ALLIANCE PORTFOLIO DIVERSITY AND FIRM PERFORMANCE

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In this paper, we offer a comprehensive alliance portfolio diversity construct that includes partner, functional, and governance diversity. Grounding our work primarily with the resource- and dynamic capabilities-based views, we argue that increased diversity in partners’ industry, organizational, and national background will incur added complexity and coordination costs but will provide broadened resource and learning benefits. Increased functional diversity results in a more balanced portfolio of exploration and exploitation activities that expands the firm’s knowledge base while increased governance diversity inhibits learning and routine building. Hypotheses were tested with alliance portfolio and performance data for 138 multinational firms in the global automobile industry during the twenty-year period from 1985 to 2005. We found alliance portfolios with greater organizational and functional diversity and lower governance diversity were related to higher firm performance while industry diversity had a U-shaped relationship with firm performance. We suggest firms manage their alliances with a portfolio perspective, seeking to maximize resource and learning benefits by collaborating with a variety of organizations in various value chain activities while minimizing managerial costs through a focused set of governance structures. Copyright © 2010 John Wiley & Sons, Ltd.

INTRODUCTION

Research on strategic alliances has proliferated commensurate with their increasing use (Lavie, 2007). The majority of the strategic alliance literature can be categorized into two main streams. The first focuses on the alliance as the principal unit of analysis, examining determinants of alliance formation, governance, management, and performance. The second adopts a network perspective, exploring outcome implications of a firm’s position in a network of cooperative relationships. While both aid our understanding of strategic alliances, recently emerging is a firm-level perspective where a firm’s alliances are viewed as a portfolio with a focus on the composition of alliance partners (e.g., Goerzen and Beamish, 2005; Lavie, 2007; Reuer and Ragazzino, 2006; Stuart, 2000).

Keywords: alliance portfolio diversity; partner diversity; functional diversity; governance diversity; diversity and performance; auto industry

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Our study extends this emerging literature by establishing a comprehensive construct of alliance portfolio diversity that incorporates functional diversity (the range of activities for which the firm uses alliances), governance diversity (the variety of structures with which the firm manages alliances), and partner diversity (the diversity of partners with which the firm allies), and examines these constructs with respect to firm performance.

We underpin our work with resource-based theory where the firm is a bundle of heterogeneous resources (Barney, 1991) and the dynamic capabilities framework where competitive advantage draws from the firm’s ability to exploit as well as combine and recombine resources that are valuable, rare, and hard to imitate and substitute (Teece, Pisano, and Shuen, 1997). In addition to internal operations (i.e., the make) and external acquisitions and outsourcing (i.e., the buy) alliance strategies are often an indispensable part of a firm’s overall corporate strategy where an effective alliance portfolio can be a vital component for exploiting resources and exploring new opportunities for attaining superior performance.

THEORY AND HYPOTHESES

Firms enter alliances for many reasons, such as to pool complementary resources (Eisenhardt and Schoonhoven, 1996), share costs and risks of undertaking expensive and highly uncertain projects (Hagedoorn, 1993), and access or acquire needed resources, capabilities, or knowledge (Powell, Koput, and Smith-Doerr, 1996). Studies found that greater alliance intensity is positively associated with firm survival (Baum and Oliver, 1991), higher firm growth rates (Powell et al., 1996), and higher levels of innovation (Hagedoorn and Schakenraad, 1994). However, Hagedoorn and Schakenraad (1994) found no effect of technology alliances on profitability, and Stuart’s (2000) work shows not all alliances positively impact firm performance. We go beyond recent work on network partner attributes to examine the diversity of alliance portfolio composition and its relationship to firm performance.

Partner diversity and firm performance

Partner selection is important since accessing or learning new skills from partners is a prevalent rationale for creating an alliance (Doz and Hamel, 1998; Hagedoorn, 1993). Prior studies examined the relationship between partner characteristics and various firm performance measures. For instance, Hagedoorn and Schakenraad (1994) found characteristics of alliance partners are more important than the absolute number of alliances. Stuart (2000) found firms achieve higher innovation and growth rates when the alliance partners are larger and possess more technological resources, while Goerzen and Beamish (2005) found that diversity in Japanese firms’ foreign subsidiary networks in terms of industry and country background had a U-shaped relationship with corporate performance.

Parkhe (1991) distinguished between two types of partner diversity in his discussion of interfirm diversity. Type I diversity forms ‘the underlying strategic motivations for entering into alliances’ in that partner differences can be complementary resources that ‘facilitate the formulation, development, and collaborative effectiveness’ of strategic governance structures of the alliances. Prior studies have focused on partner diversity at the dyad (e.g. Parkhe, 1991) or network level (e.g. Goerzen and Beamish, 2005). We contend that alliance portfolio diversity must also consider variance in the functional scope and governance structure of alliances. Thus, three key issues in alliance formation can be addressed. The first issue is partner selection; with whom the firm allies. Our notion of alliance portfolio partner diversity is similar to Goerzen and Beamish’s (2005) network diversity and refers to the degree of variance in partners’ resources, capabilities, knowledge, and technological bases. The second issue is the functional purpose of an alliance; what value chain activities the firm performs in its alliances. The third is governance structure; how the firm organizes and manages its alliances using different organizing structures. Alliance portfolios vary in diversity along these three dimensions and despite a large alliance literature, there is a lack of studies examining all three of these alliance diversity aspects in concert. In this study, we explore these three key dimensions of portfolio diversity and their relationship to firm performance.
alliances. ‘Type II diversity... refers to the differences in partner characteristics’ that might impede communication, encumber knowledge transfer, and increase coordination difficulty (Parkhe, 1991: 580). Over time, Type II diversities go down and Type I diversity benefits increase (Parke, 1991). At the portfolio level, firms can reap net gain benefits from increasing partner diversity when the benefits from Type I diversity outsize the costs resulting from managing Type II diversity.

Firms face trade-offs as they increase the diversity of their alliance portfolio. On the one hand, a highly diversified portfolio provides broadened search options, access to enriched resource pools, and, hence, added value creation and capability development opportunities. On the other hand, increased diversity can bring more complexity, the potential for more conflicts, and, hence, increased coordination and managerial costs. Thus, the arguments for and against portfolio diversity are often equally compelling. Following studies that consider curvilinear relationships to reconcile two compelling contrary arguments (see, for example, Golden and Zajac, 2001) we punctuate these opposing arguments and explore the notion of nonlinear relationships between our three partner diversity dimensions and firm performance.

Industry diversity

Alliances with firms from different industries can bring a host of benefits and costs. Partners from the same industry are often competitors who may bring the greatest learning through imitation and greater absorptive capacity due to an overlap in backgrounds, experiences, knowledge, and technological bases (Cohen and Levinthal, 1990). On the other hand, conflicts of interest exist and learning races (Doz and Hamel, 1998) can happen, increasing monitoring and safeguarding costs. Partnering in upstream or downstream activities can offer complementary resources and/or improve value chain coordination, while partners in unrelated industries can facilitate entry into new markets (Kogut, 1988) or stimulate technological innovations. However, such alliances are prone to resource misfits and/or lack of synergies, causing alliances to underperform. Partners from different industries may also have very different routines and processes that can make collaboration difficult. Thus, while greater partner industry diversity may provide learning and resource access benefits, firms have to first overcome two hurdles. First, different partners often bring myriad Type II diversities that can impede alliance value creation (e.g., conflicts with competitors, lack of synergy with partners in unrelated industries). Second, increased diversity increases alliance management complexity. These downsides appear immediately as firms start increasing the degree of partner diversity. However, as firms become more adept at dealing with such costs and as learning and resource benefits accumulate, they may reach a minimum degree of diversity effectiveness and can expect net gains surpassing this threshold. Goerzen and Beamish’s (2005) work, for instance, shows a U-shaped relationship between partner diversity (measured by industry and national background) and firm performance. We therefore propose:

Hypothesis 1a: Greater alliance portfolio partner industry diversity is associated with firm performance that first decreases and then increases forming a U-shape.

National diversity

Alliances increasingly involve firms from different nation states. Cross-border alliances can facilitate market entry (Glaister and Buckley, 1996), provide complementary capabilities (Lane, Salk, and Lyles, 2001), and enhance different knowledge bases and learning (Lubatkin, Florin, and Lane, 2001), but can pose a high potential for conflicts. For example, Parkhe (1991, 1993) identified and tested five dimensions of diversity that might cause tension at the alliance level: societal culture, national context, corporate culture, strategic direction, and management policies/organization. Cross-border partners bring differences in political economic systems, societal and cultural institutions, government policies, and national industry structures. Such macro-level factors often result in differences in corporate culture, strategic direction, and management practices where diversity in these various dimensions can cause conflicts and increase alliance costs. Tung (1993), for instance, contrasted different communication patterns between Americans and Japanese managers and offered a typology that punctuates the difficulties in the interaction/acculturation process involving nationals from different countries. At the portfolio level, allying with partners from different countries provides market and resource access advantages.
Yet, high national diversity can create excessive coordination and integration costs due to the complexity in managing Type II diversities. Thus, firms must deal with the downside of increased national diversity before they can reap net benefits. We propose:

Hypothesis 1b: Greater alliance portfolio partner national diversity is associated with firm performance that first decreases and then increases forming a U-shape.

Organizational diversity

More global, dynamic, and competitive environments have forced many firms to develop core competencies in fewer areas and consequently rely on external sources for supplementary and complementary capabilities and knowledge (Santoro and Chakrabarti, 2002). Alliances can be formed between large multidivisional firms, between public and private firms, and between for-profit businesses and not-for-profit organizations such as universities and government agencies. Different types of organizations offer different pools of resources and capabilities (Harrison et al., 2001).

For example, large public pharmaceutical firms often ally with small private biotech firms to tap into proprietary technologies or specific technological expertise while smaller private biotechnology firms benefit by gaining access to financial, marketing, and/or managerial resources and capabilities (Santoro and McGill, 2005). Not-for-profit universities and government agencies can provide basic and pre-competitive research that complements and supplements an industrial firms shorter-term and more applied research and development (R&D) efforts (Santoro and Chakrabarti, 2002). Firms allying with organizations of different sizes, structures, and purposes increase their breadth of search, learning capabilities, and resource access thereby reducing the threat of core rigidities. However, diverse organizations tend to have different goals, decision-making processes, and systems that cause communication and coordination difficulties, resulting in increased managerial costs. We therefore propose:

Hypothesis 1c: Greater alliance portfolio partner organizational diversity is associated with firm performance that first decreases and then increases forming a U-shape.

Functional diversity and firm performance

Alliances can serve different functional purposes as firms employ marketing, manufacturing, and distribution alliances to broaden their market reach, enhance value creation, and further exploit core competencies (Prahalad and Hamel, 1990). R&D alliances are prevalent in many industrial sectors as firms take advantage of rapid technological advances while dealing with soaring costs and risks of R&D (Hagedoorn, 1993). R&D involves exploration activities while marketing, manufacturing, and distribution involve exploitation activities. Firms must balance both because exploitation relates to a firms current viability, while exploration may critically influence a firms future viability (March, 1991). As a firm increases the functional diversity of its alliance portfolio, it builds a more balanced portfolio that incorporates core and noncore activities, gains access to supplementary and complementary assets, and expands its knowledge base as well as its market reach. This balanced approach can extend the firm’s range of value creation activities, increase flexibility, and enhance overall firm performance. Following this reasoning, we therefore propose:

Hypothesis 2: Greater alliance portfolio functional diversity is positively associated with firm performance.

Governance diversity and firm performance

Alliances can be structured as nonequity or various equity-ownership arrangements where different governance structures have different implications on level of commitment, degree of integration, and learning (Kogut, 1988). Matching structure with the characteristics of each cooperative venture is important to balance value creation and value appropriation (Lavie, 2007) and to reduce transaction costs (Santoro and McGill, 2005). However, it takes time and repeated iterations to understand how to set up and manage a particular governance form since each governance structure requires unique resource commitments, managerial attention, and relationship-building routines. Sampson (2005) found that repeated experience with a specific governance structure can help the firm accumulate and institutionalize knowledge and skills about a particular governance form. Once institutionalized, this knowledge
becomes organizational routines and operational protocols that can be readily applied to future alliances, thereby reducing managerial costs. While attempting to match governance structures to the variety of relationships in the portfolio can be thought of as a way to deal with transaction cost issues, firms will be better served with a focused set of familiar structures rather than trying a new governance form with each new alliance. Excessive experimenting with different governance structures can significantly increase managerial complexity and create lost opportunities for institutional learning while providing minimal additional reduction in transaction cost hazards. Following this reasoning, we propose:

**Hypothesis 3:** Greater alliance portfolio governance diversity is negatively associated with firm performance.

**METHOD**

We used the SDC Platinum Database to identify alliance portfolios for firms in the global automobile industry (Standard Industrial Classification [SIC] codes 3714, 3711, 3751, 3713, 3715) during the period from January 1985 to December 2005. Performance data were obtained from Research Insight and Thompson Banker One. We triangulated these data and obtained datasets for 138 multinational firms. A two-period longitudinal panel for the period 1985–2005 with two time points (2000 and 2005) was created to examine the cumulative effect of a firm’s alliance activities on a lagged measure of firm performance. Years 2000 and 2005 were chosen for comparison since the number of alliances in our sample frame was skewed toward the latter years of this 20-year period.

**Dependent variable**

Corporate-level three-year average of net profit margin (2000–2002 for time point one and 2005–2007 for time point two) is our performance measure. Net profit margin has been used in a number of previous studies to determine firm performance (e.g., Min and Woffinbarger, 2005) and is useful for comparing corporate performance in the same industry. A lagged three-year average performance in each time period was used to reduce the likelihood of spurious results due to one unusual performance year (Tanriverdi, 2006).

**Independent and control variables**

Alliance portfolio diversity is a multidimensional construct that includes partner, functional, and governance diversity. We first coded each individual alliance into different categories. For *industry diversity*, alliances were coded into five categories: ‘4’ for an alliance formed with a partner in the same four-digit SIC code; ‘3’ same three-digit SIC code; ‘2’ same two-digit SIC code; ‘1’ same one-digit SIC code, and ‘0’ sharing no SIC code. For *organizational diversity*, two measures were created to capture two, but related categories. Organizational diversity I codes alliances for ownership: ‘1’ for same ownership (public-public, private-private); ‘0’ different ownership (public-private, public-government, private-government). Organizational diversity II codes alliances for organizational level: ‘1’ same organization level (parent-parent, subsidiary-subsidiary); ‘0’ for different organization level (parent-subsidiary). For *functional diversity* we coded alliances into four categories where marketing is ‘1,’ manufacturing ‘2,’ R&D ‘3,’ and other ‘4’ (other activities had insufficient numbers to justify individual coding). For *governance diversity* we coded each alliance into six categories: ‘1’ = nonequity, ‘2’ = minor equity share up to 20 percent, ‘3’ = substantial equity share 21–49 percent, ‘4’ = equal equity share 50 percent, ‘5’ = major equity share 51–79 percent and ‘6’ = dominant equity share 80+ percent.

We then obtained our portfolio level diversity measures by using the Blau Index of Variability (Blau, 1977). The Blau Index has been widely used in the group diversity literature to measure heterogeneity of categorical variables where for any given diversity variable: $D = 1 - \sum p_i^2$ where $D$ represents degree of diversity, $p$ represents the proportion belonging to a given category, and $i$ is the number of different categories. The variables range from 0 (a perfectly homogeneous group) to 1 (a perfectly heterogeneous group, with members spread evenly among all categories). Since the size of each firm’s alliance portfolio was different (ranging from 2 to 354 alliances), we divided the absolute diversity score by the highest possible Blau score based on the size of the firm’s alliance portfolio. For *national diversity* we coded...
a continuous variable, with ‘0’ for a portfolio with alliances with no foreign partners, ‘1’ with partners from one foreign country, ‘2’ with partners from two foreign countries, and so on.

Our single industry controls for much variance. In addition, we included three control variables, firm size (three year average of total assets for the years 2005, 2006, and 2007; and for the years 2000, 2001, and 2002 in hundred million U.S. $), portfolio size (the firm’s total number of alliances at year 2000 and year 2005), and portfolio size squared for a potential curvilinear effect.

Models and results

We used random-effects generalized least squares (GLS) regression analysis for hypotheses testing. Random-effects GLS is considered more efficient and appropriate than fixed-effects modeling if the data can pass the Hausman test. A Hausman test showed the coefficient estimates provided by the random-effects estimator were not significantly different to those offered by the fixed-effects model (Model 2 X^2, 8d.f. = 9.42, p = 0.31 and Model 3 X^2, 12d.f. = 11.3, p = 0.50), thus the more efficient random-effects model was used. Table 1 presents the descriptive statistics and correlations, Table 2 our GLS regression analysis.

Model 1 included only the control variables, Model 2 added all our portfolio diversity variables, and Model 3 the quadratic terms for partner diversity. We mean centered the variables to avoid multicolinearity issues arising from adding quadratic terms. The control variables show consistent results across all models and are consistent with previous studies. Model 3 shows the root term for industry diversity is significant and negative (β = −2.8, p < 0.05), while the squared term is significant and positive (β = 7.35, p < 0.05) indicating a U-shaped relationship thereby providing support for Hypothesis 1a. National diversity is not significant, thus Hypothesis 1b is not supported. Both organizational diversity root terms are positive and significantly related to firm performance (β = 6.69, p < 0.05, and β = 11.98, p < 0.001, respectively). However, since the root and square terms for our organizational diversity measures are both positive and significant, this indicates a J-shaped relationship rather than a U-shaped relationship as we proposed in Hypothesis 1c. Model 3 shows functional diversity is positively related to firm performance (β = 5.29,
DISCUSSION AND CONCLUSION

Overall, we found a complex relationship between alliance portfolio diversity and firm performance. Mixed results were found regarding our three partner diversity constructs and firm performance. Partner industry diversity has a U-shaped relationship with firm performance, similar to Goerzen and Beamish’s (2005) findings in their study of Japanese firms. Organizational diversity showed a strong positive J-shaped relationship with firm performance, suggesting benefits from collaborating with different types of partners (e.g., private and public, for-profit and nonprofit) outweigh the costs of managing these types of relationships. Functional diversity was found desirable as a diverse portfolio of value chain activities, such as alliances in R&D, manufacturing, and marketing, brings both exploration and exploitation opportunities as firms combine and leverage complementary and supplementary resources and capabilities. Governance diversity was found to be negatively associated with firm performance, reflecting the importance of accumulating knowledge through repetition for managing and organizing cooperative relationships.

Our results highlight the trade-offs in managing a diverse alliance portfolio between broadened search, resource, and learning benefits and increased managerial complexity and costs as a firm’s alliance portfolio diversity increases. Greater organizational and functional diversity can be beneficial, while greater governance diversity can be detrimental to firm performance. We believe organizational and functional diversity capture the learning and resource access benefits accruing from collaborating with diverse organizations for a wide scope of functional purposes, while governance diversity points to the organizing difficulty and complexity of dealing with myriad structures. Our diversity measures punctuate these results since a maximum diversity score means a firm has an equal number of alliances in each category. In the case of industry diversity, for example, the firm with a highly balanced alliance portfolio is collaborating with a variety of partners in different sectors that help add to the firm’s knowledge base. In the case of governance diversity, it means the firm employed many different ownership structures where more is not necessarily better; too many different governance forms are creating undue complexity and deterring knowledge accumulation through a lack of systematic learning. These findings illuminate the difficult tensions that must be balanced as firms reach out to different partners in an attempt to maximize learning and, at the same time, manage costs by not losing focus on unfamiliar and under practiced governance forms.

One of our key contributions is advancing our multidimensional alliance portfolio diversity construct that extends prior work focused solely on partner attributes. Future work could build upon our functional and governance diversity measures to examine how widely firms use alliances for various learning and value chain activities, and to gauge their linkage to different governance forms. For practicing managers, our results highlight the strategic importance of developing a comprehensive firm-level alliance strategy, adopting a
portfolio perspective, installing an alliance portfolio management process, and actively managing such a portfolio to further develop capabilities for improving firm performance (Hoffmann, 2007).

Managers should consider collaborating with different organizations to access diverse pools of resources and knowledge, and use alliances for different value chain activities to enhance value creation and flexibility since benefits appear to emanate by learning from and working with partners on different activities. We caution managers not to be overly zealous in allying with partners from too many different countries or by employing many different alliance governance forms since a more focused array of organizing structures may be more cost effective.

Our data shows alliances are important to the global auto industry as our sample represents a significant portion of the global automobile industry network. Since our one industry design limits the generalizability of our findings, future research could investigate additional industries such as telecommunications and electronics where alliances are also prevalent. We found a nonsignificant relationship between national diversity and firm performance. We surmise the auto industry’s widespread use of global alliances (as shown in our data and recent conversations one of the authors had with auto industry executives) reduced the impact of national diversity. Although beyond the scope of this current study, this could be examined in future research, which could also build upon our multidimensional alliance portfolio diversity construct to examine the ways firms can optimize the learning and resource benefits while limiting the complexity and coordination costs of managing a diverse alliance portfolio.

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REFERENCES

Min S, Wolfinbarger M. 2005. Market share, profit margin, and marketing efficiency of early movers,