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The effects of strategic alliance emphasis and marketing efficiency on firm value under different technological environments

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ABSTRACT

Firms are increasingly engaging in alliances, and managers need to set strategic priorities for their alliance portfolios. This study defines the relative priority firms place on specific types of alliances over others (i.e., strategic alliance emphasis). Using data on firm alliances and financial information, this study empirically examines how strategic alliance emphasis and marketing efficiency impact firm value in various technological environments. The results indicate that alliance success depends on a firm's marketing efficiency. We also find that the technological environment plays a moderating role in this relationship. This study contributes to the literature on strategic alliances by testing how various types of strategic alliances affect firm value. The results can provide managers with guidance on handling their alliance portfolios.

1. Introduction

Firms are forming multiple alliances in a wide range of functions with partners from diverse industries, creating what is known as a firm's "alliance portfolio" (e.g., Toyota with Mazda, Panasonic, and Softbank; Collins & Riley, 2013). The benefits firms gain from alliance portfolios can include acquiring new resources in functions, skills, and knowledge, or accessing new product/market opportunities that they cannot obtain internally. Thus, alliance portfolios are an important driver of firm value (Gnyawali & Charleton, 2018; Lichtenthaler, 2016; Tuli, Bharadwaj, & Kohli, 2010).

The portfolio view of alliances suggests that investment decisions in alliance portfolios may lead managers to set strategic priorities among alliance types (Cui & O'Connor, 2012; Rahman & Korn, 2010). Investing adequately in a certain alliance type within a portfolio is strategically critical. However, no study has provided direct evidence of firms' trade-offs among alliance types; studies have instead focused on examining how different alliance types affect firm value (Collins & Riley, 2013; Hagedoorn, Lokshin, & Zobel, 2018; Lavie, 2007; Wuyts & Dutta, 2012). To fill this gap, this study uses the concept of "strategic alliance emphasis"—which refers to the relative priority a firm places on a specific type of alliance in an alliance portfolio—and examines how shifts in strategic alliance emphasis affect firm value (Luo, Rindfleisch, & Tse, 2007; Mizik & Jacobson, 2003; Thomaz & Swaminathan, 2015). We examine the relative effects of specific alliance types by employing a ratio measurement as an indicator of shifts in strategic alliance emphasis. The results should provide managers with insights into how to compete effectively by investing their limited resources in alliance portfolio management.

Prior studies have recognized that the alliance type is the main driver of firm value in alliance portfolios. This study focuses on firms' strategic balancing of investment decisions regarding their alliance portfolios by examining how shifts in strategic alliance emphasis, the allocation of support for each alliance type, and two boundary conditions (marketing efficiency as a firm-specific factor and technological environment as an external factor) and their interactions influence the effectiveness of strategic alliance emphasis. Fig. 1 illustrates the proposed framework.

This study undertakes the following steps. (1) It develops the concept of "strategic alliance emphasis"; (2) it then assesses how marketing efficiency affects firm value and examines their interactions; (3) next, it investigates the complementary effect of strategic alliance emphasis and marketing efficiency in different technological environments. The proposed framework is tested using a dataset comprising firm alliances via mergers and acquisitions and financial information on publicly listed high- and low-technology manufacturing firms in the United States. The results show that the relative emphasis firms place on certain alliance types over others in alliance portfolios is important for explaining why some firms benefit more from alliance portfolios than others do.

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2. Theory and hypotheses

2.1. Alliance types

The alliance literature has made various attempts to classify alliance types (Baum, Calabrese, & Silverman, 2000; Song, Droge, & Hanvanich, 2005; Yang, Zheng, & Zhao, 2014). Research has tended to classify alliances according to industry or functional scope. In industry scope classification, alliances can be characterized as same- versus across-industry types depending on whether the partners compete in the same or different industries using highly similar resources (Oum, Park, Kim, & Yu, 2004). In functional scope classification, functional activities—such as production, marketing, distribution, and service—characterize strategic alliances depending on whether firms pool the same or different functions in the value chain (Arora & Gambardella, 1990; Kalaignanam, Shankar, & Varadarajan, 2007). Building on these classifications by scope, this study posits the following four types of strategic alliance according to the interaction between industry and functional scope: the SI-SF alliance, SI-DF alliance, AI-SF alliance, and AI-DF alliance (see Fig. 2).

Although this classification by scope is conceptually well-understood, the varying popularity levels among the alliance types limits our ability to capture all four possible conditions (Andrevski, Bass, & Ferrier, 2016; Hoffmann, Lavie, Reuer, & Shipilov, 2018). Firms enter strategic alliances to create cooperative synergies between partnering firms; however, when the partnering firms become direct rivals while differing in their functions, they tend to adopt competitive behavior, such as using their partners' resources to pursue their own interests (Arslan, 2018; Kumar, 2011). Thus, this study argues that firms in SI-DF alliances have a strong tendency to consider only their own perspectives, which hinders joint value creation and, in turn, threatens the value of the SI-DF alliance (Rindfleish & Moorman, 2001). In support of this argument, no SI-DF alliances were found in the data we collected for this study. Therefore, this study focuses only on three types of strategic alliance: SI-SF, AI-SF, and AI-DF.

2.2. Strategic alliance emphasis in alliance portfolios

Most firms acquire the resources they require from multiple alliances; the literature calls this collection of firm alliances an "alliance portfolio" (Hagedoorn et al., 2018). However, firms have limited budgets and thus need to set strategic priorities and allocate appropriate support levels to each alliance (Rahman & Korn, 2010). This study uses the concept of "strategic alliance emphasis," which refers to the relative priority firms place on a specific type of alliance over other types in an alliance portfolio (Mizik & Jacobson, 2003; Swaminathan, Murshed, & Hulland, 2008).

Firms are guided by different strategic motives when forming alliances, and emphasizing one type over others affects firm value in several ways. First, the SI-SF alliance protects a firm's core competences against rivals with similar functional capacities that are competing for market share in the same industry (e.g., between Kraft and General Foods; Oum et al., 2004). Firms form SI-SF alliances for two reasons: (1) to promote current or new products and (2) to achieve cost reductions (Kogut, 1991; Luo et al., 2007). By pooling similar resources through SI-SF alliances, firms can strengthen their competitive position against rivals by broadening product lines, filling the gap in product lines, combining the best of their resources and skills, building entry barriers, and gaining access to global markets (Hoffmann et al., 2018; Nakamura, Shaver, & Yeung, 1996). Cost reductions can be achieved via economies of scale in production and distribution, by obtaining bargaining power over buyers and suppliers, and engaging in risk sharing between partnering firms (Lavie, 2007). Therefore, a firm that prioritizes SI-SF alliances places greater value on defending or enhancing its position in its current markets than on accessing opportunities in new ones (Srivastava, Shervani, & Fahey, 1999).

Second, an AI-SF alliance opens up new product/market opportunities while maximizing the efficiency of existing functions (Auh & Menguc, 2005). According to the literature, firms in AI-SF alliances want to gain a foothold in new/evolving industries at minimal expense by reproducing their existing functions (Gupta, Smith, & Shalley, 2006; Jiang, Tan, & Thursby, 2010). For example, Toyota, a Japanese car manufacturer, formed a joint venture with Panasonic, a consumer electronics manufacturer, to enhance its presence in an emerging market. This alliance allowed Toyota to access Panasonic's advanced technology in batteries, which have become critical to the automotive battery business, while enjoying the operational efficiency resulting from the use of its own manufacturing facilities. This alliance has accelerated Toyota's battery development capability and strengthened its competitiveness in the battery market. Therefore, a firm that emphasizes AI-SF alliances is strategically placing more value on finding market opportunities in a new industry while enjoying operational efficiencies by limiting its search for market opportunities to its current industry (Oxley & Sampson, 2004).

Third, an AI-DF alliance is used to compete based on business diversification across the firm's competence boundaries (Khamseh & Nasiriyar, 2012). Firms aim to diversify their market presence by increasing their customer reach (Sahni & Juhari, 2019; Woo, Kim, Kim, & Wang, 2019). For example, Compaq, a personal computer manufacturer, formed an AI-DF alliance with Navisite, a web hosting service provider, in an emerging industry. Through this alliance, Compaq was able to access the online-managed hosting service as an extension of its current business offering. Thus, the diversification strategy of firms that prioritize the AI-DF alliance is to add new lines of functional activities across industries with regard to their product offerings rather than merely maintaining their current position by continuing to be the most cost-effective firm.

Firms can form alliance portfolios with different combinations to achieve competitive advantage. However, as each type of strategic alliance affects firm value differently, the impact on firm value may differ depending on whether the SI-SF, AI-SF, or AI-DF alliance is being strategically emphasized. We thus propose the following:

H1. Firm value is affected differently depending on whether the strategic alliance emphasis in an alliance portfolio is placed on (1) SI-SF alliances, (2) AI-SF alliances, or (3) AI-DF alliances.

2.3. Marketing efficiency

Studies on alliances have examined the possible interactions between marketing efficiency and firm resources in creating firm performance (Krasnikov & Jayachandran, 2008; Sarkees & Luchs, 2015). Marketing efficiency increases firm value for two reasons. First, efficient investment in marketing offers the same levels of customer demand while requiring less advertising, promotional, and R&D spending relative to competitors (Luo & Donthu, 2006; Song, Kim, Kim, & Lee, 2019). This marketing efficiency generates higher profits, which in turn enables a firm to enhance firm value. Second, to be efficient in managing their marketing, firms must understand not only the factors influencing consumer behavior but also the market by, for example, changing when necessary and sensing market trends (Bonilla, Arriaga, & Andreu, 2019; O'Dwyer & Gilmore, 2018; Woodside & Bernal, 2019). The market-sensing aspects of marketing efficiency that are customer-related allow firms to identify segments (Margariti, Boutsouki, & Hatzithomas, 2019; Yu, Rahman, & Yan, 2019). Segmentation allows for better targeting, which then leads to a better positioning of the firm's products relative to that of its competitors (Slater & Narver, 2000; Yuan, Kim, Song, & Lee, 2018). Therefore, marketing efficiency

helps a firm promote demand and financial performance, which ultimately increases firm value. We thus propose the following:

H2. Marketing efficiency is positively related to firm value.

Furthermore, the impact of strategic alliance emphasis on firm value may vary depending on the firm's level of marketing efficiency (Angulo-Ruiz, Donthu, Prior, & Rialp, 2018; Powell, Koput, & Smith-Doerr, 1996). First, the alliance literature has highlighted the importance of partner selection in alliances (Baum et al., 2000; Gulati, 1998; Jiang, Bao, Xie, & Gao, 2016). Firms seek to complement their existing resources through alliances to enhance their product/market opportunities (Sarkees & Luchs, 2015; Shah & Swaminathan, 2008). Accordingly, this study suggests that marketing efficiency helps firms better identify new needs in the market, which enables them to target partners that have the greatest potential (Hult, 1998; Morgan, Vorhies, & Mason, 2009; Song, Kim, & Kim, 2016). Second, firms adopt strong risk-avoidance behavior when investing in alliances (Joshi & Hanssens, 2010). Firms are outcome oriented and carefully consider the financial payoffs resulting from market opportunities, cost reductions, and economies of scale. Only when these financial payoffs are perceived to be profitable do firms see value in investing in alliances (Rust, Moorman, & Dickson, 2002). Again, marketing efficiency can change how firms regard the financial value of an alliance type. Though finding market opportunities across the boundaries of existing fields is difficult, firms with good marketing efficiency can evaluate and promote complementary resources more effectively than firms with low marketing efficiency can. This capacity can change the strength of the relationship between strategic alliance emphasis and firm value. We thus propose the following:

H3. Marketing efficiency and strategic alliance emphasis interact to affect firm value positively.

2.4. Moderating role of technological environment

The technological environment can affect how firms regard the value of their resources (Hong, Song, & Yoo, 2013; Mason, 2007). High-tech industries feature rapid changes in the technology used in production, while the production technology used in low-tech industries changes slowly (Achrol, 1991; Koka & Prescott, 2008).

This study suggests that an industry's technological level affects the relationship between strategic alliance emphasis and firm value. The profit-earning periods in rapidly changing markets are short (Jiang et al., 2010). Thus, rather than protecting core competences with existing products, firms in high-tech industries must access new markets while taking advantage of existing resources to increase the capitalization of products (Auh & Menguc, 2005). This capitalization enables a firm to enjoy higher sales and profits, which can increase its firm value (Rust et al., 2002). Since the strategic task of the AI-SF alliance is focused on stimulating existing functional resources across industries, the value of high-tech firms responds most strongly to a strategic alliance emphasis on AI-SF alliances. Contrariwise, products in low-tech industries remain largely the same over many years, as they are in the mature stage of their life cycle (Chandler, 1994) and competition is intense (Auh & Menguc, 2005). This market stability leads firms to strategically emphasize product promotion by broadening lines, filling gaps, and pursuing cost reduction rather than accessing new markets, which implies higher risk (Mason, 2007; Oum et al., 2004). Thus, in a low-tech industry, firm value responds most to an emphasis on SI-SF alliances. We therefore propose the following:

H4(a). In a high-tech industry, firm value responds more to a firm's increased strategic alliance emphasis on AI-SF alliances than to an emphasis on an SI-SF or AI-DF alliance in an alliance portfolio.

H4(b). In a low-tech industry, firm value responds more to a firm's increased strategic alliance emphasis on SI-SF alliances than to an emphasis on an AI-DF or AI-DF alliance in an alliance portfolio.

In a volatile and unpredictable market, the relevance of market knowledge tends to be inconsistent over time; consequently, the deployment efficiency of a firm's value creation tends to decrease (Ngo & O'Cass, 2012; Schilke, 2014). Conversely, in a relatively stable and predictable market, market/consumer knowledge and patterns remain informative, which increases the deployment efficiency of value creation (Wilden & Gudergan, 2015). This suggests that the technological environment level moderates marketing efficiency's effect on firm value. We thus propose the following:

H5. The effect of marketing efficiency on firm value is greater in low-tech industries than in high-tech industries.

This study extends the existing analysis on technological environment's role and discusses how the interaction between marketing efficiency and strategic alliance emphasis affects firm value. The ability to capitalize on products from new markets is critical to survival for firms in high-tech industries, where product life cycles are short (Stuart, 2000). Accessing new markets unrelated to the currently served market increases uncertainty, which reduces the potential benefits of strategic alliances (Srivastava et al., 1999). Thus, marketing efficiency can play an important role in the relationship between strategic alliance emphasis and firm value. As a firm's marketing efficiency increases, its understanding of consumers and markets (Luo & Donthu, 2006) can reduce the uncertainty involved in strategic alliances. Thus, AI-DF strategic alliances can drive business diversification enabling the maximum number of opportunities (i.e., pooling different functional activities across industries). Specifically, when a firm's marketing efficiency is high, firm value reacts most strongly to a strategic alliance emphasis on an AI-DF alliance because the firm's market knowledge enables it to reduce the uncertainty involved in an AI-DF alliance; in this situation, emphasizing an AI-DF alliance creates the most value and the maximum number of opportunities.

In a low-tech industry, as the market matures, the products remain much the same over time, and firms are already emphasizing the strategy of increasing product values (Oum et al., 2004). Thus, product development and cost reduction are still important for firms with high marketing efficiency, but firm value responds more to an emphasis on reproducing activities that have proven successful in the current market than to an emphasis on pursuing new markets to increase demand; the demand enables firms to generate sales in new markets, whereas the strategic option of strengthening their current position in saturated markets limits sales growth. Thus, the stock market responds most strongly to a strategic alliance emphasis on AI-SF alliances. Therefore, this study hypothesizes as follows:

H6(a). In a high-tech industry, as a firm's marketing efficiency level increases, firm value responds more strongly to a strategic alliance emphasis on an AI-DF alliance than to one on an SI-SF or AI-SF alliance in an alliance portfolio.

H6(b). In a low-tech industry, as a firm's marketing efficiency level increases, firm value responds more strongly to a strategic alliance emphasis on an AI-SF alliance than to one on an SI-SF or AI-DF alliance in an alliance portfolio.

3. Methodology

3.1. Data

Information on 337 alliances—including data on mergers,

acquisitions, and capital investments between 1994 and 2014—was collected from the Securities Data Company. These data were cross-checked to complement the records on alliance formation through searches for alliance announcements in the Lexis/Nexis database. This sample was then matched with stock information in the Center for Research in Security Prices database and with firm-specific financial data in COMPUSTAT.

The study's unit of analysis is alliance emphasis in an alliance portfolio. The primary Standard Industrial Classification (SIC) was used to define the similarity between any two partners (Arslan, 2018; Rahman & Korn, 2010). For each alliance, we coded the primary SIC of the focal and partner firms; the time of the alliance formation; the functional activities involved in the alliance; the focal firm's ownership percentage; and the partner's name, public status, and country of origin. The sample comprises firms from the computer equipment industry (matching the three-digit SIC code 357) and food industry (matching the two-digit SIC code 20), classified into high- and low-tech subsamples. The full sample comprises 40 firms that reported for all or some of the period from 1994 to 2014. Of the 337 observations available for the analysis, 177 involve computer equipment companies and 160 involve food companies.

3.2. Measures

3.2.1. Firm value

The dependent variable is firm value. This study treated firm value as the market value of a firm's equity. The annual market value of each firm was calculated by multiplying the average of the 12 end-of-month daily values by the number of common shares outstanding.

3.2.2. Strategic alliance emphasis

To classify alliance types, we used both the primary SIC codes and the functions involved in an alliance (Cui & O'Connor, 2012). First, industry scope (i.e., same vs. across) was defined by matching the two- or three-digit SIC codes between partners. Second, functional scope was defined by considering the activities involved in an alliance, such as marketing, manufacturing, or R&D.

We measured strategic alliance emphasis using the ratio of each of the three types of alliance in an alliance portfolio (Mizik & Jacobson, 2003). For example, we measured the strategic alliance emphasis between SI-SF and AI-SF alliances by taking the number of SI-SF alliances less the number of AI-SF alliances divided by the total number of alliances in an alliance portfolio. We applied a five-year moving window to measure the size of the alliance portfolio (Stuart, 2000).

3.2.3. Marketing efficiency

We measured each firm's marketing efficiency using the data envelopment analysis (DEA) approach (Büschken, 2007; Cooper & Zhu, 2004). Four types of firm-specific information—advertising expense, R &D expense, number of employees, and brand power—were collected from COMPUSTAT as multiple input variables (Dutta, Narasimhan, & Rajiv, 1999; Hanssens & Pauwels, 2016; Rather, Tehseen, Itoo, & Parrey, 2019; Vorhies & Morgan, 2005). The data on brand value were obtained from *Fortune* (Luo & Donthu, 2006). A company was coded as 1 if it was listed among the top *Fortune* 500 firms and 0 otherwise. For the output variable, we used the total amount of annual sales from COMPUSTAT. Data were obtained for the 12 years from 2003 to 2014. A firm's marketing efficiency was measured using the output-oriented DEA model as follows:

$$
\begin{aligned}
&\text{Max } \phi \\
&\text{Subject to} \\
&\text{s. t. } \sum \lambda_j \text{Ln(advertising expense)}_j \geq \text{Ln(advertising expense)}_{jo} \\
&\text{s. t. } \sum \lambda_j \text{Ln(R\&D expense)}_j \geq \text{Ln(R\&D expense)}_{jo} \\
&\text{s. t. } \sum \lambda_j \text{Ln(no. of employees)}_j \geq \text{Ln(no. of employees)}_{jo} \\
&\text{s. t. } \sum \lambda_j \text{Ln(brand power)}_j \geq \text{Ln(brand power)}_{jo} \\
&\phi \text{Ln(sales)}_{jo} \geq \sum \lambda_j \text{Ln(sales)}_j \\
&\sum \lambda_j = 1 \\
&\lambda_j \geq 0 \quad j = \text{company } 1, \ 2, \ \ldots \ N \\
&\text{where } \phi = \text{a marketing efficiency parameter and } \lambda = \text{weights.}
\end{aligned}
\tag{1}
$$

3.2.4. Control variables

We controlled for several firm characteristics and alliances that are known to influence firms' market valuation.

3.2.4.1. Firm-specific factors. *Firm size* was measured as the firm's total asset value (Lavie, 2007). We also considered a firm's *advertising* and *R& D expenses* (Joshi & Hanssens, 2010). To reduce the skewness and variability of the data across firms, the values were log transformed.

3.2.4.2. Alliance characteristics. We included four variables. *Alliance experience* was measured by calculating the total number of alliances since 1994 until the five years preceding the current alliance portfolio (Mani & Barua, 2015). We measured a focal firm's *majority control* (Cui & O'Connor, 2012): If the focal firm had majority ownership, we coded it as 1; if the focal firm had minority ownership, we coded it as -1; and if the focal firm and its partner had equal ownership, we coded it as 0. *Partner's brand value* was also considered, as it can influence the quality of new alliances (Swaminathan & Moorman, 2009). (Luo & Donthu, 2006). The partner was coded as 1 if it was listed among the top *Fortune* 500 firms and 0 otherwise. We then calculated the partner's brand value by taking the average of all the alliances in its alliance portfolio. Furthermore, the *national dispersion* of the alliance portfolio was considered (Ganesan, Malter, & Rindfleisch, 2005). National dispersion was measured as the unique number of partner countries in an alliance portfolio; we then divided this number by the number of total alliances in the portfolio. Table 1 shows the study's descriptive statistics and strategic alliance formations.

3.3. Method of analysis

This study used unbalanced cross-sectional time series data. We applied a random effects model to address issues related to the small sample size (Wooldridge, 2002). Operationalizing strategic alliance emphasis in terms of the ratios of SI-SF to AI-SF, SI-SF to AI-DF, and AI-SF to AI-DF in the alliance portfolio created potential multicollinearity issues. Thus, this study considered only the ratios of SI-SF to AI-SF and SI-SF to Al-DF in the alliance portfolios. The impact size of AI-SF vs. AI-DF strategic alliance emphasis on firm value was calculated only when the relative impacts on firm value of SI-SF vs. AI-SF and SI-SF vs. Al-DF were statistically significant. The model is as follows:

$$
\begin{aligned}
\ln FV_{it} = {} & \beta_{1i} + \beta_2 ME_{it} + \beta_3 SAE(SI - SF \quad vs. \quad AI - SF)_{it} \\
& + \beta_4 SAE(SI - SF \quad vs. \quad AI - DF)_{it} \\
& + \beta_5 ME_{it} \times SAE(SI - SF \quad vs. \quad AI - SF)_{it} \\
& + \beta_6 ME_{it} \times SAE(SI - SF \quad vs. \quad AI - DF)_{it} + \beta_7 \ln FS_{it} \\
& + \beta_8 \ln Mexp_{it} + \beta_9 \ln R\&Dexp_{it} + \beta_{10} TA_{it} + \beta_{11} AE_{it} \\
& + \beta_{12} FMC_{it} + \beta_{13} PBV_{it} + \beta_{14} ND_{it} + u_{it}
\end{aligned}
\tag{2}
$$

where

$\ln FV_{it}$ = log of firm value for firm i at time t,

ME_{it} = marketing efficiency for firm i at time t,

$SAE(SI-SF \text{ vs. } AI-SF)_{it}$ = strategic alliance emphasis of SI − SF versus AI − SF for firm i at time t,

$SAE(SI-SF \text{ vs. } AI-DF)_{it}$ = strategic alliance emphasis of SI − SF versus AI − DF for firm i at time t,

$ME \times SAE(SI-SF \text{ vs. } AI-SF)_{it}$ = interaction between marketing efficiency and strategic alliance emphasis of SI − SF versus AI − SF for firm i at time t,

$ME \times SAE(SI-SF \text{ vs. } AI-DF)_{it}$ = interaction between marketing efficiency and strategic alliance emphasis of SI − SF versus AI − DF for firm i at time t,

$\ln FS_{it}$ = log of firm size for firm i at time t,

$\ln Mexp_{it}$ = log of marketing expense for firm i at time t,

$\ln R\&Dexp_{it}$ = log of R&D expense for firm i at time t,

TA_{it} = no. of total alliances for firm i at time t,

AE_{it} = alliance experience for firm i at time t,

FMC_{it} = focal firm's majority control for firm i at time t,

PBV_{it} = partner's brand value for firm i at time t,

ND_{it} = national dispersion for firm i at time t.

We assumed that β_{1i} was a random variable with a mean value of β_1. The intercept value for a firm was defined as follows:

$$\beta_{1i} = \beta_1 + \varepsilon_i \quad i = 1, 2, \cdots, N. \quad \varepsilon_i \sim N(0, \sigma_\epsilon^2) \tag{3}$$

where ϵ_i represents the cross-sectional error in Eq. (3), and ω_{it} indicates the combined time-series and cross-sectional error in Eq. (2). Both error terms (ϵ_i and ω_{it}) follow the usual assumptions (Eq. (4)), and a generalize least squared estimation was conducted:

$$\begin{aligned} &\epsilon_i \sim N(0, \sigma_\epsilon^2), \quad u_{it} \sim N(0, \sigma_u^2) \\ &E(\epsilon_i u_{it}) = 0, \quad E(\epsilon_i \epsilon_j) = 0 \quad (i \neq j) \\ &E(u_{it} u_{is}) = E(u_{it} u_{jt}) = E(u_{it} u_{js}) = 0 \quad (i \neq j, t \neq s) \end{aligned} \tag{4}$$

To test our hypotheses, we first ran a full sample regression. Then, to test the differential effects of technological environment, we ran separate regressions for high- and low-tech industries.

4. Results

Table 2 provides the correlation matrix of our entire sample, and Table 3 reports the findings.

First, we tested the hypotheses regarding how strategic alliance emphasis and marketing efficiency affect firm value with the full sample. The results showed that firm value did not react differently depending on which alliance type was emphasized in an alliance portfolio. Thus, H1 is not supported (β_3 = 0.060, n.s., β_4 = -0.003, n.s.). Marketing efficiency and its interaction with strategic alliance emphasis did not create value for a firm. Thus, H2 (β_2 = 0.026, n.s.) and H3 are also not supported (β_5 = 0.036, n.s., β_6 = −0.003, n.s.).

Then, we tested the effects of different technological environments using the high- and low-tech industry subsamples. In the high-tech industry, as both SAE (SI-SF vs. AI-SF) and SAE (SI-SF vs. AI-DF) showed significant values ($\beta_3 = -0.151, p < 0.1$, $\beta_4 = 0.183, p < 0.05$), we were able to calculate the effect of SAE (AI-SF vs. AI-DF) on firm value. As the SI-SF alliance became the basis for the comparison of effects, we subtracted the value of SAE (SI-SF vs. AI-DF) from the value of SAE (SI-SF vs. AI-SF), obtaining a value of 0.334 for SAE (AI-SF vs. AI-DF). The effect of alliance type on firm value was operationalized as a measurement of relative efficiency; thus, the interpretation of each coefficient should take an absolute value. Therefore, for the high-tech industry, firm value responds most strongly to an emphasis on an AI-SF alliance (at 0.344) among the three alliance types, supporting H4(a). Conversely, in the low-tech industry, the effects on firm value did not differ depending on which alliance type was emphasized (β_3 = 0.045, n.s., and β_4 = -0.049, n.s.). Thus, H4(b) is not supported.

In addition, the results showed that marketing efficiency could not create value in a high-tech industry (β_2 = 0.063, n.s.), and even showed a negative impact on firm value in the low-tech industry (β_2 = -0.241, $p < 0.001$). Thus, H5 is not supported. However, the results support the interaction of marketing efficiency in the relationship between strategic alliance emphasis and firm value in different technological environments. In the high-tech industry, as a firm's level of marketing efficiency increased, firm value reacted most highly to an emphasis on an AI-DF alliance (at 0.520) among the three alliance types, supporting H6(a). Conversely, in the low-tech industry, as a firm's marketing efficiency level increased, firm value reacted most highly to an emphasis on an AI-SF alliance (β_5 = -0.245, $p < 0.05$), while firm value did not respond differently between emphases on an SI-SF alliance or an AI-DF alliance. Thus, H6(b) is supported.

5. Discussion and conclusion

This study examines the relationships between strategic alliance emphasis and firm value and two important boundary conditions of this relationship: one based on an internal factor and the other based on an external factor. The results for the performance impact of strategic alliance emphasis shows that the impact of marketing efficiency on firm value can be obtained in a particular environmental context only. In high-tech industries, firm value reacted the most when emphasis was placed on an AI-SF alliance. However, this effect shifted depending on the firms' marketing efficiency. Firms with high marketing efficiency benefited more by emphasizing an AI-DF alliance over SI-SF and AI-SF alliances in a high-tech industry, whereas placing a specific strategic alliance emphasis could not create value for a firm in a low-tech industry. Instead, firm value in a low-tech industry reacted most strongly to an emphasis on an AI-SF alliance only when the relative strategic emphasis had been established along with high marketing efficiency.

5.1. Implications for theory

This study contributes to the alliance literature in four ways. First, we apply the concept of strategic alliance emphasis to alliance portfolio management. While most studies have addressed the effects of specific

types of alliances (Gupta et al., 2006; Kauppila, 2015; Swaminathan et al., 2008), this study examines the relative priority firms place on a specific type of alliance through ratio measurements (Sarkees & Luchs, 2015), used as an indicator of shifts in strategic alliance emphasis. Second, this study applies a marketing efficiency approach to the relationship between strategic alliance emphasis and firm value. To the best of our knowledge, this study is the first to provide empirical evidence that the response of firm value to strategic alliance emphasis changes depending on a firm's marketing efficiency level. Our results reveal that firms' emphasis on a specific type in an alliance portfolio is not always beneficial in itself; rather, its impact depends on the firm's marketing efficiency. Third, this study enriches the evidence on the value-creation effects of strategic alliance emphasis and marketing efficiency by considering the moderating role of technological environments; this specification helps clarify the mixed results regarding strategic alliance valuation in the literature (Luo et al., 2007). In a high-tech industry, an increased strategic alliance emphasis on an AI-SF alliance (over SI-SF and AI-DF alliances) is associated with the highest increase in firm value, and this effect shifts based on a firm's marketing efficiency. Marketing efficiency reduces the risks involved in product/market diversification through an AI-DF alliance, thereby increasing emphasis on the AI-DF alliance to create the most value. The results show that, even in a low-tech industry, where the production technology has remained unchanged for years, firm value reacts most strongly to a strategic alliance emphasis on an AI-SF alliance, but only when that emphasis is accompanied by high marketing efficiency. The study's final contribution is its empirical testing of its hypotheses. Because of the difficulties involved in measuring strategic alliance emphasis and marketing efficiency as well as their effects, few empirical studies have examined the effects of varying types of alliances on firm value. Our study fills this gap in the empirical literature.

5.2. Implications for managers

Our findings also have important practical implications for the management of alliance portfolios for successful firm performance. First, the findings indicate the importance of balancing a strategic alliance portfolio. The results imply that managers of alliance portfolios need to make strategic decisions that place emphasis on SI-SF, AI-SF, and AI-DF alliances and to allocate adequate support for each. Furthermore, to enhance firm value, managers must carefully balance strategic alliance emphasis according to its environmental condition. For instance, increased emphasis on an AI-SF alliance over SI-SF and AI-DF alliances in an alliance portfolio creates the most value for firms in a high-tech industry; however, strategic alliance emphasis alone cannot create value for a firm in a low-tech industry. Second, by showing the complementary relationship between strategic alliance emphasis and marketing efficiency in two different technological environments, this study highlights the need for marketing managers to become more involved in alliance management. In particular, they should be aware that better knowledge of markets enables high-tech firms to benefit from a change in strategic alliance emphasis from an AI-SF to AI-DF alliance. Interestingly, more value is obtained by low-tech firms by emphasizing an AI-SF alliance when the strategic alliance emphasis is accompanied by high marketing efficiency. In general, given the conditional benefits of strategic alliance emphasis in an alliance portfolio, it is important for managers to take account of both marketing efficiency and the technological environment as moderators.

5.3. Limitations and opportunities for future research

Despite this study's new insights, it has several limitations, which provide directions for future research. First, though alliances are classified into four types, only three are included in our analysis. The emergence of an SI-DF alliance is possible in current dynamic business environments. Therefore, it would be worth including this type of alliance when examining the effects of shifts in strategic alliance emphasis. Second, given this study's small sample, the results might not be generalizable to all firms. Thus, future studies should test the findings using broader samples. Third, this study shows that the main effect of marketing efficiency is not statistically supported in the full sample. Although this result is surprising, a few studies have shown negative insignificant or non-linear effects of marketing efficiency on firm performance (Arunachalam, Ramaswami, Herrmann, & Walker, 2018; Luo, 2008). Therefore, even the main effect of marketing efficiency does not have a clear impact, and this study shows the possibility of both positive and marginal negative interaction effects between strategic alliance emphasis and marketing efficiency. This means that the effect of marketing efficiency can be determined based on the status of the strategic alliance emphasis. Thus, future research should attempt to deepen our understanding of marketing efficiency. Furthermore, future research could apply various performance measures that encompass not only forward-looking long-term measures (i.e., firm value) but also short-term measures (i.e., profitability). Because of the inherent trade-off between long-term and short-term performance objectives (Joshi & Hanssens, 2010), strategic alliances may produce different effects across different performance measures.

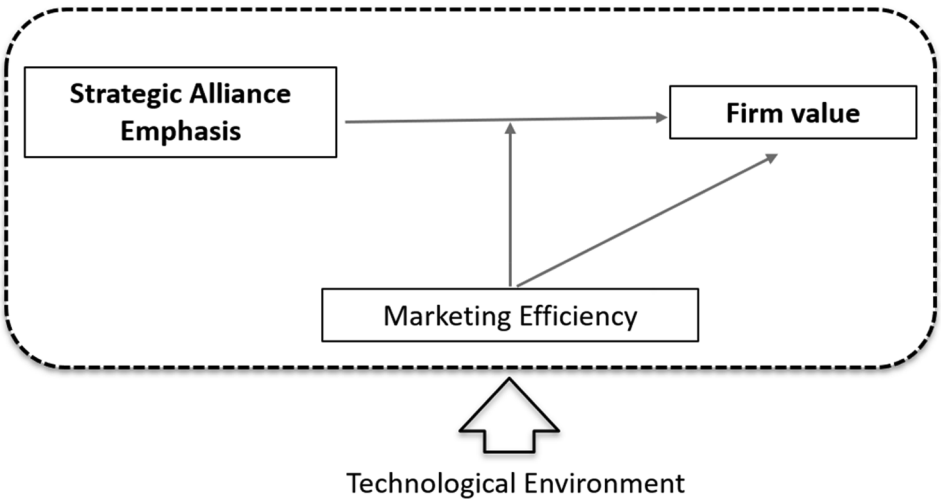

Fig. 1. Research framework.

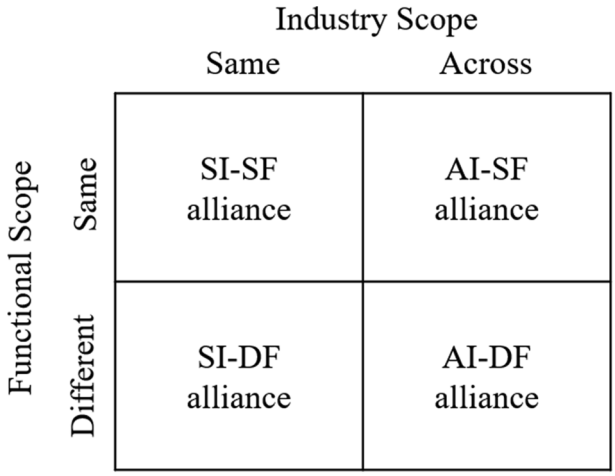

Fig. 2. Types of strategic alliances.

Table 1
Descriptive statistics.

	Variable No. of observations	Full sample 337		High-tech industry 177		Low-tech industry 160	
		M	*SD*	*M*	*SD*	*M*	*SD*
Firm characteristics	Marketing efficiency (ME)	0.64	0.48	0.70	0.46	0.57	0.49
	Firm value (FV) ($000)	13463.45	21629.13	12110.43	18609.99	14960.23	24514.20
	Firm size (FS) ($000)	4102.80	5962.80	4942.95	7318.53	3173.38	3767.30
	Marketing expense (Mexp) ($000)	281.21	446.65	130.08	291.62	448.41	523.34
	R&D expense (R&Dexp) ($000)	400.53	720.41	652.58	911.64	121.72	166.87
Strategic alliance characteristics	SI-SF alliance	2.17	2.35	1.71	2.38	2.67	2.21
	AI-SF alliance	2.80	2.88	2.46	2.93	3.18	2.80
	AI-DF alliance	1.35	2.03	1.63	2.19	1.05	1.79
	Total no. of alliances (TA)	6.32	4.85	5.81	5.27	6.89	4.29
	Alliance experience (AE)	9.77	8.27	7.70	7.99	12.07	7.98
	Focal firm's majority control[1] (FMT) (%)	79%	–	75%	–	83%	–
	Partner's brand value[1] (PBV) (%)	68%	–	71%	–	63%	–
	National dispersion[3] (ND)	0.50	0.31	0.42	0.30	0.59	0.28

Notes: [1] Nominal scales were used for the focal firm's majority control and the partner's brand value. Thus, instead of expressing values by means, we used percentage (%). In high-tech industry, 75% of focal firms had majority control over their partners and 71% of firms formed strategic alliances with partners with strong brands. [3] National dispersion ranges from 0 to 1, with a higher value indicating a higher level of national dispersion.

Table 2
Correlation matrix.

Variable	1	2	3	4	5	6	7	8	9	10
1. Firm value	1									
2. SAE (SI-SF vs. AI-SF)	0.01	1								
3. SAE (SI-SF vs. AI-DF)	0.05	0.67*	1							
4. Marketing efficiency	−0.12*	0.05	0.09	1						
5. Ln firm size	0.90*	−0.01	0.02	0.02	1					
6. Ln marketing expense	0.76*	−0.13*	−0.04	−0.18*	0.73*	1				
7. Ln R&D expense	0.63*	−0.03	−0.10	−0.07	0.76*	0.38*	1			
8. Total alliance	0.42*	−0.10	−0.14*	0.13*	0.45*	0.29*	0.26*	1		
9. Alliance experience	0.30*	−0.08	−0.06	0.13*	0.38*	0.26*	0.08	0.42*	1	
10. National dispersion	0.08	0.02	−0.01	−0.17*	0.03	0.21*	−0.04	−0.26*	0.05	1

* $p < 0.05$, SAE: Strategic Alliance Emphasis.

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Appendix A

Table 3
Effects of strategic alliance emphasis (SAE) and marketing efficiency (ME) on firm value.

Variable	Full sample	High-tech industry	Low-tech industry
Intercept	0.409*	0.338	1.360***
ME	0.026	0.063	−0.241***
SAE (SI-SF vs. AI-SF)	0.060	−0.151†	0.045
SAE (SI-SF vs. AI-DF)	−0.003	0.183*	−0.049
SAE (AI-SF vs. AI-DF)	–	0.334*	–
ME × (SI-SF vs. AI-SF)	0.036	0.262**	−0.245*
ME × SAE (SI-SF vs. AI-DF)	−0.003	−0.258*	0.10
ME × SAE (AI-SF vs. AI-DF)	–	−0.520*	–
Control variable			
ln assets	0.399***	0.333***	0.258***
Ln marketing expense	0.070***	0.120	0.140***
Ln R&D expense	−0.016	0.123***	−0.046†
Total no. of alliances	−0.005	0.113*	0.006
Alliance experience	−0.004*	−0.012**	−0.010**
Majority control	0.034	0.031	0.411***
Partner reputation	0.164**	0.039	−0.223**
National dispersion	0.088	0.057	−0.032
R-square	0.837	0.921	0.883
Wald (log likelihood) χ^2	711.32	1766.46	1028.14

† $p < 0.1$.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

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