Proceedings of the 2nd International Conference on Financial Technology and Business Analysis
DOI: 10.54254/2754-1169/60/20231223

How Does a Company Being Acquired Affect Rivals' Innovation in Technology Industry?

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Abstract: Previous research on mergers and acquisitions has predominantly focused on the companies involved in the acquisition process. This paper aims to extend the scope of study by including the response of rivals, specifically those of the companies being acquired. This paper studies how the rivals of companies being acquired change their innovation in technology industy. This study compares R&D expenses of rival firms before and after the acquisitions to analyze these changes. However, our analysis does not reveal a strong correlation between a company's level of innovation and the occurrence of its rivals being acquired. Other factors such as company size, industry competitiveness, and leverage held by the company appear to influence a company's innovation.To gain a more comprehensive understanding of the impact of rivals being acquired on a company's innovation, further research is required. Future studies should explore additional variables and factors that may mediate or moderate the relationship between M&A activities and innovation outcomes.In conclusion, while our study does not provide clear evidence of the effect of rivals being acquired on a company's innovation, it emphasizes the crucial role of considering multiple dimensions when examining the relationship between M&A and innovation. This study contributes to the ongoing discussion on understanding the complex dynamics of M&A and their influence on firms' innovation strategies.

Keywords: merger and acquisition, competition, innovation

1. Introduction

How rivals react to an M&A is a generally discussed topic in finance. The acquisition of a company can affect its competitors' innovation strategy. Companies may increase their level of innovation in response to their rivals being acquired, or they may reduce their innovation expenses to save budgets and focus on management to avoid undervaluation and acquisition. This research seeks to examine whether firms increase or decrease their innovation expenses when their competitors are acquired in the technology industry. The study will use R&D expenses as the primary source of firms' innovation, consistent with the measurement of innovation used by Audretch, Coad, Segarra [1]. This article focuses on the technology industry, which heavily relies on innovation. In the technology sector, innovation is crucial for companies to maintain competitiveness and market share. Furthermore, M&A activities have a significant impact on the technology market. On one hand, companies may acquire excessive market share through M&A, resulting in unfair advantages and the formation of an unhealthy competitive environment. On the other hand, innovation in the technology industry directly

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benefits consumers and society as a whole. Technology plays a vital role in societal development. Therefore, it is important to recognize the significance of innovation in the technology sector and its broader implications for the well-being of both consumers and society.

It is crucial to study the effect of rivals being acquired on a company's innovation decisions from many perspectives. First, the anti-trust regulator can better analyze the M&A deal and make better decisions about whether they should reject the deal by considering the impact on other companies in the industry and consumers. Furthermore, rivals can take better action in response to the M&A activity in the industry. On the one hand, rivals being acquired could increase a company's innovation because the company wants to increase its value through innovation and seek to be acquired by other companies. On the other hand, it can decrease a company's innovation intensity when the company does not want to be acquired, and they will change the leverage level to spend more money on the management of the company to reduce agency costs and achieve their value. In this case, a company may spend more money on current operations than on investing in the future by innovation. This paper aims to investigate whether a company being acquired can positively or negatively affect its rivals' innovation.

2. Literature Review

There are several studies that focus on the effect of M&A on rival innovation. Phillips and Zhdanov found that small companies tend to increase their innovation investments in order to attract acquisition by larger firms, while large companies may gain innovation through acquiring smaller firms [2]. Uhlenbruch, Hughes-Morgan, Hitt, Ferrier, and Brymer examined the impact of companies' M&A activities on their rivals' innovation strategies [3]. Their study primarily explores how the acquisition of companies affects the innovation decisions of their rivals. Servaes and Tamayo investigated how firms respond when their competitors are taken over, specifically looking at adjustments in leverage and cash flow [4]. Valentini studied the effects of M&A on the quantity and quality of patents filed by the companies involved in the transactions, without focusing on the impact on rivals [5].

Therefore, this study specifically focuses on how competitors change their innovation strategies in response to mergers and acquisitions. Additionally, this study utilizes data from the period spanning 2003 to 2023, which sets it apart from previous studies. Moreover, this study specifically examines the effect of M&A within the technology industry.

3. Data

The data on companies' innovation was constructed in the following manner. This study collected 25 large mergers and acquisitions that occurred between 2003 and 2023. For a merger or acquisition to be considered large, the transaction value had to exceed $5 billion, and the companies involved had to have a market capitalization of over $50 billion. Next, based on factors such as product similarity, industry, and company sizes, I identified 44 competitors of the acquired companies among these 25 mergers and acquisitions. To measure the innovation of these competitor companies, the Compustat North America Fundamentals Annual dataset was utilized to gather their R&D expenses. Considering the varying timing of when these competitors were acquired, their R&D expenses were collected for four years prior to the acquisition and four years after the acquisition. The rate of exchange of R&D expenses for each year was calculated by comparing the expenses from four years prior to the M&A to four years after the M&A. Additionally, the acquisition dates were collected to exclude any potential influence of the economic environment on the data.

Table 1 presents the descriptive statistics for each variable. In the first row, the variable "RDexpenses" represents R&D expenses. The mean value of R&D expenses is 1032, indicating that the average R&D expenses for the selected 44 companies amount to 1032 million dollars. The

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minimum R&D expense is 11 million dollars, while the maximum is 8623 million dollars. This demonstrates a wide range of R&D expenses across different companies. The standard deviation of 1388 million dollars also highlights significant variation in R&D expenses. On the second row, "logRD" represents the natural logarithm of RDexpenses. It is utilized to normalize the data and mitigate the impact of large standard deviations in regression analysis. On the third row, "RateofchangeRD" signifies the rate of change of R&D expenses. Similarly, it is used to normalize the data and reduce the influence of large standard deviations. The mean value for logRD is 6.11, suggesting an average natural logarithm value of R&D expenses at 6.11. The standard deviation is 1.43, with a minimum of 2.45 and a maximum of 9.06. In comparison to RDexpenses, logRD exhibits a smaller standard deviation and a more normally distributed pattern. On the third row, "RateofchangeRD" represents the rate of change of R&D expenses. Utilizing this rate of change helps eliminate the impact of company size and budget on a company's innovation. The mean value for RateofchangeRD is 0.147, indicating that the selected companies increase their average R&D expenses by 14.7% annually. "Postacquisition" is a dummy variable. If the R&D expenses occur before acquisition, the value of Postacquisition is 0. Conversely, if it occurs after acquisition, the value of Postacquisition is 1. "Timetoacquisition" represents the difference in years between the year of R&D expenses and when the rivals were acquired. Since the data is collected from four years prior to acquisition to four years after, the mean value for Timetoacquisition is 0.

Table 1: The descriptive statistics for each variable.

Variable	Obs	Mean	Std. dev.	Min	Max
RDexpenses	396	1032.164	1388.621	11.633	8623
logRD	396	6.110149	1.428373	2.453846	9.062188
RateofchangeRD	352	0.1467905	0.2316309	-0.4471229	1.10097
Postacquisition	396	0.4444444	0.4975326	0	1
Timetoacquisition	396	0	2.585255	-4	4

4. Results

4.1. Specification 1

In the first specification, the dependent variable is logRD, representing the natural logarithm of research and development (R&D) expenses. The purpose of using the natural log is to normalize the data and achieve a more natural distribution. The independent variable is post-acquisition. The regression analysis reveals a coefficient of 0.519, which is statistically significant. This suggests that following the acquisition of a rival company, a company increases its R&D expenses by 51.9%.

4.2. Specification 2

In the second specification, both post-acquisition and time to acquisition are included as independent variables. Time to acquisition is the difference in year of R&D expense and year of rivals being acquired. Companies may react differently to their rival companies in different stages of being acquired. The coefficient for Time to acquisition is 0.114, which is statistically significant. It indicates that from four years prior to the rival company being acquired to 4 years after, companies increase RD expenses by 11.4% each year. The coefficient of post-acquisition is 0.007, but it is statistically

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insignificant. This suggests that there is a trend of increasing RD expenses each year, and rivals being acquired have little influence on a company's innovation.

4.3. Specification 3

In the third specification, post-acquisition is included as an independent variable, along with year fixed effects to control for macroeconomic and global factors that may impact companies' R&D expenses. The coefficient for post-acquisition is 0.204, but it is not statistically significant. This implies that after the acquisition of rivals, companies tend to increase their R&D expenses by 20%, although this result lacks significance. Hence, it can be concluded that the acquisition of rivals has no significant influence on companies' innovation.

4.4. Specification 4

In the fourth specification, the dependent variable is changed to the rate of change of RD expenses. R&D expenses of a company can be affected by its size and budget. Company with more market value and more budget generally has higher R&D expenses. To exclude the effect of difference in company size, this study uses Rate of change of RD as our dependent variable. Using the Rate of change of RD can normalize the data and make the regression results more accurate. On the first specification, I include post-acquisition as my independent variable. The coefficient of post-variable is -0.208. It suggests that after rivals are acquired. The company decreased RD expenses by 28.2%, but this result is insignificant.

4.5. Specification 5

In the fifth signification, both post-acquisition and Time to acquisition are included as independent variables. The coefficient for post-acquisition is 0.106, and the coefficient for Time to acquisition is -0.034. Both results are significant. It indicates that from 4 years prior to a rival's being acquired and 4 years after the rival's being acquired, companies decrease their RD expenses by 0.2% each year. However, companies increased their RD expenses by 10.6% after their rivals were acquired.

4.6. Specification 6

In the last specification, post-acquisition is included as the only independent variable, while controlling for year fixed effects. The coefficient of post-acquisition is -0.119, and it is statistically significant. It indicates that after rivals are acquired, companies decrease their RD expenses by 11.9%.

Table 2: The descriptive statistics for each variable.

Variable	Log RD			Rate of change of RD		
	(1)	(2)	(3)	(4)	(5)	(6)
Post-acquisition	0.519** (0.000)	0.007 (0.981)	0.204 (0.424)	-0.282 (0.255)	0.106* (0.034)	-0.119** (0.004)
Time to acquisition		0.114* (0.038)			-0.034** (0.002)	
_cons	5.880** 0.000	6.107** 0.000	3.135* (0.026)	0.161** (0.000)	0.110** (0.000)	0.609** (0.008)
Year FE	No	No	Yes	No	No	Yes

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Table 2: (continued).

R-squared	0.0326	0.0432	0.0767	0.0037	0.0301	0.0892
Adjusted R-squared	0.0302	0.0328	0.0301	0.0009	0.0249	0.0400

In the figure1, the diagram illustrates the relationship between the average rate of change and the time to acquisition. The figure indicates that rate of change has a general trend of decreasing every year. However, from one year prior to rivals being acquired to one year after rivals being acquired, company increases their R&D expenses. When Time to acquisition equals to zero, which is the year that the rival is acquired, company increase their R&D expenses by about 12.5%, which is close to the constant in specification 5.

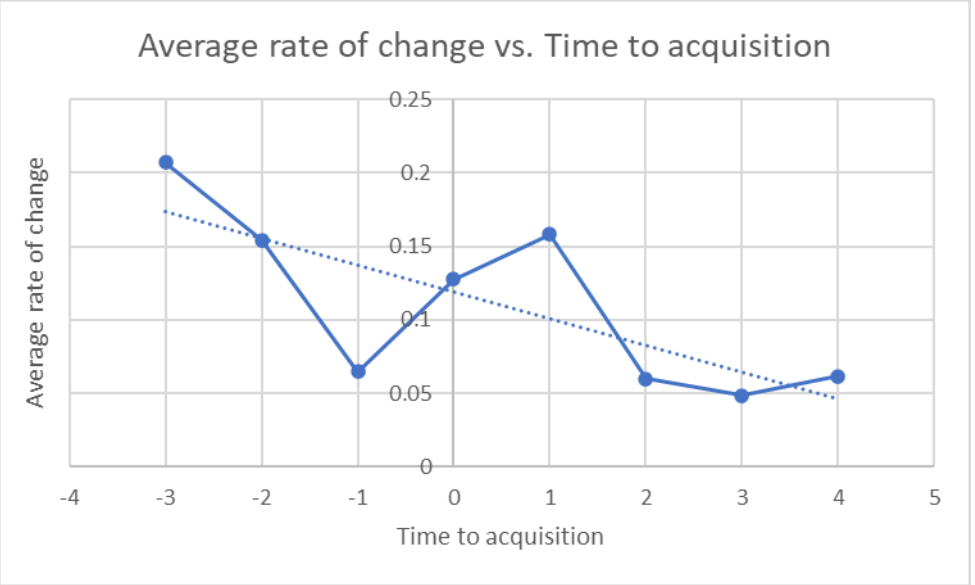

Figure 1: The average rate of change respect to time to acquisition.

5. Conclusion

The objective of this paper is to investigate the impact of rivals being acquired on a company's innovation. The effect of rivals being acquired on companies' innovation is unclear. In the model, rivals being acquired can affect a company's RD expenses by 51.9%, and it is statistically significant. However, when Time to acquisition and date are added as independent variables, the coefficient for post-acquisition becomes statistically insignificant. It suggests that rivals being acquired do not affect logRD. When post-acquisition is included as an independent variable, and the Rate of change of RD is the dependent variable, the effect of rivals being acquired is insignificant. After Time to acquisition is included as an independent variable, the effect of post-acquisition on the Rate of change of RD becomes significantly significant with positive coefficient. When Time to acquisition is replaced by date in the analysis, it leads to a negative coefficient for the Rate of change of RD. This suggests that companies decrease their RD expenses after rivals are acquired. However, these results are inconsistent with previous findings, indicating no clear relationship between rivals being acquired and companies' innovation. The data shows that from 2011-2016, the influence on innovation is more statistically significant; it shows that companies' innovation is related to Time. The unclear relationship between rivals being acquired and companies' innovation is likely due to companies' incentives under different scenarios. Companies react differently to different kinds of acquisition. The acquirer may adopt different kinds of acquisition strategies depending on the rivals' capital

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structure, which can affect the companies being investigated in this study differently. Acquirers tend to acquire the inferior company in existing geography and superior companies in new geography. When rivals are acquired, company react differently depends on what geography they are mainly on [6]. Acquirers may acquire a company to discontinue its innovation, and this type of acquisition is called “killer acquisitions” [7]. In this case, if the company also wants to be acquired, it may increase its innovation to attract other more prominent companies to acquire them. However, if they do not want to be acquired, they may decrease their absolute leverage deviation, adjusting their leverage ratio to optimal level [8]. In this case, they will decrease their spending on innovation. When the company's rivals are acquired, there is less competitiveness in the industry. Companies do not need to spend money on competing market share. They can have more free money to spend on research and development. Therefore, the relationship between innovation and rivals being acquired remains to be seen based on different scenarios and incentives of the companies.

The relationship between rivals being acquired and companies' innovation is likely to be affected by other factors beyond the scope of analysis. For example, the competitiveness in the industry, how close the companies are related to rivals, company size, acquirer size, and aggressiveness of the acquisition. Further research is needed to understand better the relationship between rivals being acquired and companies' innovation.

There are several limitations of this research. The sample companies collected needed to be more significant. The results will be more accurate if there are more companies taken into account. Besides, the definition of rivals needs to be clarified. Every company that produces a similar product of similar size in a similar industry is considered a rivals. A company can have several rivals being acquired at different Times. The number of rivals being acquired needs to be taken into account. It causes inaccuracy in the regression. The different type of acquisition needs to be considered. Different aggressiveness, size, and acquisition duration can cause different reactions of the rival firm.

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