

# The Technological Innovation Performance of Chinese Firms After Cross-border M&A

## From Cross-Border M&A Frequency and TMT International Experiences Perspective

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### ABSTRACT

Cross-border mergers and acquisitions (M&A) have always been used as an important means to enter the host country market or to obtain strategic resources. In recent years, Chinese firms are increasingly introducing capital into foreign countries through cross-border M&A. This article examines the relationship between the technological innovation performance of Chinese firms after cross-border M&A and the frequency of cross-border M&A. It also discusses whether international experiences for management who are engaged in cross-border M&A have positive impacts on the technological innovation performance. 81 listed companies in the Shenzhen and Shanghai stock markets were selected as the sample. Besides, related data from 2005 to 2014 were chosen. The technological innovation performance is measured by the number of patent applicants one year after cross-border M&A. The cross-border M&As frequency is measured by accumulative cross-border M&As number. Management international experiences are measured by international work experiences percentage and international education experiences percentage in top management team (TMT). The model adopts negative binominal regression analysis and fixed effects for control variables. The research results show that cross-border M&A frequency can significantly improve Chinese firms' technological innovation performance. Moreover, more international work experiences are beneficial to the technological innovation performance after cross-border M&A while international education experiences have negative effects on technological innovation performance after cross-border M&A. In conclusion, Chinese companies can catch up with technology through cross-border M&A. This research both contributes to the study of management communication, and guides the decision making of the management team during the cross-border process.

**Keywords:** *Cross-border M&A, Technological innovation performance, International work experiences, International education experiences. Chinese companies*

### 1. INTRODUCTION

Cross-border mergers and acquisitions are one foreign investment of acquiring the host country assets. With the economic development and globalization of emerging markets, cross-border mergers and acquisitions become one common internalization strategy to enter foreign markets. Also, the increase of technology demands motivate more companies in emerging markets to choose cross-border mergers and acquisitions as the strategy of acquiring new technology. As one of the emerging markets, more and more Chinese firms participate in cross-border M&As.

Rui and Yip consider that firms in emerging markets like China tend to focus on acquiring strategic resources, especially advanced technologies [1]. Other research shows that cross-border M&As could not create value for companies. Instead, Stiebale provides empirical evidence that cross-border M&As could improve technological innovation performance [2]. However, there is no consistent conclusion. Moreover, previous research mostly uses firms

in developed countries as research sample rather than firms in emerging markets. Therefore, whether cross-border M&As improve the innovation performance for firms in emerging markets still needs more works. Besides, the research on the effect of the management team on performance after cross-border M&As is scarce. However, Hambrick and Mason consider that the management team plays an important role in company decisions making, which influences M&A behaviors [3]. Based on this research, whether international experiences will broaden management's international vision and better understand the international markets to improve the technological innovation performance after cross-border M&As?

To solve the above questions, the research collects the data of 81 Chinese listed companies from 2005 to 2015, including basic financial reporting data, cross-border M&As number, the number of patent applicants one year after cross-border M&As, and management team foreign experience data. The analysis model adopts negative binominal regression and fixed effects for control variables. Based on the above methods, the

article examines the relationship between the technological innovation performance of Chinese firms after cross-border M&A and the frequency of cross-border M&A. It also discusses whether more international experiences for TMT who are engaged in cross-border M&A have positive impacts on the technological innovation performance.

## 2. LITERATURE REVIEW AND HYPOTHESIS

Regarding the literature of cross-border M&As, Wang and Wong analyzed the impact of cross-border M&As on the home country economy or the regional economy from the macro perspective [4]. From a micro perspective, Barney J considers that cross-border M&As enable companies to gain access to the resources of the target enterprise, including technology, human resources, government resources, etc. and then break into the new market to improve efficiency and competition [5].

Many scholars discuss the enterprise performance after mergers and acquisitions and its influence. Li and Usher discuss the time point of merger and acquisition [6] and Capron and Shen discuss the target selection, which both are mainly focused on financial performance [7]. No agreements reach based on the relationship between innovation and cross-border M&As. Stiebale and Reize find that cross-border M&As will decrease the R&D cost based on Germany firms' empirical results [8] while Horn and Persson consider that cross-border M&As will increase the market share and then improve the innovation performance through economic scale [9]. Stiebale provides empirical evidence to verify the relationship between cross-border M&As and innovation performance. The result shows that the number of patent applicants increases by 20% after cross-border M&As [2]. Consequently, previous studies are mostly focused on financial performance after M&As but no consistent conclusions for innovation performance. Additionally, most research samples are companies in developed countries. Therefore, the first research question is that, whether firms in an emerging market like China can improve technological innovation performance by adding cross-border M&As frequency?

*H1: Chinese firms can improve technological innovation performance by increasing cross-border M&As frequency.*

The enterprise strategies are usually made by TMT, including M&As behaviors. Nadolska and Barkema explored the influence of the TMT on M&A success from an organizational behavior perspective and find that TMT M&A experiences and educational background both have impacts on the M&A performance [10]. Filatotchev provides empirical evidence that the management team with international work experience or education will improve innovation performance by using Chinese hi-tech companies' data [11]. However, research related to the effect of management international experience on technological innovation performance after cross-border M&As is rare. Therefore, the second research question is that, whether TMT international experiences will contribute to the

technological innovation performance after cross-border M&As?

*H2a: For Chinese firms, TMT international work experiences will contribute to the technological innovation performance after cross-border M&As.*

*H2b: For Chinese firms, TMT international education experiences will contribute to the technological innovation performance after cross-border M&As.*

Technological innovation performance is related to many other factors, including firm size, firm age, etc. The research analysis will incorporate these common factors into the econometric model.

## 3. METHODOLOGY

### 3.1. Data Source

The samples are 81 Chinese public companies relate data in the period 2005 – 2014, including cross-border M&As data, financial data, the number of patent applicants, and TMT international experiences data.

Cross-border M&As data and financial data are collected from the Z database. Chinese companies have become active in cross-border M&As activities since 2005 so that the research chooses 2005 as the first year. Excluding finance companies and below 50% shares M&A transactions, 81 Chinese listed firms are selected from Shanghai and Shenzhen stock markets.

The number of patent applicants is obtained from the State Intellectual Property. TMT background information including TMT size, international work experience, and international education is partly acquired through CSMAR and partly obtained from annual financial reports.

### 3.2. Variables

#### 3.2.1. Dependent variables

It is common to use R&D costs to measure innovation investment and the number of patent applicants to measure innovation performance during studies. Therefore, the number of patent applicants is regarded as the measurement of technological innovation performance. Considering that integration after M&As takes lots of time and that patents application consumes time, one year after the number of patent applicants ( $DV_{\text{patent } i, t+1}$ ) is applied into the model.

#### 3.2.2. Independent variables

The author adopted accumulative outbound mergers and acquisition numbers as independent variables as mergers and acquisitions will continually influence

technological innovation performance.  $CBMA_{i,t}$  represents the accumulative cross-border M&As numbers of firm  $i$  at time  $t$ .

TMT international work experiences and TMT international education experiences are regarded as the TMT international experience measurement.  $TMT_{Overseas-work_i}$  represents the percentage of management with international work experiences in the firm  $i$  and  $TMT_{Overseas-education_i}$  represents the percentage of management with international education experiences in the firm  $i$ .

### 3.2.3. Control variables

**Size:** The log function of assets at the end of year measures firm size, namely Log-Asset.

**Profitability:** Return on assets (ROA) measures profitability. With high profitability, the management team has sufficient capital to merge and acquire.

**Industry:** One virtual variable is set to classify industry. Different industries will produce different M&A behaviors and performance.

**Management size:** TMT.size represents the number of the management team.

**Ownership:** One dummy variable is set to classify ownership, including national and non-national.

**Firm age:** Different firm age will lead to different patent application processes, which might influence technological innovation performance.

## 3.3. Regression models and descriptive analysis

### 3.3.1. Model 1

$$\begin{aligned} \text{Innovation performance} - DV_{\text{patent } i, t+1} &= \alpha_0 + \alpha_1 CBMA_{i,t} + \alpha_3 ROA + \alpha_4 \text{Firm-size} + \alpha_5 \text{Industry} + \alpha_6 \text{TMT.size} + \alpha_7 \text{Ownership} + \alpha_8 \text{Age} + \varepsilon \end{aligned}$$

### 3.3.2. Model 2

$$\begin{aligned} \text{Innovation performance} - DV_{\text{patent } i, t+1} &= \alpha_0 + \alpha_1 CBMA_{i,t} + \alpha_2 TMT_{Overseas-work_i} + \alpha_3 ROA + \alpha_4 \text{Firm-size} + \alpha_5 \text{Industry} + \alpha_6 \text{TMT.size} + \alpha_7 \text{Ownership} + \alpha_8 \text{Age} + \varepsilon \end{aligned}$$

### 3.3.3. Model 3

$$\begin{aligned} \text{Innovation performance} - DV_{\text{patent } i, t+1} &= \alpha_0 + \alpha_1 CBMA_{i,t} + \alpha_2 TMT_{Overseas-education_i} + \alpha_3 ROA + \alpha_4 \text{Firm-size} + \alpha_5 \text{Industry} + \alpha_6 \text{TMT.size} + \alpha_7 \text{Ownership} + \alpha_8 \text{Age} + \varepsilon \end{aligned}$$

In the above models, model 2 adds  $TMT_{Overseas-work_i}$  into model 1, and model 3 adds  $TMT_{Overseas-education_i}$  into model 1.  $\alpha_0$  is the intercept,  $\alpha_1 \sim \alpha_8$  are the coefficients, and  $\varepsilon$  is the error term.

### 3.3.4. Regression model

As the sample data are unbalanced panel data and the number of patent applications per year is not continuous integers, the regression model should adopt a nonlinear counting model. The negative binomial fixed effect model is adopted as the commonly used Poisson model has an inherent defect of excessive dispersion, which affects the regression effect to a certain degree. Additionally, it can control the influence of non-observed variables.

3.3.5. Descriptive analysis of the data

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
DVPATENT	176.8314	945.9326	1										
CBMA	0.7832	1.3706	0.2982	1									
ROA	18.9106	263.3402	-0.0099	-0.0342	1								
FIRMSIZE	22.9852	2.30218	0.3843	0.3413	-0.1845	1							
INDUSTRY	1.6514	1.1403	0.0993	0.0561	0.0545	0.1426	1						
TIMESIZE	17.4551	6.7924	0.1113	0.0198	-0.0773	0.2774	-0.0338	1					
OWNERSHIP	0.4328	0.496	0.1993	0.0506	-0.042	0.5136	0.1731	0.1873	1				
AGE	10.2029	6.085	-0.0724	-0.0998	0.0797	0.0821	0.1756	-0.076	0.3413	1			
YEAR	2009.5	2.8743	0.0626	0.5545	-0.0713	0.1234	-0.0152	0.0206	-0.1728	-0.3354	1		
Overseas-work	0.0399	0.0625	0.21	0.0929	-0.0294	0.1279	0.08	0.1302	-0.0436	-0.183	0.1563	1	
Overseas-education	0.0362	0.0616	0.1529	0.0899	-0.0282	0.2828	-0.0885	0.2819	0.0729	-0.1394	0.0737	0.4802	1

Figure 1 Descriptive analysis of the data

4. REGRESSION RESULTS

Variables	Innovation Performance		
	Model 1	Model 2	Model 3
CBMA	<b>0.0668*</b>	<b>0.0584*</b>	<b>0.0649*</b>
Overseas-work	0.0317	<b>2.0424*</b>	0.0306
Overseas-education		0.8995	<b>-3.0114**</b>
ROA	-0.0009	-0.0009	-0.0009
Firm size	0.0009	0.0009	0.0008
Industry	<b>0.1122**</b>	<b>0.1061*</b>	<b>0.1616****</b>
TMT size	0.0461	0.0465	0.0505
Ownership	0.0638	0.0704	0.0212
Age	0.104	0.1054	0.103
Constant	-0.1224	-0.0152	-0.0039
Log likelihood	0.0112	0.111	0.0118
Sample	-0.0764	-0.3847	-0.0284
	0.2374	0.2381	0.2345
	<b>-0.1190***</b>	<b>-0.1206***</b>	<b>-0.1232***</b>
	0.0198	0.1964	0.0198
	-0.8466	-0.7249	-1.9068
	10.168	1.0246	1.1301
	-1662.421	-1660.0805	-1659.2203
	810	810	810

Figure 2 Regression results

Figure 2 shows the regression results. Model 1 verifies the impact of cross-border M&As frequency on technological innovation performance. Model 2 and Model 3 add TMT international work experience and TMT international education experience factors. Based on the above regression results, the conclusions are:

The result of model 1 supports H1 - Chinese firms can improve technological innovation performance by increasing cross-border M&As frequency. The coefficient of CBMA is 0.0668, which is slightly positive and statistically significant. It represents that one additional cross-border M&A will produce 0.0668 additional patent applicants one year after M&A. It shows that firms with higher cross-border M&As frequency will have better technological innovation performance. One possible explanation is that

higher cross-border M&As frequency brings more complementary resources to the firm so that it could obtain better profits to invest the innovation, which creates a virtuous circle. Therefore, cross-border M&As could be one strategy to achieve technology advance for Chinese companies.

Additionally, the coefficient of company size is 0.1122, which is slightly positive and statistically significant. It represents that one additional firm size will increase 0.1122 additional patent applicants. The possible explanation is that larger companies have more capital to support innovation development. The coefficient of firm age is -0.1190, which is slightly negative and statistically significant. It represents that one additional firm age will decrease 0.1190 additional patent

applicants. The possible explanation is that younger companies tend to have more innovation vigor and become more cautious when they mature. The regression results of ROA, industry, TMT size, and ownership are statistically insignificant.

The result of model 2 supports H2a - For Chinese firms, TMT international work experiences will contribute to the technological innovation performance after cross-border M&As. The coefficient of overseas-work is 2.0414, which is positively related and statistically significant. It represents that one additional international work experience percentage will increase 2.0414 patent applicants. It is easier for management with international working experience to acquire and learn advanced techniques. During the cross-border M&As process, they tend to select complementary target companies and better integrate new technology into companies. Therefore, international work experiences are beneficial to innovation performance after M&A.

The result of model 3 does not support H2b - For Chinese firms, TMT international education experiences will contribute to the technological innovation performance after cross-border M&As. The coefficient of overseas-education is -3.0114, which is negatively related and statistically significant. It represents that one additional international education experiences percentage will decrease 3.0114 patent applicants. The regression result of education experience is the opposite of the regression result of work experience. One possible explanation could be that innovation performance may depend on work experiences rather than international experiences. More researches and related data are needed.

## 5. CONCLUSION

The research finds that more cross-border M&As slightly improve technological innovation performance. Company size slightly contributes to innovation performance while company age slightly opposes innovation performance. The second finding is that TMT international work experiences positively influence innovation performance. Instead, international education experiences negatively impact innovation performance.

The findings could be biased with the consideration of these factors. Firstly, the sample is not large and only includes 81 firms. Secondly, the measurement of innovation performance could be biased as it only considers the patent applicants' number but no R&D costs. Additionally, the number of patent applicants could be biased as the same patents can be applied in different countries. It is possible that after M&A, some firms apply for the patents in the host country which are originally registered in a foreign country before M&A. In this case, patent applicants could not represent the innovation performance.

This finding and conclusion have important implications. To better catch up with the technology, cross-border M&As could be a shortcut for companies. The result of TMT international work experiences provides suggestions for shareholders and board members during the TMT selection

who are engaged in the M&A. However, more researches are needed to support the conclusions.

Although the number of Chinese firms involving in cross-border M&As has been increasing as well as the deal value, there is still limited data for listed companies. To exclude some other factors which might influence the research result, the research excludes some M&A cases for the financing purpose and then get these 81 listed firms' sample. The disadvantage is the sample number is small. However, it is unavoidable within Chinese markets. Therefore, the future research direction could use other emerging markets data such as Vietnam or make a comparison with developed markets to verify the universality of the research conclusion.

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