The International Journal of Business Management and Technology, Volume 3 Issue 1 January - February 2019
ISSN: 2581-3889

Research Article Open Access

Characteristics of inter-firm technological alliances and stock market reactions——Empirical evidence from listed firms in China's IT industry

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Abstract: Inter-firm alliances have been regarded as an effective mechanism for acquiring specialized complementary assets and achieving synergies. Although previous literatures have provided important insights on inter-firm technology alliances, few scholars have paid attention to the impact of types of R&D alliances, business similarity and relative size on the value creation for focal firms. Taking the listed firms involved in technological alliances in China's IT industry as the sample, the article empirically investigated the impact of technological alliance announcements, and characteristics inter-firm technological alliances on the abnormal returns for focal firms is empirically discussed. The results show that technological alliance announcements may increase the abnormal returns for focal firms, and technological alliance announcements by relatively smaller firms can significantly increase their abnormal returns. While the declaration of the technological alliances of firms in similar industries have a significant impact on abnormal returns, while the declaration of dissimilar firms has an insignificant impact on abnormal returns.

Key Words: inter-firm technological alliances; abnormal returns; stock market reactions; technological alliance announcements

I. Introduction

In today's business environment, inter-firm technological alliances are a ubiquitous phenomenon (Contractor and Lorange, 2002; Gulati, 1998). For example, in April 2016, ZTE and China Mobile signed a memorandum of cooperation on 5G joint innovation center, focusing on R&D and application of 5G end-to-end to promote product innovation. In the increasingly competitive markets, firms gain competitive advantages through technological alliances. As an effective mechanism for acquiring specialized complementary assets and achieving synergies, a large number of studies have shown that inter-firm technological alliances can create value for focal firms (Mcconnell and Nantel, 1985; Chang et al.,2008). However, due to the potential difficulties in the alliance process, not all firms that declare technological

alliances can achieve abnormal returns. Some scholars show that about half of inter-firm alliances have ended in failing. Therefore, it is deserved to investigate on how technological alliances affect the value creation and what factors that affect the value creation.

Since the seminal work of Gulati (1995, 1998), inter-firm alliances have been regarded as an effective mechanism for acquiring specialized complementary assets and achieving synergies. A number of studies have shown that alliances may create value for involved firms (Mcconnell and Nantel, 1985; Chang et al.,2008). Some literature mainly examined the influence of the types of inter-firm alliances on the value creation of firms. For example, McConnell and Nantell (1985) showed that joint ventures between U.S. firms and firms in developed countries could generate positive abnormal returns on the announcement date. Koh and Venkatraman (1991) found that the announcements of establishing joint ventures has a positive impact on the value creation for focal firms. Chang et al. (2008) investigated the wealth impact for Japanese and US firms that announce non-equity strategic alliances, and found that on average, both Japanese and US shareholders benefit from the formation of international alliances, and that both Japanese and US partnering firms display significant improvements in operating performance over the three-year period subsequent to the formation of international alliances.

Although previous literatures have provided important insights on inter-firm technology alliances, there are still some limitations. Firstly, few scholars have paid attention to the impact of types of R&D alliances, business similarity and relative size on the value creation for focal firms. Further exploration is needed. Secondly, extant literature on technological alliances have mainly been focusing on joint ventures. This paper tries to extend this line of inquiry by investigating the non-equity alliances. Thirdly, most studies have examined the impact of technological alliances on the value creation of firms in the context of developed countries. Can inter-firm technological alliances create value for firms in the context of developing countries or emerging economies (such as China)? It is still a question worthy of further study.

This paper initially studies whether the stock market will generally reward firms that announce technological alliances. The method we use is the event history study that describes the short-term response of the stock market to the technological alliance announcements. Second, we investigate how the differences in the characteristics of firms and alliances affect abnormal returns. The structure of this paper is as follows: Part two puts forward hypotheses with regard to the factors influencing the value creation for focal firms, including the technological alliance announcements, the types of technological alliances, business similarity, and the impact of relative size of firms. Part three presents variable definitions, measurements and data sources. Part four conducts an empirical study with a sample of 67 technological alliances to test the hypotheses in Part2. Part five proposes research conclusions, research limitations and further research directions.

1. Theoretical background and research hypotheses

1.1 Technological alliance announcements and the value creation for focal firms

Resource-based view (RBV) argues that a firm is a collection of productive resources, and its competitive advantages mainly come from resource heterogeneity. Creating and maintaining the heterogeneity is the key for a firm to obtain sustainable competitive advantages (Barney,1991). Since knowledge possessed by firms is limited, it is necessary to obtain complementary resources from other organizations as innovation inputs, and inter-firm alliance is an important way for partners to acquire complementary resources (Cantner et al., 2010). In high-tech industries, increasingly rapid technological changes, higher level of product complexity and higher R&D costs make technological alliances particularly important. Inter-firm technological alliance announcements may increase focal firm's value in following ways. Firstly, technological alliances usually involve inter-firm knowledge sharing, Inter-firm knowledge sharing may be confronted with the problem of public good and externality, which may lead to high level of transaction costs. Technological alliances may contribute to reducing transaction costs and promote knowledge transfer (Das et al.,

1998). Secondly, technological alliances enable firms to access new knowledge and skills, which means that firms may not need to conduct internal R&D unrelated to the core businesses, resulting in lower costs. Thirdly, when the R&D costs are extremely high, customer requirements are uncertain, and product life cycle are short, inter-firm alliance are necessary to reduce costs and risks involved in R&D. Fourthly, RBV argues that technological alliances may bring competitive advantages for firms by acquiring complementary assets of partners, such as physical capital, technology, manufacturing facilities and other resources. Some of these strategic resources are often are rare in markets and lack of direct substitutes. Thus, we propose the following hypothesis:

Hypothesis 1: Technological alliance announcements may create value for focal firms.

1.2 The impact of technological alliances types on value creation

Technological alliances include technology licensing agreements, R&D cooperations, technology transfer or contract manufacturing agreements, and various combinations of the above types. Alliances are generally seen as increasingly important instruments for learning. The process of learning in alliances basically boils down to the exchange of technological knowledge and capabilities. In this paper, we will distinguish between exploratory and exploitation alliances by the type of R&D activities Based on March's (2001) seminal work, exploratory alliances are generally used when R&D efforts are aimed at the creation of radically new technologies and new procedures, while exploitation alliances facilitate single-loop learning because they concentrate on current technologies, process improvements and adapting existing procedures.

Existing studies have shown that the type of alliances is determined by environmental uncertainty. Although joint ventures can better satisfy the motives of partners, the contractual agreements may provide more flexibility for partners participating or terminating the relationship (Harrigan, 1988). Therefore, non-equity alliances are particularly important for firms in an environment of technological upheaval (Chan et al., 1997). Zahra (1996) argued that both R&D expenditures and patent applications are relatively high in an environment with low technological dynamics, and there are more technological opportunities than otherwise. Chang et al (2012) conducted a study of 405 multinational technological alliances in different industries and found that R&D cooperation can better protect the core business and competitiveness of firms compared with joint ventures. So, we propose:

Hypothesis 2: The exploratory alliance announcements may create more value for focal firms than exploitative alliance announcements.

1.2 The impact of Business similarity on value creation

Similarities in products, markets, and technologies between two firms are often referred to as business similarities (Koh and Venkatraman, 1991). Tanriverdi and Venkatraman (2005) put forward that economic benefits of resource combinations are basically derived from similarities and complementarities of resources among firms. In fact, extant literature has shown that higher degree of business similarities is beneficial to M&A and alliances (Seth, 1990; Datta and Puia, 1995; Dyer and Singh, 1998; Stuart, 2000). First, RBV deems that the greater the degree of resource heterogeneity, the easier it is to create entry barriers (Barney,1991), and technology similarities among partners may increase their absorptive capacity and make use of each other's knowledge base successfully, so that knowledge can be spread more widely among alliance partners, eventually create more value for focal firms (Koga et al. 2016). Second, business similarities among partners provide a platform for development of shared technologies and skills, thus contributing to improve the efficiency of production (Chan et al., 1997). Firms with similar products are more likely to share technologies and markets, which will help them more effectively identify the contributions of collaborators (Chang et al, 2008) and provide opportunities for value creation (Wang and Zajac, 2007). Additionally, alliance partners are all

involved in the decision-making processes, and it is necessary to reach an agreement on controversial issues, thus leading to expensive and time-consuming negotiations and delays. If two firms have similar businesses, they can more accurately assess the assets and capabilities of potential partners (Wang and Zajac, 2007). In other words, business similarity may contribute to better understanding for alliance partners, and information asymmetry can thus be significantly reduced, which may prevent opportunistic behaviors of partners and reduce the costs associated with technological alliances (Chang et al., 2008). Koh and Venkatraman (1991) conducted a study on firms in information technology industry and found that firms with similar businesses could create more value from alliance announcements than those with dissimilar businesses. Based on the above points, we propose:

Hypothesis 3: The higher the degree of business similarity among alliance partners, the higher the value created by the technological alliance announcements.

1.4 The impact of relative size on value creation

It is common to form alliances for firms with different sizes, especially in the computer industry (Barley et al., 1992). According to resource dependence theory (Pfeffer & Salancik, 1978), firms enter alliances in search of valuable resources that they themselves lack. Although there is interdependence, it is rarely symmetric. Large firms usually choose smaller and innovative firms as alliance partners in search of their own distinct technological capability (Koh and Venkatraman, 1991).

Establishing alliances with large-scale firms can provide important advantages for relatively small firms. First, large firms usually have plenty of resources in capital, production capacity, and marketing that are critical to the long-term development of small firms (Alvarez and Barney, 2001). Through technological alliances, small firms can get resources that are not available in factor market. Besides, building partnerships with larger firms may endow smaller firms with legitimacy, thus enabling them to gain access to resources across the boundary of technological alliances. For example, by building technological alliances with larger firms, smaller firms may have the opportunity to join an international network or gain legitimacy within the network (Gulati, 1995). Finally, Larger firms usually seek out smaller, innovative firms to form alliances for their technological know-how. Therefore, the relative bargaining power of the smaller partner in a technological alliance will be significantly higher than that of the large partner (Das et al, 1998). Koh and Venkatraman (1991) conducted a research on firms in the information technology industry, and the result showed that compared with larger firms, smaller firms may receive more benefits from joint venture announcements. Das et al (1998) conducted a study that analyzed 119 strategic alliances formed during the period 1987-1991 and showed that abnormal returns are negatively correlated with firm size. Therefore, we propose:

Hypothesis 4: In a technological alliance, smaller firms may achieve higher excess returns than larger firms.

II. Data and variable measurement

2.1 Data

This article takes the listed firms in information technology industry that have establish technological alliances in pairwise as the sample. Data are obtained from various sources, including CSMAR, the official website of Shenzhen Stock Exchange, and the official website of Shanghai Stock Exchange. Specifically, we take the following tactics in collecting samples. Firstly, in the "Chinese Stock Market Trading Database" of CSMAR, we chose January 1, 2010 to December 31, 2014 as the time horizon. Then we select the information technology industry in the SFC industry classification and retrieve 230 firms as the initial samples. Next, by excluding ST firms and those firms whose stock codes start with 2, 3, and 9, and we got 119 firms. Thirdly, we screened the annual reports of the above 119 firms, and selected 101 firms who have established cooperations such as joint ventures, licensing, etc. By manually screening, we got 4 firms with 12 production alliances, 28 firms with 158 sales alliances, and 43 firms with 239 technological alliances.

In order to avoid other mixed events distorting the impact of inter-firm alliances on the value creation for focal firms, we removed sample firms which have any other announcement within ten days before and after the announcement of technology alliances and thus we got 38 firms with 193 technology alliances. In addition, we excluded firms with no returns during the event window period and those establishing alliances involved three or more firms, and finally we got 67 samples.

2.2 Variable measurement

(1) Dependent variable

The paper uses the abnormal returns to measure the value creation for focal firms. Based on the event history analysis, we use the Fama-French three-factor model to calculate the abnormal income for focal firms. The three-factor model can explain the excess returns as follows:

$$r_{it} = \alpha_i + \beta_i(r_m - r_f) + s_i SMB_t + h_i HML_t + \varepsilon_{it}$$

where r_{it} refers to the expected returns; r_m refers to the market returns; r_f refers to the risk-free interest rate. SMB is the difference of the average returns between two groups with large-and small- firm size, which represents the factor for firm size. HML is the difference of the average returns between two groups with high- and low- book market value, indicating the factor for book market value. β_i, s_i, h_i respectively indicate the sensitivity of stock *i* to these three market factors; α_i represents the portion of the returns that the Fama-French three-factor model cannot explain. The parameters in the model are estimated from 200 days to 20 days before the announcement date.

In the model, we use an estimate of $\hat{r}_{it}$ to represent the daily returns of a firm on the event date. By comparing the actual value r_{it} with the estimated value $\hat{r}_{it}$, we can calculate the daily abnormal returns that is expressed as:

$$AR_{it} = r_{it} - \hat{r}_{it}$$

where AR_{it} represents the daily abnormal returns for the focal firm. The firm's cumulative abnormal returns CAR_{it} can be obtained by summing up individual event windows, and the actual daily returns are obtained through CSMAR.

（2）Independent variables

Types of technological alliances: Exploratory alliances refer to the exploration of new knowledge and exploitative alliances refer to the re-refining or reusing of extant knowledge (Ahuja et al, 2002). As an example for an exploratory alliance, Inspur Group and Beijing SuperMap Software Co., Ltd. have developed in-depth cooperation, and the two sides have established a joint technological team to promote the development and application based on KI and GIS, which belongs to the exploratory alliance. As another example for an exploitative alliance, Zhuoyi Technology and Qualcomm signed a license agreement by which Qualcomm license CDMA patent to Zhuoyi Technology. In the article, we use dummy variables to indicate the types of technological alliances. Technological alliance dummy equals one when the technological alliance is exploratory, and zero otherwise.

Business similarity: For listed firms involved in technology alliances, we classify them according to the standards

of the SFC industry. If the alliances partner firm and the focal firm are in the same industry, the value of business similarity is high. For unlisted firms involved in technology alliances, we classify them based on their main business. If the alliances partner firm has the same main business as the focal firm, the value of business similarity is high. Similarly, we use dummy variables to indicate the business similarity. The business similarity dummy equals one if the partners have high business similarity, and zero otherwise.

Relative size: We measure relative size by the ratio of the total number of employees of focal firms to partners at the year-end immediately preceding an alliance announcement (Das et al, 1998). If the value is above the median of the sample, which indicate the focal firms are larger in size. Otherwise the focal firms are smaller in size. For listed firms involved in technology alliances, the total number of employees can be obtained through the annual report. For unlisted partners, the total number of employees is available at www.baidu.com. The relative size dummy equals one if the alliance partner's size is relative small, and zero otherwise.

(3) Control variables

In order to eliminate the impact of other factors on the value creation for focal firms, we take the firm size, the nature of ownership, profitability and the year as control variables. Firm size is measured by the logarithm of the total assets. The nature of ownership dummy equals one if the first shareholder of the listed firm is state-owned, and zero otherwise. Profitability is measured by return on equity (ROE). The year is set to a dummy variable, indicated by $t_1 \sim t_4$.

2.3 Research methodology

The methodology used in this paper is the event history analysis, which is widely used in finance, accounting, and marketing literature to evaluate the impact of the occurrence of events (such as M&As, earnings announcements, or refinancing behaviors, etc.) on stock prices. The impact can be reflected in the following aspects: the effect of average stock prices, changes in variance of market returns (reflecting changes in the volatility of stock price), changes in trading stock volume, the change of business (accounting) performance and so on. The method is based on efficient markets hypothesis (EMH), so any relevant information disclosed and its impact on the business may be reflected by changes of stock prices after the disclosure of the information.

Considering the disclosure of information before the announcement date and delayed response to the announcement by the market, we define the event window as the three days before and after the event day. In addition, we calculate the cumulative abnormal returns for different event windows to minimize the noise.

III. Empirical results

3.1 The impact of announcements of technological alliances on abnormal returns for focal firms

To avoid missing information and ensure that the event date is accurate, we proceed in two steps. First, we manually confirm the news bulletin. Second, in accordance with other studies (e.g. Das et al. 1998), we calculate the cumulative abnormal returns for each event window (+3 to -3). Moreover, t-test was used to examine whether the cumulative abnormal return of each event window is significantly zero or not. The results are shown in Table 1. It can be seen from Table 1 that under the selected event window, the cumulative abnormal return of the alliance announcement is positively and significantly non-zero. Taking the (-2, 1) window as an example, the results show that the technological alliance announcement increases the abnormal returns of firms by 1.34%. Thus, the announcements of technological alliances will increase abnormal returns for focal firms.

Table 1 Excess returns for different window periods

		Cumulative excess returns		
Event window	Mean（%）	t-value	Median（%）	P-value
（-3,3）	1.33	2.22	0.86	0.03**
（-2,2）	1.39	2.37	1.00	0.021**
（-1,1）	1.05	2.06	0.17	0.043**
（-1,2）	1.15	2.108	0.39	0.039**
（-1,3）	1.17	2.212	0.39	0.03**
（-2,1）	1.34	2.38	0.16	0.02**
(-3,1）	1.15	1.924	0.39	0.059*

***. P<0.01, **. P<0.05, *. P<0.1

As shown in Table 2, under each event window, the impact of the exploratory alliance announcements on the abnormal returns is significantly positive. Taking the window of (-2, 1) as an example, the exploratory alliance announcements increase the abnormal returns by 2.04%, and the impact on the stock market is significantly positive. While the exploitative alliance announcements increase the abnormal returns by 1.32%, and the impact on the stock market is also significantly positive. However, there is no significant difference between the two groups, so the results cannot support Hypothesis 2.

Table2 Stock market reaction of announcements of exploratory alliances and exploitative alliances

Exploratory alliances					Exploitative alliances				
Event window	Mean（%）	t-value	Median（%）	P-value	Mean（%）	t-value	Median（%）	P-value	Mean Difference
（-3,3）	2.40**	2.692	1.17	.011	1.20**	2.188	0.97	.037	0.016
（-2,2）	2.18**	2.371	1.08	.023	1.28**	2.355	1.21	.026	0.0114
（-1,1）	1.95**	2.323	0.51	.026	0.54	1.401	0.16	.172	0.0159
（-1,2）	2.16**	2.394	1.08	.022	0.52	1.255	0.35	.220	0.0186
（-1,3）	2.17**	2.543	0.84	.015	0.69	1.504	0.35	.144	0.0174
（-2,1）	2.04**	2.306	0.13	.027	1.32**	2.551	1.00	016	0.009
（-3,1）	2.11**	2.298	0.54	.027	0.98**	2.091	0.51	.046	0.145

***. P<0.01, **. P<0.05, *. P<0.1

The results in Table 3 show that under the event window of (-2, 1), the announcements of the technological alliances for focal firms in similar businesses have a significant impact on abnormal returns, while the announcements of dissimilar businesses have no significant impact on abnormal returns, which is consistent with Chan et al. (1997). That is, alliances in similar businesses can lead to stronger market responses. However, there is no significant difference between the two subsamples, so Hypothesis 3 cannot be supported.

Table3 Stock market reaction of alliance announcements of similar business and dissimilar business

similar business					dissimilar business				
Event window	Mean（%）	t-value	Median（%）	P-value	Mean（%）	t-value	Median（%）	P-value	Mean Difference
（-3,3）	1.87**	2.241	0.89	.031	1.49*	1.976	0.98	.058	0.0129
（-2,2）	1.62*	1.906	-0.18	.064	1.79**	2.411	1.24	.023	0.009
（-1,1）	1.38*	1.732	0.03	.091	1.10*	1.917	0.37	.066	0.007
（-1,2）	1.11	1.325	0.03	.193	1.69**	2.587	0.90	.015	-0.001
（-1,3）	1.35*	1.715	0.73	.094	1.50**	2.279	0.44	.031	0.004
（-2,1）	1.93**	2.394	-0.16	.022	1.27*	1.774	0.95	.087	0.017
（-3,1）	1.84**	2.135	0.4	.039	0.99**	1.393	0.64	.175	0.017

***. P<0.01, **. P<0.05, *. P<0.1

Table 4 shows that under all event windows, the influence of relatively small firms on abnormal returns is significantly positive, while the influence of relatively large firms on abnormal returns is not significant. Taking the window of (-2, 1) as an example, relatively small firms can significantly increase the abnormal returns by 2.51%. The mean difference between the two subsamples is 0.025, which is significant at the 5% significance level. The results support Hypothesis 4, which indicate that the stock market is more responsive to alliance announcements of relatively small firms.

Table4 Reaction of the relative size of alliance partners to the stock market

Relatively small size					Relatively large size				
Event window	Mean（%）	t-value	Median（%）	P-value	Event window	Mean（%）	t-value	Median（%）	Mean Difference
（-3,3）	2.57***	3.091	1.49	0.004	0.57	0.800	0.73	0.430	0.024**
（-2,2）	2.71***	3.337	.1.53	0.002	0.36	0.469	-0.59	0.643	0.029**
（-1,1）	2.02**	2.529	.0.39	0.016	0.27	0.498	-0.08	0.622	0.019**
（-1,2）	2.29***	2.798	1.02	0.008	0.12	0.180	-0.96	0.858	0.024**
（-1,3）	2.05**	2.660	0.44	0.011	0.58	0.850	0.73	0.403	0.018*
（-2,1）	2.51***	3.092	.0.86	0.004	0.53	0.793	-0.16	0.435	0.025**
（-3,1）	2.44***	2.764	0.86	0.009	0.24	0.377	-0.08	0.709	0.025**

***. P<0.01, **. P<0.05, *. P<0.1

3.2 Regression results and discussions

In order to investigate the influence of the characteristics of technological alliances on abnormal returns more accurately, we establish five multiple regression models. Model 1 only includes control variables. Model 2, Model 3, and Model 4 add different independent variables in turn. Model 5 simultaneously examines the impact of all independent variables and control variables on the value creation for focal firms. The results of the regression models are shown in Table 5.

In general, the fitness indices of Model 5 are higher than other models. It can be seen from Table 5 that among the control variables, profitability, the nature of ownership, and firm size are all significantly affect the abnormal returns, indicating that the stronger the profitability of focal firms and the larger size of focal firms, the lower the abnormal returns obtained by focal firms' announcing technological alliances. In addition, the abnormal returns are higher when focal firms are state-owned.

In Model 2 and Model 3, types of technological alliances and business similarity have no significant influence on abnormal returns, which indicates that different types of technology alliance announcements and the degree of business similarity both have no effects on the value creation for focal firms. Therefore, Hypothesis 2 and Hypothesis 3 are not supported. In Model 4, the effect of relative size on abnormal returns for focal firms is significantly positive (β=0.024, P=0.023). After adding the independent variables, including types of technological alliances and business similarity, the impact of relative size on the abnormal returns for focal firms is still significantly positive (β=0.024, P=0.026), thus verifying Hypothesis 4. The results show that in the technological alliances, the smaller size of focal firms will obtain higher abnormal returns. RBV holds that a firm is a collection of resources, and the competitive advantage mainly comes from the heterogeneity of resources. Creating and maintaining such resource heterogeneity is the key to capture competitive advantage for a firm. In order to enter new markets or expand existing markets, smaller and innovative firms may have established alliances with larger firms to acquire production or marketing capabilities. In the view of investors, this is a win-win situation for both sides. In the technological alliances, larger firms mainly rely on technological capabilities of smaller firms, thereby increasing the bargaining power of smaller firms. Hence, we find that the stock market is more responsive to relatively smaller firms than relatively larger ones, i.e., relatively smaller firms receive more abnormal returns than larger ones.

Table 5 Regression results

Explanatory variables	Model 1	Model 2	Model 3	Model 4	Model 5
SIZE				0.024** (0.023)	0.024** (0.026)
BUSINESS			0.0158 (0.167)		0.015 (0.181)
TYPE		0.002 (0.852)			-0.003 (0.789)
PROFIT	–0.194** (0.047)	–0.194** (0.049)	–0.184* (0.057)	–0.168* (0.075)	–0.160* (0.092)
OWNERSHIP	0.042*** (0.002)	0.042*** (0.002)	0.044*** (0.002)	0.041*** (0.002)	0.042*** (0.002)
ASSET	–0.011*** (0.0002)	–0.011*** (0.0004)	–0.010*** (0.001)	–0.011*** (0.0001)	–0.010*** (0.001)
t_1	0.007 (0.718)	0.008 (0.696)	0.008 (0.685)	0.005 (0.792)	0.004 (0.817)
t_2	-0.010 (0.504)	-0.001 (0.527)	-0.013 (0.394)	-0.009 (0.558)	-0.012 (0.430)
t_3	-0.014 (0.351)	-0.014 (0.364)	-0.019 (0.229)	-0.009 (0.533)	-0.014 (0.368)
t_4	-0.001 (0.953)	-0.001 (0.958)	-0.004 (0.780)	0.002 (0.917)	-0.002 (0.904)
R^2	0.257	0.257	0.2809	0.320	0.342
Adjusted R^2	0.168	0.155	0.1817	0.226	0.225
Durbin-Watson	1.865	1.878	1.835	1.927	1.869
F-value	2.909	2.508	2.832	3.414	2.914
Prob(F-statistic)	0.011	0.021	0.010	0.003	0.005

Note: P-value in brackets; ***. P<0.01, **. P<0.05, *. P<0.1

IV. Conclusion

Taking the listed firms involved in technological alliances from January 2010 to December 2014 in China's IT industry as the sample, the article empirically investigated the impact of technological alliance announcements, and characteristics inter-firm technological alliances on the abnormal returns for focal firms is empirically discussed. The results show that technological alliance announcements may increase the abnormal returns for focal firms, and technological alliance announcements by relatively smaller firms can significantly increase their abnormal returns. While the declaration of the technological alliances of firms in similar industries have a significant impact on abnormal returns, while the declaration of dissimilar firms has an insignificant impact on abnormal returns.

As with other research, this article also suffers some limitations. First, this article takes the China's information technology industry as the research background, and conclusions may not be generalizable to other industries in the Chinese context. Future research should investigate other industries in China and other countries. Second, we only consider the value creation of the technology alliances announcement for focal firms. Future study should simultaneously analyze the impact of technology alliances announcement on all alliance partners.

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