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RESEARCH ARTICLE

Zhengping Fu, Wei Peng

Effect of Alliance Orientation on Firm Performance: An Empirical Study on High-Technology Firms in China

Abstract Based upon the dynamic-capability view and social capital theory, this paper examines the effect of alliance orientation on firm performance. Hypotheses are tested with data collected from 195 high-tech firms in China. Results show that alliance orientation has a significant and positive effect on firm performance. Moreover, market dynamism exerts a positive moderating effect on the relationship between alliance orientation and firm performance, whereas technological dynamism negatively moderates the relationship. Moreover, relational capital partially mediates the same relationship and the interaction effects of alliance orientation and market dynamism on firm performance.

Keywords alliance orientation, firm performance, relational capital, environmental dynamism

1 Introduction

Over the past decades, strategic alliances have become an increasingly important way for companies to strengthen their competitive advantage by gaining access to external resources or capabilities, reducing risks and sharing costs, improving market position, and entering into new markets (Kogut, 1988; Ireland, Hitt, & Vaidyanath, 2002; Kale & Singh, 2009). With the increasing popularity of strategic alliances, a growing number of researchers have studied strategic alliance from a variety of different theoretical lenses. For example, some used theories grounded in the social network literature to examine the effect of

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Zhengping Fu
Sun Yat-sen Business School, Sun Yat-sen University, Guangzhou 510275, China
E-mail: mnsfzp@mail.sysu.edu.cn

Wei Peng (✉)
Sun Yat-sen Business School, Sun Yat-sen University, Guangzhou 510275, China
E-mail: sysupengwei@163.com

alliance network characteristics on firm performance (Ahuja, 2000; Capaldo, 2007). Others explored how firms improve their learning capability and strengthen their performance through alliances from the perspective of organizational learning theory (Anand & Khanna, 2000; Kale & Singh, 2007). Still others applied transaction cost economics to explore the antecedents and consequences of governance structure for strategic alliances (Nielsen, 2010; Wang, 2011).

In sum, scholars have obtained abundant evidence concerning alliance activities. However, little attention has been drawn to strategic alliance from the perspective of strategic orientation. In practice, many firms have regarded alliances as an important strategic orientation of the developmental process. The essence of strategic orientation is to guide firms to improve performance by a particular business philosophy, values, and beliefs. Strategic management scholars have paid much attention to market orientation, learning orientation, and entrepreneurial orientation. By comparison, the research on alliance orientation is rare. In addition, prior literature on strategic alliances has mostly focused on the behavior of U.S. and European-based firms, while the alliance behavior of Chinese firms as a representative of emerging markets has largely been ignored. Therefore, this research intends to make a contribution to the literature by exploring the effect mechanism of alliance orientation on firm performance. We hope it can help provide empirical evidence of Chinese firms for strategic alliance literature.

The remainder of this paper is organized as follows. Firstly, we briefly summarize the key arguments of the dynamic capability view and social capital theory, as the theoretical background for this study. We then put forward research hypotheses and discuss the methodological aspects of the study, followed by the results of empirical analyses. Lastly, we conclude the paper by discussing the key results, contributions and limitations of this paper and provide the directions for future research.

2 Theoretical Background and Hypotheses

2.1 Theoretical Background and Research Framework

How does alliance orientation influence firm performance? Our search for the answers is from the perspectives of the dynamic capability view and social capital theory.

2.1.1 Dynamic-Capability View

The dynamic capability view of the firm evolving from the static resource-based

view (RBV) of competitive strategy has been influential in the field of strategic management. Teece (2007) proposed that firms acquire dynamic capabilities to adapt to the changing environment and shape the ecosystem that they occupy. Jiao, Wei, & Cui (2010) regarded dynamic capability as composed of environmental sensing capability, change and renewal capability, technological flexibility capability, and organizational flexibility. Firms that are able to build dynamic capability can enhance existing resource configurations, and build long-term competitive advantage (Eisenhardt & Martin, 2000; Zollo & Winter, 2002). According to the dynamic capability view, alliances could be regarded as a strategic option that firms use to pool and deploy resources from partner firms to compete more effectively in the market (Varadarajan & Cunningham, 1995). Meanwhile, alliance-orientated firms can be viewed as those that place a high priority on present and prospective alliance activities.

2.1.2 Social Capital Theory

A central premise of social capital theory is that economic transactions among different parties are embedded in a social context. The key concept of this theory is social capital, which has received considerable attention from sociologists, organizational theorists, economists, and psychosocial scientists alike (Burt, 1977). Nahapiet and Ghoshal (1998) defined social capital as the sum of the actual and potential resources embedded within, available through and derived from the network of relationships possessed by an individual or social unit. Lin (2001) viewed social capital as resources embedded in a social structure that are accessed and mobilized in purposive actions. Based on Granovetter's (1985) distinction between structural and relational embeddedness, social capital can be distinguished by the structural dimension that focuses on social interaction and the relational dimensions that focuses on the quality and nature of connection (Tsai & Ghoshal, 1998). When applied within the context of organizational alliance relationship, the relational dimension of social capital can be regarded as relational capital, which is defined as the level of mutual trust, respect and friendship that arises out of close interactions among alliance partners (Kale, Singh, & Perlmutter, 2000).

2.1.3 Research Framework

Based upon the dynamic capability view and social capital theory, we develop a relationship framework among alliance orientation, relational capital, environmental dynamism, and firm performance, as described in Fig.1. In this framework, alliance orientation has a positive effect on firm performance and the relationship between alliance orientation and firm performance is mediated by

relational capital and moderated by environmental dynamism. Furthermore, this framework postulates that relational capital mediates the interaction effects of alliance orientation and environment dynamism on firm performance. Below, we will discuss each of the above relationships and develop the corresponding hypotheses.

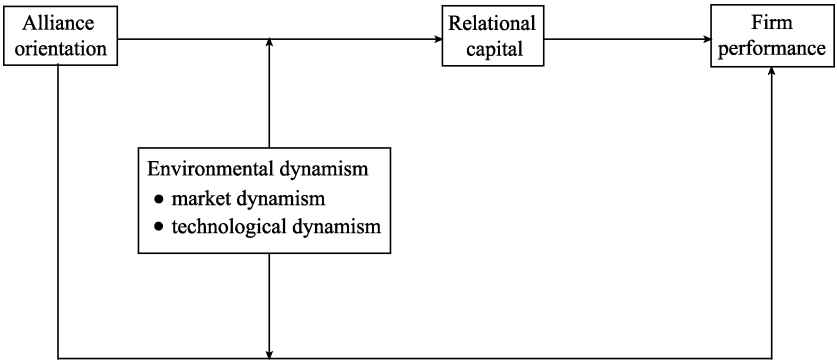

Fig. 1 Conceptual Model and Hypothesized Relationships

2.2 Alliance Orientation and Firm Performance

Faced with a rapidly changing external environment, more firms recognize that all needed resources, especially those rare, heterogeneous and valuable knowledge resources, can not be provided only by themselves. Alliances are helpful for firms to gain access to external knowledge resources to respond more efficiently to an increasingly changing environment and to cultivate competitive capability (Ireland, Hitt, & Vaidyanath, 2002). Alliance-orientated firms tend to place a high priority on present and perspective alliance relationships, which is defined as alliance orientation by Kandemir, Yaprak, & Cavusgil (2006). Alliance orientation is composed of three dimensions: alliance scanning, alliance coordination, and alliance learning. Alliance scanning refers to the capability for firms to identify prospective alliance opportunities through scanning external environment. Alliance coordination means the capability for firms to effectively coordinate present alliance activities. Alliance learning refers to the capability for firms to learn from alliance experience (Kandemir, Yaprak, & Cavusgil, 2006).

Because of environmental uncertainty and incomplete information, to find the right partner is a critical but difficult step for firms. Faced with external environment composed of information about potential partners, the higher the capability for a firm to catch a potential alliance opportunity from a rapidly changing environment, the more likely the firm to find suitable partners which are helpful for firms to make full use of partners' resources and enhance own

competitive capability.

In addition, strategic alliance is an incomplete contract in essence. Because of the divided authority structure and the physical, cognitive and cultural distance among partners, many strategic alliances failed due to inappropriate coordination mechanisms (Schreiner, Kale, & Corsten, 2009). In some cases, the cost of failed coordinated action for alliance activities may even exceed the benefits of alliances (Park & Ungson, 2001). Therefore, the higher the capability for firms to coordinate alliance activities, the more likely for them to share information and resources, which is helpful for firms to access more external resources and benefit more from alliance activities.

Moreover, many studies indicated that firms can accumulate experience from alliance activities, which is helpful for these firms to succeed in future alliances (Simonin, 1997). However, previous successful alliance experience does not necessarily guarantee success of future alliances and firms can achieve a huge success in future alliances only if they can develop alliance capability through learning from past alliance experience (Kale, Dyer, & Singh, 2002). Therefore, the higher the degree of capability to learn from alliance, the more likely for these firms to succeed in future alliance activities, thus the better the performance of allied businesses.

Accordingly, we propose that:

Hypothesis 1: Alliance orientation is positively related to firm performance.

2.3 The Moderating Role of Environmental Dynamism in the Relationship between Alliance Orientation and Firm Performance

The environment has long been considered as one of the critical contingencies in the field of strategic management (Child, 1972). Many scholars make conceptualizations of the environment according to Dess and Beard's (1984) three dimensions: munificence, complexity, and dynamism. In our research, we focus on the environment dynamism as the contingent variable of research model. Environmental dynamism composed of market dynamism and technological dynamism refers to the rate of unpredictable change in a firm's external environment.

Market dynamism refers to the degree of changes in the composition of customers in the market and their preferences (Kohli & Jaworski, 1990). Compared to the firms in a stable environment, those in a dynamic environment should improve their products and processes to respond to rapidly changing customer preferences through accessing information about market dynamism and resource from partners. In addition, alliance-orientation firms can rapidly scan the change of environment and timely find potential alliance opportunities, which is helpful for them to make use of the resources that are embedded in their

alliance network. Moreover, high market dynamism can make sure the competitive advantage of alliance-orientation firms cannot be easily imitated by competitors. Therefore, the positive relationship between alliance orientation and firm performance is stronger for firms in a highly dynamic environment, as compared with firms in low market dynamism. Accordingly, we predict a moderating effect as follows:

Hypothesis 2: The positive relationship between alliance orientation and firm performance is moderated positively by market dynamism—the more dynamic the market environment, the higher the degree of the relationship.

Technological dynamism refers to the rate of change in new products and technologies, which is caused by uncertainty of emergence of new technology and unpredictability of mainstream technology development and influence of new technology (Jaworski & Kohli, 1993). In an environment with high technological dynamism, it is difficult for firms to predict the needed technological resources. Through high market dynamism enhance the positive effect of alliance orientation on firm performance, technological dynamism may reduce the positive effect of alliance orientation on firm performance. The reason is that in the environment with high technological dynamism, if enterprises rely too much on their alliance partners, it is difficult for them to recognize the gap between their core technological capabilities and the needed resources and capabilities. Moreover, firms may tend to continuously adjust their alliance partners in order to gain access to external technological resources and capabilities. However, most product innovations often come from the outsider of the industry. Therefore, the importance of making use of the knowledge of present alliance partners, coordinating different alliance activities and learning from alliance experience is reduced for firms in an environment with high technological dynamism. Accordingly, we predict a moderating effect:

Hypothesis 3: The positive relationship between alliance orientation and firm performance is moderated negatively by technological dynamism—the higher the level of technological dynamism, the weaker the relationship.

2.4 The Mediating Role of Relational Capital

When applied within the context of alliances, we define alliance relational capital as the configuration and social structure of the group through which resources are accessed. We view the level of alliance relational capital by the degree of mutual respect, trust and close interaction among alliance partners. Alliance firms should cultivate their alliance relational capital at all phases of alliance development, which can be enhanced by high alliance orientation. The reasons can be stated as follows. Firstly, the higher the capability for firms to identify alliance

opportunity, the more likely firms to select their partners based on reciprocity. In addition, the higher the capability to coordinate alliance activities, the less likely for alliance partners to deceive each other. Accordingly, the level of mutual trust among alliance partners is enhanced. Furthermore, the higher the capability to learn from alliance experience, the more likely the firms are to increase investment on their alliance activities, which is useful to improve the level of social interaction among partners. Therefore, we propose:

Hypothesis 4a: Alliance orientation is positively related to relational capital.

In accordance with social capital theory, relational capital facilitates communication and information sharing between partners (Kale, Singh, & Perlmutter, 2000) and social interactions provide more opportunities and channels to exchange information and knowledge among partners (Tsai & Ghoshal, 1998). Moreover, relational capital can also be viewed as a social control mechanism. When the level of relational capital is high, the opportunistic behavior of alliance partners can be reduced, which is helpful for firms to minimize the cost of monitoring and controlling the alliance relationship (Gulati, 1995). In general, a higher level of relational capital can result in better firm performance, as we assume that alliance orientation has a positive effect on relational capital in Hypothesis 4a. Therefore, we propose:

Hypothesis 4b: Relational capital mediates the positive relationship between alliance orientation and firm performance.

In an environment with high market dynamism, it is more likely that alliance-orientation firms identify potential alliance opportunities and find the right alliance partners based on the principle of reciprocity. Moreover, high market dynamism makes a high level of relational capital among partners more important to improve firm performance. However, in an environment with high technological dynamism, the higher the alliance orientation, the more likely for firms to be locked in present alliance networks which may hamper the cultivation of relational capital among partners. Furthermore, locking in the present alliance network because of high technological dynamism is also harmful for firms to build new alliance relationship and cultivate richer relational capital through breaking the network boundary. Therefore, we propose the following hypotheses:

Hypothesis 5a: Market dynamism positively moderates the positive relationship between alliance orientation and relational capital.

Hypothesis 5b: Relational capital mediates the interaction effect of alliance orientation and market dynamism on firm performance.

Hypothesis 6a: Technological dynamism negatively moderates the positive relationship between alliance orientation and relational capital.

Hypothesis 6b: Relational capital mediates the interaction effect of alliance

orientation and technological dynamism on firm performance.

3 Methods

3.1 Empirical Setting

With the economic globalization and rapidly changing technologies, high-technology industries are facing increasingly fierce competition. In such environments, strategic alliances are generally considered an important path for high-technology firms to gain access to external information and improve learning capability (Hagedoorn & Duysters, 2002; Grant & Baden-Fuller, 2004). Rothaermel and Deeds (2006) also pointed out that gaining competitive advantage through strategic alliance has become an important strategic thinking for most high-technology firms. Therefore, we focus on high-technology firms in China as our empirical settings, which is also helpful for us to control for industry effect.

In China, lots of high-technology firms are generally clustered in high-tech development zones. At present, there are over one hundred national high-tech development zones approved by the State Council nationwide. In order to facilitate the investigation, we selected two national high-tech development zones, namely the Beijing Zhongguancun Science and Technology Park (ZSTP) and Huizhou Zhongkai High-Tech Development Zone (ZHDZ), as our samples. After twenty years of development, ZSTP, where nearly twenty thousand high-tech firms are located, has become one of the largest high-tech industry clusters in China. Established in 1992, ZHDZ is located in the east of the Pearl River Delta and consists of over five hundred high-tech firms. Both are representative of China's high-tech industrial clusters.

3.2 Data Collection and Sample

This study, in line with other research, focuses on dyadic alliance (i.e. two partners) which allows us to capture and measure key strategic variables more easily.

Our questionnaire survey was carried out in two steps. Firstly, we conducted a pre-study in ZHDZ. At this stage we distributed 80 questionnaires and recovered 38 valid questionnaires. The reliability test showed that all scales had satisfactory reliability. Then we conducted a large-scale questionnaire survey in ZHDZ, in which we emailed 500 questionnaires and recovered 194 copies two weeks later (126 valid copies). A similar large-scale questionnaire survey was also conducted in ZSTP in which we entrusted a business consulting company to randomly select 120 companies in its client list to distribute questionnaire and recovered 81

questionnaires, (69 valid copies). In all, our large-scale survey collected usable data from 195 high-tech firms, with a total valid response rate of 25.2 percent. Considering the rather high response rate, the data collected in this article can be adopted to studies on strategic alliances (Tsang, 2002). In addition, to ensure a high quality of responses, we required every questionnaire to be completed by senior managers or middle-level managers who generally had in-depth knowledge of their firms' alliance activities and the impact of alliance activities on the overall firm operation. 47.5% of our valid questionnaires were filled in by senior managers and all others were completed by middle-level managers, which guaranteed respondents' possession of high-quality and reliable assessments of the items in questionnaire (Eisenhardt & Schoonhoven, 1996).

In addition, because our valid samples came from different groups, we should test the difference between the two groups. We conducted a *t*-test between the group consisting of 126 valid samples (ZHDZ group) and the other group consisting of 69 valid samples (ZSTP group), and did not find any significant differences on firm age and number of employee at the 0.05 level. Therefore, the data collected from the above two industrial parks can be considered as one batch. In total, the descriptive statistics of sample firms are shown in Table 1, as below.

Table 1 Descriptive Statistics of Sampled Firms

Variable	Attributes	Obs.	%	Firm	Attributes	Obs.	%
Firm age (year)	⩽5	84	43.1	Total assets (million yuan)	⩽5	62	31.8
	6–10	57	29.2		5–10	36	18.5
	11–15	20	10.3		10–40	43	22
	>15	34	17.4		>40	54	27.7
No. of employees	⩽50	78	40	Industry	Electronic information	51	26.2
	51–100	30	15.4		Biomedicine	47	24.1
	101–200	31	15.9		New materials	39	20
	201–500	25	12.8		Electrical equipment	30	15.4
	>500	31	15.9		Others	28	14.3

3.3 Measurement

Tentative measures were either developed or adopted from the literature and then tested for content validity with the help of three doctoral students who majored in strategic management and five senior executives who were responsible for alliance activities in their own firms. All interviews were taped, transcribed and studied in depth. Through an iterative process of linking the theory with empirically derived concepts, all items in the questionnaires were carefully

worded and could be easily understood by respondents. Measurement items, factor loadings, Cronbach's alpha reliabilities and composite reliability are shown in Table 2.

3.3.1 Alliance Orientation

We adopted the conceptual framework of Kandemir, Yaprak, and Cavusgil (2006) and identified three dimensions of alliance orientation. Each of the three dimensions is measured by three items and all items are measured by a seven-point Likert scale.

3.3.2 Environmental Dynamism

This construct is measured with ad a seven-point Likert scale, adopted from Germain and Daugherty (1994) and Jaworski and Kohli (1993). Market dynamism refers to the rate of change in the composition of customers and their preferences, while technological dynamism refers to the rate of technological change.

3.3.3 Relational Capital

We assessed relational capital using measurement developed by Kale, Singh, and Perlmutter (2000), and building on earlier work of Dyer and Singh (1998) and Mohr and Speckman (1994). The scale consisted of five items measuring the level of mutual respect, trust, reciprocity, interaction and friendship among partners. All items were measured by a seven-point Likert scale.

3.3.4 Firm Performance

The work of Murphy, Trailer, & Hill (1996) was adopted to measure firm performance variable with three items: sale growth, market share and net profit margin. The respondents rated the firm performance on a seven-point Likert scale in relation to competitors.

3.3.5 Control Variables

Control variables were included in the model to control for various factors that might influence our analysis results. Firm size was measured as a log transformation of the number of full-time employees employed. In addition, firm age measured as the number of years a sample firm in business was also controlled.

3.4 Non-Response and Common Method Biases

Although there is no generally accepted minimum percentage for response rates, non-response bias is always a concern for questionnaire survey. Therefore, we followed the suggestions by Armstrong and Overton (1977) and used 195 valid questionnaires and 80 invalid questionnaires to form two groups to test for non-response bias. A *t*-test between the two groups showed no significant differences at the 0.05 level, thus indicating that the two groups did not differ significantly in their assessments and there was not significant non-response bias in our study.

In addition, common method bias that could lead to an overstatement of the statistical relationship among our variables is also a key concern for questionnaire survey. To address common method bias, all questionnaire items were arranged so that the dependent variable followed, rather than preceded, the independent variables (Salanick & Pfeffer, 1977). And we also followed the suggestions of Podakoff and Organ (1986) and used Harman's singer-factor test for common method bias. Specifically, all the items were entered together into a singer factor analysis, and the results of the unrotated factor solution were examined. Results showed that five factors with eigenvalues greater than one accounted for 76.78% of the total variance and the first factor only accounted for 28.19% of the total variance. In other words, there was no single factor that can explain the majority of the total variance, which indicated that the common-method effects were insignificant in this research.

4 Results

4.1 Measurement Model and Reliability and Validity Test

We conducted a confirmatory factor analysis (CFA) to test the measurement model of this study. The results of CFA show that GFI = 0.91, RMR = 0.07, and RMSEA = 0.079, which indicate that the degree of absolute fit of the model is fine. In addition, CFI = 0.95, IFI = 0.95, NFI = 0.93, NNFI = 0.94, and RFI = 0.91, indicate a satisfactory degree of relative fit of the model. Furthermore, PNFI = 0.81, and X^2/df = 3.24, indicate the model is parsimonious. In a word, our measurement model shows a satisfactory goodness-of-fit.

As shown in Table 2, the Cronbach's alpha for all the measured variables are larger than 0.7. The composite reliability of alliance orientation, market dynamism, technological dynamism, relational capital and firm performance is 0.96, 0.71, 0.75, 0.94, and 0.87, respectively, all of which are above the acceptable threshold level of 0.70 (Nunnally, 1978). In sum, both the results of Cronbach's alpha and composite reliability tests confirm that our measurement

scales are reliable.

We tested convergent validity and discriminate validity through AVE and correlation coefficients for all measured variables. As shown in Table 2, the AVE of alliance orientation, market dynamism, technological dynamism, relational capital and firm performance is 0.73, 0.47, 0.51, 0.76, and 0.70, respectively, all of which are larger than 0.4, indicating that all our measurement scales have good convergent validity (Ford, McCallum, & Tait, 1986). In an analysis based on Fornell and Larcker (1981), we assessed the discriminant validity of the factors in our overall research model. We found that the square root of the average variance extracted by the measure of each factor was larger than the correlation of that factor's measure with all measures of other factors (see Table 3). Therefore, we concluded that all factors possessed strong discriminant validity.

Table 2 Items, Reliability and Convergent Validity of Scale

Variable	Items	Loading	*t*-value	*a*	C.R.	AVE
Alliance orientation	Actively monitor external environment to identify partnering opportunities	0.63	9.7	0.96	0.96	0.73
	Routinely gather information about prospective partners from various sources	0.67	10.6			
	Be alert to market developments that create potential alliance opportunities	0.82	13.9			
	Activities across different alliances are well coordinated	0.93	17.0			
	Systematically coordinate strategies across different alliances	0.93	17.1			
	Have processes to systematically transfer knowledge across alliance partners	0.92	16.7			
	Conduct periodic reviews of alliances to understand what we are doing right and where we are going wrong	0.91	16.3			
	Periodically collect and analyze field experience from our alliance(s)	0.91	16.4			
	Modify our alliance-related procedures as we learn from experience	0.91	16.3			
Market dynamics	Market demand changes rapidly and unstably	0.89	10.7	0.70	0.71	0.47
	Market demand is difficult to predict	0.63	8.0			
	The needs of new customers are very different from those of existing customers	0.46	5.9			

(*To be Continued*)

(*Continued*)

Variables	Items	Loading	*t*-value	*a*	C.R.	AVE
Technological dynamics	The frequency of new product or technology emergence in this industry is rather high.	0.81	11.7	0.73	0.75	0.51
	The technology in this industry changes rapidly	0.77	11.0			
	The rate of new product in this industry is high	0.53	7.2			
Relational capital	There is a close, personal interaction among partners	0.84	14.2	0.94	0.94	0.76
	The alliance is characterized by mutual respect among partners	0.90	16.0			
	The alliance is characterized by mutual trust among partners	0.87	15.2			
	The alliance is characterized by personal friendship among partners	0.88	15.3			
	The alliance is characterized by high reciprocity among partners	0.88	15.5			
Firm performance	Sale growth	0.86	14.3	0.87	0.87	0.70
	Market share	0.77	12.1			
	Net profit margin	0.87	14.5			

Note: *a* = Cronbach's alpha, C.R. = composite reliability; AVE = average variance extracted.

Table 3 Descriptive Statistics and Correlation Matrix (N = 195)

	1	2	3	4	5	6	7
1. Alliance orientation	**0.85**						
2. Market dynamism	0.05	**0.68**					
3. Technological dynamism	0.30**	0.36**	**0.71**				
4. Relational capital	0.65**	0.14*	0.31**	**0.87**			
5. Firm performance	0.47**	0.01	0.42**	0.45**	**0.84**		
6. Firm age	–0.05	0.02	–0.08	0.03	–0.15*	**1.00**	
7. Firm size	0.02	0.01	–0.03	0.04	–0.05	0.46**	**1.00**
Mean	4.79	4.38	4.67	4.30	4.35	8.18	1.98
S.D.	1.19	1.10	1.14	1.42	1.24	6.06	0.73

Note: S.D. = standard deviation. Bold numbers on the diagonal show the square root of the average variances extracted for all measured variable; ** and * indicate significant at the level of 0.01 and 0.05 respectively (2-tailed).

4.2 Hypotheses Testing

We used mean-based composite indicators for all variables that were measured

with multiple-item scales and tested the hypotheses using ordinary least squares (OLS) regression. Following the suggestions of Muller, Judd, and Yzerbyt (2005), we firstly tested the effect of alliance orientation, environmental dynamism and their interaction on firm performance, and then tested the effect of alliance orientation, environmental dynamism and their interaction on relational capital. Lastly, the mediating effect of relational capital was tested.

4.2.1 Effect of Alliance Orientation on Firm Performance and Moderating Role of Environmental Dynamism

We tested the moderating role of environmental dynamism on the relationship between alliance orientation and firm performance by using a hierarchical regression analysis and entering variables in four steps. Model 1 shows the estimates for control variables and their influence on firm performance. Firm age is significantly and negatively related to firm performance ($\beta = –0.163$, $P < 0.05$), while firm size has no significant influence on firm performance ($\beta = 0.024$, n.s.).

As indicated in Model 2, independent and control variables together explained 23.8 percent of the variance of the dependent variables. Moreover, alliance orientation was significantly and positively related to firm performance ($\beta = 0.466$, $P < 0.001$), which supported the argument that the higher the alliance orientation, the greater the firm performance becomes. Therefore, Hypothesis 1 was supported. Although we had no formal hypothesis for a direct effect, the results of Model 3 show a negative and significant relationship ($\beta = –0.130$, $P < 0.05$) between market dynamism and firm performance and a positive and significant relationship ($\beta = 0.349$, $P < 0.001$) between technological dynamism and firm performance.

Model 4 is used to test the interaction effects of alliance orientation and environmental dynamism on firm performance. To address potential multicollinearity between main effects and interaction terms, we centered the variables prior to calculating the interaction analyses (Aiken & West, 1991). To detect possible multicollineartiy, we not only investigated the correlation between the variables (see Table 3), but also calculated the variance inflation factors (all < 1.282) for Models 1–4, which were below the acceptable threshold level of 10. Thus, multicollinearity was not a concern in Models 1–4 (Hair et al., 1998). As shown in Models 4, significant interaction terms exist for market dynamism ($\beta = 0.119$, $P < 0.05$) and technological dynamism ($\beta = –0.038$, $P < 0.1$). In order to interpret these results, we followed the suggestion of Aiken and West (1991) and graphically plotted the interaction (see Fig. 2 and Fig. 3). The independent variable (alliance orientation) and the moderators (market dynamism, technological dynamism) took the value of one standard deviation below and one above the mean. Although Fig. 2 indicated a positive relationship between

alliance orientation and firm performance for both high and low levels of market dynamism, the stronger relationship at a high level, as indicated by the steeper upward slope, supported Hypothesis 2. Meanwhile, Fig. 3 indicates a positive relationship between alliance orientation and firm performance for both high and low levels of technological dynamism, the stronger relationship at a low level, as indicated by the steeper upward slope, supported Hypothesis 3.

Table 4 Results of Hierarchical Regression Analysis

Independent variables	Model 1	Model 2	Model 3	Model 4
Step 1: control variables				
Firm age	–0.163*	–0.118*	–0.093	–0.097
Firm size	0.024	–0.019	–0.014	–0.006
Step 2: main effects				
Alliance orientation		0.466***	0.375***	0.373***
Step 3: moderator				
Market dynamism			–0.130*	–0.132*
Technological dynamism			0.349***	0.342***
Step 4: interaction effects				
Alliance orientation × market dynamism				0.119*
Alliance orientation × technological dynamism				–0.038+
R^2	0.024	0.238	0.336	0.349
ΔR^2		0.214	0.098	0.013
F	2.319+	19.929***	19.103***	14.301***
VIF max	1.264	1.273	1.280	1.282

Note: N = 195. Standardized regression coefficients are reported. *** indicates $P < 0.0001$, ** indicates $P < 0.01$, * indicates $P < 0.05$, + indicates $P < 0.10$.

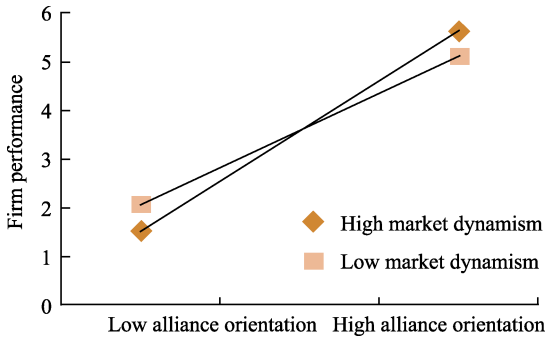

Fig. 2 Market Dynamism as a Moderator of Alliance Orientation-Firm Performance Relationship

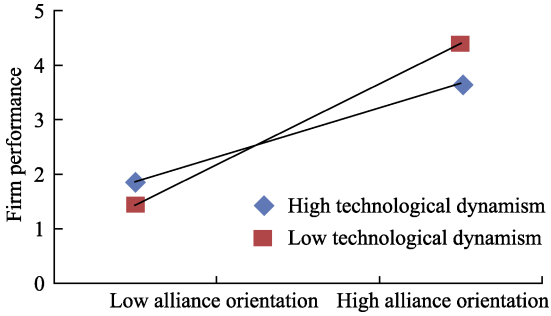

Fig. 3 Technological Dynamism as a Moderator of Alliance Orientation-Firm Performance Relationship

4.2.2 Effect of Alliance Orientation on Relational Capital and Moderating Role of Environmental Dynamism

We also tested the moderating effect of environmental dynamism on the relationship between alliance orientation and relational capital by using a hierarchical regression analysis and entering variables in four steps. Model 5 shows the estimates for control variables and their influence on relational capital. Results indicate no significant influence of firm age and firm size on relational capital ($\beta = 0.010$, n.s.; $\beta = 0.035$, n.s.).

As indicated in Model 6, independent and control variables together explain 42.9 percent of the variance of the dependent variable. Moreover, alliance orientation was significantly and positively related to relational capital ($\beta = 0.655$, $P < 0.001$), which supported the argument that the higher the alliance orientation, the greater the relational capital. Therefore, Hypothesis 4a was supported. Although we had no formal hypothesis for a direct effect, the results of Model 7 show a positive and significant relationship ($\beta = 0.102$, $P < 0.1$) between technological dynamism and relational capital.

Model 8 was used to test the interaction effects of alliance orientation and environmental dynamism on relational capital. To address potential multicollinearity between main effects and interaction terms, we centered the variables prior to calculating the interaction analyses (Aiken & West, 1991). To detect possible multicollineartiy, we not only investigated the correlation between the variables (see Table 3), but also calculated the variance inflation factors (all < 1.279) for Models 5–8, which were below the acceptable threshold level of 10 (see Table 5). Thus, multicollinearity was not a concern in Models 5–8 (Hair et al., 1998). As shown in Model 8, significant interaction terms existed for market dynamism ($\beta = 0.074$, $P < 0.1$) while technological dynamism had no significant effect on the relationship between alliance orientation and relational capital ($\beta = 0.076$, n.s.), which indicates that Hypothesis 6a was not

supported. In order to interpret the interaction effect of market dynamic, we followed the suggestion of Aiken & West (1991) and graphically plotted the interaction (see Fig. 4). The independent variable (alliance orientation) and the moderator (market dynamism) took the value of one standard deviation below and one above the mean. Although Fig. 3 indicated a positive relationship between alliance orientation and relational capital for both high and low levels of market dynamism, the stronger relationship at a high level, as indicated by the steeper upward slope, supporting Hypothesis 5a.

Table 5 Results of Hierarchical Regression Analysis

Independent variables	Model 5	Model 6	Model 7	Model 8
Step 1: control variables				
Firm age	0.010	0.061	0.066	0.062
Firm size	0.035	–0.004	–0.003	0.002
Step 2: main effects				
Alliance orientation		0.655***	0.621***	0.611***
Step 3: moderator				
Market dynamism			0.072	0.060
Technological dynamism			0.102+	0.097
Step4: interaction effects				
Alliance orientation × market dynamism				0.074*
Alliance orientation × technological dynamism				–0.076
R^2	0.002	0.429	0.448	0.462
ΔR^2		0.427	0.019	0.014
F	0.155	47.791***	30.731***	22.972***

Note: N = 195. Standardized regression coefficients are reported. *** indicates $P < 0.0001$, ** indicates $P < 0.01$, * indicates $P < 0.05$, + indicates $P < 0.10$.

4.2.3 Mediating Effect of Relational Capital

To test whether relational capital mediates the relationship between alliance orientation and firm performance, as well as the interaction effects of alliance orientation and environmental dynamism on firm performance, we applied Baron & Kenny's (1986) approach to test for mediation. As shown in Table 6, the dependent variables for Models 4 and 9 and Model 8 were firm performance and relational capital, respectively. In Model 4, the path from alliance orientation to firm performance was significant, so was the interaction effect of alliance orientation and market dynamism on firm performance. As indicated in Model 9, when the relational capital construct was included, the direct path from alliance

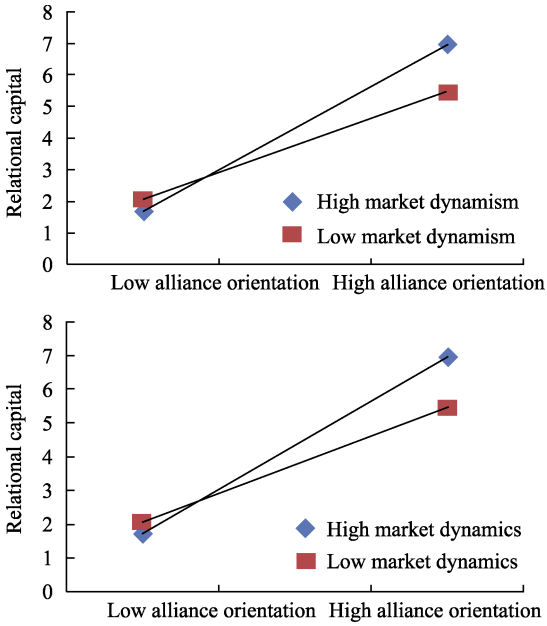

Fig. 4 Market Dynamism as a Moderator of Alliance Orientation-Relational Capital Relationship

Table 6 Test for Mediation of Relational Capital

Dependent variables	Model 4 Firm performance	Model 8 Relational capital	Model 9 Firm performance
Firm age	–0.097	0.062	–0.116+
Firm size	–0.006	0.002	0.006
Alliance orientation	0.373***	0.611***	0.252***
Market dynamism	–0.132*	0.060	–0.146*
Technological dynamism	0.342***	0.097	0.315***
Alliance orientation × market dynamism	0.119*	0.074*	0.103+
Alliance orientation × technological dynamism	–0.038+	–0.076	–0.062
Relational capital			0.206**
R^2	0.349	0.462	0.374
F	14.301***	22.972***	13.875***

Note: N = 195. Standardized regression coefficients are reported. *** indicates $P < 0.0001$, ** indicates $P < 0.01$, * indicates $P < 0.05$, + indicates $P < 0.10$.

orientation to firm performance and the interaction effects of alliance orientation and market dynamism on firm performance were also significant but the path

coefficients became smaller (from 0.373 to 0.252 for the effect of alliance orientation on firm performance; from 0.119 to 0.103 for the interaction effects of alliance orientation and market dynamism on firm performance). Therefore, relational capital partially mediated the relationship between alliance orientation and firm performance, supporting Hypothesis 4b and the interaction effects of alliance orientation and market dynamism on firm performance was also partially mediated by relational capital, supporting Hypothesis 5b.

As indicated in Model 4, the interaction effects of alliance orientation and technological dynamism on firm performance were significant ($\beta = -0.038$, $P < 0.1$). However, the interaction effect of alliance orientation and technological dynamism on relational capital was not significant. Therefore, Sobel (1982) test was conducted to verify whether relational capital mediated the interaction effects of alliance orientation and technological dynamism on firm performance. The result of Soble's test did not confirm the mediating role of relational capital for the interaction effects of alliance orientation and technological dynamism on firm performance ($Z = 1.19$, $P > 0.1$), thus Hypothesis 6b was not supported.

5 Conclusion and Discussion

Drawing on the theoretical background of the dynamic-capability view and social capital theory, this study investigated the effect mechanism of alliance orientation on firm performance and got important research results. Firstly, results indicate that alliance orientation has a positive impact on firm performance. In other words, it is likely that alliance-oriented firms can identify potential alliance partners by scanning external environment and have high capability to coordinate present alliance activities and learn from alliance experience, all of which are helpful for firms to improve their performance. Secondly, we examined the moderating effect of environmental dynamism and found that market dynamism has a positive moderating effect on the relationship between alliance orientation and firm performance while technological dynamism negatively moderates the positive relationship between alliance orientation and firm performance. This result is helpful for us to understand that how firms match their alliance strategic and external environment to improve their performance. Lastly, by examining the mediating role of relational capital on the relationship between alliance orientation and firm performance and on the interaction effects of alliance orientation and environmental dynamism on firm performance, we found that relational capital partially mediates the relationship between alliance orientation and firm performance and the interaction effects of alliance orientation and market dynamism on firm performance is partially mediated by relational capital. The result further explains the effect mechanism of alliance orientation on firm performance, which also enriches the theoretical results in the field of strategic

orientation.

This study has important implications for Chinese firms on how to improve performance by strategic alliance. Firstly, alliance orientation exerts a positive impact on firm performance. Therefore, firms with poor resources should positively scan external environment, actively make reliable alliance relationship with potential partners and coordinate different alliance activities to make full use of resources of partners that can improve the vale of alliance. Secondly, research results also indicate the match between alliance strategy and environmental dynamism has a significant impact on firm performance. Therefore, firms should adopt an alliance-oriented strategy according to the actual situation and pay close attention to the changing environment that is helpful for firms to make use of alliance strategy to enhance performance. Lastly, research results show that the impact of alliance orientation on firm performance and the interaction effects of alliance orientation and market dynamism on firm performance are mediated by relational capital. Therefore, when conducting alliance orientation strategy, firms should be committed to cultivate relational capital between alliance partners besides coordinating the alliance activities, which enables firms to enhance their performance.

This study also has several limitations. First, the alliance activity as described in our study is regarded as a broad definition, including different forms of alliances (joint venture alliance, equity exchange alliance, et al.) and different contents of alliances (joint R&D, joint production, etc.). However, difference exits among different forms or contents of alliances in essence (Anand & Khanna, 2000). Therefore, future research can explore the effect of alliance orientation on firm performance for different forms or contents of alliances. Second, the data of this study comes solely from high-technology industry, in which numbers of firms pay much attention to strategic alliance. As a result, caution is required before extending the conclusions to other traditional industries. Therefore, future research can explore the effect mechanism of alliance orientation on firm performance in different industries. Lastly, as we collected only cross-section data, the conclusions in essence are correlations among variables. Thus more precise causality relationships among variables of our research models can be verified by longitudinal studies or case studies in the future.

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