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PRODUCT INNOVATION STRATEGY AND THE PERFORMANCE OF NEW TECHNOLOGY VENTURES IN CHINA

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Investigating the effect of product innovation strategy on the performance of new technology ventures in China, we found the innovation-performance link was contingent on both environmental factors, including environmental turbulence and institutional support, and the relationship-based strategies of the ventures, such as strategic alliances for product development and political networking. Our results suggest the need for simultaneous consideration of environment- and relationship-based strategy factors as moderators in the discourse on product innovation strategy among new technology ventures.

Scholars argue that product innovation is a critical strategy for new technology ventures, defined here as technology-based firms eight years old or younger (Boeker, 1989; Eisenhardt & Schoonhoven, 1990; McCann, 1991). Despite its potential attractiveness, the empirical findings on the impact of product innovation strategy on new technology venture performance appear inconclusive. Some studies have indicated that product innovation may have a negative relationship with new technology venture performance (Chandler & Hanks, 1994). In fact, in a review of the large body of the relevant literature, Capon, Farley, and Hoenig (1990) found that empirical results of prior studies have been mixed, with over two-thirds of the studies finding a positive relationship between product innovation strategy and firm performance, and the rest finding a negative relationship or none at all. A possible explanation for the contradictory empirical results is that most studies have not examined factors that may moderate the strength of the relationship between product innovation strategy and firm performance. Given the paramount importance of contingency factors in strategy research (Ginsberg & Venkataraman, 1985), the lack of studies investigating moderation of the relationship between product innovation strategy and new technology venture performance is an important research gap.

In this study, we sought to add to prior studies conducted in the West that have explored the outcomes of product innovation strategy among new technology ventures in two ways. First, product innovation is a high-risk and resource-consuming activity. As newly established firms, new technology ventures tend to have severely limited managerial and financial resources (Eisenhardt & Schoonhoven, 1990), and they may be particularly vulnerable in pursuing this strategy. Thus, how both environmental factors and relationship-based strategies moderate the product innovation strategy–performance relationship becomes an important issue. Using resource dependence theory as a theoretical angle (Pfeffer & Salancik, 1978), we are the first to develop and test hypotheses on such moderating effects. Second, we investigated these hypotheses among a sample of new technology ventures from China. Extant research suggests that transitional economies such as China pose severe resource, management and other challenges for firms (Nee, 1992; Peng & Heath, 1996; Xin & Pearce, 1996). Thus, China provides a highly interesting setting for examining the role of product innovation strategy in new technology venture performance. Insights in this respect are also important as they may inform managers on the conditions and strategies appropriate to enhance the effectiveness of a product innovation strategy.

THEORETICAL FRAMEWORK AND HYPOTHESES

Brown and Eisenhardt (1995) identified two major research streams on innovation. The first stream

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examines issues related to the diffusion of innovations across nations, industries, and organizations (e.g., O'Neill, Pouder, & Buchholtz, 1998). In this stream, an innovation is defined as a technology, strategy, or management practice that a firm is using for the first time, whether or not other organizations or users have previously adopted it, or as a significant restructuring or improvement in a process (Nord & Tucker, 1987: 6). The second stream examines the influence of organizational structures, processes, and people on the development and marketing of new products (e.g., Zirger & Maidique, 1990). Within this research stream, an innovation refers to a new product that an organization has created for the market; it represents the commercialization of an invention, where invention is an act of insight (Myers & Marquis, 1969). New products may take different forms, such as upgrades, modifications, and extensions of existing products; they may be new to the firm, the market, or the world.

This latter research stream may be further split into two categories based on the level of analysis adopted by scholars. The first category, the more popular one, focuses on the project level and examines all the activities needed to conceive, design, produce, and deliver a new product to the market (e.g., Myers & Marquis, 1969; Zirger & Maidique, 1990). The second category focuses on the firm or strategic business unit (SBU) as the unit for analysis and examines product innovation as a dimension of the entrepreneurial strategic posture of firms (Covin & Slevin, 1989; Miller, 1987; Zahra & Covin, 1993). Objective evidence of a firm's product innovation strategic posture may take several forms, such as the level of R&D expenditures (Boulding & Staelin, 1995; Miller, 1987) and the number of engineers, scientists, and other technical personnel employed (McCann, 1991). Subjective evidence may include evaluations of a firm's degree of emphasis (in terms of resource allocation) on new product development, varieties of new product lines, and frequency or speed in introducing such products to market (Covin & Slevin, 1989; Miller, 1987; Zahra & Covin, 1993).

Consistent with this latter line of research, we define *product innovation strategy* as a reflection of a firm's commitment to developing and marketing products that are new to the firm and/or the market. Thus, a Chinese new technology venture's allocation of substantial resources to R&D, its developing a variety of products new to the firm, quickly imitating foreign products for sale in China, and making significant changes in existing products to improve benefits and the variety of market choices are all indications of commitment to a product innovation strategy.

Most of new venture research focuses on product innovation as a strategic posture (e.g., Boeker, 1989; Chandler & Hanks, 1994; McCann, 1991). However, as noted earlier, prior empirical results on the relationship between product innovation strategy and firm performance are inconclusive, leading us to propose a contingency approach in the current study. The contingency view has a long tradition in organization and strategy research (e.g., Burns & Stalker, 1961; Lawrence & Lorsch, 1967) and has also emerged in recent product innovation research (Boulding & Staelin, 1995; Covin & Slevin, 1989).

Our conceptual framework is informed by resource dependence theory, which stresses the effects of the environment and other external forces on how firms organize to compete in the marketplace (Pfeffer & Salancik, 1978). It offers an explanation not only for why firms adopt product innovation strategies, but also for why such a strategy's effect on performance may be contingent upon the environment and other firm strategies. It has two broad tenets that are particularly relevant to our study (cf. Greening & Gray, 1994). First is the tenet that firms attempt to manage uncertainty and mitigate the effects of external forces in order to enhance their performance. Second is the tenet that firms are constrained by and depend on other organizations that control critical resources for them. Consequently, managers make strategic choices concerning interorganizational and other external relationships in an attempt at "altering the system of constraints and dependencies confronting the organization" (Pfeffer & Salancik, 1978: 267). Drawing on these two tenets, we argue that the effectiveness or ineffectiveness of the product innovation strategies of new technology ventures in China depends on the perceived environmental conditions and the relationship-based strategies they adopt. We present arguments pertaining to each contingency factor in turn.

Moderating Role of Environmental Factors

The first tenet of resource dependence theory suggests that managers interpret demands and dependencies in their environment prior to making strategic choices and instituting adjustments to organizational strategies (Hrebeniak & Joyce, 1985; Pfeffer & Salancik, 1978). In this respect, we argue that the effectiveness of product innovation strategies of new technology ventures in China depends on managerial perceptions of the peculiarities of the transitional economic environment. New technology ventures in China face more complex envi-

ronmental situations than their counterparts in market economies. The relatively underdeveloped government, legal, and financial institutions in China lead to environmental turbulence as well as dysfunctional competition (Nee, 1992; Peng & Heath, 1996; Xin & Pearce, 1996). We believe that the effectiveness of Chinese new technology ventures' use of a product innovation strategy may depend not only on how they manage environmental turbulence and dysfunctional competition but also on the degree of support they receive from government institutions to alleviate their resource and managerial problems.

Dysfunctional competition refers to the extent to which the competitive behavior of firms in a market is opportunistic, unfair, or even unlawful. Given the inadequate legal framework that defines and protects property rights in transitional economies, firms engage in widespread opportunistic and unlawful behavior (Nee, 1992; Peng & Heath, 1996), with the tacit support of local authorities in some cases (Tsang, 1996). For example, it has been observed that patent and copyright violations, broken contracts and agreements, and unfair competitive practices have become widespread in China (Guo, 1997). The intellectual property rights of new technology ventures resulting from product innovation may go unprotected, making product innovation a highly risky and less profitable strategy. Thus, in such a dysfunctional competitive environment, new technology ventures' dependence on external resources becomes vital for their survival.

Institutional support reflects the extent to which administrative institutions (such as government departments) provide support for firms in order to reduce the adverse effects of the inadequate institutional infrastructure in the transition process (Xin & Pearce, 1996). In an economic transition, the redistributive institutions interact with market forces in a manner that subordinates market institutions (Nee, 1992). Thus, although new technology ventures in market economies may receive support from government institutions, such support is particularly significant for those in transitional economies, given their underdeveloped "factor markets" (Peng & Heath, 1996). Since product innovation is a resource-consuming strategy, such support should alleviate the risks and resource constraints for new technology ventures in China pursuing such a strategy (Guo, 1997; Tsang, 1996).

Environmental turbulence refers to the degree of change and unpredictability of a market environment. New technology ventures tend to adopt a product innovation strategy in a turbulent environment because such an environment triggers "unlearning" of current routines and offers novel opportunities to take advantage of emerging market needs (Miller, 1987). For these reasons, extant research suggests a product innovation strategy leads to higher performance in volatile environments. For example, Covin and Slevin (1989) found that, in contrast to small firms in stable and benign environments, those in volatile and hostile environments obtained higher performance from product innovation. This discussion suggests the following hypothesis:

Hypothesis 1a. The relationship between the use of a product innovation strategy and the performance of new technology ventures in China is moderated negatively by perceived dysfunctional competition.

Hypothesis 1b. The relationship between the use of a product innovation strategy and the performance of new technology ventures in China is moderated positively by institutional support.

Hypothesis 1c. The relationship between the use of a product innovation strategy and the performance of new technology ventures in China is moderated positively by environmental turbulence.

The Moderating Role of Relationship-Based Strategies

According to resource dependence theory, interorganizational strategies are pursued to mitigate the adverse impact of external forces and thus enhance the efficacy of an organization's strategies (Hrebeniak & Joyce, 1985; Pfeffer & Salancik, 1978). Consistently, research suggests that strategic alliances and networking with people with political influence are important extraorganizational strategies for firms to use to secure resources and influence (Peng & Heath, 1996). Anecdotal evidence suggests that new technology ventures in transitional economies tend to develop strategic alliances with other firms and relationships with government and administrative officials in order to alleviate their resource inadequacy (Beijing Experimental Zone Office, 1995; Nee, 1992; Tsang, 1996; Zhao & Aram, 1995). Indeed, such relationship-based management capabilities are argued to be potential substitutes for absent institutional infrastructure in transitional economies (Xin & Pearce, 1996). We examine two such strategies: strategic alliances for product development and political networking.

New technology ventures frequently enter into cooperative agreements such as licenses, R&D agreements, and joint ventures with other firms to develop and market new products (Bucklin & Sen-

gupta, 1993; Dowling & McGee, 1994; Shan, 1990). These agreements, which we refer to as strategic alliances for product development, are frequently used by new technology ventures in transitional economies to complement internal product innovation efforts. However, such alliances are often difficult to manage because of contractual and cultural misunderstandings, and they may divert scarce resources and managerial attention away from the core strategy of a firm (Peng & Heath, 1996). Despite the potential problems, cooperative alliances have been shown to lead to successful product innovation (Kotabe & Swan, 1995). This is because these alliances help new technology ventures to acquire resources to improve their technical and marketing capabilities and also provide reputation benefits for the effective marketing of their new products (McGee, Dowling, & Meggins, 1995; Shan, 1990).

Political networking refers to a firm's allocating resources to cultivate relationships with government officials, banks, and administrative and other regulatory agencies (Kotler, 1986; McKee, Varadarajan, & Pride, 1989; Tsang, 1996). Note that this construct differs from institutional support, which is an environment-based rather than a relationship-based construct. As discussed previously, institutional support reflects the degree of support from government institutions perceived by a new technology venture's managers. Political networking is a concept similar to *guanxi* (use of personal connections and the exchange of favors) and is seen as a potential substitute for the lack of institutional infrastructure in China (Xin & Pearce, 1996). For example, given the weak institutional arrangements in China, cultivating political connections is argued to be an effective way for new technology ventures to gain resources and influence to support new initiatives (Peng & Heath, 1996; Xin & Pearce, 1996). Providing testimony for its moderating role, McKee, Varadarajan, and Pride (1989) found that prospector firms achieved better results from product innovation efforts than other types of firms did, because prospectors placed more emphasis on engaging in political activities to support those efforts. This discussion leads to the following hypotheses:

Hypothesis 2a. The relationship between the use of a product innovation strategy and the performance of new technology ventures in China is positively moderated by strategic alliances for product development.

Hypothesis 2b. The relationship between the use of a product innovation strategy and the performance of new technology ventures in China is positively moderated by political networking.

METHODS

Sample and Data Collection

We selected 300 new technology ventures from a sample frame of 500 firms in the Beijing Experimental Zone (BEZ), one of the most developed high-technology industrial zones in the country. The ventures, which were selected on the basis of their willingness to participate in the research, covered a broad range of high-technology industries in the BEZ. They met three criteria used to define a new technology venture in China: that the management of the firm be composed of engineers or scientists; that 30 percent or more of its employees be technical employees; and that it spend 3 percent or more of total sales on R&D. Consistent with an accepted definition of a new venture, all sampled firms were eight years old or younger (e.g., McDougall, Covin, Robinson, & Herron, 1994).

The conventional method of back-translation was used to translate the measures from English to Chinese. We refined the measures through in-depth interviews with 8 founders and 15 senior managers from ten new technology ventures to ensure their relevance to the Chinese context. We collected the data through on-site interviews. This procedure allowed us to assess the suitability of the respondents for the study. It also offered respondents an opportunity to ask for clarifications about the issues under study. We minimized biases associated with the retrospective data collection process following the suggestions of Miller, Cardinal, and Glick (1997). We interviewed top managers who were directly involved in the firms' strategic decision making. We restricted the recall time frame to three years and assured confidentiality to all respondents. Finally, we offered to provide a summary of the study results to each respondent.

We received 202 completed questionnaires, of which 18 were deemed not usable because of missing data. Thus, the effective response rate was 36.8 percent (184/500). We received 54.4 percent of our responses from CEOs and the rest from R&D/engineering or marketing managers. The distribution of responses over these groups was virtually the same for all but two of the study variables, so we pooled the data for further analysis. On a 9-point scale, the mean levels of informants' knowledge and the extent of their involvement in product innovation in the new technology ventures were 7.18 and 7.09, respectively. The informants' average experience in the industry was 7.8 years. These data indicate that our informants were knowledgeable about the issues under study.

Of the responding new technology ventures, 50.5 percent were in the electronic information industry

(information technology, telecommunications, electronics, computer manufacturing, and computer peripherals); 17 percent were in integrated optical-mechanical and electric products; 12.6 percent were in new energy and new materials; 10.4 percent were in new pharmaceutical and bioengineering; and 9.3 percent were in industries classified as "other," such as scientific instruments. These percentages are generally consistent with those published by the BEZ Office (1995), which indicate an industry distribution of 47.9 percent, 20.1 percent, 13.1 percent, 9.3 percent, and 9.6 percent, respectively. We view this consistency as evidence that our sample is representative of new technology ventures in the Beijing Experimental Zone. Mean R&D expense as a percentage of sales was 20 percent. On the average, 39 percent of firms' total employees were engineers or scientists. Sixty-six percent of the new technology ventures were independent ventures, and the rest were corporate ventures. Finally, we found no significant nonresponse bias based on new technology venture size or age.

Measures and Validation

The Appendix presents the measures and their sources. As is indicated there, we created some new measures specifically for the study. Measures of three constructs—product innovation strategy, environmental turbulence, and strategic alliance for product development—were adapted from the extant literature. The adaptation involved making word and sentence changes to enhance understanding in the Chinese context. For example, to measure product innovation strategy, we adapted Covin and Slevin's (1989) semantic differential items, such as "a strong emphasis on the marketing of tried and true products or services/a strong emphasis on R&D, technological leadership, and innovations" and "changes in product or service lines have been mostly of minor nature/changes in product or service lines have usually been quite dramatic" to read "placed emphasis on developing new products through allocation of substantial financial resources" and "developed a large variety of new product lines." Note that new technology venture performance is composed of five financial and four market performance measures, which we combined into a single variable because they were highly correlated ($r = .66$, $p < .001$).

A common method variance problem can result from collecting the dependent and independent variables from the same respondent in the same survey. We checked for this potential problem with the Harman one-factor test (Podsakoff & Organ, 1986). A factor analysis of the dependent and independent variables yielded seven factors accounting for 60 percent of the variance, and factor 1 accounted for 21 percent of the variance. Since a single factor did not emerge and one general factor did not account for most of the variance, common method variance is unlikely to be a serious problem in the data.

We examined the unidimensionality and convergent validity of the constructs with confirmatory factor analysis. Given sample size restrictions, we divided the constructs into two submodels of theoretically related groups: environmental variables and strategy variables (cf. Bentler & Chou, 1987). The fit indexes indicate that the models fit the data well (environmental variables: $\chi^2 = 115.29$, $p = .00$; GFI = .92, RMSEA = .06, NNFI = .95, CFI = .96; strategy variables: $\chi^2 = 44.25$, $p = .05$; GFI = .95, RMSEA = .05, NNFI = .94, CFI = .96).[1] All items loaded on their respective constructs, and each loading was large and significant at the .01 level. As shown in the Appendix, the constructs have high reliability, with all but one having alphas over .70.

To assess the discriminant validity of the constructs, a model in which the correlation between a pair of constructs was constrained was compared with an unconstrained model. To satisfy the discriminant validity criteria, the fit of the unconstrained model had to be significantly better than that of the constrained model. The "pairwise" tests among the constructs indicated that in each case the chi-square difference was significant at the .01 level, providing evidence of discriminant validity. For example, the comparison involving product innovation strategy and strategic alliances for product development yielded 179.02 ($p < .01$; complete results are available upon request). Table 1 presents the correlation matrix, descriptive statistics, and reliabilities of the constructs.

ANALYSIS AND RESULTS

We used hierarchical moderated regression analysis to test the contingency hypotheses. Prior to the creation of interaction terms, both independent and moderator variables were mean-centered to reduce the potential problem of multicollinearity (Aiken & West, 1991). Examination of the variance inflation factors (VIFs) associated with each regression coefficient showed a range of from 1.01 to 1.65, suggesting no serious problems with multicollinearity. Four control variables were included: new technol-

[1] GFI is the goodness-of-fit index, RMSEA is the root-mean-square residual, NNFI is the nonnormed fit index, and CFI is the comparative fit index.

TABLE 1
Correlation Matrix and Summary Statistics[a]

Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9	10
1. New technology venture performance	3.52	0.62										
2. Product innovation strategy	3.92	0.88	.47***									
3. Dysfunctional competition	3.36	0.82	−.01	.18*								
4. Institutional support	2.78	0.87	.17	.10	−.19*							
5. Environmental turbulence	3.08	0.87	−.09	.13	.19*	.09						
6. Strategic alliance for product development	3.84	0.96	.17	.37***	.09	.24**	.28**					
7. Political networking	3.95	0.80	.19*	.36***	.09	.08	.14	.34***				
8. New technology venture size	160.98	200.16	−.04	−.05	−.14	−.01	.07	−.07	.07			
9. New technology venture origin	0.34	0.47	−.16	−.16*	.03	.07	−.16*	−.22**	−.09	−.14		
10. New technology venture age	4.83	2.03	−.02	−.02	−.06	−.01	.00	−.04	−.05	.25***	−.06	
11. New technology venture ownership	0.78	0.42	.23**	.15	−.01	.13	.06	.14	.02	−.23**	−.27**	−.10

[a] $n = 184$.
* $p < .05$
** $p < .01$
*** $p < .001$

ogy venture *size* (the natural logarithm of the number of full-time employees), *origin* (dummy-coded: "independent" = 0, "corporate" = 1), *age* (in years), and form of *ownership* ("state or collectively owned" = 0, "joint venture/privately-owned" = 1). Previous research has indicated that these factors may affect new technology ventures' strategy making and performance (Chandler & Hanks, 1994; McCann, 1991). Table 2 presents our results.

As shown in Table 2 (model 1), product innovation strategy had a positive relationship with new technology venture performance ($b = 0.34$, $p < .001$). The addition of the interaction terms (model 2) increased the multiple squared correlation coefficient (R^2) by 9 percent, compared to model 1, indicating the existence of moderating effects. Hypothesis 1a, positing that the relationship between product innovation strategy and new technology venture performance will be negative when dysfunctional competition is high, was not supported. Hypothesis 1b was supported, as the interaction between product innovation strategy and institutional support was significant and positively related to new technology venture performance ($b = 0.22$, $p < .01$; $\Delta R^2 = .05$, $p < .01$). Similarly, Hypothesis 1c was supported, as the interaction between production innovation strategy and environmental turbulence was positive and significantly related to new technology venture performance ($b = 0.16$, $p < .05$; $\Delta R^2 = .02$, $p < .05$). Hypothesis 2a, dealing with the contingent effects of strategic alliances for product development, was refuted ($b = -0.17$, $p < .01$; $\Delta R^2 = .03$, $p < .05$). Finally, Hypothesis 2b, positing a positive moderating effect of political networking, was not supported. To facilitate interpretation, we plotted the moderating effects, as shown in Figures 1a, 1b, and 1c. Figures 1a and 1b indicate that when institutional support and environmental turbulence are higher, product innovation strategy has a stronger, positive relationship with new technology venture performance, thus supporting Hypotheses 1b and 1c. Figure 1c, however, indicates that, contrary to Hypothesis 2a, product innovation has stronger, negative relationship with new technology venture performance when strategic alliances for product development are more frequent.

We noted the subjective nature of our measures previously and addressed the potential common method problems. We were successful in obtaining three-year average sales and market share growth data from a limited sample (in the 47–62 range). We tested our model again, replacing the subjective dependent variable, new technology venture performance, with each of these more objective performance measures. Although the results of these analyses are limited by the small sample used, and they must therefore be treated with some caution,

TABLE 2
Results of Regression Analyses

Independent Variables	New Technology Venture Performance			
	Model 1		Model 2	
	b	*t*	*b*	*t*
Controls				
New technology venture size	0.00	0.07	0.00	0.08
New technology venture origin	−0.11	−0.99	−0.17	−1.56
New technology venture age	−0.00	−0.20	−0.01	−0.67
New technology venture ownership	0.19	1.48	0.20	1.64
Direct effects				
Product innovation strategy	0.34	4.97***	0.35	5.01***
Dysfunctional competition	−0.01	−0.27	−0.03	−0.46
Institutional support	0.09	1.49	0.05	0.74
Environmental turbulence	−0.13	−2.04*	−0.15	−2.30*
Strategic alliance for product development	−0.02	−0.35	−0.01	−0.19
Political networking	0.03	0.40	0.02	0.34
Moderating				
Product innovation strategy × dysfunctional competition			−0.04	−0.61
Product innovation strategy × institutional support			0.22	2.89**
Product innovation strategy × environmental turbulence			0.16	2.39*
Product innovation strategy × strategic alliance for product development			−0.17	−2.76**
Product innovation strategy × political networking			0.01	0.15
Constant	2.28	5.46***	2.29	5.58***
R^2	.30		.39	
ΔR^2			.09**	
F	4.72***		4.61***	
df	10, 116		15, 111	

* $p < .05$
** $p < .01$
*** $p < .001$
One-tailed for hypothesized effects and two-tailed for controls.

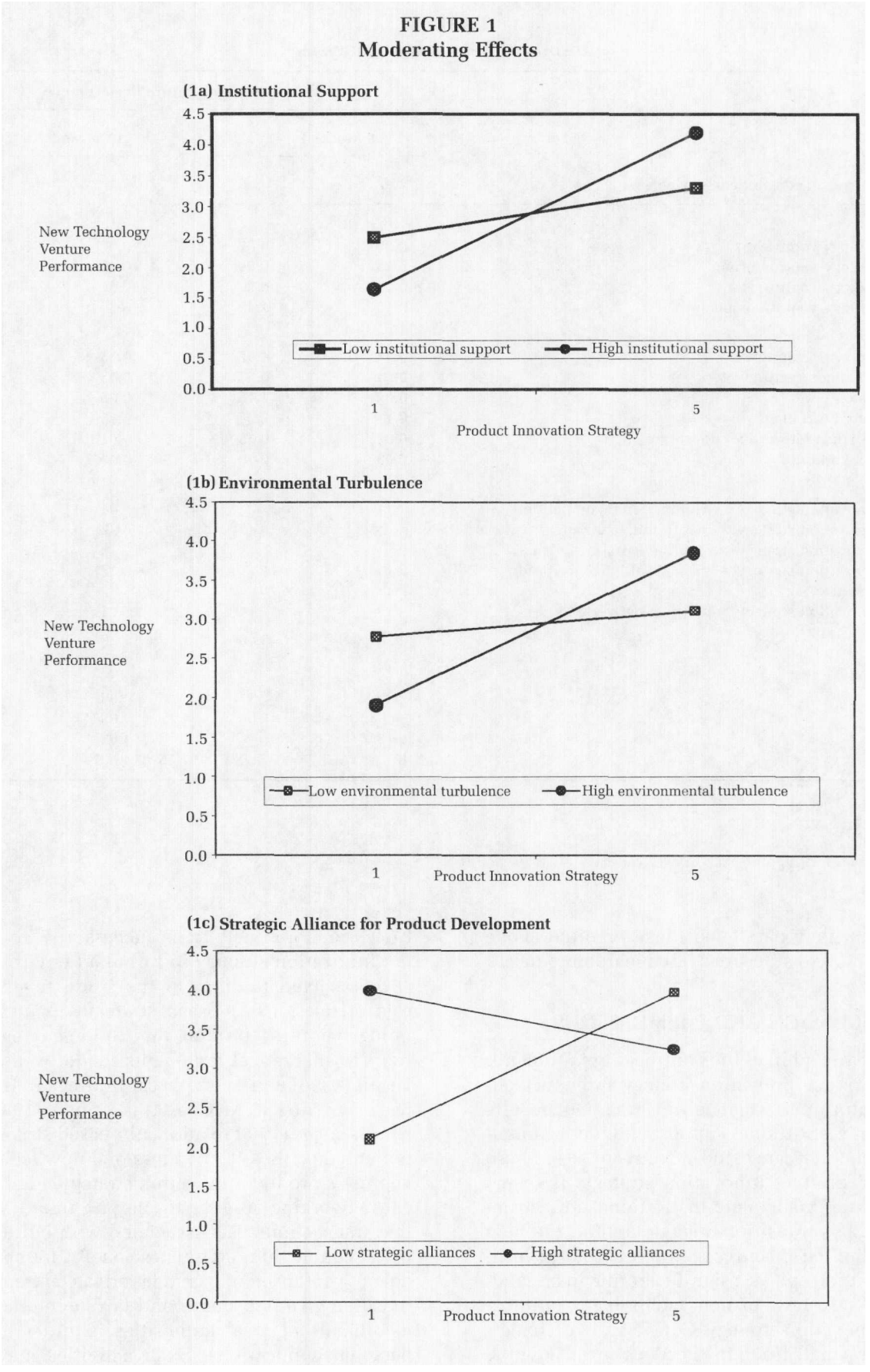
we note that they paralleled those reported above (supplementary results are available upon request).

DISCUSSION AND IMPLICATIONS

This study examined the contingent relationship between product innovation strategy and new technology venture performance in China. Our results suggest that institutional support and environmental turbulence enhance the effectiveness of these companies' product innovation strategy. It seems that, given the inadequate institutional infrastructure in China's transitional economy and the new ventures' limited resources, support from government institutions plays a significant role in enhancing the effectiveness of new technology ventures' product innovation strategy. Consistent with extant research on small firms in the West (e.g., Covin & Slevin, 1989), our results also indicate these ventures are more likely to be successful with a product innovation strategy in turbulent environments.

Unexpected findings of the study relate to the role of relationship-based strategies in new technology ventures' product innovation strategy. Contrary to theoretical arguments made by Peng and Heath (1996) and to empirical findings in the West (e.g., Dowling & McGee, 1994; Shan, 1990), our results suggest that relationship-based strategies do not enhance the effectiveness of a new technology venture's product innovation strategy. First, political networking appears to play no role. It may be that transaction costs associated with building political connections attenuates benefits for new technology ventures. For example, private entrepreneurs in China give free shares and lavish entertainment to officials of local authorities in order to build personal connections. Such activities may drain the finances of the firms as well as hamper their

FIGURE 1
Moderating Effects



efficient management (Tsang, 1996). In line with this argument, Guthrie commented on the declining economic importance of guanxi in China and the increasing realization that "*guanxi* only helps if you are competitive" (1998: 281). Our finding, coupled with this comment, appears to challenge the assertion that political networking is a performance-enhancing strategy and may substitute for the inadequate institutional infrastructure in transitional economies (Nee, 1992; Peng & Heath, 1996; Xin & Pearce, 1996).

The second surprising finding is that strategic alliances for product development appear to hinder the positive effect of product innovation strategy on new technology ventures' performance. A plausible explanation for this finding is that new technology ventures in China may have managerial and other problems in leveraging the benefits of such alliances, perhaps owing to lack of experience. As McGee, Dowling, and Megginson (1995) found, the success of such strategic alliances in new technology ventures may be determined largely by the prior experience of their management teams. It is also possible that difficulties in the relationships between alliance partners and new technology ventures may divert scarce managerial resources and attention away from core product innovation strategies.

These results are informative for new technology venture researchers and managers in two main respects. First, they indicate that future research examining the efficacy of new technology ventures' use of a product innovation strategy in transitional economies needs to broaden its purview to address complex and diverse environmental situations as well as the extraorganizational relationship strategies these ventures adopt. Second, the results suggest that successful management of a product innovation strategy in new technology ventures in transitional environments may require careful assessment of the potentially conflicting effects of the environment and firm strategies. Unlike new technology venture researchers in the West, who have not examined the contingent effects of environmental and strategy factors simultaneously, we found that engaging in strategic alliances for product development tends to hinder the effectiveness of a product innovation strategy. This finding is a contrast to those for institutional support and environmental turbulence.

These results need to be interpreted within the limitations of the study. The nonrandom sampling procedure limits the generalizability of our findings. Hence, replicating and extending this study in other regions of China and in other transitional economies may provide a basis for an external validation of the framework tested here. The relatively low amount of variance in performance explained suggests that other factors affecting new technology venture performance in China deserve attention. One possible area of research would be the impact of founder or top management team characteristics (Boeker, 1989; Eisenhardt & Schoonhoven, 1990). Another possible area of research emerges from the fact that we did not control for either the background of the strategic alliance partners or the type of alliances. New technology venture alliances may involve either domestic or foreign firms and different types of agreements, such as R&D contracts, production of new products under license, and joint ventures. Depending on the specific alliance strategy it employs and the loci of its markets, the strategic and environmental issues facing a new technology venture could vary drastically, and these variables should be examined in future research.

Although we adapted four items from past research (e.g., Miller, 1987) to measure environmental turbulence, we retained only two items, which yielded an alpha of .50. In this respect, given the very low reliability of the environmental turbulence construct in the current study, future research needs to examine its dimensions, which include hostility, dynamism, and heterogeneity (Covin & Slevin, 1989; Lawrence & Lorsch, 1967). Additionally, this study would have benefited from a time lag between the measurement of product innovation strategy and performance, particularly in view of the single-respondent method and the potential common method problems. The results from our sample of ventures based on objective measures mentioned previously provide some confidence in our conclusions. However, we caution that inferring causality in the relationships uncovered here may be premature. Kenny (1979) argued that careful study of cross-sectional relationships should precede more costly time-lagged studies in efforts to establish causal relationships. We suggest that our results could serve as a foundation for such a future study.

In conclusion, we note that this is a small, preliminary attempt to study a large and complex issue, product innovation of new technology ventures, in a context of rapid and constant change. Our results provide unique insights into some of the idiosyncratic factors in China that may affect the effectiveness of the use of a product innovation strategy among new technology ventures. However, since cultural, political, and economic factors intertwine to influence these ventures' strategies and activities, the question remains whether our findings are unique to the Chinese context or would

apply to other transitional economies (such as those in Eastern Europe). We hope this study serves as a foundation for an effort to sharpen understanding of the product innovation–performance relationship in new technology ventures.

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APPENDIX
Study Measures

NTV Performance[a] (Source: McDougall et al., 1994)

$\alpha = .88$

Relative to your principal competitors, rate your firm performance over the last three years on: return on investment, return on sales, profit growth, return on assets, overall efficiency of operations, sales growth, market share growth, cash flow from market operations, and firm's overall reputation.

Product Innovation Strategy[b] (Sources: Covin & Slevin, 1989; Zahra & Covin, 1993)

$\alpha = .83$

Rate your firm relative to its major competitors over the last three years on the extent to which it has:

- Placed emphasis on developing new products through allocation of substantial financial resources
- Developed a large variety of new product lines
- Increased the rate of new product introductions to the market
- Increased its overall commitment to develop and market new products

Dysfunctional Competition[b] (New items based on interviews)

$\alpha = .71$

Indicate the extent to which your principal industry has experienced the following in the last 3 years:

- Unlawful competitive practices such as illegal copying of new products
- Counterfeiting of your firm's own products and trademarks by other firms
- Ineffective market competitive laws to protect your firm's intellectual property
- Increased unfair competitive practices by other firms in the industry

Institutional Support (New items based on report from Beijing Experimental Zone Office, 1995)[b]

$\alpha = .71$

Please indicate the extent to which in the last three years government and its agencies have:

- Implemented policies and programs that have been beneficial to your firm's operations
- Provided needed technology information and technical support to your firm
- Played a significant role in providing financial support for your firm
- Helped your firm to obtain licenses for imports of technology, manufacturing and other equipment

Environmental Turbulence (Source: Miller, 1987)[c]

$\alpha = .50$

Rate the degree to which each of these statements describe your firm's environment over the last 3 years:

- Actions of local and foreign competitors have been highly unpredictable
- Market demand and consumer tastes have been unpredictable

[a] Measured on a five-point scale: 1, "worse"; 5, "much better."

[b] Measured on a five-point scale: 1, "to no extent"; 5, "to a great extent."

[c] Measured on a five-point scale: 1, "strongly disagree"; 5, "strongly agree."

Strategic Alliance for Product Development[c] (Source: Bucklin & Sengupta, 1993)

$\alpha = .86$

To what extent do these statements describe your firm over the last 3 years relative to your competitors?

Entered into cooperative agreements with other firms to design and manufacture new products
Collaborated with other firms to market new products
Joined with other firms to introduce new products
Jointly promoted new product lines with other firms
Jointly distributed and provided support services for new products with other firms
Established cooperative agreements with other firms and institutions for R&D

Political Networking Strategy[b] (New items, based on Xin & Pearce, 1996)

$\alpha = .86$

Please indicate the extent to which top management of your firm over the last three years have:

Spent much effort in cultivating personal connections with officials of government and its agencies
Maintained good relationships with officials of state banks and other government financial agencies
Devoted substantial resources to maintain good relationships with officials of administrative agencies
Spent a lot of money on building relations with the top officials in government

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