



# Exploration versus exploitation in alliance portfolio: Performance implications of organizational, strategic, and environmental fit<sup>☆</sup>

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## ABSTRACT

How does the nature of firms' alliance portfolio in terms of exploration versus exploitation affect performance? Building on prior research grounded in the resource-based view and the relational perspective, we expand firms' boundary to include their inter-firm relationships and their immediate environment, and develop an extended resource-based framework centering on the concept of fit. Specifically, we propose that whether the exploration versus exploitation orientation of an alliance portfolio may benefit firm performance depends on how such an orientation fits the firm's internal organizational characteristics, strategic orientations, and the industry environment. Data from five U.S. industries over eight years largely support our thesis. Overall, our study calls for a holistic approach to consider the importance of *organizational, strategic, and environmental fit* in understanding the performance implications of alliance-formation choices.

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## 1. Introduction

While strategic alliances often carry positive implications for firm performance (Das et al., 1998; Schreiner et al., 2009), how and when such impact may manifest have not yet been systematically examined, in particular when a firm can have multiple alliances with different purposes (Lin et al., 2009). Under what conditions does a firm's alliance portfolio lead to superior performance? To address the research question we extend the resource-based view with a relational perspective, and argue that the performance implications of a firm's alliance portfolio need to be considered in terms of its fit with organizational, strategic, and environmental factors.

According to the resource-based view, firm behaviors are resource-driven (Barney, 1991; Dierickx and Cool, 1989). Yet, such

a traditional view tends to treat firms with closed boundaries within which resources reside. Meanwhile, more scholars have started to recognize the relational nature of a firm and the broad social and economic environment that a firm is embedded in. For example, Dyer and Singh (1998), Lavie (2006), and Arya and Lin (2007) have proposed an extended resource-based view to bridge the traditional resource-based view and the relational perspective. In line with this direction, we build on the more recent and extended resource-based view, which expands firms' boundaries to their inter-firm alliance relationships and the alignment with their external environment (Dyer and Singh, 1998; Lavie, 2006). From such a perspective, we view firms' alliance portfolio (in terms of exploration and exploitation) as their capabilities of accessing and deploying different resources in inter-firm relations, and further emphasize how important these capabilities need to *fit* with firm characteristics, strategic orientations, and industry conditions.

Our study intends to contribute to the literature in four important aspects. First, while the purpose of a strategic alliance may be for mutual benefits, the benefit of an individual alliance may not always be transferable to the parent firm (Baum et al., 2000; Gulati, 1998). In this study we thus move beyond individual alliances to examine the impact of a firm's alliance portfolio. Specifically, we ask how alliance-formation choices between exploration and exploitation in a firm's alliance portfolio affect firm performance. By viewing alliance formations as firms' strategic choices in terms of exploration and exploitation, we attempt to explore the mechanism through which rents are created from such alliance-formation choices. In this sense, our study also contributes

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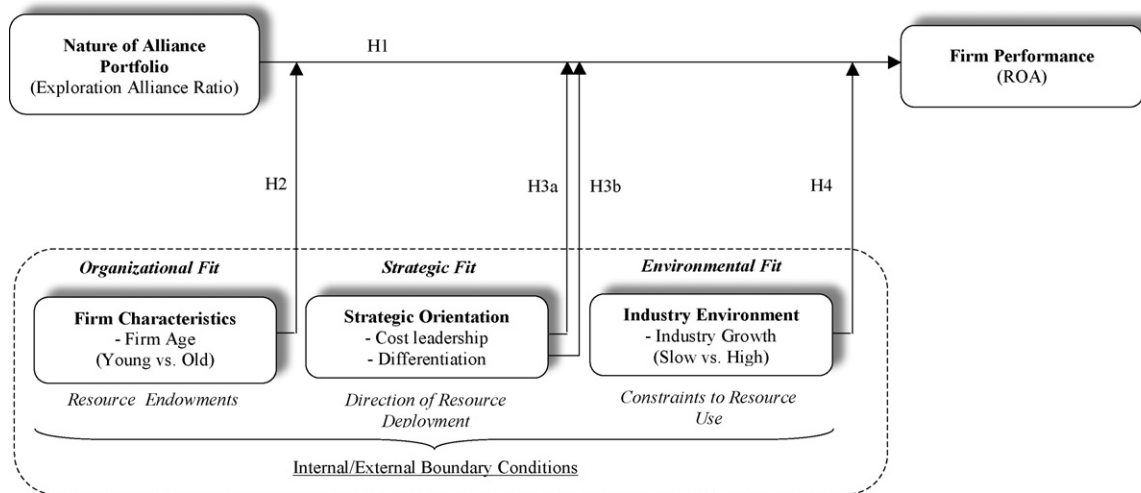


Fig. 1. Theoretical framework.

to the burgeoning literature that delineates the boundary of the exploration–exploitation paradigm.

Second, we clarify the relationships among firms' alliance purpose, competitive strategy, and performance. This study builds on the recent stream of research (e.g., Ruiz-Ortega and Garcia-Villaverde, 2008; Vorhies et al., 2009) that extends the resource-based view through meshing it with other perspectives (e.g., competitive strategy, relational perspective). We further advance the extended resource-based view (Dyer and Singh, 1998; Lavie, 2006) by applying it to the study of strategic alliances while considering firms as having open boundaries with inter-firm alliance relations.

Third, in implementing the extended resource-based view, we highlight the importance of fit – organizational, strategic, and environmental fit that affects firm performance – as suggested in other studies (e.g., Kratzer et al., 2008). Specifically, we explore whether a firm's alliance portfolio leads to superior performance when its resources are combined effectively with appropriate organizational characteristics, strategic orientations and environmental circumstances (Dickson and Weaver, 1997). Our approach not only addresses endogeneity issues commonly confronted by prior studies in this area, but also examines the impact of fit among internal and external *boundary conditions* that affect firm performance. To truly understand strategic alliances it is as important as exploring the antecedents to examine the consequences of a firm's alliance-formation choices and its boundary conditions (Lin et al., 2009).

Fourth, we attempt to make a contribution to the literature by empirically testing our model in a multi-industry setting. While prior research has generally focused on one industry (Park et al., 2002; Rothaermel, 2001a), we employ a multi-industry context to increase heterogeneity within our sample. Overall, our study extends the resource-based framework to include not only firm characteristics but also their inter-firm relations and their immediate environment when investigating the role of a firm's alliance portfolio on firm performance (Lavie, 2006; Rothaermel, 2001b).

## 2. Theory and hypotheses

As behavioral players, firms are embedded in the broad social and economic environments and must rely on their past experience for future actions (Cyert and March, 1963; March and Simon, 1958). To deal with the uncertainty and ambiguity of the external environment, managerial discretion is often reflected through the choices of flexibility and stability (Burgelman, 1991, 2002) or in the

words of March (1991), “exploration and exploitation.” Exploration is associated with terms like search, variation, risk taking, experimentation, discovery, and innovation; while terms like refinement, production, implementation, and execution are associated with exploitation (Levinthal and March, 1993; March, 1991:71). Koza and Lewin (1998) further extend the concept to strategic alliances and suggest that those with the purpose for discovery and development of new technology including research and development (R&D) alliances and technical alliances are exploratory in nature, while those with the purpose for efficient transactions and utilizations of resources including licensing alliances, marketing alliances, and supplying alliances are exploitative in nature.

Yet, how such alliance portfolios of different purposes may impact firm performance has not received sufficient investigation until recently (Jiang et al., 2010; Lavie, 2007). One of the constraints may be partly attributed to the fact that prior studies have largely relied on the traditional resource-based view (Barney, 1991; Dierickx and Cool, 1989), which tends to treat firms with clearly defined boundaries within which resources reside. Consequently, strategic alliances are often considered as the result of firms' internal calculations alone. In this study, we build on the more recent and extended resource-based view, which bridges the relational perspective and expands firms' boundaries with their inter-firm alliance relationships and the alignment with their external environment (Dyer and Singh, 1998; Lavie, 2006). This is also consistent with the purpose of strategic alliances, which is about pooling partners' resources together to explore and exploit internal and external resources (Das and Teng, 2000; Noda and Bower, 1996; Park et al., 2004; Rivkin and Siggelkow, 2003).

In sum, we argue that firm performance can be affected by the choices of exploration/exploitation alliances in its alliance portfolio. Further, this main effect is subject to a joint consideration of its fit with organizational, strategic, and environmental characteristics as we believe that organizational characteristics such as firm age reflect the level of resource endowments; internal strategic orientations such as cost leadership and differentiation strategies entails the way in which a firm deploys its resources; external environmental contexts such as industry growth constrains the supply of resources. Consequently, our research question is: How does the fit between alliance-formation choices and organizational characteristics, strategic orientation, and industry condition affect firm performance? Our theoretical framework is presented in Fig. 1.

### 2.1. Alliance-formation choices (exploration vs. exploitation) and firm performance

The choice between exploration and exploitation in alliance formation is a function of firms' strategic intent, organizational learning, and their expected returns (Koza and Lewin, 1998). Specifically, on the one hand, entering an exploration alliance requires a desire by the firm to discover new opportunities through the acquisition of knowledge, skills, and capabilities which are novel to the firm, with the aim of creating new resources and competencies to adapt to the environment (Koza and Lewin, 1998). Exploitation alliances, on the other hand, are built to leverage existing firm resources and capabilities; the goal is to join existing competencies with complementary assets that exist beyond a firm's boundary (Rothaermel and Deeds, 2004).

March (1991) suggests that organizations benefit from a balance between exploration and exploitation in their choices. Empirical studies, though few, also seem to echo this view regarding alliance formation (e.g., He and Wong, 2004). However, firms do have different preferences for their alliances given the limited resources, strategic orientations, and external environmental conditions. Furthermore, there is little empirical evidence to show what should be the balance and whether such a balance will bring financial benefits to the firm (Lin et al., 2007; Raisch and Birkinshaw, 2008). Given that returns to exploitation alliances are more proximate, predictable, and less risky compared to exploration alliances (Rothaermel, 2001a; Rowley et al., 2000), the performance impact from exploitation alliances is likely to be greater especially in the near term. Vice versa, exploration alliances (as opposed to exploitation alliances) should bring less direct and immediate financial benefit to the parent firm. Thus,

**H1.** A higher ratio of exploration (as opposed to exploitation) alliances in a firm's alliance portfolio will be negatively associated with its immediate firm performance.

#### 2.1.1. Organizational fit: alliance portfolio (exploration vs. exploitation) and firm age

Firm age is an important indicator for a firm's accumulative resource base. Prior research has consistently found that firm age plays a critical role in firms' strategic decisions and performance (Freeman et al., 1983; Sørensen and Stuart, 2000; Sutton, 1997). Drawing on the extended resource-based view, we expect that firm performance is affected by a fit between its alliance portfolio (firms' choice between exploration and exploitation) and age. In other words, we predict that a fit between a firm's alliance-formation choices and age will lead to enhanced performance. Specifically, we argue that younger firms will benefit more from exploitation alliances, while older firms will benefit more from exploration alliances in their alliance portfolio.

In general, younger firms face a liability of newness and smallness (Stinchcombe, 1965) because of their lack of strong connections to resource providers, such as distributors, potential customers, etc., thus having limited internal resources and capabilities (as opposed to more mature firms). While technologies pioneered by younger firms are likely to have greater impact on their field (Sørensen and Stuart, 2000), their lack of internal resources makes it necessary to cooperate with older firms to access complementary assets such as financial capital, marketing, and distribution capabilities (Pisano, 1991; Tushman and Anderson, 1986) and increase their legitimacy and reputation (Stuart et al., 1999). Therefore, while some younger entrepreneurial firms are found to be obsessed by their exploratory activities even at the time of environmental shifts (Anderson and Tushman, 2001), exploitation alliances enable younger firms to make more efficient use of their existing resources and capabilities.

When firms age, successful exploitative practices tend to be retained, reinforced, and diffused through different organizational levels, while organizational memories and routines are built (Macpherson and Holt, 2007). This repetition and fine-tuning of existing resources and capabilities may lead firms to organizational simplicity (Miller, 1993), competency traps (Levitt and March, 1988), and core-rigidity (Leonard-Barton, 1995).

Such organizational inertia can limit firms' ability to absorb and act on knowledge developed beyond their boundaries (Hannan and Freeman, 1984). Under this condition, older firms' existing resources and capabilities become obsolete and no longer match with the demands of the current environment (Eisenhardt, 1989; Thompson, 1967). An important mechanism that older firms use to adapt to changing environmental conditions is entry through alliances (Hill and Rothaermel, 2003). Alliances provide them with a learning opportunity to retool obsolete resources and capabilities (Rothaermel, 2001a). However, exploitation alliances by their nature – exploiting what already exists – does not provide significant learning opportunities as exploration alliances do. Entry into exploration alliances enables older firms to access cutting-edge thinking on product and process development for rejuvenating their technology base and discovering new opportunities (Hagedoorn and Schakenraad, 1994). Thus,

**H2.** Younger firms will benefit more from a higher ratio of exploitation alliances, while older firm will benefit more from a higher ratio of exploration alliances, in their alliance portfolio.

#### 2.1.2. Strategic fit: alliance portfolio (exploration vs. exploitation) and strategic orientation

The choice of alliance as well as the performance consequences of that particular choice can be driven by firm strategy, the way how a firm deploys its resources. While there are a number of different conceptualizations of strategies in the literature (e.g., Miles and Snow, 1978; Rumelt, 1974; Barlow, 2000), we examine the impact of the classic strategies of cost leadership and differentiation (Porter, 1980). Cost leadership emphasizes efficiency and low cost relative to competitors (Dess and Davis, 1984). Cost leaders are successful in markets primarily because their products cost less than competitors' equivalent products. Differentiation strategy, on the other hand, involves value creation that is perceived as unique (Hill, 1988).

As a result of the difference in resource deployment, it may be useful to examine the relative emphasis of a firm's strategic orientation.<sup>1</sup> Exploitation alliances are an important means for firms to maximize the benefits of existing resources and capabilities. As noted by March (1991), exploitation exhibits returns that are positive, proximate, and predictable, while those of exploration are uncertain, distant, and often negative. In this study, we argue that the strategy reflected in a firm's choice of resource allocation can influence the performance consequences of its choice of exploration or exploitation alliances—namely, in terms of *strategic fit*.

Strategic fit among many activities is fundamental not only to competitive advantage but also to the sustainability of that advantage (Porter, 1996). Strategic fit is the consistency among a firm's

<sup>1</sup> We would like to re-emphasize here that we are not advocating the mutually exclusive understanding of strategic orientation and alliance portfolio; it would be too extreme to characterize that firms with differentiation orientation will only engage in exploration alliances while those with cost leadership orientation will only engage in exploitation alliances. Cost leadership firms may be forced to hunt for new processes and methods to make them more efficient under certain circumstances, and alliances may simply be one means by which they achieve this. Rather, what we argue here is the relativity in their portfolio that firms with differentiation focus will tend to have more exploration alliances whereas those with cost leadership focus will tend to have more exploitation alliances.

system of activities, and their ability to reinforce and create synergy among each other so as to support the firm's strategy and create a competitive position in the marketplace. Classic examples include the myriad of ways in which Southwest Airlines works to drive out costs and improve reliability, Wal-Mart's continuous effort to drive down delivery costs, and 3M's intricate system of rewards and recognition of individual innovation. In each of these cases, success is not achieved simply due to the overall strategy – be it cost leadership or differentiation – but rather the “fit” between the chosen strategy and the system of activities undertaken by the firm to implement the chosen strategy. A choice between exploration and exploitation alliances is one activity in a firm's system of activities and the proper fit with the strategy will be critical for the firm to realize returns from its alliances.

We argue that exploitation alliances provide a better fit with a cost leadership strategy. It is common to observe that firms with a cost leadership strategy will be more likely to focus on cost-saving and efficiency in alliances, while reducing their expenses for experimentation and exploration activities. Exploitation alliances act as an important means for firms to implement their cost strategy by maximizing the benefits of existing resources. In contrast, a differentiation strategy places a high premium on uniqueness, which differentiates a firm from its rivals. A constant search for new technologies and new opportunities is needed for firms that adopt a differentiation strategy. Moreover, a differentiation strategy requires firms to be sensitive to the changing markets and places high demands on creating new capabilities to meet such changes (Koza and Lewin, 1998). Thus, firms with a differentiation strategy will more likely see the value of exploration alliances (Gilsing and Nooteboom, 2006). In other words, for firms pursuing a differentiation strategy with demand for continuous innovation and introduction of new products and services, exploration alliances become a better fit. Thus,

**H3(a).** Firms with a focus on cost leadership strategy will benefit more from a higher ratio of exploitation alliances, while H3(b): Firms with a focus on differentiation strategy will benefit more from a higher ratio of exploration alliances, in their alliance portfolio.

### 2.1.3. Environmental fit: alliance portfolio (exploration vs. exploitation) and industry context

While scholars have alerted us to the importance of understanding the nature of exploration and exploitation, questions remain regarding the role of the environmental context (Gibson and Birkinshaw, 2004; O'Reilly and Tushman, 2004). The critical impact of the external environment on firms' strategic decisions and subsequent performance has been widely acknowledged in the management literature (Eisenhardt, 1989; Provan, 1989; Soh and Roberts, 2003). From an extended resource-based view which regards firms' boundaries as including inter-firm relations, the external environment where firm and their alliances operate should be even more important. Indeed, studies suggest that environmental condition plays an important role in the effect of strategic alliances (Lin et al., 2007; Robertson and Gatignon, 1998). Exploring the fit between a firm's alliance portfolio (choice of exploration vs. exploitation) and the environment will enhance our understanding of the boundary conditions, and extend the theoretical insights of the exploration and exploitation framework, which is fundamentally about how to utilize external resource opportunities. Among the various dimensions of an organizational environment theoretically delved in the literature (Castrogiovanni, 1991; Dess and Beard, 1984), we focus on an important and well-researched aspect that captures the environmental resource condition: industry growth. Given that industry growth reflects the resource supply and opportunities of the firm's environment, it will influence the impact of a firm's alliance choices of exploration vs.

exploitation on subsequent firm performance (Spanos et al., 2004).

Low levels of industry growth are associated with greater competitive stability and continued emphasis on strategies that acknowledge mutual interdependence and complementarity (Rajagopalan and Deepa, 1996). Managers are likely to have low pressure for high-risk searches in new domains, and push their bias towards exploiting existing resources and capabilities, and reaping the positive, proximate and predictable returns to exploitation. Moreover, in a low growth industry where entry barriers are typically high, exploitation alliances allow a firm to build stable relationships with the main players of the industry and extract greater financial benefit through the exercise of coordination and market power (Koza and Lewin, 1998). The presence of scale economies enables firms to concentrate on cost reduction and get the most out of their existing resources (Porter, 1980). Therefore, forming exploitation alliances enables the firms in a low growth industry to exploit their existing resources and capabilities as well as enhance coordination and market power.

In contrast, rapid increases in demand, high turnover of rivals, and volatile mappings of market share characterize high growth industries (Anderson and Zeithaml, 1984; Eisenhardt and Schoonhoven, 1996). Firms in an industry with a high growth rate face a more competitive environment and must differentiate themselves and their products in order to survive (Soh and Roberts, 2003). As noted earlier, differentiation depends on doing something unique, valuable, and difficult to imitate, which biases firms towards exploratory search. An industry's growth is an indicator of market attractiveness and industry evolution (Scherer and Ross, 1990). High growth markets provide firms with new technological and market opportunities, but also tend to make current technological advantages obsolete more quickly (Rawski, 1994). Driven by the need to explore new technologies and opportunities in a booming market, firms in a high-growth market will reap more benefits by entering more exploration alliances as opposed to exploitation alliances.

Furthermore, the high growth rate in an industry increases firm opportunities, which in turn, tends to reward a firm's risk-taking behaviors (March and Shapira, 1987, 1992). In other words, when a firm with an emphasis on exploration alliances has the aim of building new competencies and creating new skills, such benefits may be amplified when the firm is in a high-growth industry environment where opportunities are ample and incentives for new product development are high (Danneels, 2002; Rothaermel, 2001a). Thus,

**H4.** In a high-growth industry firms will benefit more from a higher ratio of exploration alliance, whereas in a low-growth industry firms will benefit more from a higher ratio of exploitation alliances in their alliance portfolio.

## 3. Method

### 3.1. Sample

Our main financial data source is Standard and Poor's COMPUSTAT (SPC), which we further complemented with Moody's FIS Online. We focused on 95 firms from five industries (pharmaceutical, computer, food, steel, and paper) over eight years (1988–1995 inclusive) given that these industries have distinctive resource growth conditions and alliance activities over this time period, which can offer useful contrast and variance, but less alternative explanations for our analysis such as dotcom bubble and financial crisis. For each firm, alliance data during the time period (including the purpose of each alliance and the history of each alliance) were retrieved from SDC platinum. We found little cross-industry alliances. The data for industry growth rate was obtained from



census data for manufacturers from Bureau of Census, United States Department of Commerce. Covering the five different industries enabled us to account for five different environmental contexts in terms of industry growth.

### 3.2. Measures

*Firm performance* is our dependent variable. We used return on assets (ROA) obtained from the year-end report in COMPUSTAT to capture the magnitude of firms' economic performance (Bettis and Hall, 1982; King et al., 2004).

*Exploration alliance ratio.* This variable represents the ratio of newly formed exploration alliances (as opposed to exploitation alliances). In other words, we focus on how exploration-heavy a firm's alliance portfolio is (as opposed to exploitation-heavy). Following the works by Koza and Lewin (1998), Rothaermel (2001a), and Beckman et al. (2004), we adopted a strict measure of exploration/exploitation. Specifically, we coded alliances based on both alliance purpose and partner history. For the "purpose" aspect, we utilized Lavie and Rosenkopf's (2006) approach, as they provide a scheme for coding exploration/exploitation based on the announced purpose of each alliance. For the "history" aspect, we relied on March's (1991) approach to capture whether the alliance relationship is new or old in the past five years. We examined the descriptions of all alliances formed by a firm in a given year. Those alliances that were focused on marketing and resource utilization such as licensing alliances, marketing alliances, and supplying alliances and those with existing partners were considered exploitative. In contrast, those alliances that were focused on discovery and development of new technology such as R&D alliances and technical alliances as well as those with new partners were considered exploratory in nature (Koza and Lewin, 1998). Alliances that have natures of both exploitation and exploitation were assigned partial weights accordingly (Lavie and Rosenkopf, 2006).

To obtain the exploration alliance ratio, the simplest way was to use the ratio—the total number of exploration alliances over the total number of alliances formed. However, in order to have a positive value to indicate a greater exploration alliance ratio (and a negative value to indicate a greater exploitation alliance ratio) for a given year, we used the following formula:

$$\text{Exploration alliance ratio} = \frac{\text{Total number of (exploration alliances – exploitation alliances) formed by the firm in year } t}{\text{Total number of exploitation alliances formed by the firm in year } t} \quad (1)$$

*Firm age* was measured by subtracting the incorporated year from the alliance event year. More specifically, it is calculated by: the year of observation (for specific alliance events) minus the year the firm was incorporated, plus one.

*Strategic orientation: cost leadership vs. differentiation.* Following the work by Hambrick (1983) we operationalized cost leadership strategy by a firm's cost efficiency (the degree to which costs per unit of output are low) and asset parsimony (the degree to which assets per unit of output are low). Cost efficiency is one important measure of cost leadership (Porter, 1980) and is measured by calculating the ratio of cost of goods sold over total sales. Asset parsimony is measured by two variables: capital intensity and capital expenditures (Nair and Filer, 2003). Capital expenditure is the net expenditure for plant and equipment over total sales, while capital intensity is measured by the ratio of total assets to total sales. We created a composite variable for cost leadership strategy by summing up the above three variables since they have the same denominator. There are two advantages for using a composite measure. First, we are concerned with the overall strategy a firm adopts rather than strategy in a specific area. A composite variable measures firms' resource allocation in the above three areas. Second, all the three indexes share a same denominator – total sales – which made it possible for us to combine them. We reversed the signs of

values from positive to negative since the greater the focus on cost leadership, the lesser the value.

The differentiation strategy was measured by the ratio of a firm's general selling and administration expenses over total sales, which captures a firm's willingness to spend on marketing and selling related activities per unit of sales in an effort to differentiate itself from its rivals by crafting its product image and strengthening its post-sale services. It is also manifested by the ratio of R&D expenses over total sales, which measures a firm's product differentiation through innovation (Berman et al., 1999; David et al., 2002). The higher these two ratios, the more likely the firm is pursuing differentiation strategy either in the form of service and/or brand name marketing or in the form of new product innovation and functionality. Similar to the cost leadership strategy variable, a composite measure was created by summing up the above two ratios since they are all divided by total sales and measure different aspects of differentiation strategy.

*Industry growth* was measured by calculating the growth rate of product shipments in a given year as compared to the previous year at the industry level.

We controlled for several factors. For *year dummies*, since there are multiple years involved in our study, we coded all eight years into eight dummy variables to control for yearly fluctuations. We also controlled for *firm size* measured as the log form of employee number. In addition, we controlled for *total (cumulative) number of alliances*, measured as log form of the total number of alliances formed until a certain year for the firm. The log forms were used to address the skewness. We also controlled for a firm's *knowledge stock*, measured by the cumulative number of patents the firm holds until the alliance event year. To avoid the left censoring problem, we traced back the patent stock to the year of 1985 for each firm. Furthermore, we controlled for *industry concentration* measured by four-firm ratio in the industry shipment. Finally, we controlled for the *inverse Mills ratio* obtained from a regression model exploring the "antecedents" of alliance formation to avoid the potential bias due to endogeneity (Heckman, 1979). Following the Heckman procedure, we entered a variable of *industrial alliance trend* in the first regression model (antecedents of alliance formation) but not in the second regression model (consequence of alliance formation). The

variable of *industrial alliance trend* (measured as the total number of alliances in the industry at each year) was expected to affect the alliance formation, while not directly influence the performance consequences of alliance formation.

### 3.3. Analysis

We adopted a cross-sectional time series feasible generalized least squares (FGLS) regression model to analyze our panel data. This technique provides reliable estimates in the presence of heteroskedasticity and autocorrelation than ordinary least squares regression (Wooldridge, 2002). We entered the variables sequentially. First, control variables were entered into the regression model. Second, the direct effects were entered. Last, we added the interaction terms into the regression model.

To test our hypotheses, we used *firm performance* as our dependent variable, and *exploration alliance ratio*, *firm age*, *cost leadership*, *differentiation*, and *industry growth* as independent variables, while controlling for *year dummy* variables, *firm size*, *total number of alliances*, *knowledge stock*, *industry concentration*, and *inverse Mills*

**Table 1**  
Descriptive statistics and correlation matrices.

No.	Variable	Mean	Std Dev.	1	2	3	4	5	6	7	8	9	10
1	Firm performance	.05	.18										
2	Firm size	2.49	2.12	.44									
3	Total number of alliances	2.14	1.31	.06	.29								
4	Knowledge stock	.17	.45	.05	.28	.38							
5	Industry concentration	.42	.16	.02	-.03	-.05	-.09						
6	Inverse Mills ratio	1.39	.09	.13	.17	-.03	-.16	.31					
7	Exploration alliance ratio	-.82	.30	-.17	-.09	.13	.12	-.08	-.39				
8	Firm age	48.47	32.93	.21	.61	.14	.23	.13	.21	-.08			
9	Cost strategy	-.80	2.92	.28	.20	.02	.03	.05	-.02	-.39	.10		
10	Differentiation strategy	.47	.27	-.59	-.42	.01	.02	-.25	-.25	.10	-.17	.21	
11	Industry growth	.09	.03	.00	-.31	.20	.27	-.35	-.47	.20	-.48	-.02	.27

$N=760$ ,  $p < .05$  for  $r > |.12|$  and  $p < .01$  for  $r > |.17|$ .

**Table 2**  
Cross-sectional time-series FGLS estimation for alliance consequences.

Variables	Model 1	Model 2	Model 3
Step 1: Control variables			
Firm size	.03 (6.51)**	.01 (1.47)	-.003 (-.81)
Total number of alliances	-.01 (-1.88) <sup>†</sup>	-.01 (-2.18) <sup>†</sup>	-.004 (-.98)
Knowledge stock	.03 (.80)	.01 (.24)	.004 (.18)
Industry concentration	.04 (.71)	.01 (.30)	.03 (.91)
Inverse Mills ratio	.06 (.48)	.12 (1.26)	-.02 (-.27)
Step 2: Main variables			
Exploration alliance ratio (H1)		.04 (1.90) <sup>†</sup>	-.68 (-7.42)***
Firm age		.00 (1.44)	.001 (2.56) <sup>†</sup>
Cost strategy		.34 (8.80)***	.20 (3.26)**
Differentiation strategy		-.35 (-12.33)***	-.25 (-4.14)***
Industry growth		1.09 (3.31)**	2.48 (3.54)***
Step 3: Interactions			
Firm age × exploration alliance ratio (H2)			.001 (2.51) <sup>†</sup>
Cost strategy × exploration alliance ratio (H3a)			-.53 (-6.23)***
Differentiation × exploration alliance ratio (H3b)			.29 (4.45)***
Industry growth × exploration alliance ratio (H4)			2.18 (2.90)**
Log-likelihood	128.35	203.33	249.99
Wald $\chi^2$	51.79	342.41	680.09

Note: Total sample size is 760. *t*-Statistics are in parentheses. Year dummies are included in the model but not listed here. Dependent variable is "Firm performance."

<sup>†</sup>  $p < .10$ .

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

*ratio*. To examine the effect of these variables, we calculated all the above measures of control variables and our main variables based on the data prior to the event year, when the new alliances are announced. In other words, we used a one-year lag effect to investigate the role of these driving factors to examine the causal effect.

#### 4. Results

Table 1 presents the means, standard deviations, and correlations for the variables in our models. Table 2 reports the results of the hierarchical regression models.

To assess the potential threat of multicollinearity problems associated with high correlation, we estimated the variance inflation factors (VIFs) and condition indexes for our hierarchical regression model. The highest VIF was 2.23, and the average VIF was 1.35, which are well below the recommended ceiling of 10 (Kleinbaum et al., 1988), suggesting no concern of multicollinearity.

Hypothesis 1 investigates the effect of a firm's alliance portfolio on its performance. We find that exploration alliance ratio is significant ( $p < .01$ ) and negatively associated with firm performance (Model 3, Table 2) which suggests that firms having more newly formed exploration alliances does not improve the short-

term economic returns as compared to entering more exploitation alliances.<sup>2</sup> Thus, Hypothesis 1 is supported.

Hypothesis 2 examines the effect of organizational fit (between alliance portfolio and firm age). We argue that it is beneficial for younger firms to form more exploitation alliances, while older firms benefit by forming more exploration alliances in their alliance portfolio. This argument is supported by the significant ( $p < .05$ ) and positive coefficient of the interaction term. The result indicates that firms whose alliance formation choices fit their age will see greater short-term performance. The significant influence of firm age on the relationship between exploration alliance ratio and firm performance is depicted in Fig. 2A.

H3(a)Hypotheses 3a and 3b explore the performance implications of strategic fit (between alliance portfolio and strategic orientation—cost leadership vs. differentiation). We predict that

<sup>2</sup> We would like to emphasize here, that we are not advocating that exploration alliances are detrimental for performance, thus in essence, firms should not be engaging in this type of alliance. First, we are only able to explore the effect on short-term performance. Exploration alliance, literally, are argued to have more distant effect in the longer term, which we are unable to capture. Second, our focus has been on the overall alliance portfolio of a firm, and not on the type and effect of an individual alliance. Our findings suggest that firms with exploration-heavy alliance portfolio are less likely to obtain greater short-term financial performance than those with exploitation-heavy alliance portfolio.

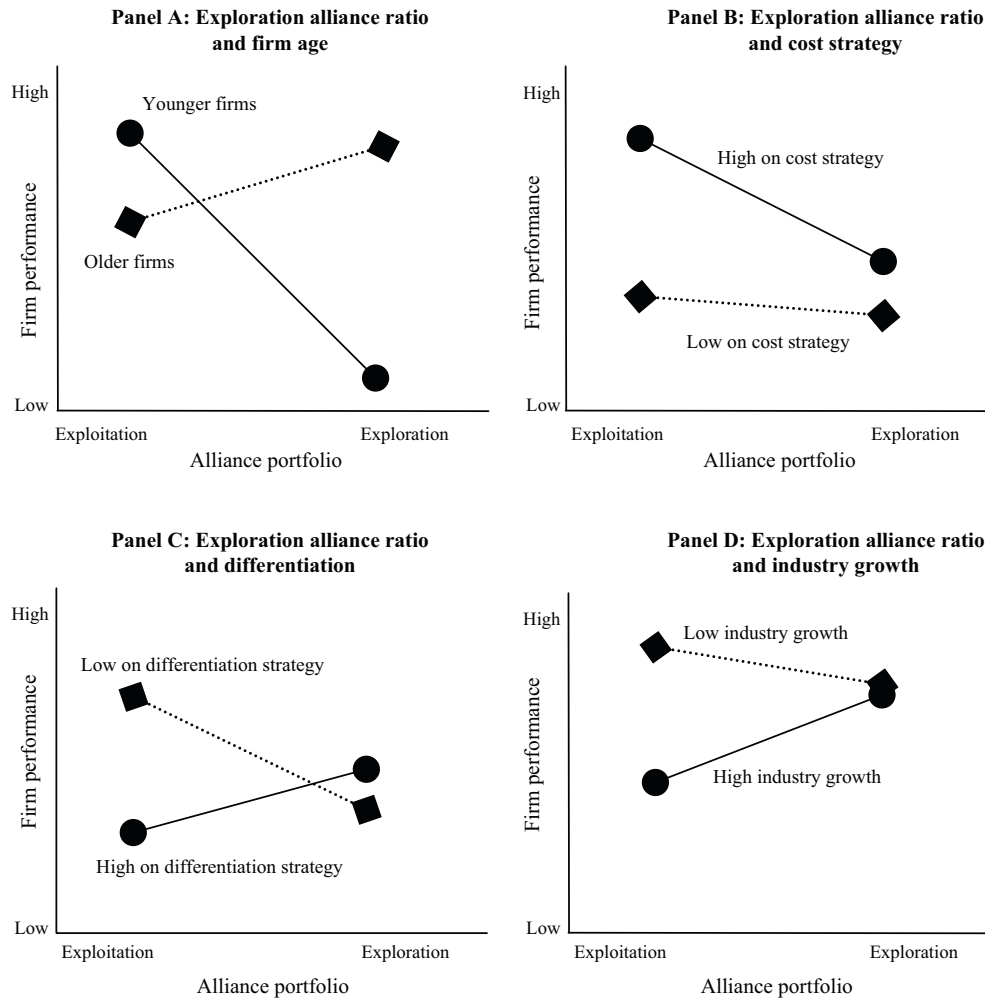


Fig. 2. Interaction effects.

firms whose alliance-formation choices fit their strategy will have enhanced performance. Specifically, firms that achieve fit by matching either exploitation alliances with a cost leadership strategy (H3(a)Hypothesis 3a) or exploration alliances with a differentiation strategy (H3(a)Hypothesis 3b) will see enhanced performance. The coefficient for the interaction between cost leadership and exploration alliance ratio is negative and significant ( $p < .01$ ), supporting H3(a)Hypothesis 3a. Similarly, H3(a)Hypothesis 3b is supported by the positive and significant relationship ( $p < .01$ ) for the interaction between differentiation strategy and exploration alliance ratio. Indeed, the results highlight the importance of strategic fit. We plotted these interaction graphs in Fig. 2B and C.

Hypothesis 4 examines the effect of environmental conditions such as industry contexts. Specifically, we explore the influence of industry growth on the relationship between firms' alliance portfolio and financial outcome. We argue that in a high-growth industry firms benefit more by forming more exploration alliances, while in a low-growth industry firms benefit more by forming more exploitation alliances. Hypothesis 4 is supported as the interaction term exhibits a significant ( $p < .01$ ) and positive result. The interaction effect is depicted in Fig. 2D.

In order to examine the robustness of our findings, we experimented with several additional measures of firm performance. For example, we tested industry adjusted ROA. While not as strong as using ROA due to reduced variance after adjustments at industry levels, the patterns were generally consistent. Furthermore, we

tested “productivity” (the net income per employee) as well as “Tobin’s Q” for additional measures of firm performance. The results are consistent, and are qualitatively similar to our main findings, thus providing further support to our findings.

## 5. Discussion

This study has adopted an extended resource-based view and examined the performance consequences of a firm’s alliance portfolio in terms of exploration and exploitation (March, 1991) while considering its fit with firm characteristics, strategic orientation, and industry condition. Our findings show that it is not only important to consider alliances as expansions of firms’ boundaries but also fruitful to understand the relationships among firms, their alliances, the external environment, and their impacts on firm performance.

We find that firms forming more exploitation alliances (as opposed to exploration alliances) tend to have higher performance in the near term. This suggests that exploitation alliances may bring more direct and immediate benefits to the parent firm when compared with exploration alliances, which supports March’s (1991) original contention that returns to exploitation are “positive, proximate, and predictable.” Given the time frame and the nature of our study to investigate the performance implications, additional research expanding the time horizon and examining the impact of the choice of exploration vs. exploitation alliances on intermediate and long term performance needs to be undertaken.

The results of our analyses also reveal the importance of organizational, strategic, and environmental fit in relation to a firm's alliance portfolio and its performance consequences. We find that firms whose alliance-formation choices fit their age will experience high performance. In other words, as we predicted, younger firms benefit more from a higher ratio of exploitation alliance while older firms benefit more from a higher ratio of exploration alliances in their alliance portfolio. Interestingly, while we find that a higher exploration alliance ratio in a firm's alliance portfolio does not necessarily lead to better immediate financial performance, it leads to better performance even in the short-term when combined with a differentiation strategy. Similarly, we find that cost leadership strategy further strengthens the link between an exploitation alliance ratio and firm performance. In other words, firms whose alliance-formation choices fit their competitive strategy (e.g., higher ratio of exploration alliances and differentiation strategy, higher ratio of exploitation alliances and cost leadership strategy) will experience enhanced performance. This may reflect a positive reaction by shareholders to the announcement of alliances that 'fit' with the expressed strategy of the firm and their expectations regarding the actions of the firm.

Furthermore, our results also confirm that firms whose alliance-formation choices fit the industry context (e.g., level of growth) will earn greater benefits in terms of immediate financial performance. While firms may differ in their internal resources and strategic orientation, they operate under the same industry, and face similar challenges that the environment brings. From this standpoint, our research receives strong support for the role of the environment. In particular, we find that industry growth is an important factor in understanding firms' performance consequences of their alliance-formation choices.

In sum, our study calls researchers' attention to the interplay among the concepts of strategic choice (exploration vs. exploitation), internal and external fit, and firm performance—in other words, the importance of boundary conditions through fit. We find that the relationship between a firm's alliance portfolio in terms of exploration vs. exploitation and its financial performance is contingent upon certain conditions of fit—namely, organizational characteristics (e.g., firm age), strategic orientation (e.g., cost leadership, differentiation), and environmental context (e.g., industry growth). Under certain conditions, exploration- vs. exploitation-heavy alliance portfolio may well drive firms to achieve better performance.

These results caution us against the universal adoption of the balance assumption, and point out that there are boundary conditions under which a different mix of exploration and exploitation may be more beneficial (Mc Namara and Baden-Fuller, 2007). Building on recent works (e.g., Ruiz-Ortega and Garcia-Villaverde, 2008; Vorhies et al., 2009), our study extends our understanding of how the relationship between resources and firm performance is contingent on internal and external fit conditions—namely, the fit between alliance portfolio and firm characteristics, strategic orientation, and industry contexts.

### 5.1. Contributions

Theoretically, our study contributes to the resource-based view and the exploration/exploitation literature in the following ways. First, while there is little understanding of the mechanism by which the process of how strategies are deployed, and ultimately, rents are created (Barney, 2001), we show in our study how firms' strategic choices between exploration and exploitation alliance formation can drive firm performance.

Second, we conceptually clarify the relationships between alliance-formation choices, firms' competitive strategy, and performance. We not only provide the performance implications of

firms' alliance portfolio (in terms of exploration and exploitation) but also consider the important role of organizational fit (firm characteristics—age), strategic fit (strategic orientation—cost leadership, differentiation), and environmental fit (industry contexts—industry growth). Our findings highlight the importance of fit that under certain conditions when resources are combined effectively with the appropriate orientation of deployment and strategic use, as well as under the appropriate environmental circumstances, it will lead to superior performance. The resource-based view has been criticized for its lack of considering the boundary conditions (Priem and Butler, 2001). Prior studies in general have been limited in terms of under-investigating the role of internal and external constraints. Building on the recent stream of research that has succeeded to complement the resource-based view by meshing it with other perspectives such as that of competitive strategy and relational perspective (e.g., Ruiz-Ortega and Garcia-Villaverde, 2008; Vorhies et al., 2009), we have further shown the importance of expanding firms' boundaries to include their inter-firm relationships as well as their immediate environmental conditions when investigating firm performance. This is an important step towards a more holistic understanding of firms as well as their behaviors that drive performance.

In terms of the exploration–exploitation paradigm, we have added nuance to the balance assumption by providing systematic evidences that there is no absolute criterion for the balance between exploration and exploitation. Rather, such a balance may need to vary with different firm characteristics, strategic orientation, and industry environments. In other words, an absolute balance criterion, if adopted indiscriminately, may be harmful to firms under certain conditions (Lin et al., 2007).

From a different angle, our study also contributes to the alliance literature in general. We have shown that the recent research streams, although accepting the explorative and exploitative motives in alliance formation, do not explore extensively the performance implications of such motives. Put differently, the literature lacks proper specification of how exploration vs. exploitation in a firm's alliance portfolio impact firm performance. Moreover, the literature on strategic alliances also tends to overlook the interaction between firm characteristics, internal resource conditions, the market factors, as well as the configuration of these resources such as the strategic orientation in explaining the performance consequences of exploration vs. exploitation motivations in alliance formation. Overall, our results support the assertions that firms are bounded by their stages of development, their strategic orientations, and the industry environment.

Methodologically, this study has several contributions as well. We have defined the measure of exploration and exploitation to consider both content and experience. We have also created composite measures of cost leadership and differentiation strategies by integrating important dimensions from existing studies (Berman et al., 1999; Hambrick, 1983; Kotha and Nair, 1995). Further, we have examined five manufacturing industries, unlike previous research that generally focused only on one industry (Park et al., 2002; Rothaermel, 2001a). As a result, we have provided heterogeneity within our sample and generated results in a multi-industry framework.

As a noteworthy point, our study suggests that the exploration/exploitation in alliances may differ from the self-exploratory/exploitative activities in nature. For example, although it is reasonable to argue that exploitation should be based on previous exploration within a firm's own boundary, it may not be true under the context of alliances. Even without prior exploration, firms may still form exploitation alliances, not only due to their resource constraints, but also as a means to utilize partners' resources and legitimize their own existence.



## 5.2. Managerial implications

Our study offers valuable insights for managerial implications. For example, our findings attest to the need for *exploration* orientation in larger and more established corporations. In the process of building organizational memories and routines, exploitation activities are found to crowd out exploration activities. As firms get older, the crowding effect tends to become stronger. Given the implications of organizational simplicity (Miller, 1993), competency traps (Levitt and March, 1988), and core-rigidity (Leonard-Barton, 1995), managers may be more inclined to the repetition and fine-tuning of existing resources and capabilities. Most importantly, managers in large established firms often give disproportional attention to exploitation activities so as to reap economic benefits from its large pool of resources. However, our findings suggest otherwise. We find that the older the firms, the greater returns their exploration-oriented alliance portfolio will bring about. Firms that engage in exploration alliance do break away from their existing boundaries to obtain new resources (e.g., knowledge base). This in turn allows them to increase their ability to create valuable, impactful new innovation (Sørensen and Stuart, 2000).

When it comes to strategic orientation, our findings suggest that managers of firms that focus on differentiation should embrace more exploration alliances while those of firms that focus on cost leadership strategy should embrace more exploitation alliances. Finally, the need for environmental fit suggests that when the industry is in high-growth, managers should be more prone to engaging in exploration alliances, whereas when the industry is in low-growth, they should be more prone to engaging in exploitation alliances to reap the short-term financial benefits from strategic alliances.

## 5.3. Limitations and future research

Our research is not without limitations, which in turn, should offer opportunities for future research. First of all, our study has relied more on firms that have complete information. This may have excluded some smaller and younger firms that have not proven their business models prior to IPO, which may impact the relationship between exploration/exploitation alliance orientation and performance. Furthermore, while the time period of our study was intended to represent a relatively stable period among the sample industries in order to evoke less alternative explanations, future research could explore more recent years including the impact of financial crisis or the dotcom bubble on the relationship under inquiry. Secondly, future research endeavors will benefit from a greater sample size as well as from greater variety of sectors. While the study has made a conscious attempt to integrate previously separated research into one study, it will be worthwhile for future research to expand to broader industry contexts and further investigate the links between alliance-formation choices and the subsequent performance implications. Finally, the performance consequences of alliances can be decided by each firm's specific investment into the alliances, and future study linking firm-specific or alliance-specific resources to consequences of exploration vs. exploitation alliance formation might give us additional explanatory power in explaining firm performance.

## 6. Conclusion

Our study has highlighted the importance of using an extended resource-based view to examine the relationship between a firm's alliance-formation choices and its performance. Our findings suggest that performance implications of a firm's alliance portfolio depend on organizational, strategic, and environmen-

tal fit. Specifically, it is critical to consider the level of fit among alliance formation (exploration/exploitation), firm age, firm strategy (cost leadership/differentiation), and industry condition (industry growth) so as to gain a better understanding of firm performance.

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