

# How Are Acquirers and Targets Different?

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November 12, 2010

## **Abstract**

To help understand mergers and acquisitions (M&As), this paper utilizes the most recent M&A data (1991-2007) to establish empirical facts on a variety of performance measures for M&A acquirers, targets, and non-participants. Unlike the finance literature which mainly focuses on abnormal returns, our performance measures include firm size, technology, productivity, and profitability. Generally, prior to M&As and during post-merger period, acquirers perform better than targets, whereas targets perform better than non-participants. Better acquirers purchase better targets. The gap between an acquirer's performance and its target's performance is smaller in within-industry M&As than in cross-industry M&As. Firms with better performance prior to M&As are more likely to bring success to their M&As.

*Key Words:* mergers and acquisitions; acquirers; targets; performance

*JEL Classification:* D21, G34, L25

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*Acknowledgment:* We would like to thank Keith Head, Xinyu Hua, Qiao Liu, and Wing Suen for their helpful discussions and suggestions. We also benefitted from presenting this paper in seminars at Northeastern University (Boston), the University of Hong Kong and the University of Washington (Seattle).

## 1. Introduction

Mergers and acquisitions (M&As) have been an active economic activity since the 1980s. Important questions that need to be addressed are as follows: Why do firms engage in M&As? What causes M&As? Do M&As create value? How?<sup>1</sup> Economic theory has provided some answers to these questions. For example, mergers create synergies, result in economies of scale, and increase market power. Empirical research has also tried to address some of these questions but failed from giving satisfactory answers.<sup>2</sup> This paper aims to contribute to empirical literature by investigating individual firms' performance before and after their M&A activities and comparing them to non-participants, that is, firms that do not engage in M&As.

We will paint a complete portrait of the M&A participating firms called M&A participants. In particular, we will explain how M&A participants are different from non-participants, how acquiring firms (called acquirers) and target firms (called targets) are different, how within-industry M&As are different from cross-industry M&As, and how firms in successful M&As are different from those in unsuccessful M&As. Our empirical study has a number of distinguishing advantages compared with the existing literature. First, we use the most recent M&A data and cover a longer time span (1991–2007). Second, some of our analysis is based on individual M&A deals, allowing us to compare directly the acquirers and targets. Third, we examine a comprehensive set of performance measures, such as size, technology, productivity, and profitability. Finally, we show how successful acquirers (targets) are different from unsuccessful acquirers (targets) prior to their M&As. The goal of this paper is not to provide a theory or test any existing theory but to present a set of empirical regularities about acquirers, targets, and non-participants. Results from the present study will enhance our understanding of M&A activities and will be useful for future theoretical studies and empirical investigations. Although we have provided explanations to some of the results, full explanations require extensive reviews of existing theories and introduction of new theories, which are beyond the scope of this study.

Our findings show that compared with non-participants, M&A participants are larger in size [measured in terms of sales, total assets, number of employees, total intangible assets, total capital expenditure, and research and development (R&D) expenditure, respectively]; have better technologies (measured in terms of asset to labor ratio, capital expenditure to labor ratio, and R&D expenditure to labor ratio, respectively); have higher productivity (defined as sales per worker); and have higher profitability (defined as total earning, earning per worker, and earning to asset ratio, respectively). For the participants, acquirers are better than targets in all these performance measures.

We find that in individual M&A deals, better acquirers purchase better targets. Firms that acquire targets from other industries (cross-industry M&As) generally have better performance measures than those that acquire the same industry's targets (within-industry M&As). In contrast, targets that are acquired by the same industry's firms generally have better performance measures than those acquired by other industries' firms. As a result, the performance gaps between acquirers and targets are smaller in within-industry M&As than cross-industry M&As. Some M&As are successful, while others are not. Acquirers that have better performance prior to their M&As are more likely to have successful M&As.

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<sup>1</sup> From the social welfare point of view, examining the effects of M&As on consumers and competition is also important.

<sup>2</sup> Andrade et al. (2001) and Bruner (2002) are two useful reviews of the empirical literature.

The same result also holds for targets, but the performance difference is less significant, implying that acquirers are more crucial in determining whether or not the M&As will be successful.

We also provide a dynamic analysis of firm characteristics and performance, enabling us to see how firms are different from a different perspective. Our general findings are as follows: (i) acquirers' growth in most performance measures is faster in the pre-merger period than in the post-merger period; (ii) targets' growth in the pre-merger period and in the post-merger period generally do not differ significantly; (iii) in the pre-merger period, acquirers, targets, and non-participants do not have statistically significant differences in their growth rates with regard to all performance measures; and (iv) in the post-merger period, their growth rates are not significantly different either.<sup>3</sup> These findings have clear implications on the impacts of M&As. It is important to make it clear that our results are mainly about the *correlations* between the firm performance and the selection of the firms (i.e., as acquirers, targets, or non-participants), but not about *causal effects*.

Although this study is the first to provide a systematic analysis of M&A firms' performance, it is closely related to a large literature of empirical studies on M&As. In their survey article, Andrade et al. (2001) point out that mergers occur in waves and have strong clusters by industries. This pattern is observed based on aggregate-level (country and industry level) data and has been explained largely by technological innovations, supply shocks, and deregulations. This line of research has improved our understanding of why and when mergers occur. In contrast, our study uses micro-level (firm level) M&A data to provide a detailed and complete picture of the merging firms. Hence, our study supplements this line of research and enhances our understanding of who engages in mergers. Some studies (e.g., Andrade and Stafford, 2004; Bradley and Sundaram, 2006; and Breinlich, 2008) have also compared acquirers, targets, and non-participants, but they focused on a much smaller set of performance measures than that covered in our study.<sup>4</sup>

In finance literature, there are numerous studies on returns to M&As, as surveyed by Andrade et al. (2001), Bruner (2002) and Betton et al. (2008). This literature is mainly concerned about how M&As affect the acquirers' and targets' stock prices, and whether they generate abnormal profits.<sup>5</sup> In contrast, we compare acquirers, targets, and non-participants based on a set of performance measures and examine the changes in growth rates of those measures from the pre-merger period to the post-merger period. Our analysis allows us to see the impacts of M&As in a broader set of financial aspects.<sup>6</sup> Although there are several studies on merger impacts using firms' reported financial data, they were

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<sup>3</sup> Using stock prices, Bradley and Sundaram (2006) examine the relation between the pre-acquisition and post-acquisition performance of acquiring firms. They find that performance drives acquisitions in the sense that acquirers' performance is better than the market prior to the acquisitions but not post-acquisitions.

<sup>4</sup> Table 7 of Andrade and Stafford (2004) summarizes the comparison between acquirers and targets. They find that for the sub-sample of own-industry M&As, acquirers have significantly higher q, cash flows, and lagged stock returns, as well as lower leverage and capacity utilization than their target companies. Bradley and Sundaram (2006) also compare some aspects of firm characteristics. They find that acquiring firms outperform the market, and frequent acquirers significantly outperform infrequent acquirers. However, the performance in their study is mainly stock price. Breinlich (2008) finds that the Canada-U.S. Free Trade Agreement results in a wave of domestic M&As in which acquirers are generally more productive than targets.

<sup>5</sup> A general conclusion is that after the announcements of acquisitions, target firms' stock prices go up (more precisely, they earn abnormal return from the market), but the changes in acquiring firms' stock prices are not so clear cut.

<sup>6</sup> Bruner (2002, Exhibit 1) presents a comparison between using stock market price and using reported financial data on their strengths and weaknesses.

conducted based on different samples of mergers (e.g., different time periods, different industries, different countries, etc.) and different performance measures.<sup>7</sup> As a result, their findings are hard to compare and are inconclusive. Our study contributes to this line of research, hoping to help reach some conclusions in the future when more studies are available. One advantage of our study is that it uses a newer and larger database to examine a larger set of performance measures.<sup>8</sup>

The remainder of the paper is organized as follows. We describe our data in Section 2. In Section 3, we provide broad pictures of M&A activities at the aggregate level. Various comparisons of acquirers, targets, and non-participants are presented in Sections 4, 5, 6, 7 and 8. Section 9 provides the concluding remarks.

## 2. Data

This study is based on the most complete M&A data from Thomson Financial Securities Data Company (SDC). The SDC database includes all M&A deals (both private and public transactions) in the world.<sup>9</sup> For each deal, SDC reports the date of the transaction, value of the transaction (if available), shares transacted, firms involved, acquirer's and target's nations and industries, and many items from the firms' financial statements. Our study focuses on the period of 1991–2007. Year 1991 was the beginning of a new merger wave that ended in 2002, whereas 2007 was the latest year with a complete record of the world M&A deals in the SDC database at the time when this study began.

One objective of this study is to analyze firms' pre- and post-merger performance, and thus we need detailed firm-level pre- and post-merger information. Given this intensive data requirement, we focus on the US domestic M&As because the required data are readily available from Compustat North America. Compustat North America includes financial and market information of all US companies that are publicly traded. Data are extracted from these companies' income statements, balance sheets, statements of cash flows, and other supplementary data sources.

M&As take place in all sectors of an economy. The impacts and patterns of M&As in different sectors can be very different. To obtain clear results, we confine our analysis to the manufacturing sector. Within the manufacturing sector, we further divide firms into various industries following the 1987 version four-digit standard industry classification (SIC) system.

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<sup>7</sup> Ravenscraft and Scherer (1989) focus on return on assets and find that mergers destroy value. In contrast, Healy et al. (1992) focus on operating cash flows and conclude that merged firms have higher operating cash flows than their industry peers. Andrade et al. (2001) use a better methodology and a longer time span to reach the following conclusion: the combined target and acquirer's operating performance is better than their industry peers prior to the merger, and the relative performance improves slightly subsequently to the merger transaction. The specific performance measure in their study is a firm's operating margin, which is the ratio of cash flow to sales. McGuckin and Nguyen (1995) and Schoar (2002) focus on more fundamental performance, that is, total factor productivity and find that mergers do not change the acquiring firms' productivity because the productivity improvement in the acquired plants is offset by the productivity loss in the acquirers' existing plants.

<sup>8</sup> The types of financial performance measures used in the literature include leverage, Tobin's q, holdings of cash, managerial share ownership, level of management confidence, and size of capitalization. However, we use a very different set.

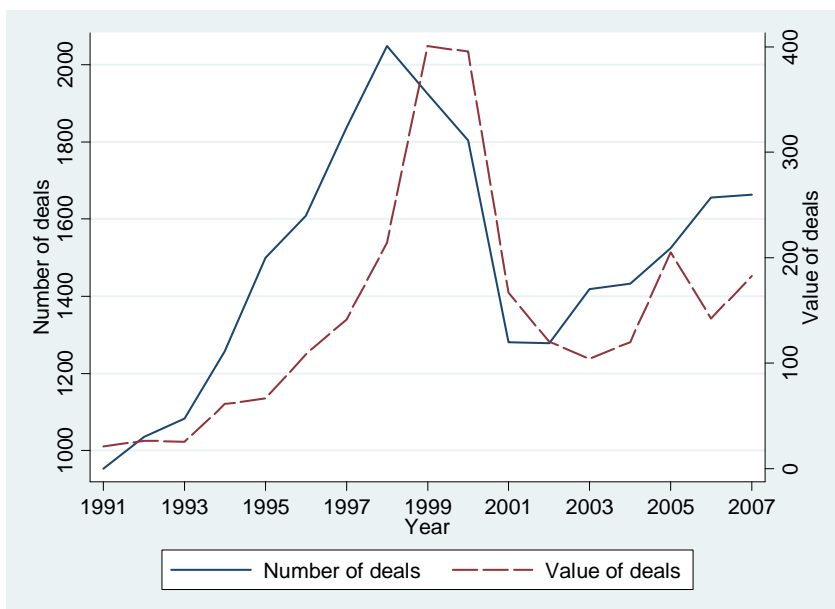
<sup>9</sup> Before 1992, SDC included only deals involving at least 5% of the ownership of a company, where the transaction was valued at \$1 million or more or where the transaction value was not disclosed. The SDC database classifies all M&As in 10 categories. We exclude two categories in our study, that is, buy back and recapitalization, because they are very different types of acquisitions from the others.

To link firms' performance with their M&A activities, we construct a new dataset based on the abovementioned databases. In our new dataset, all firms are listed American firms in the manufacturing sector found in Compustat North America. Each firm's information in our dataset includes the firm's financial data from 1991–2007, which are downloaded from the Compustat North America, and the firm's M&A data during the same period, which are downloaded from the SDC database.<sup>10</sup> Our analysis on pre- and post-merger performance is therefore based on and confined to this new dataset.

### 3. Overview of M&As

In this section, we will describe the general features of M&As. We will examine M&As at the country, industry, and firm level, respectively. Since in this section we do not need firms' performance information, we include all American firms, both public and private, from the SDC database.

**Figure 3-1: M&A Deals during 1991–2007**



#### 3.1. Merger Waves

To give a general picture of M&As in the 1991–2007 period, we plot the number of M&As (the solid curve against the left vertical axis) and their values (the dotted curve against the right vertical axis, in billion US\$) in Figure 3-1 on an annual basis. There are two waves of M&As during the period of 1991–2007 in both the number of deals and the value of transactions. The first wave ended in around 2002, and the second wave started in around 2003.<sup>11</sup>

#### 3.2. M&A Distribution across Industries

One stylized fact identified in the literature (e.g., Mitchell and Mulherin 1996; Andrade, Mitchell and Stafford, 2001) based on M&A data from the earlier years is the strong industry clustering of M&As. That is, some industries receive far more M&As than others during a given time period. One

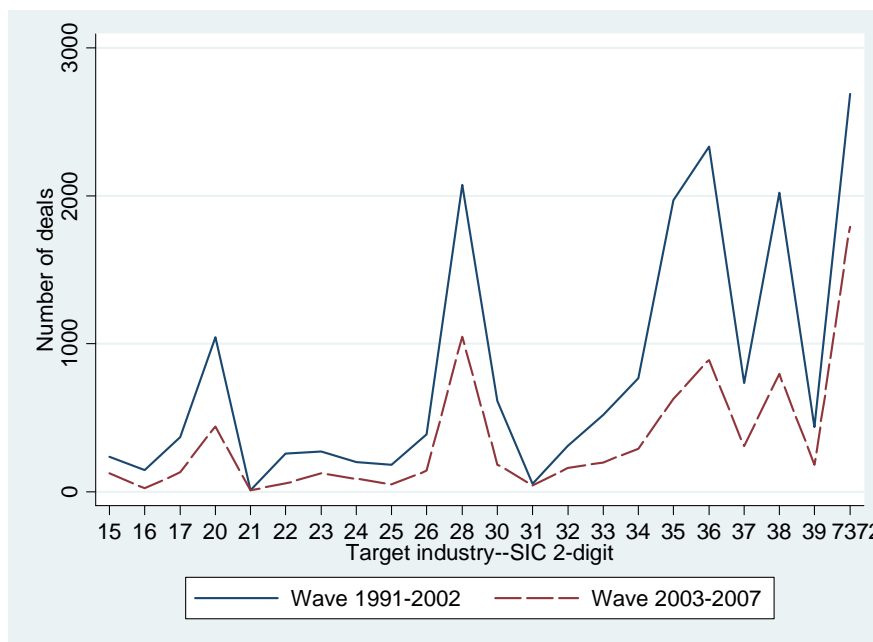
<sup>10</sup> The matching of the firms from the two databases is conducted using CUSIP (the company codes), which is available in both databases.

<sup>11</sup> Mergers occur in waves. This is a consistent feature observed in the literature (e.g., Mitchell and Mulherin 1996; Andrade, Mitchell and Stafford, 2001). Qiu and Zhou (2007) offer a theoretical explanation for merger waves.

explanation for such clustering is that M&As are partly driven by industry-specific shocks (e.g., costs, demands, or deregulation). This force for M&As implies that if the industry-specific shocks are different during different time periods, we should expect to see different M&A clusters across industries.

We explore the above possibility using our data. To this end, we divide the manufacturing sector into 22 industries based on SIC two-digit level and, following Mitchell and Mulherin (1996), derive M&A distribution according to the targets' industries.<sup>12</sup> Figure 3-2 depicts the distribution based on the number of M&A deals during the first merger wave (1991–2002) and during the second merger wave (2003–2007). Figure 3-3 depicts the corresponding distributions based on the value of M&A deals in billion US\$. We observe that when focusing on industries within the manufacturing sector, the industry distributions of M&As in the recent two merger waves are almost identical. There are two possible reasons for this feature. First, the shocks in those two waves may have been similar; that is, the merger-inducing shocks that occur in an industry in the first wave occur again in the same industry in the second wave, and those industries that do not experience many merger-inducing shocks in the first wave do not experience those shocks again in the second wave. Second, there are common shocks in all industries (e.g., GDP shocks) in both waves, but some industries are more responsive to the shocks than others due to the different natures of those industries. For example, firms in some industries adjust their structures more quickly and drastically than firms in other industries.

**Figure 3-2: M&A Distribution across Industries (Number of Deals)**

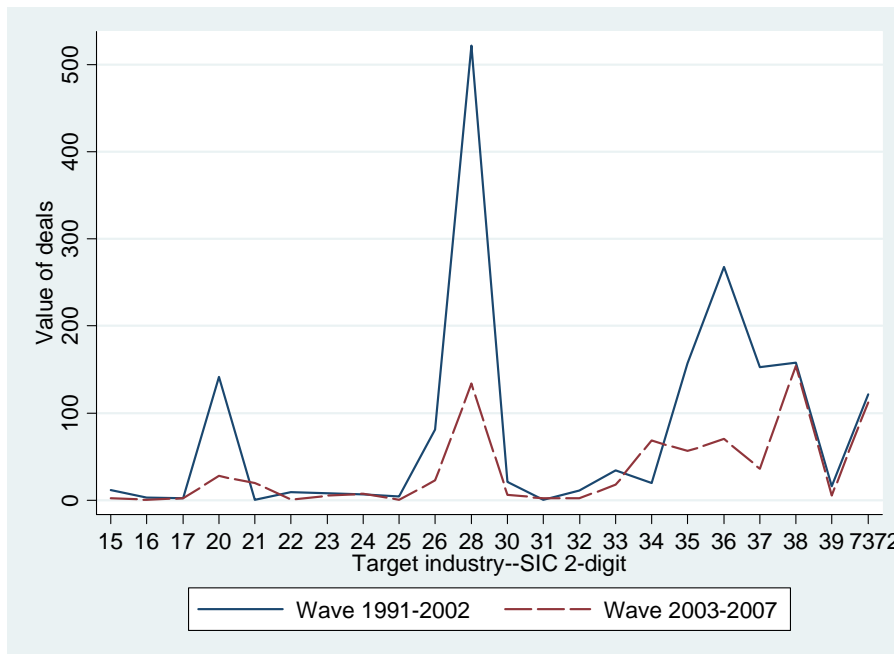


In any case, this feature of M&A distribution is in contrast to the finding by Andrade et Al. (2001) who use data from all industries' M&As. Focusing on public firms' M&As, they find that the types of industries that made up the waves in the three decades, that is, 1970s, 1980s and 1990s, are tremendously different. As we have just shown, this pattern has changed in the recent two waves, 1990s and 2000s. Although our observations are based on merger activities of both public and private firms,

<sup>12</sup> The SDC classification of industries is slightly different from the 1987 version four-digit SIC system. Aside from the manufacturing sector defined in SIC (Division D in SIC), SDC also includes construction (Division C in SIC) and prepackaged software (7372 in SIC) in its manufacturing sector.

we also draw graphs based on public firms only and find that the patterns are almost identical to those in Figures 3-2 and 3-3. While the above industry distributions are derived from the targets' industries, the results are similar if we classify M&As by acquirers' industries.

**Figure 3-3: M&A Distribution across Industries (Value of Deals)**



In individual M&A deals, both the acquirers and the targets may belong to the same industry (i.e., within-industry M&A) or different industries (i.e., cross-industry M&A). An ensuing question is which type of M&As is more popular. The answer clearly depends on how fine the industry classification is. Despite this, some patterns can be found. We report in Table 3-1 the numbers and percentages of within-industry and cross-industry M&As at different aggregate levels.

**Table 3-1: Distribution of Within- and Cross-industry M&As**

Sample	Industry definition	Within-industry M&As		Cross-industry M&As	
		number	percent	number	percent
Wave 1991-2002	SIC 4-digit	7482	42.49%	10128	57.51%
	SIC 3-digit	9265	52.61%	8345	47.39%
	SIC 2-digit	11538	65.52%	6072	34.48%
Wave 2003-	SIC 4-digit	3931	51.09%	3763	48.91%
	SIC 3-digit	4634	60.23%	3060	39.77%
	SIC 2-digit	5395	70.12%	2299	29.88%
Total: 1991-2007	SIC 4-digit	11413	45.10%	13891	54.90%
	SIC 3-digit	13899	54.93%	11405	45.07%
	SIC 2-digit	16933	66.92%	8371	33.08%

Note: Within-industry M&As are the deals of both the acquirers and the targets that belong to the same industry. Otherwise, the deals are cross-industry M&As.

As shown by Table 3-1, on average, the distribution of total M&As in the entire period is quite even between within-industry and cross-industry categories. On the other hand, in the latest merger wave since 2003, the share of within-industry deals is higher than that in the previous wave during 1991–2002 at all three types of aggregation. This finding is consistent with that of Andrade et al. (2001) based on the earlier time period for public firms' M&A activities. They find that there is an increasing trend in the share of within-industry M&As from 1973–1998.<sup>13</sup> We show that this trend continues in the two recent waves based on both public and private firms' M&As.

### 3.3. Firms' Participation in M&As

The previous subsections provide a general picture of the total M&As over time and their distribution across industries. In this subsection, we examine individual firms' participation in M&As. First, we look at the *extensity* of the publicly traded firms' participation in M&As.<sup>14</sup> Our dataset allows us to calculate the number of public firms in the manufacturing sector in each year [column (2) in Table 3-2], the number of firms (both public and private) participating in M&As in each year [column (3)], and the number of public firms participating in M&As in each year [column (4)]. Based on these three sets of numbers, we calculate and report in column (5) the extensity of public firms' participation in M&As, that is, the percentage of public firms that engage in M&As (as acquirers or targets). On average, in every year, there are 14.26% of public firms participating in M&As, and there is an increasing trend in this share.<sup>15</sup> We also calculate and report in column (6) the relative importance of public firms' participation in M&As. Among all M&A participating firms, on average, 19.37% of them are public firms, and the rest are private. Thus, private firms dominate M&A activities. Moreover, we observe that this ratio drops slowly over time, indicating that the growth of private firms engaging in M&As is faster than that of public firms.

Second, we analyze the frequency, or *intensity*, of firms' participation in M&As, which is reported in Table 3-3. Among all 33918 firms (both public and private) that participated in M&As during the period of 1991–2007, 34.94% of them (11852 firms) acquired other firms, the rest of them (65.06%) were pure targets (i.e., they did not acquire other firms), and 5.80% of them (1968 firms) were both acquirers and targets (in different M&A deals).

The left panel of Table 3-3 shows the intensity of firms' participation in M&As as either a target or an acquirer. A firm can be an acquirer at one time and a target at another time. Evidence shows that for firms involved in M&As during 1991–2007, 82.79% of them participated only once, 8.85% participated twice, and there were only a small number of firms, 1175 (or 3.47%), that participated in M&As five times or more.

The middle panel of the table shows the intensity of firms' participation as acquirers. For all firms that had acquired other firms during the period of 1991–2007, majority of them (65.90%) acquired once

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<sup>13</sup> See Table 1 of Andrade et al. (2001).

<sup>14</sup> Compared with private firms, public firms may have different incentives to acquire other firms. For example, according to the market-timing theory of merger waves (see Shleifer and Vishny, 2003, and Rhodes-Kropf and Viswanathan, 2004), merger waves are the results of some firms using their overvalued stock to buy assets of less valued firms driven by managerial desire. This gives an incentive for the public firms to engage in M&As, which is absent for the private firms.

<sup>15</sup> We are not able to compare this share with that for private firms because we do not have the data on the total number of private firms.

only, some of them (15.31%) acquired twice, and a small percentage (8.47%) acquired five times or more.

**Table 3-2: Extensivity of Public Firms' Participation in M&As (1991–2007)**

Year	No. of public firms	No. of M&A firms	No. of public M&A firms	public M&A firms/public firms	public M&A firms/M&A firms
(1)	(2)	(3)	(4)	(5)=(4)/(2)	(6)=(4)/(3)
1991	3,434	1702	336	9.78%	19.74%
1992	3,615	1852	375	10.37%	20.25%
1993	3,774	1926	420	11.13%	21.81%
1994	3,871	2182	480	12.40%	22.00%
1995	4,129	2610	552	13.37%	21.15%
1996	4,130	2797	588	14.24%	21.02%
1997	4,089	3154	679	16.61%	21.53%
1998	3,973	3380	688	17.32%	20.36%
1999	3,941	3245	674	17.10%	20.77%
2000	3,816	3074	606	15.88%	19.71%
2001	3,617	2281	437	12.08%	19.16%
2002	3,493	2294	438	12.54%	19.09%
2003	3,304	2552	453	13.71%	17.75%
2004	3,118	2597	489	15.68%	18.83%
2005	2,895	2728	444	15.34%	16.28%
2006	2,724	2954	464	17.03%	15.71%
2007	2,360	2958	419	17.75%	14.16%
Average	3546.06	2605.06	502.47	14.26%	19.37%

The right panel shows the firms' intensity as targets. It is natural that an individual firm should not be acquired many times; that is, the intensity of being targeted is low relative to that of being an acquirer. This is evident in Table 3-3.

**Table 3-3: Intensity of Firms' Participation in M&As (1991–2007)**

No. of times involved in M&As	No. of firms	Percent	No. of times as acquirer	No. of firms	Percent	No. of times as target	No. of firms	Percent
1	28,082	82.79%	1	7,810	65.90%	1	22,934	95.42%
2	3,001	8.85%	2	1,814	15.31%	2	966	4.02%
3	1,078	3.18%	3	779	6.57%	3	107	0.45%
4	582	1.72%	4	445	3.75%	4	20	0.08%
5-10	885	2.61%	5-10	729	6.15%	5	5	0.02%
11-94	290	0.86%	11-94	275	2.32%	6	2	0.01%
Total	33918	100%		11852	100%		24034	100%

Although the intensity figures in Table 3-3 suggest that firms do not participate in M&A activities very frequently, it is worth pointing out that there are some firms that actively acquire other firms. For example, some firms acquired other firms more than 90 times during the period of 1991–2007.<sup>16</sup> Two companies, Cyberonics Inc. (CUSIP code 23251P) and Hayes Microcomputer Prods. Inc. (CUSIP code 42077A), were targeted six times during the same period.

## 4. Comparing Acquirers, Targets, and Non-participants

While there is a large number of empirical studies about the impacts of M&As on both targets and acquiring firms, why firms engage in M&As remains less understood. Although we do not aim to provide a direct answer to this M&A-participation question, we believe it is important to understand how the would-be merging firms are different from the non-merging firms and how the would-be acquirers are different from the would-be targets. In this section, we will provide a series of comparisons among acquirers, targets, and non-participants in many aspects, including firm size, technology, productivity, and profitability. As we need financial data of the non-participants, we confine our comparisons to all publicly listed firms.

### 4.1. Data and Summary Statistics

We are particularly interested in four categories of firm performance: (1) *size*, which includes a firm's total sales (SALES), total assets (ASSET), number of employees (LABOR), intangible assets (IN-ASSET), capital expenditure (CAPITAL), and R&D expenditure (R&D); (2) *technology*, which includes assets per employee (ASSET/LABOR), intangible assets per employee (IN-ASSET/LABOR), capital investment per employee (CAPITAL/LABOR), and R&D expenditure per employee (R&D/LABOR); (3) *productivity*, that is, labor productivity, which is sales per employee (SALES/LABOR); and (4) *profitability*, which includes earnings (EARNING), earning per employee (EARNING/LABOR), and earning per dollar of asset or return on assets (EARNING/ASSET). Note that earning is the earnings before interest, taxes, depreciation, and amortization (i.e., EBITDA, which is the difference between income and cost).

A number of issues arise when we construct the above performance measures. First, when firm A acquires firm B in a year, we treat A as an acquirer in that year, but when A is acquired by firm C in another year, we treat A as a target in that year. A firm may be an acquirer in some years and a target in some other years. This may not be a bad treatment because the same firm can be very different over time; thus, this may be part of the reason why it is an acquirer at some time and a target at some other time. Second, because it is often a lengthy process to reach an M&A deal, we use a firm's financial data in the year before the deal to represent the firm's performance before or at the time of the M&A deal. This approach has also been adopted by Maksimovi and Philips (2001) and Andrade and Stafford (2004). Alternatively, we can measure a firm's performance using a five-year average prior to the M&A deal. The results obtained are the same qualitatively as those using one year before the M&A deal and so we just report the result using the latter approach. Third, firms participate in M&As at different times, and thus their performances are affected by the overall economic situation at the time of their M&As. To make those monetary measures comparable over time, we adjust them using GDP, taking 1991 as the

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<sup>16</sup> Three of the most intensive acquirers, Cisco Systems Inc. (CUSIP code 17275R), Microsoft Corp. (CUSIP code 594918), and Intel Corp. (CUSIP code 458140) engaged in acquiring activities 94, 73, and 70 times, respectively.

base year. Specifically, we multiply each performance value in year  $t$  by  $GDP_{1991}/GDP_t$ .

Based on the above classification, we obtain 31930 observations of listed firms, in which 66.44% of them (21215 in number) are firms that never engaged in any M&A during 1991–2007, and the rest (10715) are M&A participants. Among the M&A participants, 93.78% of them (10048 in number) are acquirers, and 6.22% of them (667 in number) are targets.<sup>17</sup>

The summary statistics of all performance measures for the different types of firms and their comparisons are presented in Table 4-1. All nominal measures are in million US\$, and labor is in thousand people. Columns (1)-(3) are the means of the corresponding measures. Acquirers have larger means than targets in all performance measures, and targets have larger means than non-participants except IN-ASSET, IN-ASSET/LABOR, and R&D/LABOR.<sup>18</sup>

**Table 4-1: Means and Comparisons for Acquirers, Targets, and Non-participants**

Variable	Acquirers	Targets	Non-participants
	(1)	(2)	(3)
<b>Size:</b>			
SALES	199.09	50.88	25.43
ASSET	172.62	57.35	35.31
LABOR	4.75	2.47	1.62
IN-ASSET	6.48	3.14	3.40
CAPITAL	13.05	5.29	3.40
R&D	14.78	6.60	4.56
<b>Technology:</b>			
ASSET/LABOR	54.26	30.47	23.29
IN-ASSET/LABOR	1.73	1.43	2.22
CAPITAL/LABOR	3.63	2.51	2.16
R&D/LABOR	3.64	3.02	3.18
<b>Productivity:</b>			
SALES/LABOR	61.47	27.51	16.97
<b>Profitability:</b>			
EARNING	262.16	154.54	83.74
EARNING/LABOR	42.22	-6.77	-106.13
EARNING/ASSET	0.05	-0.24	-1.63

Acquirers and targets are particularly large (size measures) relative to non-participants, and this partly explains the lower value (in relative terms or even in absolute terms) in the measures with ratios for the participants.

<sup>17</sup> Such difference between the number of acquirers and that of targets is mainly due to the fact that many publicly listed firms acquire private firms.

<sup>18</sup> This pecking order is also confirmed by the Kolmogorov-Smirnov test.

## 4.2. Regression Results

The simple comparison based on Table 4-1 can be misleading because there may be some other factors driving the differences among the three groups of firms. One obvious factor is that firms belong to different industries and different industries have different performance results by nature. For example, the fact that the acquirers' capital/labor ratio is larger than that of the targets may be the case in which the acquirers mainly come from more capital intensive industries while the targets are mainly in less capital intensive industries. To obtain a more reasonable comparison, we examine the performance differences among the three groups of firms by controlling for industry specific factors. To this end, we run the following regression for *each* performance measure (X):

$$\ln X_i = \alpha + \beta_1 ACQ_i + \beta_2 TAR_i + IND_i + \varepsilon_i$$

where  $ACQ_i$  is a dummy variable equal to one if firm  $i$  is an acquirer and zero otherwise;  $TAR_i$  is a dummy variable equal to one if firm  $i$  is a target and zero otherwise;  $IND_i$  is the industry dummy (at SIC 4-digit level); and  $\varepsilon_i$  is the normally distributed error term.  $\beta_1$  and  $\beta_2$  are the premia of the acquirers and targets, respectively, relative to the non-participants. The regression results are reported in Table 4-2.

The pecking order presented earlier in Table 4-1 is confirmed by our regression results. First, the estimate of the acquirers' dummy,  $\beta_1$ , is significant in all regressions and positive in almost all regressions (except IN-ASSET/LABOR), indicating that the acquirers are better than the non-participants in almost all performance measures. The negative estimate of IN-ASSET/LABOR is due to the fact that acquirers are much larger than the non-participants in terms of the size of labor but are not much larger in terms of total intangible asset.

**Table 4-2: Pre-merger Performance Differentials**

Dependent variables	Independent variables				Obs	R-squared	p-value of F-test
	ACQ		TAR				
<b>Size:</b>							
SALES	1.967***	(0.0261)	0.880***	(0.0795)	31723	0.408	0.0000
ASSET	1.609***	(0.0251)	0.628***	(0.0761)	31908	0.333	0.0000
LABOR	1.002***	(0.0122)	0.437***	(0.0369)	27474	0.437	0.0000
IN-ASSET	0.655***	(0.0256)	0.101	(0.0791)	27855	0.285	0.0000
CAPITAL	1.336***	(0.0190)	0.529***	(0.0581)	31297	0.375	0.0000
R&D	1.164***	(0.0212)	0.344***	(0.0615)	22279	0.288	0.0000
<b>Technology:</b>							
ASSET/LABOR	0.937***	(0.0186)	0.396***	(0.0566)	27470	0.268	0.0000
IN-ASSET/LABOR	-0.173***	(0.0227)	-0.248***	(0.0695)	23834	0.222	0.2927
CAPITAL/LABOR	0.584***	(0.0116)	0.217***	(0.0353)	27031	0.328	0.0000
R&D/LABOR	0.331***	(0.0147)	0.0190	(0.0427)	19243	0.371	0.0000
<b>Productivity:</b>							
SALES/LABOR	1.268***	(0.0198)	0.639***	(0.0600)	27378	0.376	0.0000
<b>Profitability:</b>							
EARNING	211.2***	(12.40)	103.5***	(38.31)	30403	0.132	0.0057
EARNING/LABOR	134.7***	(23.45)	120.4*	(71.98)	25918	0.010	0.8445
EARNING/ASSET	1.611***	(0.441)	1.368	(1.365)	30314	0.009	0.8609

Note: Standard errors are in parentheses. \*\*\* denotes  $p < 0.01$ , \*\* denotes  $p < 0.05$ , and \* denotes  $p < 0.1$ . SIC four-digit industry fixed effects are controlled for in all regressions.

Second, the estimate of the targets dummy,  $\beta_2$ , is positive in all regressions except IN-ASSET/LABOR. The regression results are significant in all performance measures except IN-ASSET, R&D/LABOR, and EARNING/ASSET. Similar to the acquirers, the targets are better than the non-participants in almost all performance measures.<sup>19</sup> However, due to their larger labor size, the targets are not as good as the non-participants in IN-ASSET/LABOR.

By direct comparison, we immediately observe that  $\beta_1$  is larger than  $\beta_2$  for all performance measures. We also conduct the F-tests for all regressions (see the last column of Table 4-2) and find that generally the null hypothesis “ $\beta_1 > \beta_2$ ” is not rejected. Hence, the acquirers have better performance than the targets in all aspects. This finding is consistent with the theory and observation of Jovanovic and Rousseau (2002) and Maksimovic and Phillips (2001). Jovanovic and Rousseau (2002) argue that mergers can be viewed as acquisitions of low productive firms' assets by firms with high productivity. By studying plant sales between firms, Maksimovic and Phillips (2001) find that transactions improve the allocation of resources. Related to this literature, our study adds two points. First, we find that assets are transferred from low performance firms to high performance firms where performance is measured not only by productivity but also many other aspects. Second, the high performance firms choose to buy assets from some less well performed firms, but not from those firms with very low performance.

Table 3-3 shows that firms become involved in M&As in very different frequencies. To explore further the differences in performance among the three groups of firms and the differences across firms with different M&A frequencies within a group, we introduce intensity variables to the regression models. Specifically, we run the following regressions:

$$\ln X_i = \alpha + \beta_1 ACQ_i + \gamma_1 ACQ_i \bullet ACQNO_i + \beta_2 TAR_i + \gamma_2 TAR_i \bullet TARNQ_i + IND_i + \varepsilon_i,$$

where  $X_i$  is firm  $i$ 's performance in the first year of the data period if firm  $i$  is a non-participant, but it is firm  $i$ 's performance in the year before it became involved in a deal if it is a participant;  $ACQ_i$  and  $TAR_i$  are defined according to the first deal firm  $i$  is involved;  $ACQNO_i$  is the number of times firm  $i$  acquired other firms' assets during 1991–2007 ( $ACQNO_i = 1, \dots, 94$ ) called acquiring intensity; and  $TARNQ_i$  is the number of times firm  $i$  is targeted by other firms ( $TARNQ_i = 1, \dots, 6$ ) called target intensity. For the non-participants, both variables are zero. This regression allows us to examine how performance is related to M&A intensity.

The regression results related to M&A intensity, that is,  $\gamma_1$  and  $\gamma_2$ , are reported in Table 4-3. These results reinforce the pattern observed in Table 4-2. Generally, for the performance measures in Table 4-2 that are positive and statistically significant, the corresponding  $\gamma_1$  and  $\gamma_2$ , that is, the intensity in the corresponding performance, are also positive and significant in Table 4-3. In particular, most of  $\gamma_1$  are positive (except IN-ASSET/LABOR) and statistically significant (except EARNING/LABOR and EARNING/ASSET). This means that not only the acquirers perform better than the non-participants, but the more active acquirers perform even better than the less active acquirers. On the other hand,

<sup>19</sup> Harris and Robinson (2002) find that foreign firms acquire the most-productive plants in U.K. This of course implies that targets are better than the non-participants.

many  $\gamma_2$  are positive and statistically significant, which means that firms with better performance are targeted more often.

**Table 4-3: Performance and M&A Intensity**

Dependent variables	ACQ*ACQNO		TAR*TARNO		Obs	R-squared
<b>Size:</b>						
SALES	0.0847***	(0.00534)	0.495***	(0.168)	5107	0.393
ASSET	0.0806***	(0.00499)	0.462***	(0.157)	5202	0.335
LABOR	0.0340***	(0.00233)	0.222***	(0.0744)	3366	0.401
In-ASSET	0.0284***	(0.00474)	0.610***	(0.161)	4539	0.264
CAPITAL	0.0643***	(0.00338)	0.164	(0.108)	5016	0.384
R&D	0.0526***	(0.00338)	0.258**	(0.130)	3518	0.270
<b>Technology:</b>						
ASSET/LABOR	0.0393***	(0.00380)	0.0985	(0.121)	3365	0.310
In-ASSET/LABOR	-0.00464	(0.00407)	0.405***	(0.136)	2857	0.236
CAPITAL/LABOR	0.0277***	(0.00211)	-0.0529	(0.0685)	3262	0.379
R&D/LABOR	0.0184***	(0.00227)	0.0495	(0.0943)	2219	0.388
<b>Productivity:</b>						
SALES/LABOR	0.0423***	(0.00415)	0.148	(0.132)	3325	0.361
<b>Profitability:</b>						
EARNING	9.308***	(1.102)	36.37	(34.65)	5020	0.284
EARNING/LABOR	0.947	(0.615)	-4.977	(19.59)	3220	0.107
EARNING/ASSET	0.0177	(0.0135)	0.136	(0.426)	4997	0.038

Note: Standard errors are in parentheses. \*\*\* denotes  $p < 0.01$ , \*\* denotes  $p < 0.05$ , and \* denotes  $p < 0.1$ . SIC four-digit industry fixed effects are controlled for in all regressions.

### 4.3. Comparisons between Pre-merger and Post-merger Performance

The preceding subsection reveals the performance differences among acquirers, targets, and non-participants before their M&As (i.e., in the pre-merger period). However, how are firms different after their M&As, and how does each firm's performance change after its M&A? To answer these questions, we first define and construct post-merger data. Corresponding to the pre-merger data, we focus on a firm's post-merger performance in the year after its M&A deal. Accordingly, we obtain 32605 observations of the listed firms, in which 65.07% of them (the same 21215 observations as in the pre-merger dataset) never engaged in any M&A during 1991–2007 and the rest (11390) are M&A participants. Among the M&A participants, 94.36% (10748) are acquirers and 5.64% (642) are targets.

We run the regressions similar to those in the preceding section but use post-merger performance data. The results are reported in Table 4-4. All estimates are positive and statistically significant (except for the targets' profitability measures), indicating that both acquirers and targets are better than non-participants after the M&As. Acquirers still have better performance than targets after the M&As.

**Table 4-4: Post-merger Performance Differentials**

Dependent variables	Independent variables				Obs	R-squared	p-value of F-test
	ACQ		TAR				
<b>Size:</b>							
SALES	2.967***	(0.0250)	1.344***	(0.0790)	32470	0.484	0.0000
ASSET	2.864***	(0.0240)	1.325***	(0.0761)	32572	0.445	0.0000
LABOR	1.124***	(0.0114)	0.383***	(0.0360)	29905	0.435	0.0000
IN-ASSET	3.015***	(0.0268)	0.745***	(0.0876)	28979	0.436	0.0000
CAPITAL	2.015***	(0.0186)	0.842***	(0.0591)	31983	0.444	0.0000
R&D	2.111***	(0.0216)	0.926***	(0.0646)	22966	0.421	0.0000
<b>Technology:</b>							
ASSET/LABOR	1.704***	(0.0169)	0.900***	(0.0531)	29899	0.373	0.0000
IN-ASSET/LABOR	1.863***	(0.0216)	0.390***	(0.0701)	26508	0.329	0.0000
CAPITAL/LABOR	0.894***	(0.0109)	0.467***	(0.0342)	29437	0.371	0.0000
R&D/LABOR	0.922***	(0.0146)	0.547***	(0.0432)	21217	0.452	0.0000
<b>Productivity:</b>							
SALES/LABOR	1.809***	(0.0177)	0.927***	(0.0558)	29830	0.439	0.0000
<b>Profitability:</b>							
EARNING	585.3***	(17.76)	64.34	(57.38)	30747	0.114	0.0000
EARNING/LABOR	115.3***	(19.50)	92.86	(63.06)	27960	0.008	0.7255
EARNING/ASSET	1.646***	(0.435)	1.552	(1.409)	30657	0.007	0.9479

Note: Standard errors are in parentheses. \*\*\* denotes  $p < 0.01$ , \*\* denotes  $p < 0.05$ , and \* denotes  $p < 0.1$ . SIC four-digit industry fixed effects are controlled for in all regressions.

We next examine the differences in performance between the pre-merger and post-merger periods for the acquirers and targets, respectively. To this end, we first run the following regressions for the acquirers:

$$\ln X_{im} = \alpha + \beta AFTER_m + D_i + \varepsilon_{im},$$

where  $m=0$  is for the pre-merger period,  $m=1$  is for the post-merger period,  $AFTER_m$  is a dummy equal to one for the post-merger period and equal to zero for the pre-merger period, and  $D_i$  is the firm fixed effect. As we control for firm fixed effect,  $\beta$  then measures the average within-firm difference in performance between pre- and post-merger periods. We then run the same regressions for the targets. The results are reported in Table 4-5.

One observation is that both acquirers and targets are generally better off after their M&As. For the acquirers, almost all estimates are positive (except EARNING/LABOR) and statistically significant (except EARNING/LABOR and EARNING/ASSET). For the targets, most of the estimates are positive (except EARNING and EARNING/LABOR) and statistically significant (except EARNING and EARNING/ASSET). The size expansion result for targets is somewhat surprising because targets usually shrink after selling part of their assets. This may be true for partial asset acquisitions. However, most of the targets in our data set are not of this type. They are mergers or partial interest acquisitions, which result in asset reallocation from the acquirers to the targets.

**Table 4-5: Performance Comparison: Pre-merger versus Post-merger**

Dependent variables	Independent variables		Independent variables	
	$\beta$ for Acquirers		$\beta$ for Targets	
<b>Size:</b>				
SALES	1.077***	(0.00963)	0.647***	(0.0492)
ASSET	1.303***	(0.0108)	0.745***	(0.0487)
LABOR	0.313***	(0.00547)	0.0419***	(0.0153)
IN-ASSET	2.309***	(0.0229)	0.767***	(0.0805)
CAPITAL	0.776***	(0.00882)	0.354***	(0.0423)
R&D	1.013***	(0.0108)	0.622***	(0.0422)
<b>Technology:</b>				
ASSET/LABOR	0.796***	(0.00741)	0.449***	(0.0397)
IN-ASSET/LABOR	1.872***	(0.0229)	0.625***	(0.0856)
CAPITAL/LABOR	0.396***	(0.00664)	0.215***	(0.0374)
R&D/LABOR	0.609***	(0.00770)	0.450***	(0.0349)
<b>Productivity:</b>				
SALES/LABOR	0.628***	(0.00643)	0.434***	(0.0427)
<b>Profitability:</b>				
EARNING	417.7***	(15.72)	-13.74	(41.53)
EARNING/LABOR	-9.849	(7.161)	-40.89**	(18.19)
EARNING/ASSET	0.0172	(0.0112)	0.160	(0.130)

Note: Standard errors are in parentheses. \*\*\* denotes  $p < 0.01$ , \*\* denotes  $p < 0.05$ , and \* denotes  $p < 0.1$ . Firm fixed effects are controlled for in all regressions. The R-square for acquirers ranges from 0.630–0.991, whereas that for targets ranges from 0.582–0.981.

#### 4.4. Summary

The following are the main results obtained in Section 4 from the comparisons among acquirers, targets, and non-participants:

- (i) *M&A participants have better performance measures than non-participants prior to their M&As.*
- (ii) *Acquirers have better performance measures than targets prior to their M&As.*
- (iii) *The comparisons in (i) and (ii) also hold for post-merger performance.*
- (iv) *Acquirers' post-merger performance is better than their pre-merger performance, and targets' post-merger performance is also better than their pre-merger performance.*
- (v) *More frequent acquirers have better performance than less frequent acquirers prior to their M&As.*

### 5. Acquirer and Target in Each M&A Deal

In the previous two sections, we investigated the performance *differentials* between M&A participants and non-participants and those between acquirers and targets. One important finding is that acquirers are generally better than targets. In this section, we ask a different question: what is the performance *correlation* between an acquirer and its own target? That is, what kinds of targets will a

given type of acquirers buy, and vice versa? To answer this question, we examine each pair of acquirer and target from each M&A deal. To obtain all the performance measures, we confine the data to the deals in which both acquirers and targets are public firms.<sup>20</sup>

We first run the following regressions to see how acquirers are different and how they are correlated with their own targets:

$$\ln AX_i = \alpha + \beta_1 \ln TX_i + \beta_2 SAMEIND_i + ACQIND_i + \varepsilon_i$$

where in each regression,  $AX_i$  is the performance measure of the acquirer in M&A deal  $i$ ;  $TX_i$  is the performance measure of the target in the same M&A deal;  $SAMEIND_i$  is a dummy equal to one if the deal is a within-industry one and zero otherwise;  $ACQIND_i$  is the industry dummy for the acquirer; and  $\varepsilon_i$  is the normally distributed error term. The regression results for the various performance measures  $AX$  are reported in left-half of Table 5-1.

Generally,  $\beta_1$  is positive and statistically significant in all performance measures, except EARNING/ASSET for which it is not statistically significant. This result indicates that better performing targets are acquired by firms with better performance. This finding is consistent with that of Rhodes-Kropf and Robinson (2008): the market-to-book ratios of the targets and acquires are similar. That is, firms with high (low) market-to-book ratio tend to acquire firms with high (low) market-to-book ratio. We show that such similarity is seen in many other performance measures. Rhodes-Kropf and Robinson (2008) explain this like-buys-like observation as a result of matching of complementary assets in a search model. We think another possible reason for this pattern is that the assets of better performing targets are more expensive, and only better performing acquirers can afford to pay.

Note that  $\beta_2$  is intended to check the differences across acquirers. The negative sign of  $\beta_2$  (except In-ASSET/LABOR, R&D/LABOR, and EARNING/ASSET) implies that firms that acquire targets from different industries have better performance measures than those that acquire targets from the same industry.

To see the differences among targets across different kinds of M&As, we run the following regressions:

$$\ln TX_i = \alpha + \beta_1 \ln AX_i + \beta_2 SAMEIND_i + TARIND_i + \varepsilon_i$$

where  $TARIND_i$  is the industry dummy for the target; other variables are defined similarly as in the previous model. The regression results are presented in the right-half of Table 5-1. Comparing  $\beta_1$  ( $AX$ ) in the targets' regression to  $\beta_1$  ( $TX$ ) in the acquirers' regression, we observe a perfect match: they have the same sign and significance in all corresponding regressions (except for the significance property of EARNING/LABOR). This is not surprising as better acquirers buying better targets is equivalent to better targets being purchased by better acquirers, which are two sides of the same coin. In any case, the targets' regression results reveal that firms with better performance generally target firms with better performance, although such a link is not present in the earning per unit of asset.

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<sup>20</sup> This restriction significantly reduces the number of observations to a few hundreds. However, the basic conclusions from this section do not change when we use M&A deals with at least one party being a public firm or even both parties being private firms. The drawback of this latter approach is that information on some performance measures is not available from private firms.

**Table 5-1: Performance of Different Acquirers and Different Targets**

Dependent variable	Acquirers' Regression				Targets' Regression			
	TX		SAMEIND		AX		SAMEIND	
<b>Size:</b>								
SALES	0.371***	(0.0488)	-0.240	(0.227)	0.319***	(0.0396)	0.224	(0.216)
ASSET	0.461***	(0.0482)	-0.0437	(0.210)	0.331***	(0.0373)	0.146	(0.198)
LABOR	0.539***	(0.0588)	-0.361**	(0.143)	0.264***	(0.0386)	0.139	(0.124)
In-ASSET	0.364***	(0.0666)	-0.364	(0.271)	0.272***	(0.0366)	-0.215	(0.212)
CAPITAL	0.467***	(0.0562)	-0.113	(0.216)	0.288***	(0.0345)	0.262	(0.176)
R&D	0.588***	(0.0582)	-0.129	(0.207)	0.360***	(0.0384)	-0.0413	(0.180)
<b>Technology:</b>								
ASSET/LABOR	0.417***	(0.0455)	-0.00728	(0.112)	0.407***	(0.0535)	0.144	(0.129)
In-ASSET/LABOR	0.198**	(0.0904)	0.187	(0.291)	0.114***	(0.0427)	0.0254	(0.212)
CAPITAL/LABOR	0.392***	(0.0572)	-0.00101	(0.114)	0.280***	(0.0472)	0.198*	(0.110)
R&D/LABOR	0.517***	(0.0508)	0.0529	(0.0883)	0.481***	(0.0493)	-0.290***	(0.0977)
<b>Productivity:</b>								
SALES/LABOR	0.252***	(0.0467)	-0.133	(0.128)	0.316***	(0.0601)	0.164	(0.151)
<b>Profitability:</b>								
EARNING	0.582***	(0.0523)	-255.7**	(114.2)	0.178***	(0.0243)	37.64	(62.54)
EARNING/LABOR	0.121*	(0.0708)	-5.075	(7.160)	0.0589	(0.0626)	2.932	(7.390)
EARNING/ASSET	-0.0253	(0.0423)	0.0810	(0.0691)	-0.0436	(0.0599)	0.0956	(0.0761)

Note: Standard errors are in parentheses. \*\*\* denotes  $p < 0.01$ , \*\* denotes  $p < 0.05$ , \* denotes  $p < 0.1$ . Both acquirers' and targets' SIC four-digit industry fixed effects are controlled for in all regressions.

In contrast to  $\beta_2$  in the acquirers' regression,  $\beta_2$  in the targets' regression has a positive sign in most performance measures (except intangible asset, R&D, and R&D/LABOR). This indicates that targets that are acquired by the same industries' firms generally have better performance measures than those acquired by the other industries' firms.

The above results and comparisons lead to the following hypothesis on the difference between within-industry M&As and cross-industry M&As: the performance gap between acquires and targets in within-industry M&As is smaller than that in cross-industry M&As. To test this hypothesis, we run the following regression:

$$GAPX_i = \alpha + \beta SAMEIND_i + \varepsilon_i$$

where  $GAPX_i$  is the difference between the acquirer's  $X$  and the target's  $X$  in M&A deal  $i$ . The regression results are reported in Table 5-2. The negative sign of  $\beta$  (except In/ASSET/LABOR and R&D/LARBOR, which are not statistically significant) confirms the hypothesis. The constant term indicates the absolute acquirer-target differences.

**Table 5-2: Difference between Within-industry and Cross-industry M&As**

Dependent variable	Independent variable				Obs	R-squared
	SAME_IND		CONSTANT			
<b>Size:</b>						
SALES	-0.574**	(0.240)	2.094***	(0.160)	528	0.011
ASSET	-0.415*	(0.217)	1.973***	(0.145)	537	0.007
LABOR	-0.492***	(0.146)	1.109***	(0.0973)	405	0.027
InASSET	-0.170	(0.277)	1.140***	(0.186)	350	0.001
CAPITAL	-0.500**	(0.210)	1.876***	(0.139)	506	0.011
R&D	-0.286	(0.203)	1.605***	(0.135)	412	0.005
<b>Technology:</b>						
ASSET/LABOR	-0.285**	(0.120)	0.809***	(0.0799)	405	0.014
InASSET/LABOR	0.260	(0.305)	-0.0971	(0.208)	255	0.003
CAPITAL/LABOR	-0.320***	(0.119)	0.816***	(0.0788)	382	0.019
R&D/LABOR	0.106	(0.0956)	0.272***	(0.0639)	305	0.004
<b>Productivity:</b>						
SALES/LABOR	-0.395***	(0.150)	0.905***	(0.100)	402	0.017
<b>Profitability:</b>						
EARNING	-301.7***	(107.8)	597.3***	(73.87)	400	0.019
EARNING/LABOR	-12.26*	(7.299)	28.12***	(5.083)	297	0.009
EARNING/ASSET	-0.0634	(0.0864)	0.201***	(0.0592)	400	0.001

Note: Standard errors are in parentheses. \*\*\* denotes  $p < 0.01$ , \*\* denotes  $p < 0.05$ , and \* denotes  $p < 0.1$ .

Acquirer industry fixed effects are controlled for in all regressions.

■ **Summary.** The following are the main results obtained in this section from the comparisons between acquirers and targets in individual M&A deals:

(i) *Better performing acquirers (targets) purchase (are purchased by) firms with better performance.*

(ii) *The performance gap between acquirers and targets in cross-industry M&As is larger than that in within-industry M&As.*

## 6. Growth Pattern Comparison

In the previous sections, we identified that M&A participants are different from non-participants prior to the time of and right after their M&A deals based on *static* comparisons. In this section, we will make *dynamic* comparisons on the following issues: (i) Is there any difference between the growth rates of the M&A participants before and after M&As? (ii) Are the growth rates of the M&A participants *before* the M&As systematically different from those of the non-participants? (iii) Are the growth rates of the M&A participants *after* the M&As systematically different from those of the non-participants? We will also compare acquirers and targets in all these aspects.

To answer these questions, we specify a time window to define a firm's M&A participation. As before, we define M&A non-participants as the firms that never became involved in any M&A deal

during the entire sample period of 1991–2007. However, unlike before, M&A participants are the firms that became involved in at least one M&A deal during the window period of 1998–2002 but were not involved in any M&A deal in the other two periods, that is, 1991–1997 and 2003–2007.<sup>21</sup> Note that this classification is different from that used earlier because we need a long pre-merger period and a long post-merger period to calculate the growth.

### 6.1. M&A Participants: Pre-merger versus Post-merger Period

We calculate the growth rates of individual performance measures for the pre-merger period and the post-merger period, respectively. For each participant  $i$ , we first identify the M&A year  $T_i$ , which is the first year when the firm had an M&A deal during 1998–2002. We then calculate the average growth rate of measure  $X$  in the five-year period prior to  $T_i$  as the pre-merger growth rate,  $GX_{i0}$ , and similarly the average growth rate of measure  $X$  in the five-year period after  $T_i$  as the post-merger growth rate,  $GX_{i1}$ . Specifically,

$$GX_{i0} = \frac{1}{5} \sum_{t=T_i-5}^{T_i-1} \frac{X_{i(t+1)} - X_{it}}{X_{it}} \quad \text{and} \quad GX_{i1} = \frac{1}{5} \sum_{t=T_i}^{T_i+4} \frac{X_{i(t+1)} - X_{it}}{X_{it}}$$

Our objective is to determine whether there is any systematic difference between firms' pre-merger growth and post-merger growth. To this end, we run the following regressions:

$$GX_{im} = \alpha + \beta AFTER_m + \gamma X_{im} + T_i + IND_i + \varepsilon_{im}$$

where  $m=0$  is for the pre-merger period,  $m=1$  is for the post-merger period,  $GX_{im}$  is firm  $i$ 's growth rate,  $AFTER_0=0$ ,  $AFTER_1=1$ ,  $X_{i0} = X_{i(T_i-4)}$ , and  $X_{i1} = X_{iT_i}$ . As a variable's average growth rate in a given period may be affected by the absolute values of the variable, we control for this effect by incorporating the initial value of  $X_i$  of the corresponding period. This is how  $X_{im}$  is defined. The time variable  $T_i$  captures the M&A participation year fixed effect, which is a dummy equal to 1998, 1999, 2000, 2001, or 2002. We run these regressions for all acquirers and all targets, respectively.

The results are reported in Table 6-1. For acquirers, firms generally grow faster in the pre-merger period than in the post-merger period. This result indicates that when firms expand very fast, they seek to acquire other firms' assets to capitalize their growth. Consequently, acquisitions slow down their growth pace because their sizes have been enlarged. Note that one profitability measure, namely, EARNING/ASSET is better in the post-merger period than in the pre-merger period.<sup>22</sup> However, this effect is not statistically significant.

The results from the targets group are different. For targets, the differences in growth rates before and after M&As are not statistically significant for most performance measures. Two significant estimates with negative sign are total asset and total employment, indicating that the growth rates are faster in the pre-merger period than in the post-merger period. The only significant estimate with positive sign is asset per labor, meaning that this growth is faster in the post-merger period. All measures in the technology and productivity categories have positive estimates, and all profitability

<sup>21</sup> Note that there is another type of firms that had M&As in either the 1991–1997 period or the 2003–2007 period. However, it is not clear how they should be different from other firms.

<sup>22</sup> In the finance literature, which mainly focuses on stock returns, Healy, Palepu, and Ruback (1992) check the merged firms' operating cash flows and find that cash flows drop from the pre-merger level on average.

measures have negative estimates. Hence, the growth in technology and productivity is faster in the post-merger period than in the pre-merger period. However, the growth pattern is reversed in profitability.<sup>23</sup>

**Table 6-1: Growth Comparisons**

Dependent variable	$\beta$ for Acquirers		$\beta$ for Targets	
<b>Size:</b>				
SALES	-0.302***	(0.0973)	-0.110	(0.493)
ASSET	-1.580	(1.488)	-0.418**	(0.193)
LABOR	-0.477	(0.561)	-0.332*	(0.166)
In-ASSET	-1.638	(1.409)	2.153	(3.155)
CAPITAL	-1.378***	(0.471)	0.388	(0.544)
R&D	-0.391**	(0.155)	0.0128	(0.242)
<b>Technology:</b>				
ASSET/LABOR	-0.0196	(0.297)	0.216*	(0.110)
In-ASSET/LABOR	-1.564	(1.441)	4.674	(3.725)
CAPITAL/LABOR	-0.480	(0.486)	0.456	(0.409)
R&D/LABOR	-0.258	(0.161)	1.007	(0.618)
<b>Productivity:</b>				
SALES/LABOR	-0.240	(0.179)	0.253	(0.296)
<b>Profitability:</b>				
EARNING	-0.770	(0.757)	-1.950	(1.854)
EARNING/LABOR	-0.0609	(0.747)	-1.546	(2.469)
EARNING/ASSET	0.385	(0.876)	-2.050	(1.954)

Note: Standard errors are in parentheses. \*\*\* denotes  $p < 0.01$ , \*\* denotes  $p < 0.05$ , \* denotes  $p < 0.1$ . SIC 4-digit industry fixed effects and year fixed effects are controlled for in all regressions.

## 6.2. M&A Participants versus Non-Participants: Pre-merger Period

We now examine whether M&A participants and non-participants have different growth rates in their pre-merger period than in their post-merger period. To this end, we calculate the average growth rate of each non-participant in the 1993–1997 (five years) for comparison in the pre-merger period and the average rate of each non-participant in the 2003–2007 for comparison in the post-merger period.

Following the formula for the M&A participants, we have  $GX_{i0} = \frac{1}{5} \sum_{t=1992}^{1996} \frac{X_{i(t+1)} - X_{it}}{X_{it}}$  for all

non-participants in the pre-merger period. We then run the following regressions for the pre-merger growth including all firms:

$$GX_i = \alpha + \beta_1 ACQ_i + \beta_2 TAR_i + \gamma X_i + T_i + IND_i + \varepsilon_i,$$

<sup>23</sup> In the literature, Ravenscraft and Scherer (1989) find that in the 1975–1977 period, target firms suffered a loss in profitability following the mergers. Our finding is not about the loss in profitability but the slowdown in the growth rate of profitability. Harris and Robinson (2002) find that productivity of the targets in U.K. decline after the acquisitions.

where  $ACQ_i$  is equal to one if firm  $i$  is an acquirer and zero otherwise, and  $TAR_i$  is equal to one if firm  $i$  is a target and zero otherwise.  $T_i$  is the year dummy as defined earlier but is equal to 1997 for all non-participants in the case of pre-merger period. In the above regressions, the baseline is the non-participants, and thus  $\beta_1$  and  $\beta_2$  measure the difference between acquirers and non-participants and that between targets and non-participants, respectively. We also calculate the non-participants' growth rate in the post-merger period as  $GX_{it} = \frac{1}{5} \sum_{t=2002}^{2006} \frac{X_{i(t+1)} - X_{it}}{X_{it}}$  and run the same regressions for all firms with the post-merger period growth.  $T_i = 2003$  for non-participants in this case.

The regression results are reported in Table 6-2. For the pre-merger period, as only one estimate (ASSET/LABOR of the acquirers) is statistically significant, M&A participants do not have significantly different growth rates compared with the non-participants in the pre-merger period. Even if we analyze the statistically insignificant estimates, the patterns are not so clear on how acquirers, targets, and non-participants are different in the growth of their pre-merger period. However, some interesting differences can be found when focusing on some categories of performance. For example, in the size category, among the six measures, only one is negative for the acquirers (IN-ASSET) and only one is positive for the targets (CAPITAL). This indicates that future acquirers generally have higher growth than non-participants in their size, and future targets generally have lower growth than non-participants in their size before the M&A deals. Both acquirers and targets have higher growth in productivity but lower growth in profitability than non-participants before their M&As.

**Table 6-2: Growth Differentials**

Dependent variable	Pre-Merger				Post-Merger			
	ACQ		TAR		ACQ		TAR	
<b>Size:</b>								
SALES	0.358	(0.625)	-0.0443	(1.010)	0.711	(0.832)	0.729	(1.238)
ASSET	0.128	(0.0815)	-0.0462	(0.130)	-1.020	(3.562)	0.373	(5.293)
LABOR	0.0966	(0.213)	-0.109	(0.341)	-0.356	(0.411)	0.628	(0.618)
InASSET	-0.104	(0.622)	-1.304	(0.931)	2.642	(5.637)	3.407	(9.176)
CAPITAL	0.208	(0.374)	0.175	(0.604)	1.527	(3.117)	1.678	(4.665)
R&D	0.0718	(0.128)	-0.144	(0.210)	0.447	(1.587)	0.204	(2.316)
<b>Technology:</b>								
ASSET/LABOR	-0.201**	(0.100)	-0.147	(0.160)	-0.102	(2.575)	0.126	(3.868)
InASSET/LABOR	0.0602	(1.550)	-1.943	(2.314)	-1.518	(11.35)	0.392	(18.60)
CAPITAL/LABOR	0.0989	(0.391)	0.366	(0.625)	1.199	(1.432)	1.199	(2.138)
R&D/LABOR	0.332	(0.202)	0.187	(0.328)	0.339	(1.968)	0.494	(2.873)
<b>Productivity:</b>								
SALES/LABOR	0.354	(0.309)	0.374	(0.497)	0.127	(0.387)	0.321	(0.583)
<b>Profitability:</b>								
EARNING	-0.00340	(1.003)	-1.073	(1.611)	2.714*	(1.610)	0.261	(2.462)
EARNING/LABOR	-0.355	(1.267)	-1.343	(2.026)	3.311	(2.012)	0.913	(3.093)
EARNING/ASSET	-0.642	(1.197)	0.580	(1.922)	2.233	(6.056)	0.375	(9.181)

Note: Standard errors are in parentheses. \*\*\* denotes  $p < 0.01$ , \*\* denotes  $p < 0.05$ , \* denotes  $p < 0.1$ . Initial X, SIC 4-digit industry fixed effects and year fixed effects are controlled for in all regressions.

For the post-merger period, there is only one estimate (EARNING of the acquirers) that is statistically significant. Again, this implies that the differences between M&A participants and non-participants with regard to their growth in the post-merger period are not statistically significant.

### 6.3. Summary

The following are the main results obtained in Section 6 from the comparisons among acquirers, targets, and non-participants:

(i) *Acquirers generally have higher growth in the pre-merger period than in the post-merger period.*

(ii) *Targets' growth in the pre-merger period and that in the post-merger period do not differ significantly.*

(iii) *M&A participants' growth is not statistically different from the non-participants in both the pre-merger and post-merger periods.*

## 7. Prediction of Acquirers and Targets

In the previous sections, we compared the three groups (i.e., acquirers, targets, and on-participants) of firms based on individual performance measures. We now ask: what is the set of performance measures that matter jointly for a firm to become an acquirer, target, or non-participant? Alternatively, given a firm's performance profile, we can ask how likely the firm will become an acquirer, a target or non-participant. The Multinomial Logit (MNL) model is an appropriate method to answer these questions (see Wooldridge, 2002). We denote a firm's choice by  $y=j$  with  $j=0$  indicating the firm's choice of being a non-participant,  $j=1$  as a target, and  $j=2$  as an acquirer. Let vector  $x$  denote the firm's performance profile (there are 14 elements in the profile). The MNL model has the following response probability:

$$\Pr(y = 0 | x) = 1/[1 + \exp(x\beta_1) + \exp(x\beta_2)],$$

and

$$\Pr(y = j | x) = \exp(x\beta_j)/[1 + \exp(x\beta_1) + \exp(x\beta_2)], \quad j = 1, 2,$$

where  $\beta_1$  and  $\beta_2$  are two coefficient vectors for targets and acquirers, respectively. The base choice is non-participant. Thus, we have the following property:

$$\ln \frac{\Pr(y = j | x)}{\Pr(y = 0 | x)} = x\beta_j, \quad j = 1, 2.$$

That is, the log-odds ratio of choice  $j$  and the base choice (non-participant) are linear in  $x$ .

**Table 7. Multinomial Logit Estimates**

VARIABLES	Acquirers		Targets	
SALES	0.595***	(0.0421)	0.253***	(0.0884)
LABOR	1.254***	(0.108)	1.665***	(0.235)
IN-ASSET	-0.474***	(0.0242)	-0.408***	(0.0536)
CAPITAL	0.180***	(0.0498)	-0.288**	(0.134)
R&D	-0.218***	(0.0401)	-0.151	(0.0972)
ASSET/LABOR	-0.345***	(0.0512)	-0.0423	(0.112)
EARNING	-0.000173**	(8.74e-05)	-4.05e-05	(0.000119)
EARNING/LABOR	0.000254**	(0.000108)	0.000367	(0.000239)
EARNING/ASSET	0.0192	(0.0168)	0.0119	(0.0382)
Observations	15539		15539	

Note: Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Non-participants as the base outcome; control for year and 4-digit SIC industry fixed effects.

We run the MNL regression to investigate the firms' choices among the three alternatives. Specifically, taking the non-participant alternative as the base choice, we estimate two coefficient vectors,  $\beta_1$  and  $\beta_2$ . In the explanatory variables  $x$ , we include the year dummy and all four sets of performance measures one year before the deals. However, due to multicollinearity, five performance variables [i.e., ASSET (correlated with SALES), IN-ASSET/LABOR (correlated with IN-ASSET), R&D/LABOR (correlated with R&D), CAPITAL/LABOR (correlated with CAPITAL), and SALES/LABOR (correlated with SALES)] are dropped automatically by the program. The MNL results are reported in Table 7. Column (1) is the estimates of  $\beta_1$ , and column (2) is the estimates of  $\beta_2$ .

If we only focus on the variables with statistically significant effects, then based on Table 7, we know that if a firm has relatively high values in sales and labor but relatively low values in intangible asset, then it is more likely to participate in M&As next year. In comparing the chance of becoming an acquirer and that of becoming a target, if a firm has relatively high values in capital and earning/labor ratio but relatively low values in R&D, asset/labor ratio and earning, but relatively low values in R&D and earning, it is more likely to be an acquirer. Hence, our analysis shows that by examining and comparing firms' performance measures ( $x$ ), we can have an idea about the likelihood of a firm being a non-participant, target, or acquirer in the future.

## 8. Successful versus Unsuccessful M&As

Although the analysis in the preceding section (Table 7) helps identify who are more likely to be targets or acquirers in the future, it does not tell us what types of firms will be more likely to succeed in their M&A activities. In this section, we will attempt to provide an answer to this question.

We first classify all realized M&As into two categories: successful and unsuccessful. We then examine in retrospect the performance differences between those firms engaged in successful M&As and those in unsuccessful ones. A challenging question is how to define successful and unsuccessful

M&As. We try two different approaches and reach similar conclusions. Below are the results based on the first approach.

We first run a “normal” performance regression. The independent variable is the annual growth rate of each firm’s *earnings*, whereas the right-hand-side variables are the year dummy and industry dummy in addition to a constant term. Data on growth rates include those of the non-participants in all years from 1991–2007 and those of the participant in all years before their respective M&As. This regression allows us to estimate the coefficients of the year and industry dummies from which we obtain a “normal” firm's earnings growth rate in each year and each industry.

We then calculate each participant's performance gap in earnings for every year after its M&A. The gap is the difference between the firm's actual earnings growth rate and the corresponding "normal" growth rate, depending on the year and the industry. For any firm, the gap can be positive for some years but zero or negative for some other years. In our first approach, we call an acquirer (or target) a successful acquirer (or target) if the number of its positive gaps is greater than that of the non-positive gaps, and an unsuccessful acquirer (or target) otherwise. According to this definition, for the 10048 acquirers in our data, 5615 of them are successful, and the rest (4433) is unsuccessful; for the 667 targets, 308 of them are successful, and the rest (359) is unsuccessful.

Subsequently, we run regressions based on each performance measure as in Section 4. We run one regression for all acquirers and one for all targets for each performance measure. Aside from the industry dummy on the right-hand side, we also have the group dummy, SUCCESS, which takes the value one if the firm is a successful acquirer (or target) and zero if the firm is an unsuccessful acquirer (or target). The regression results are reported in Table 8.

The regression results clearly show that the successful acquirers' performances prior to their mergers are significantly better than those of the unsuccessful acquirers, except in earning/labor ratio, which is statistically insignificant. However, the performances of the successful targets are much less overwhelming. The successful targets are significantly better than the unsuccessful ones only in sales, asset, and asset/labor ratio. Although most of the other performance differences are also positive, they are not statistically significant.

In our second approach, we define an acquirer (or target) as successful acquirer (or target) if the sum of its performance gaps in all post-merger years is positive, and an unsuccessful one otherwise. Different from the first approach, which focuses on the number of years in which a firm outperforms its industry average, this approach considers the magnitudes of the gaps. A firm is still considered successful if its earnings growth rates are much higher than the “normal” rates in some years even though they are slightly below the “normal” rates in more years. We redefine our group dummy SUCCESS and rerun the regressions. The results are very similar to those in Table 8.

Kaplan and Weisbach (1992) have also examined successful and unsuccessful acquisitions, but from a different perspective. First, they focus on acquisitions that later lead to divestitures, i.e., the divesting acquisitions. Second, they define whether an acquisition is successful or not based on accounting data on the gains or loss on sale from the divestiture, the divestiture sales price, or

information in the business press describing the divestiture. Third, their result is about how the acquirer's returns and total returns at the acquisition announcement are different for successful and unsuccessful acquisitions. Due to these differences, the explanations of Kaplan and Weisbach (1992) can hardly apply to our results.

**Table 8. Successful Acquirers and Successful Targets**

Dependent variables	Acquirers		Targets	
	SUCCEESS		SUCCEESS	
<b>Size:</b>				
SALES	0.838***	(0.0441)	0.330*	(0.200)
ASSET	0.875***	(0.0432)	0.443**	(0.189)
LABOR	0.358***	(0.0281)	0.134	(0.0966)
IN-ASSET	0.436***	(0.0457)	0.0990	(0.171)
CAPITAL	0.700***	(0.0380)	0.187	(0.147)
R&D	0.576***	(0.0421)	0.144	(0.157)
<b>Technology:</b>				
ASSET/LABOR	0.405***	(0.0249)	0.283**	(0.136)
IN-ASSET/LABOR	0.0784*	(0.0426)	-0.0110	(0.132)
CAPITAL/LABOR	0.259***	(0.0200)	0.101	(0.0837)
R&D/LABOR	0.175***	(0.0224)	0.0659	(0.0971)
<b>Productivity:</b>				
SALES/LABOR	0.402***	(0.0257)	0.234	(0.148)
<b>Profitability:</b>				
EARNING	41.67**	(16.38)	60.43	(80.27)
EARNING/LABOR	-2.262	(24.76)	8.013	(6.730)
EARNING/ASSET	0.130***	(0.0425)	0.130	(0.289)

Note: Standard errors are in parentheses. \*\*\* denotes  $p < 0.01$ , \*\* denotes  $p < 0.05$ , \* denotes  $p < 0.1$ . SIC four-digit industry fixed effects are controlled for in all regressions.

## 9. Concluding Remarks

In this paper, we contribute to the empirical literature on M&As by investigating individual firms' performance before and after their M&A activities and comparing them with non-participants. We observe some pecking orders. In particular, we show that compared with target firms, acquiring firms are larger in size, have better technology, have higher productivity, and have higher profitability. Similar results apply to the comparisons between targets and non-participants, and the comparisons between acquirers and targets.

We also find that better acquirers tend to purchase better targets. Acquirers in cross-industry M&As generally have better performance measures than those in within-industry M&As. In contrast, targets of within-industry M&As generally have better performance measures than those of cross-industry M&As. The gaps of performance measures between acquirers and targets are smaller in within-industry M&As than in cross-industry M&As. Successful acquirers have better performance than unsuccessful acquirers

before their M&As. In addition, we identify some dynamic patterns of firm characteristics and performance in the pre-merger period and in the post-merger period. These patterns are useful for understanding the impacts of M&As.

Our study offers some regularities on the performance differences among acquirers, targets, and non-participants. These regularities serve to motivate further theoretical research to understand firms' motivation to engage in M&As and the impacts of M&As.

As we include a very large set of performance measures (14 in total), not all of them have the same sign and are all statistically significant. Thus, we only make our conclusions based on the comparisons of the overwhelming majority of the measures, not all the measures. However, this compromise is superior to limiting the performance measures to only a few in number. Identifying the patterns based on a large number of performance measures is one of the most important distinguishing features of our study.

Data limitation prevents us from extending our analysis to more issues and making our claims more general. For example, the analysis is based on publicly listed firms only. This significantly reduces the number of observations. It also prevents us from extending our findings to all firms because private firms may have a different growth pattern. We conjecture that firms in mergers can be very different from those in acquisitions. Again, we are not able to separate them in this study to examine their differences. These issues will be tackled in our future research.

## References

- Andrade, G., M. Mitchell and E. Stafford, 2001. "New evidence and perspectives on mergers", *Journal of Economic Perspectives*, 15, 103-120.
- Andrade, G., E. Stafford, 2004. "Investigating the economic role of mergers", *Journal of Corporate Finance*, 10, 1-36.
- Betton, Sandra, B. Espen Eckbo and Karin Thorburn, 2008, "Corporate takeovers", Chapter 15, In B. Espen Eckbo (eds.), *Handbook of Empirical Corporate Finance*, Vol. 2, 289-427.
- Bradley, M., and Sundaram, A. 2006. "Do acquisitions drive performance or does performance drive acquisitions?" Working paper, Duke University, US
- Breinlich, H., 2008, "Trade liberalization and industrial restructuring through mergers and acquisitions", *Journal of International Economics*, 76, 254-266.
- Bruner, R., 2002. "Does M&A pay? A survey of evidence for the decision-maker". *Journal of Applied Finance*, 12, 48-68.
- Harris, Richard and Catherine Robinson, 2002, "The effect of foreign acquisitions on total factor productivity: Plant-level evidence from U.K. manufacturing, 1987-1992", *Review of Economics and Statistics*, 84(2), 562-568.
- Healy, P. M., K. G. Palepu, and R. S. Ruback, 1992, "Does corporate performance improve after mergers?" *Journal of Financial Economics*, 31, 135-175.
- Jarrell, G., Brickley, J., Netter, J., 1988, "The market for corporate control: empirical evidence since 1980", *Journal of Economic Perspectives*, 2, 49-68.

- Kaplan, Steven and Michael Weisbach, 1992, "The success of acquisitions: Evidence from divestitures", *Journal of Finance*, 47, 107-138.
- Maksimovic, V., Phillips, G., 2001. "The market for corporate assets: who engages in mergers and asset sales and are there efficiency gains?" *Journal of Finance* 56, 2019–2065.
- McGuckin, R., and S. Nguyen, 1995, "On productivity and plant ownership change: New evidence from the Longitudinal Research Database", *Rand Journal of Economics* 26, 257–276.
- Mitchell, M. and J. Mulherin, 1996, "The impact of industry shocks on takeover and restructuring activity", *Journal of Financial Economics*, 41, 193-299.
- Qiu, Larry D. and W. Zhou, 2007, "Merger waves: A Model of Endogenous Mergers," *Rand Journal of Economics*, 38, 214-226.
- Ravenscraft, D. J. and F. M. Scherer, 1989, "The profitability of mergers", *Journal of Industrial Economics*. 7, 101-116.
- Rhodes-Kropf, M. and D. Robinson, 2008, "The market for mergers and the boundaries of the firm", *Journal of Finance*, 63, 1169-1211.
- Rhodes-Kropf, M., S. Viswanathan, 2004, "Market valuation and merger waves", *Journal of Finance*, 59, 2685-2718.
- Schoar, A. S., 2002, "Effects of corporate diversification on productivity", *Journal of Finance* 57, 2379–2403.
- Shleifer, A., and R. Vishny, 2003, "Stock market driven acquisitions", *Journal of Financial Economics*, 70, 295–311.
- Wooldridge, J. M., 2002, *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: MIT Press.