393	0.004321	0.006444
	0.55	0.14	0.51	-0.45	0.51	0.64
R square	0.0373		0.0471		0.0445	
N	1726		994		732	

*** denotes significance at 1% level.

** denotes significance at 5% level.

* denotes significance at 10% level.

Panel C: CAR in event window (2,30)

	all mergers		horizontal mergers		Non-horizontal mergers	
	big	small	big	small	big	small
intercept	0.010157	0.04748***	0.000239	0.027578***	0.001303	0.022419**
	1.21	4.42	0.05	4.33	0.16	2.27
targetCAR	0.105286***	-0.00288	0.130947***	0.016379	0.152128***	0.035581**
	6.69	-0.14	13.33	1.33	12.03	2.31
sizeR/T	4.7E-07	-0.00002	4.67E-07	-0.00001	-1.3E-06	0.000632
	0.36	-0.58	0.37	-0.47	-0.04	0.91
Target TobinQ	-0.00136	-0.00192	0.000445	0.002759***	0.001369**	0.004791***
	-1.21	-1.33	0.78	3.88	2.02	5.78
Target Leverage	0.000105	-0.00038	0.000016	-0.00043	-0.00144	0.000531
	0.47	-1.31	0.07	-1.57	-0.97	0.29
Rival TobinQ	-0.00027	-0.00072**	-0.00031	-0.00073**	-0.00121	-0.0016
	-1.1	-2.31	-1.36	-2.54	-1.33	-1.45
Rival Leverage	0.000412	-0.00145*	0.000074	-0.00011	0.000072	-0.00008
	0.62	-1.7	0.86	-1.03	0.85	-0.81
Herfindahl Index	1.12E-06	-0.00000327*	-8.1E-08	-0.0000031**	-2.9E-06	-0.00000536**
	0.72	-1.65	-0.07	-2.09	-1.44	-2.15
Transaction Value	-0.00075*	-0.00137***	-0.00012	-0.00103***	0.000092	-0.00085*
	-1.9	-2.72	-0.49	-3.29	0.26	-1.94
Multibidder Dummy	-0.00014	0.00042	-0.00633	-0.00263	-0.01203	-0.00741
	-0.01	0.03	-1.01	-0.34	-1.45	-0.73
R square	0.0504		0.0676		0.1012	
N	1726		994		732	

*** denotes significance at 1% level.

** denotes significance at 5% level.

* denotes significance at 10% level.

The panel A presents regression during the (-1, 1) event window. According to the table, large firm CARs are positively and significantly related to target CAR, while small firm CAR is not significant during the announcement period and after. It strongly supports the hypothesis that large rivals earn positive and significant returns on target announcement day, while small rivals do not benefit from the merger announcement as much as the large rivals. In addition, it should also be noted that the transaction value of the original merger is negatively and significantly related to rival CAR, which means rivals are expected to benefit more and have higher returns when the transaction value of initial merger is lower, and market expectation on rival firms decrease when the original takeover payment is higher. According to Alexandridis,

Fuller, Terhaar and Travlos (2011), large acquisitions destroy more value for shareholders than small acquisitions due to overpayment or overconfidence. The overpayment on initial takeover target could also negatively affect market's expectation on the target's horizontal rivals. In addition, another part of the hypothesis assumes that rivals of non-horizontal mergers would gain higher returns than rivals of horizontal mergers as the market expect rival firms in the target's industry take advantage of the increased market power brought in by non-horizontal mergers. The results of seemingly unrelated regression also present some difference between horizontal mergers and non-horizontal mergers to support the hypothesis. Small rivals of non-horizontal mergers react more actively during the (-1,1) announcement period. And the parameter estimation of non-horizontal rivals are larger than parameters of horizontal rivals, so that for the same unit of target CAR, the estimated non-horizontal rival CAR are larger in scale than horizontal rival CAR.

Panel B presents results in the periods before announcement. During the event window (-30, -2), results show that both large and small rival CAR are also significantly and positively related to target CAR before the announcement. Therefore, large rivals and small rivals are both positively affected by target firms' run-up period before merger announcement day, as discussed in the full sample cross sectional regressions. Similar to previous cross sectional regression results, HHI shows some negative relation to rival CAR, indicating that rivals gain higher returns when the industry is less concentrated. For small rivals of horizontal merger, the control variable target Tobin's Q is positively and significantly related to rival abnormal return, which means when target have better performances, the market expect small rivals to receive higher return. There appears to be no big difference between horizontal and non-horizontal rivals in the pre-announcement period, as both horizontal and non-horizontal rival CARs are significantly related to target CAR.

Panel C presents results in the period (2, 30) after initial merger announcement. CAR of large rivals of both horizontal and non-horizontal mergers are positively and significantly related to target CAR. As target firms have slightly negative CAR during the period after announcement according to event study results, the large rivals are

also supposed to have negative CAR in this period. Small rival CAR of non-horizontal mergers are significantly and positively related to target CAR, while rivals of horizontal mergers do not show any significance.

In general, the results of seemingly unrelated regressions support the hypothesis, in that larger rival firms benefit more from a merger announcement in the industry. Furthermore, rivals of non-horizontal merger targets acquirer higher returns than rivals of horizontal mergers, therefore it could be that market have higher expectation on market power brought in by non-horizontal mergers, as the hypothesis posits.

6 Robustness test

The seemingly unrelated regressions model both large rival portfolio CAR and small rival portfolio CAR on target CAR. However, both large rival abnormal return and small rival abnormal return are estimated using market model. In that case, there are chances that the positive significant relation between the dependent variable and the main independent variable is derived from the same factor in both models, rather than its intrinsic significance. As presented in the tables above, large rival portfolio CAR is significantly related to target CAR, but this significance may also be created by the fact that both rival and target CAR are estimated by the same market model using simultaneous market return, as both the rival and target react to the same event, which uses exactly the same announcement day.

Therefore, I include market factors which are mutually used in estimating both target and rival abnormal return into the regression model. The market factors are derived from CAPM,

$$\mathrm{E}(R_i) - \mathrm{R}_f = \beta_i(E(R_m) - \mathrm{R}_f)$$

Where β_i is the sensitivity of firm's abnormal return in excess to the market's expected return,

$$\beta_i = \frac{cov(R_i, R_m)}{Var(R_m)}$$

And $E(R_i)$ is the expected return of a firm, R_f is the risk free rate, and $E(R_m)$ is the expected return on the market.

Based on the market beta in CAPM, the first market factor added to the regression is a product of the two market betas in the model for estimating target CAR and rival CAR. I reproduce this variable for both large rival portfolio and small rival portfolio:

Market factor 1(for large rival regression) = $\beta_{target} \times \beta_{large\ rival}$;

Market factor 1(for small rival regression) = $\beta_{target} \times \beta_{small\ rival}$.

Target betas and rival betas are the parameters of market return variable in the market model estimating target and rival abnormal returns in event study.

To strengthen the test, I substitute the first set of market beta variable with another kind of market beta variable, multiplying target market beta, big or small rival portfolio's market beta, and the variance of market beta. In event study, I use the market model for both target firms and rival firms to estimate the parameter of each market factor with estimation period data:

$$R_{target} = \alpha_{target} + \beta_{target} R_m + \varepsilon_{target}$$

$$R_{rival} = \alpha_{rival} + \beta_{rival} R_m + \varepsilon_{rival}$$

Where the R_m is the CRSP value weighted return on market portfolio. Because target and rivals share the same event day, the Rm in both equations are supposed to be the same market return on the same period.

Therefore I take the variances of the model above:

$$var(R_{target}) = (\beta_{target})^2 \sigma_{R_m}{}^2 + \sigma_{\varepsilon(target)}{}^2$$

$$var(R_{rival}) = (\beta_{rival})^2 \sigma_{R_m}{}^2 + \sigma_{\varepsilon(rival)}{}^2$$

Therefore, I calculate the market variance as

$$\sigma_{R_m}{}^2 = \frac{var(R_{target}) - \sigma_{\varepsilon(target)}{}^2}{(\beta_{target})^2}$$

Or

$$\sigma_{R_m}{}^2 = \frac{var(R_{rival}) - \sigma_{\varepsilon(rival)}{}^2}{(\beta_{rival})^2}$$

As $\sigma_{R_m}{}^2$ is the variance of market return, the $\sigma_{R_m}{}^2$ in the two equations above should be the same, and I used an F test to prove their equality.

Therefore, the second kind of market factor is calculated as:

Market factor 2(for large rival regression) $= \beta_{target} \times \beta_{large\ rival} \times \sigma_{R_m}{}^2$;

Market factor 2(for small rival regression) $= \beta_{target} \times \beta_{small\ rival} \times \sigma_{R_m}{}^2$.

After including the common market factor into the regression, if the parameter estimation of target CAR, the main variable, is still significant, the previous results of seemingly unrelated regressions that large rival firms earn abnormal returns on target firms' merger announcements are supported. Nevertheless, if the previous significance of main variable is diminished while the market factor becomes significant instead, it proves that the significant relations between rival CAR and target CAR are actually created by common market factors, not because of they are related by themselves. The results of this robustness test is presented in the following table:

TABLE 8: cross sectional regression with market factor

This table presents the results of regressions with common market factor, in order to test whether the significant relation between rival CAR and target CAR is aroused by the common market factor because they are estimated over the same announcement period using same market return. Similar to the cross sectional regression in the previous section, the dependent variable is the CAR of rival portfolios, and main independent variable is the corresponding target CAR. I also include the relative size variable which is calculated as rival market size over target market size. I also include Tobin's Q and leverage of both target and rival firms as control variable to control for firm specific characteristics. I use HHI index to adjust for industry concentration, and I also added characteristics of initial merger, which includes initial transaction value and a dummy variable indicating whether the original merger has more than one bidders. Apart from these control variables, I add two kinds of market factors into the regression to test their influence. If the main variable target CAR is still positive and significant, it means that the significant relation presented in the cross sectional regression and seemingly unrelated regression is indeed their intrinsic relation, not created by the market factor in estimating target and rival abnormal return. However, if the market factor variable becomes significant while main variable target CAR becomes insignificant, it indicates that the previous positive and significant results are actually created by the same market returns used in estimating target and rival CAR using market model.

Panel A: (-1,1) full sample

	full sample			
	big		small	
Intercept	0.00611***	0.00602***	-0.00095	-0.00054
	3.48	3.67	-0.54	-0.33
targetCAR	0.01032***	0.01033***	0.00261	0.00261
	6.17	6.17	1.53	1.53
sizeR/T	-1.16E-07	-1.18E-07	-3.4E-06	-3.4E-06
	-0.3	-0.31	-0.47	-0.47
common market factor(1)	-0.00012		0.000279	
	-0.25		0.51	
common market factor(2)		0.211		0.20189
		0.51		0.42
Target TobinQ	-4.1E-05	-5.68E-05	7.04E-05	8.01E-05
	-0.2	-0.29	0.34	0.39
Target Leverage	-8E-05	-7.92E-05	0.000159	0.00015848**
	-1.21	-1.21	2.38	2.37
Rival TobinQ	-2.2E-05	-2.33E-05	0.00023695***	0.00023883***
	-0.31	-0.33	2.71	2.76
Rival Leverage	3.69E-05	3.77E-05	-7.2E-05	-7.6E-05
	1.41	1.44	-1.15	-1.21
Herfindahl Index	4.64E-07	4.41E-07	4.36E-07	4.29E-07
	1.27	1.21	1.22	1.2
Transaction Value	1.6E-05	4.71E-06	***-0.00038883	***-0.00038998
	0.2	0.06	-4.92	-4.96
Multibidder Dummy	0.00232	0.00223	0.00128	0.00115
	1.21	1.16	0.66	0.58
R square	0.043	0.0432	0.0129	0.0127
N	1726	1726	1726	1726

*** denotes significance at 1% level.

** denotes significance at 5% level.

* denotes significance at 10% level.

Panel B: (-1,1) horizontal and non-horizontal mergers

	horizontal				non-horizontal			
	big		small		big		small	
Intercept	0.00736*	0.00726*	-0.00067	-0.00039	0.00467	0.00434	0.000771	0.00108
	2.84	2.95	-0.29	-0.19	1.54	1.53	0.25	0.38
targetCAR	0.00501*	0.00501*	0.00103	0.00103	0.0183*	0.0184*	0.00455	0.00459
	2.47	2.47	0.51	0.51	6.45	6.48	1.52	1.53
sizeR/T	-7.5E-06	-7.3E-06	-0.00023	-0.00022	-7.81E-	-8.44E-	-3.1E-06	-3.2E-06
	-0.79	-0.78	-1.36	-1.33	-0.19	-0.2	-0.39	-0.4
common market	-2.2E-05		0.000249		-0.00036		-6.7E-05	
	-0.04		0.4		-0.42		-0.07	
common market		-0.60806		-1.54123*		0.48615		0.73017
		-0.7		-1.65		0.97		1.19
Target TobinQ	1.84E-05	3.76E-05	0.000277	0.000336	2.17E-	6.65E-	-0.00042	-0.00044
	0.08	0.16	1.15	1.41	0.06	0.02	-1.1	-1.16
Target Leverage	3.45E-06	1.36E-05	-0.00026	-0.00025	-8.3E-05	-8.1E-05	0.00017651*	0.00017722*
	0.01	0.03	-0.78	-0.78	-1.16	-1.14	2.33	2.34
Rival TobinQ	-0.00025	-0.00024	0.00023099**	0.00026106***	-6.7E-06	-1E-05	0.000204	0.000165
	-0.93	-0.92	2.49	2.86	-0.09	-0.13	1.07	0.86
Rival Leverage	3.65E-05	3.62E-05	-8.6E-05	-9.7E-05	0.00013	0.00016	-6E-05	-8E-05
	1.48	1.47	-1.13	-1.27	0.66	0.81	-0.58	-0.76
Herfindahl Index	2.25E-07	2.27E-07	0.00000088976	0.00000089864	6.31E-	5.60E-	3.11E-07	2.43E-07
	0.37	0.38	1.66	1.68	1.27	1.13	0.6	0.47
Transaction Value	3.41E-05	3.84E-05	-0.00033939***	-0.00032947***	-7.6E-05	-8.6E-05	-	-
	0.33	0.38	-3.13	-3.04	-0.56	-0.65	-3.49	-3.54
Multibidder Dummy	0.00273	0.0027	0.00139	0.00131	0.00161	0.00114	0.000988	0.000234
	1.14	1.13	0.58	0.55	0.51	0.36	0.3	0.07
R square	0.0255	0.0261	0.0205	0.0234	0.0798	0.0811	0.0163	0.0183
N	994	994	994	994	732	732	732	732

*** denotes significance at 1% level.

** denotes significance at 5% level.

* denotes significance at 10% level.

Panel C: (-30,-2) full sample

	full sample			
	big		small	
Intercept	0.00413	-0.000167	0.01777***	0.01607***
	0.77	-0.03	3.17	3.1
targetCAR	0.05639***	0.05642***	0.02706***	0.02783***
	7.71	7.7	3.44	3.54
sizeR/T	1.95E-08	-1.82E-08	2.95E-05	2.92E-05
	0.02	-0.02	1.23	1.22
common market factor(1)	-0.00309**		-0.00156	
	-2.08		-0.86	
common market factor(2)		-2.5092**		1.36023
		-1.95		0.86
Target TobinQ	0.000585	0.000395	0.00133*	0.00121*
	0.93	0.64	1.94	1.79
Target Leverage	0.000222	0.000231	-0.00027	-0.00027
	1.08	1.13	-1.23	-1.23
Rival TobinQ	-0.00031	-0.000321	0.00122***	0.00115***
	-1.41	-1.47	4.21	3.99
Rival Leverage	-3.7E-05	-3E-05	0.00011	0.00011
	-0.45	-0.37	1.36	1.36
Herfindahl Index	1.09E-07	8.58E-08	8.81E-07	7.92E-07
	0.1	0.08	0.79	0.71
Transaction Value	*-0.00044487	-0.000336	***-0.00098105	***-0.00094752
	-1.81	-1.38	-3.72	-3.68
Multibidder Dummy	0.00347	0.00511	0.00311	0.00273
	0.58	0.85	0.49	0.43
R square	0.0483	0.0479	0.0355	0.0356
N	1726	1726	1726	1726

*** denotes significance at 1% level.

** denotes significance at 5% level.

* denotes significance at 10% level.

Panel D: (-30,-2) horizontal and non-horizontal mergers

	horizontal				non-horizontal			
	big		small		big		small	
Intercept	0.01494*	0.00887	0.02148**	0.01559**	0.000214	-0.00304	0.00972	0.01243
	1.65	1.04	2.57	2.03	0.03	-0.41	1.11	1.52
targetCAR	0.04951***	0.04965***	0.02786**	0.03084***	0.06159*	0.06042***	0.02105	0.02191*
	5.03	5.04	2.74	3.02	5.53	5.43	1.67*	1.74
sizeR/T	5.32E-06	1.4E-05	0.000266	0.000337	1.38E-08	-2.30E-08	2.95E-05	3.01E-05
	0.16	0.42	0.43	0.55	0.01	-0.02	1.22	1.25
common market	-0.00381**		-0.00418*		-0.00228		0.00238	
	-1.89		-1.8		-1.01		0.79	
common market		-5.20109		2.34814		-2.35586*		0.62877
		-1.71		0.68		-1.74		0.35
Target TobinQ	0.00148*	0.00138	0.00246**	0.00212**	-0.00154	-0.00173*	-0.00054	-0.00039
	1.75	1.64	2.79	2.42	-1.54	-1.75	-0.47	-0.34
Target Leverage	-0.00224	-0.00217	0.000176	0.000314	0.000268	0.000277	-0.0003	-0.0003
	-1.49	-1.44	0.15	0.27	1.38	1.43	-1.32	-1.33
Rival TobinQ	-0.00024	-0.00013	0.00119**	0.00101***	-0.00034	-	0.00147**	0.00146**
	-0.26	-0.14	3.48	3	-1.6	-1.66	2.57	2.54
Rival Leverage	-2.9E-05	-2.3E-05	-0.00014	-7E-05	-0.00029	-0.00022	0.000129	0.000125
	-0.34	-0.27	-0.49	-0.25	-0.53	-0.41	1.51	1.47
Herfindahl Index	-3.2E-06	-3.32E-06	2.59E-06	2.46E-06	1.76E-06	1.79E-06	6.43E-07	7.25E-07
	-1.53	-1.6	1.34	1.27	1.32	1.34	0.45	0.51
Transaction Value	-	-	-	-	-0.00013	-2.8E-05	-	-
	-2.44	-2	-2.95	-2.63	-0.36	-0.08	-1.71	-1.94
Multibidder Dummy	0.0047	0.00511	-0.00153	-0.0013	0.00384	0.00686	0.00841	0.00763
	0.56	0.61	-0.17	-0.15	0.45	0.8	0.9	0.81
R square	0.0561	0.0554	0.0522	0.0492	0.0639	0.0667	0.0291	0.0287
N	994	994	994	994	732	732	732	732

*** denotes significance at 1% level.

** denotes significance at 5% level.

* denotes significance at 10% level.

Panel E: (2,30) full sample

	full sample			
	big		small	
Intercept	0.00794	-0.000287	0.02179***	0.01848***
	1.41	-0.05	3.3	3.02
targetCAR	0.12937***	0.1294***	0.01626	0.01637
	13	12.93	1.34	1.35
sizeR/T	5.86E-07	5.14E-07	-1.3E-05	-1.3E-05
	0.47	0.41	-0.44	-0.46
common market factor(1)	-0.0063***		-0.00303	
	-4.01		-1.41	
common market factor(2)		-0.93213		1.0454
		-0.68		0.56
Target TobinQ	0.000968	0.000536	0.00258***	0.00234***
	1.46	0.81	3.15	2.9
Target Leverage	1.09E-05	3.05E-05	-0.00051	-0.00051
	0.05	0.14	-1.93	-1.91
Rival TobinQ	-0.00029	-0.000326	0.00143***	0.00132***
	-1.28	-1.41	4.14	3.84
Rival Leverage	6.47E-05	8.06E-05	5.46E-05	5.92E-05
	0.75	0.94	0.57	0.61
Herfindahl Index	4.91E-07	2.63E-07	-0.00000268**	-0.00000284**
	0.41	0.22	-2.02	-2.13
Transaction Value	-0.00027	-0.000119	-0.00093611***	-0.00085161***
	-1.03	-0.46	-3	-2.79
Multibidder Dummy	-0.00814	-0.00661	-0.00101	-0.00119
	-1.29	-1.04	-0.13	-0.16
R square	0.112	0.1029	0.0289	0.0278
N	1726	1726	1726	1726

*** denotes significance at 1% level.

** denotes significance at 5% level.

* denotes significance at 10% level.

Panel F: (2,30) horizontal and non-horizontal mergers

	horizontal				non-horizontal			
	big		small		big		small	
Intercept	0.0044	-0.00226	0.01764*	0.01421	0.02355**	0.01099	0.03453**	0.03097**
	0.49	-0.27	1.87	1.63	2.62	1.3	3.17	3.07
targetCAR	0.15046**	0.15015**	0.02637*	0.02791*	0.10346**	0.10423***	0.00759	0.00742
	11.61	11.56	1.8	1.81	6.6	6.57	0.38	0.38
sizeR/T	5.47E-08	9.4E-06	0.000561	0.000631	6.19E-07	4.69E-07	-1.6E-05	-1.7E-05
	0	0.29	0.8	0.9	0.49	0.36	-0.53	-0.57
common market	-0.00431**		-0.00247		-0.00967***		-0.00369	
	-2.16		-0.94		-3.74		-0.99	
common market		-4.03752		-0.98385		-0.4122		0.90112
		-1.34		-0.25		-0.26		0.4
Target TobinQ	0.00213**	0.00195	0.00449***	0.00437***	-0.00067	-0.00119	-0.00084	-0.00108
	2.51	2.3	4.45	4.36	-0.6	-1.05	-0.59	-0.77
Target Leverage	-0.0011	-0.00105	-0.00131	-0.00121	7.95E-05	0.000112	-0.00043	-0.00043
	-0.73	-0.7	-0.98	-0.91	0.36	0.5	-1.52	-1.51
Rival TobinQ	-0.00141	-0.00129	0.00127***	0.00121***	-0.00021	-0.00027	0.00186**	0.00178**
	-1.52	-1.4	3.28	3.16	-0.87	-1.12	2.62	2.48
Rival Leverage	6.48E-05	7.29E-05	6.96E-05	9.99E-05	0.000366	0.000624	4.29E-05	4.54E-05
	0.76	0.85	0.22	0.31	0.59	1	0.4	0.42
Herfindahl Index	-2.3E-06	-2.47E-06	-4.8E-06	-	1.61E-06	1.13E-06	-2.3E-06	-2.51E-06
	-1.12	-1.19	-2.19	-2.23	1.06	0.73	-1.27	-1.41
Transaction Value	8.12E-05	0.00024	-	-0.00077895*	-	-	-	-
	0.22	0.64	-2.05	-1.85	-2.58	-2.05	-2.54	-2.41
Multibidder Dummy	-0.01351	-0.01289	-0.00561	-0.00545	-0.00246	8.03E-05	0.00329	0.00286
	-1.61	-1.53	-0.56	-0.54	-0.25	0.01	0.28	0.24
R square	0.1467	0.1438	0.0516	0.0508	0.0954	0.0766	0.0238	0.0227
N	994	994	994	994	732	732	732	732

*** denotes significance at 1% level.

** denotes significance at 5% level.

* denotes significance at 10% level.

According to the table, the two newly added variables show little significance in the event window from one day before to one day after announcement, which indicate that correlation of market return is not the main factor contributing to positive rival CAR. Therefore, it proves that the significance in the previous seemingly unrelated regression is not created by the common market factor in the estimation of abnormal returns, but truly exists. This table strengthens the previous SUR results that rival CAR are significantly and positively affected by target CAR on announcement of the merger.

Panel A presents the full sample results during event window (-1, 1) around target takeover announcement period. According to panel A, it is obvious that large rivals are very significantly affected by the original target announcement, while the influence on small rivals are positive but insignificant. Therefore, big rivals benefit more from targets' merger announcement due to market expectation that big rivals might benefit from increased market efficiency. Small rivals do not benefit from target's merger announcement as much as their big counterparts, indicating that the degree of market expectation for small rivals to benefit from market efficiency is much lower than the expectation for large rivals.

Among other control variables, small rival CAR is also significantly and negatively affected by transaction value, while large rival CAR shows no significance. Lower transaction value of the original merger contribute to higher CAR for small rivals on original merger announcement, but do not affect large rivals. The relative size variable, which is the ratio of rival size to target size, is negatively but insignificantly related to rival CAR. Other firm-specific variables also present no notable significance. Industry Herfindahl index is positively but insignificantly related to rival CAR, which means industry concentration does not strongly increase the abnormal return of rival firms in that industry. The number of bidders also does not significantly affect rival CAR, as the multibidder dummy is not significant.

Panel B present the subsample results of horizontal mergers and non-horizontal mergers. The large rival CARs in both subsamples are significantly related to target CAR, while small rival CARs do not show significance. Moreover, the coefficient of rival CAR of non-horizontal initial mergers are larger than the rival CAR coefficient of horizontal mergers, which indicate a stronger reaction of rival return to target announcement in non-horizontal initial mergers.

Panel C and D present the regression on period before announcement. The results show positive and significant relations between rival CAR and target CAR for both big and small rivals before horizontal merger announcements, and a positive and significant relation for big rivals in non-horizontal mergers, while small rival CARs are not significantly positive dependent on target CARs in non-horizontal mergers.

The market beta variables do not eliminate the significance of main variable target CAR, so that it can also be concluded as the results above that the relation between rival CAR and target CAR really exists. Among other control variables, both rival and target Tobin's Q exert significant influence on rival CAR. Higher Tobin's Q contribute to higher rival return, which is consistent with the idea that better performances of both target and rival firms lead to higher rival return. Transaction values are positive and significant in all rival subsamples except for large rivals in non-horizontal mergers.

Panel E and F present the results in the period after original merger announcement. The full sample results show that in this window, large rival CARs are significantly and positively related to target CAR, while small rivals are not much affected. Similar to the run-up period, large rival CARs are significant in both horizontal and non-horizontal initial mergers, but small rivals show more significance in horizontal mergers than non-horizontal mergers. This indicate that small rivals of horizontal initial targets are expected to be more affected by the information of takeover announcement during both the run-up period and the period after announcement, compared to the small rivals of non-horizontal merger announcements. It is notable that in panel E, after adjusting for market factors, small rival of non-horizontal mergers show little significance compared to the results of seemingly unrelated regression. In addition, Parameters for relative size of rival firms to target firms are mostly positive but insignificant. Small rival firms' Tobin's Q significantly give rise to their CAR, while target firms' Tobin Q positively affect rival return only in horizontal announcement. Transaction values again negatively contribute to small rival firms' CAR, and to large rival CAR in non-horizontal mergers. Other control variables do not have significant explanation power on rival CAR.

The sample of target and rivals include financial firms, with SIC code ranging from 60 to 67. Because I include leverage as a control variable in my previous regressions, there is a concern that the leverages of financial firms are different from other firms, so that the leverage variable lacks enough explanation power. Therefore, I

exclude all financial firms from my samples and run the regressions in robustness test again, and the result still support the previous results that the significance of main variables are not affected by common market factors. The results of regressions without financial firms are presented in the appendix.

In general, the regressions which included the common market factor as a control variable strongly support the results of the previous seemingly unrelated regressions, as common market factors do not disturb the influence of target abnormal return on rival return during merger announcement periods. The results still holds that on the announcement day of the original target firm, its rival firms in the same industry also earn positive abnormal returns. Moreover, these positive abnormal returns are mostly acquired by large rival firms, while small rival firms in the same industry do not get as much abnormal returns as their larger rivals.

7   Summary and conclusion

In this paper I study abnormal returns of rival firms of takeover targets on their takeover announcement. I include in my sample the takeover announcements from January 1990 to December 2013, and identify the rival firms as all other firms in the same industry as the target. All rival firms in the same industry are formed into a rival portfolio to be matched to each merger announcement. In order to test how the market size of the firm affect rival return, I further divide the rival portfolio into a portfolio that consists of rival firms larger than industry median market size, and a portfolio that contains rivals that are smaller than industry median size.

I use event study to estimate cumulative abnormal returns of rival firms in selected event windows in target announcement period. The results confirm the findings in previous studies that rivals earn positive and significant abnormal returns on initial target's merger announcement. Moreover, large rivals show significantly higher CAR than small rivals. Then I use cross sectional regressions to further

discover how rival cumulative abnormal returns are affected by target announcement surprises, and the results again confirm the positive return on announcement period. As the large rival portfolio and small rival portfolio share the same independent variable target CAR, I used the seemingly unrelated regression to discover the relation between large or small rival CAR and target CAR. The seemingly unrelated regression results are consistent with the hypothesis that large rival are more affected by target abnormal return. Also rivals of non-horizontal mergers benefit more from the announcement compared to rivals of horizontal mergers. Moreover, as I use the same market model to estimate target abnormal return and rival abnormal return over the same announcement period, the market return works as a common factor that affects both target and rival. To test whether the significant relationship between target and rival CAR is actually induced by the common market factor, I use a robustness test to prove the feasibility of previous regressions. I add a proxy for common market factor into the regressions and the results turned out to be not influential. As the large rival portfolio CAR is still significantly and positively related to target CAR, it is consistent with the hypothesis that large rivals gain higher returns than small rivals on target announcement. Therefore, I reach the conclusion that the market have higher expectations on large rivals to benefit from the information of target takeover announcement and become more competitive, while small rivals are less expected to benefit from the takeover announcement and become less competitive.

There are still certain limitations with this paper. As discussed in the literature review part, the results cannot distinguish between collusion hypothesis and market efficiency hypothesis. This paper found that large and small rival firms differ in degree of their benefit from the information of initial takeover announcement, and concludes that larger rivals gain more abnormal return than small rivals because market expect large rivals to become more cost-efficient and more competitive after when they learn about the initial merger announcement. However, the increase in cumulative abnormal returns earned by rival firm can also come from expected collusion with the merged firm or with other rivals in the same industry. Although the

collusion hypothesis had been denied by previous studies, it still remains a question that whether the same conclusion still applies to the most recent data used in this paper. Moreover, the influence of takeover probability hypothesis has been largely reduced by eliminating all rivals that became target within one year, but still has not been completed eliminated. As the market cannot precisely predict which rival firm will become a future target, all rival firms are exposed to the market expectation of increased probability of being take over. Therefore, in order to clearly distinguish which hypothesis drives up the rival returns, future studies should further test the feasibility of collusion hypothesis by distinguishing challenged and unchallenged horizontal initial mergers, as well as the influence of collusion on large and small rival firms.

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Appendix

Table 9 presents the results of alternative tests where I excluded all financial firms in my sample, as discussed before in the robustness test section.

TABLE 9: Cross sectional regressions excluding financial firms

This table regresses rival CAR on target CAR and other control variables. All variables follow the regression in robustness test. The only difference is that I exclude financial firms from the sample, because one of the control variables, the leverage, could be strongly affected if the firm is a financial firm. The dependent variable is rival CAR, and the independent variable is target CAR and other control variables. The market factors are the same as the ones used in robustness test. If the results of this table are similar to the results in robustness test and previous cross-sectional regressions, the hypothesis could be supported.

Panel A: (-1,1) full sample

	full sample			
	big		small	
Intercept	0.00439**	0.00478**	0.00208	0.000769
	2.11	2.54	1.03	0.42
targetCAR	0.00805***	0.00802***	0.00611***	0.00616***
	4.1	4.1	3.19	3.21
sizeR/T	-1.41E-07	-1.44E-07	-2.7E-06	-2.8E-06
	-0.34	-0.34	-0.36	-0.37
common market factor(1)	0.000201		-0.00088	
	0.36		-1.45	
common market factor(2)		-1.70631*		-0.43909
		-1.89		-0.46
Target TobinQ	-0.00019	-0.000166	0.000106	7.98E-05
	-0.86	-0.74	0.48	0.36
Target Leverage	0.00019153***	0.00019147***	-0.00011	-0.00011
	2.66	2.66	-1.56	-1.56
Rival TobinQ	-3E-05	-2.7E-05	0.00038005***	0.00036764***
	-0.38	-0.34	3.85	3.66
Rival Leverage	4.51E-05	4.48E-05	-1.1E-05	-9.8E-06
	1.56	1.55	-0.15	-0.13
Herfindahl Index	0.00000104**	0.0000009898523**	4.09E-08	5.23E-08
	2.45	2.33	0.11	0.14
Transaction Value	-0.00028803***	-0.00026547***	-0.0001	-6.8E-05
	-3.16	-2.91	-1.14	-0.77
Multibidder Dummy	0.00103	0.000834	0.000619	0.000789
	0.46	0.38	0.29	0.37
R square	0.0358	0.0386	0.0228	0.0214
N	1726	1726	1726	1726

Panel B: (-1,1) horizontal and non-horizontal mergers

	horizontal				non-horizontal			
	big		small		big		small	
Intercept	0.01066***	0.01008***	0.00293	0.0022	0.00254	0.00343	0.00379	0.00105
	3.12	3.15	1.12	0.95	0.72	1.06	1.09	0.33
targetCAR	0.00501**	0.005**	0.00143	0.00143	0.01295***	0.01292***	0.01259***	0.01284***
	2.15	2.14	0.66	0.66	3.85	3.85	3.75	3.81
sizeR/T	-0.00002579**	-0.00002465**	-0.00024	-0.00021	-8.73E-08	-8.62E-08	-2E-06	-2.2E-06
	-2.4	-2.32	-1.37	-1.25	-0.19	-0.19	-0.23	-0.26
common market factor(1)	-0.00031		-0.00043		0.000571		-0.00216*	
	-0.47		-0.64		0.58		-1.91	
common market factor(2)		-1.58035		-1.2598		-1.98545		2.89913
		-1.62		-1.33		-1.06		1.21
Target TobinQ	-0.0001	-7.5E-05	0.00035	0.000364	-0.00014	-0.00013	-0.00046	-0.00051
	-0.36	-0.27	1.41	1.46	-0.33	-0.32	-1.12	-1.23
Target Leverage	-0.00023	-0.0002	-0.00057	-0.00054	0.00019503**	0.00019357**	-9.7E-05	-9.7E-05
	-0.44	-0.39	-1.29	-1.23	2.46	2.44	-1.2	-1.21
Rival TobinQ	-0.00128	-0.00127	0.00040***	0.00040***	-1.5E-05	-9.7E-06	0.000237	5.79E-05
	-2.11	-2.1	4.09	4.2	-0.17	-0.11	1.02	0.21
Rival Leverage	4.17E-05	4.19E-05	3.38E-05	3.33E-05	0.000155	0.000184	-8.2E-05	-7.5E-05
	1.57	1.58	0.4	0.39	0.39	0.46	-0.62	-0.57
Herfindahl Index	9.27E-07	8.97E-07	-2.9E-07	-2.99E-07	0.00000**	0.000001*	2.57E-07	2.82E-07
	1.38	1.34	-0.51	-0.53	1.98	1.91	0.48	0.52
Transaction Value	-0.0003001**	-0.00026**	-0.00011	-7.5E-05	-0.00035**	-0.00033**	-0.00015	-0.00012
	-2.4	-2.11	-0.93	-0.67	-2.42	-2.27	-1.02	-0.84
Multibidder Dummy	0.00145	0.00139	0.00152	0.00153	0.000276	1.56E-05	-0.00062	-4.4E-05
	0.53	0.51	0.59	0.59	0.08	0	-0.18	-0.01
R square	0.0376	0.0412	0.0375	0.0395	0.0556	0.057	0.0391	0.0355
N	994	994	994	994	732	732	732	732

Panel C: (-30,-2) full sample

| | full sample | | | |
	big		small	
Intercept	0.00284	-0.00122	0.02312***	0.01821***
	0.46	-0.22	3.35	2.96
targetCAR	0.05424***	0.05447***	0.0249***	0.02645***
	6.83	6.87	2.8	2.97
sizeR/T	3.47E-08	7.08E-09	2.85E-05	2.82E-05
	0.03	0.01	1.09	1.08
common market factor(1)	-0.0027		-0.00321	
	-1.61		-1.52	
common market factor(2)		-3.87542		2.70141
		-1.44		0.82
Target TobinQ	0.000692	0.000623	0.00107	0.000926
	1.03	0.93	1.39	1.21
Target Leverage	0.000211	0.000221	-0.00022	-0.00023
	0.99	1.03	-0.91	-0.92
Rival TobinQ	-0.0003	-0.000314	0.00155***	0.00139***
	-1.29	-1.34	4.52	4
Rival Leverage	-5.7E-05	-5.37E-05	0.000266	0.000275
	-0.66	-0.62	1.02	1.05
Herfindahl Index	4.64E-07	3.79E-07	3.94E-07	5.2E-07
	0.37	0.3	0.3	0.4
Transaction Value	-0.00048123*	-0.000359	-0.00111***	-0.00103***
	-1.78	-1.32	-3.59	-3.39
Multibidder Dummy	0.00409	0.00449	0.00227	0.00303
	0.62	0.68	0.31	0.41
R square	0.0496	0.0491	0.0376	0.0363
N	1726	1726	1726	1726

Panel D: (-30,-2)horizontal and non-horizontal mergers

	horizontal				non-horizontal			
	big		small		big		small	
Intercept	0.00707	0.00225	0.03162***	0.01906**	0.00164	-0.00262	0.00495	0.00865
	0.6	0.21	3	2.04	0.19	-0.33	0.49	0.95
targetCAR	***0.04958	0.05001***	0.02466**	0.02973**	0.05325***	0.05354***	0.01926	0.0199
	4.63	4.68	2.1	2.52	4.38	4.41	1.38	1.43
sizeR/T	2.7E-06	9.59E-06	0.000126	0.00029	1.67E-08	-4.69E-08	2.97E-05	3.02E-05
	0.07	0.26	0.18	0.41	0.01	-0.04	1.16	1.18
common market factor(1)	-0.00271		-0.00695**		-0.00331		0.00285	
	-1.18		-2.52		-1.32		0.84	
common market factor(2)		-3.10213		1.92839		-7.90722*		-0.81045
		-0.92		0.49		-1.66		-0.11
Target TobinQ	0.00128	0.00126	0.00207**	0.00181*	-0.00171	-0.0019*	-0.00032	-0.00024
	1.33	1.31	2.05	1.79	-1.63	-1.82	-0.26	-0.2
Target Leverage	-0.00258	-0.00247	0.00154	0.00175	0.000268	0.00028	-0.00028	-0.00028
	-1.46	-1.4	0.86	0.98	1.33	1.39	-1.17	-1.17
Rival TobinQ	0.00184	0.00181	0.00138***	0.00111***	-0.00034	-0.00035	0.00244***	0.00249***
	0.88	0.87	3.43	2.8	-1.53	-1.6	3.47	3
Rival Leverage	-4.9E-05	-4.6E-05	8.09E-05	9.02E-05	0.000391	0.000448	0.000582	0.000575
	-0.54	-0.5	0.24	0.26	0.39	0.44	1.46	1.44
Herfindahl Index	-2.2E-06	-2.2E-06	7.06E-07	1.12E-06	1.81E-06	1.56E-06	1.33E-06	1.33E-06
	-0.94	-0.94	0.31	0.49	1.22	1.04	0.82	0.82
Transaction Value	-0.00101**	-0.00088537**	-0.00125***	-0.000963**	-9.8E-05	9.18E-05	-0.00075*	-0.00081304*
	-2.36	-2.07	-2.7	-2.14	-0.26	0.24	-1.7	-1.85
Multibidder Dummy	0.00543	0.00594	-0.00587	-0.00471	0.00486	0.00516	0.01151	0.01085
	0.58	0.63	-0.56	-0.45	0.53	0.56	1.11	1.04
R square	0.0667	0.0659	0.0522	0.0434	0.0611	0.0629	0.0407	0.0395
N	994	994	994	994	732	732	732	732

Panel E: (2,30) full sample

	full sample			
	big		small	
Intercept	0.00941	-0.000335	0.03274***	0.02365***
	1.53	-0.06	3.99	3.23
targetCAR	0.12045***	0.12065***	0.01384	0.01474
	11.68	11.64	1.01	1.07
sizeR/T	5.93E-07	5.39E-07	-1.5E-05	-1.6E-05
	0.47	0.42	-0.49	-0.51
common market factor(1)	-0.0064***		-0.00611**	
	-3.76		-2.42	
common market factor(2)		-4.92724*		1.3189
		-1.79		0.33
Target TobinQ	0.000976	0.000763	0.00188**	0.00166*
	1.42	1.11	2.04	1.79
Target Leverage	2.73E-05	4.91E-05	-0.00044	-0.00044
	0.12	0.22	-1.49	-1.5
Rival TobinQ	-0.00021	-0.000244	0.00176***	0.00157***
	-0.88	-1.02	4.31	3.76
Rival Leverage	4.68E-05	5.41E-05	0.000332	0.000346
	0.54	0.62	1.06	1.11
Herfindahl Index	1.01E-07	2.16E-08	-0.00000402**	-0.00000385**
	0.08	0.02	-2.56	-2.45
Transaction Value	-0.00035	-0.000129	-0.00105***	**-0.00086343
	-1.28	-0.47	-2.85	-2.38
Multibidder Dummy	-0.01015	-0.00884	-0.00523	-0.00392
	-1.5	-1.31	-0.59	-0.44
R square	0.1009	0.1084	0.0337	0.0293
N	1726	1726	1726	1726

Panel F: (2,30): horizontal and non-horizontal mergers

	horizontal				non-horizontal			
	big		small		big		small	
Intercept	0.0116	0.00324	0.03038**	0.02071*	0.0261***	0.01363	0.04156***	0.03312***
	1.04	0.31	2.55	1.95	2.75	1.56	3.24	2.89
targetCAR	0.13713***	0.13779***	0.02382	0.02486	0.09951***	0.10007***	0.00762	0.00871
	10.21	10.22	1.35	1.41	6.09	6.09	0.35	0.4
sizeR/T	-2E-05	-8.5E-06	0.00017	0.000348	6.53E-07	5.01E-07	-1.8E-05	-1.9E-05
	-0.57	-0.24	0.21	0.44	0.51	0.39	-0.55	-0.58
common market factor(1)	**-0.00477		*-0.00557		***-0.00938		-0.00667	
	-2.2		-1.78		-3.38		-1.55	
common market factor(2)		-2.02564		-2.10096		**-12.59166		6.79962
		-0.63		-0.48		-2.38		0.75
Target TobinQ	0.0022**	0.0021**	0.00395***	0.00383***	-0.00062	-0.00108	-0.00182	-0.00197
	2.37	2.25	3.39	3.29	-0.53	-0.93	-1.16	-1.25
Target Leverage	-0.00123	-0.00108	-0.00094	-0.00075	8.86E-05	0.000121	-0.00039	-0.00039
	-0.73	-0.64	-0.46	-0.37	0.4	0.54	-1.27	-1.28
Rival TobinQ	-0.00317	-0.00323	0.00154***	0.00139***	-0.00018	-0.00023	0.00259**	0.00217**
	-1.6	-1.62	3.36	3.07	-0.76	-0.96	2.92	2.06
Rival Leverage	6.3E-05	6.9E-05	0.000257	0.000264	-0.00096	-0.00091	0.000408	0.000427
	0.72	0.79	0.65	0.67	-0.86	-0.81	0.81	0.84
Herfindahl Index	-2.6E-06	-2.53E-06	-0.00000683***	-0.00000659**	1.28E-06	7.99E-07	-2.9E-06	-2.88E-06
	-1.19	-1.14	-2.59	-2.5	0.78	0.48	-1.43	-1.4
Transaction Value	1.84E-05	0.000175	-0.0011**	-0.00084	-0.00109***	-0.00070674*	-0.00119**	-0.00109*
	0.05	0.43	-2.09	-1.64	-2.64	-1.68	-2.13	-1.95
Multibidder Dummy	-0.01489	-0.01368	-0.00963	-0.00876	-0.00697	-0.00551	-0.00162	5.62E-05
	-1.63	-1.5	-0.8	-0.72	-0.69	-0.54	-0.12	0
R square	0.1532	0.1474	0.0562	0.052	0.1002	0.0907	0.0331	0.03
N	994	994	994	994	732	732	732	732

*** denotes significance at 1% level.

** denotes significance at 5% level.

* denotes significance at 10% level.

The tables suggest that dropping financial firms does not affect the significance of the main variable, target CAR. The results in this table are similar to the results in table 8 in robustness test. Therefore, previous regression results are supported.