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Alliance performance and subsequent make-or-ally choices: Evidence from the aircraft manufacturing industry

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Abstract

Research Summary: We examine how the performance of a firm's prior alliances influences its propensity to persist with the alliance mode or switch to independent operations in the context of new product introductions (NPIs). Drawing on the behavioral theory of the firm (BTOF), we argue that a firm's alliance performance has a U-shaped effect on its likelihood of undertaking the subsequent NPI independently and that competitive intensity strengthens this U-shaped relationship. We also predict that firms with above-aspiration alliance performance are more likely to achieve breakthrough performance in the subsequent NPI if they switch to independence than if they continue to ally. Data on NPIs in the global aircraft manufacturing industry (1944–2000) support our hypotheses. Our study extends the alliance literature and contributes to research on how firm performance influences subsequent strategic choices.

Managerial Summary: The dilemma of whether to continue or exit an alliance or relationship is a common one for individuals, countries, and firms. Our study examines firms' strategic decision to switch to

independent operations after having partnered with other firms. Using the aircraft product development context, we show that firms that make such a change in their strategy are the ones that performed either much better or much worse than what they expected. Firms with alliance performance close to their expectations tend to persist with their current strategy. Of the firms that change their strategy, the high performers benefit much more from changing their strategy than low performers. We provide insights regarding when it is preferable for managers to continue to ally or to switch to independence, especially in launching new products.

KEYWORDS

aircraft manufacturing industry, alliance, breakthrough performance, BTOF, competitive intensity, new product introduction

1 | INTRODUCTION

Inter-firm alliances are a topic of sustained interest among strategy scholars (Ahuja, 2000; Stuart, 2000). A firm's choices about whether, when, and how to form alliances have strong implications for its performance (Aggarwal, Siggelkow, & Singh, 2011; Zollo, Reuer, & Singh, 2002), and the firm's choices to terminate alliances are equally important (Chang, Chung, & Moon, 2013; Dussauge, Garrette, & Mitchell, 2000). Because many firms form and terminate alliances repeatedly, it is important to examine under what conditions the performance of prior alliances influences a firm's subsequent choices between continuing to ally with other firms and switching to independent operations.

Such persist-or-switch decisions merit careful investigation, as they are associated with a key dilemma. First, prior alliances may increase a firm's odds of success in subsequent alliances (Robertson & Gatignon, 1998). This view suggests that prior involvement in an activity helps a firm build up the capabilities underpinning that activity, which then leads it to persist in its past behavior (Anand, Mulotte, & Ren, 2016; Kaul & Wu, 2016). For instance, a firm that has had a successful alliance may assume it has developed alliance capabilities (Kale, Dyer, & Singh, 2002) and suppose it will be equally successful in its next development if it again engages in a new alliance (Hoang & Rothaermel, 2005; Robertson & Gatignon, 1998). However, prior alliances could also drive a firm to switch to independent operations (Chang et al., 2013), as the firm may develop technical and business-related capabilities through alliances (Dussauge & Garrette, 1997; Wan & Wu, 2017), which build up its confidence and lead it to opt for arrangements that appear to have a higher potential payoff. For instance, if a firm has found success with activities undertaken through an alliance, it may no longer see the need for partners' resources and knowledge. Instead, it may assume that it will be at least equally successful in similar ventures carried out

independently (Kim, 1998; Mulotte, Dussauge, & Mitchell, 2013). The essential dilemma that firms face is the choice between persisting with what they did in the past and switching to something different (Audia, Locke, & Smith, 2000; Wu, Wan, & Levinthal, 2014).

To examine how a firm's performance in its prior alliances influences its make-or-ally choice in a subsequent endeavor, we use the theoretical lens of the behavioral theory of the firm (hereafter BTOF, Cyert & March, 1963; for a review, see Gavetti, Greve, Levinthal, & Ocasio, 2012) and its recent extensions (Kavusan & Frankort, 2019; Posen & Levinthal, 2012; Vidal & Mitchell, 2015). We argue that alliance performance that is *close to* aspirations fosters local search and drives the firm to avoid changes as radical as switching to independent operations. By contrast, performance that falls either *below* or *above* aspirations results in the firm switching from the alliance mode to independent operations, though for different reasons. When the performance shortfall is substantial, firms engage in problemistic search, which leads them to make significant changes. When the performance exceeds aspirations, firms engage in slack search, which drives them to experiment with radically new ways of doing things despite the risk involved.

Drawing on these arguments, we predict that a firm's alliance performance has a U-shaped effect on its likelihood of subsequently switching to independent operations. We also consider the moderating effect of competitive intensity and argue that firms whose alliance performance is below or above aspirations become even more likely to switch to independent operations as competitive intensity increases. We further propose two contrasting hypotheses regarding post-switch performance. On the one hand, alliance partners who switch to independent operations following below-aspiration alliance performance are less successful in their new endeavors than firms that ally again. On the other hand, partners who switch to independent operations bolstered by above-aspiration alliance performance fare *much* better in their new endeavors than firms that ally again. That is, they are more likely to achieve breakthrough performance in their post-switch endeavors. We define breakthrough performance as significantly better performance than the industry average. In other words, breakthrough performance is not merely satisfactory performance and incremental improvement, but rather extraordinary performance vis-à-vis peers. The empirical context for our study is new product introductions (NPIs), a critical activity for sustaining firm performance (Chen, Zhang, Li, & Turner, 2022; Helfat & Raubitschek, 2000). We find empirical support for our predictions using a proprietary dataset on new aircraft models introduced by 94 aircraft manufacturers during the 1944–2000 period.

Our primary contribution is to the alliance literature. We shed new light on a question that the literature has long debated: Can firms use alliances as a preliminary step toward successful independent operations (Alcacer & Oxley, 2014; Chang et al., 2013; Kim, 1998; Mulotte et al., 2013; Robertson & Gatignon, 1998; Wan & Wu, 2017)? We show that the firms most likely to switch from the alliance mode to independent operations are those firms with either below- or above-aspiration alliance performance. We also demonstrate that the likelihood of switching to independent operations increases as the intensity of competition in the industry grows. We further add to the alliance literature by showing the contingent nature of post-switch performance: Partners that have achieved below-aspiration alliance performance would fare worse if they chose to switch to independent operations in their next endeavor, whereas firms that have achieved above-aspiration alliance performance would be remarkably better off going it alone. We thus provide a more fine-grained understanding of firms' successive make-or-ally choices by emphasizing the influence of past choices (and their performance) on subsequent choices (and their performance).

We also contribute to the BTOF literature in three main ways. First, most of the empirical literature in this area has used *overall firm performance* as the independent variable and the

intensity with which a given strategy is pursued as the dependent variable—notably, new product introductions (Joseph & Gaba, 2015), acquisitions (Iyer & Miller, 2008; Kuusela, Keil, & Maula, 2017), and divestitures (Vidal & Mitchell, 2015). By contrast, we examined how a firm's strategy-specific performance (i.e., the firm's performance in implementing the alliance strategy) influences its subsequent strategic choice. Moreover, while past research has focused on decisions that are continuous in nature (e.g., R&D spending, number of acquisitions or divestitures), we join the pioneering efforts in this arena (Ref & Shapira, 2017; Shimizu, 2007) by applying BTOF to *discrete* choices associated with distinct payoffs. Second, we highlight the causal relationships existing between different search processes, persist-or-switch decisions, and subsequent performance implications. Specifically, we show that while both problemistic search and slack search trigger firms to switch its strategy, switching decisions driven by slack search are more likely to lead to breakthrough performance than switching decisions driven by problemistic search. Third, by adopting BTOF rather than a pure profit-maximizing approach, we can better understand why firms achieving below-aspiration performance often switch strategies even though they would fare better by persisting with the status quo. Our study also provides managers and business practitioners with important insights into corporate strategy and NPIs.

2 | THEORY AND HYPOTHESES

2.1 | Alliance performance and subsequent switch to independent operations

Switching from the alliance mode to independent operations is a major strategic change fraught with risks. To examine how the performance of a firm's prior alliances influences this strategic decision, we followed recent literature that has used a BTOF lens (Kavusan & Frankort, 2019; Ref & Shapira, 2017; Vidal & Mitchell, 2015) and divided our arguments into three parts: performance that is close to aspirations, performance that falls below aspirations, and performance that falls above aspirations.

2.1.1 | Performance close to aspirations

We first examined how firms respond to performance that closely approximates their aspirations. BTOF holds that in such instances, firms are reluctant to make organizational changes. Adequately performing firms and their managers do not perceive a strong need to deviate from their current course of action. Instead, they interpret the performance achieved as an endorsement of their current strategy and therefore tend to persist with it (Cyert & March, 1963; Greve, 1998). This logic has received support in a variety of empirical contexts. Researchers have found, for instance, that performance close to aspirations reduces the likelihood of major changes (Greve, 1998), risk-taking (Wiseman & Bromiley, 1996), and increased R&D intensity (Greve, 2003). Research also shows that managers of firms achieving performance close to aspired levels may engage in so-called "local search" that leads them to make minor incremental adjustments to existing routines. They will thus refrain from allocating resources to more exploratory behaviors that could prove detrimental to current performance (Greve, 2003; Posen, Keil, Kim, & Meissner, 2018; Posen & Levinthal, 2012).

In the context of make-or-ally choices for NPIs, this view suggests that when a firm's alliance performance has closely approximated its aspirations, this produces confidence in its

alliance capabilities (Kale et al., 2002). The firm is thus likely to persist with the current governance mode and develop its next product through another alliance. The firm may, however, seek to improve the effectiveness of its current way of operating. For example, it could change the board or committee overseeing the collaboration or introduce less formalized and therefore less cumbersome monitoring mechanisms (Reuer, Zollo, & Singh, 2002). Managers may also renegotiate the contract and task-sharing agreement with the current partners (Reuer & Ariño, 2002). Alternative solutions could focus on partner selection and turnover—for example, turning to familiar partners with whom the firm has allied repeatedly (Gulati, 1995), adding a new partner (Beckman, Haunschild, & Phillips, 2004), or replacing a current partner (Bae & Gargiulo, 2004). Overall, we expect firms with *alliance performance close to aspirations* to *continue using the alliance mode* in their subsequent NPIs.

2.1.2 | Performance below aspirations

When firms perform below aspirations, managers are motivated to find solutions to what they view as a very serious problem (Cyert & March, 1963; for a review, see Posen et al., 2018). Unlike close-to-aspiration performance, performance that falls below aspirations generates a sense of urgency that calls for drastic change and puts an end to "business as usual." A large negative discrepancy drives firms to search for other viable alternatives, not just improve their current practices through marginal changes. Such so-called "problemistic search" eventually leads firms to look for solutions to the problem that lie outside of their current routines and practices, resulting in major changes intended to restore performance to the aspired level. Finding an effective solution to the problem can earn managers substantial credit, and failure to do so can threaten their power and standing in the firm (Ren & Guo, 2011). Under increasing pressure from shareholders and internal politics (Tuggle, Sirmon, Reutzel, & Bierman, 2010), managers are motivated to reexamine their strategies and engage in new ways of doing things. Empirical research has emphasized that firms that perform below aspirations often search for distant and drastic alternatives (Greve, 1998; Shimizu, 2007), undertake aggressive actions (Ketchen Jr & Palmer, 1999), and engage in risky activities (Eggers & Kaul, 2018; Ref & Shapira, 2017).

In the context of make-or-ally choices for NPIs, if the performance of prior alliance projects has fallen below aspirations, a firm may begin to doubt its own "alliance competence" (Garrette, Castañer, & Dussauge, 2009) and question whether allying is the best mode through which to pursue future NPIs. The power and legitimacy of internal proponents of the alliance mode or, when it exists, of the "dedicated alliance function" established to institutionalize knowledge from alliance experience (Kale et al., 2002), may be undermined. This can make it increasingly difficult to mobilize resources across functions and divisions to support future alliances. In addition, firm decision makers must explore new ways to achieve breakthrough performance in order to repair their reputation which has been tainted by poor alliance performance. Even though the chance of a breakthrough by introducing new products independently is slim for an underdog, the firm might be so desperate to move out of the domain of losses that it would bet on this remote chance to win big. Finally, firms whose alliance performance has fallen below aspirations may become unattractive alliance partners, hindering their ability to find partners for future alliances (Bae & Gargiulo, 2004; Mowery, Oxley, & Silverman, 1998). They may have no other choice than to switch to independent operations. Consequently, following *below-aspiration alliance performance*, firms are *less likely to ally* in the future and more likely to introduce new products independently.

2.1.3 | Performance above aspirations

Managers of firms that perform above their aspiration levels are also motivated to implement new ways of doing things, though for very different reasons. Drawing upon the idea that "success breeds slack" (Cyert & March, 1963, p. 189), BTOF claims that firms with performance exceeding aspirations accumulate slack resources (Levinthal & March, 1981) and often engage in so-called "slack search" (Argote & Greve, 2007, p. 339). This literature further adds that slack search is associated with risk-taking and experimentation, made possible by the fact that firms can use their slack resources to buffer against future uncontrollable contingencies (Greve, 2003; Singh, 1986). For example, high levels of slack provide a liquidity buffer in the event of loss and hence decrease pressure for short-term performance gains, allowing for greater discretion in firm actions (Nohria & Gulati, 1996). As a result, they may consider and implement initiatives previously deemed too risky (March & Shapira, 1992), provided they present high potential payoffs (Iyer & Miller, 2008; Ref & Shapira, 2017). This logic has received support in several studies related to firms' corporate strategy decisions, such as divestitures (Vidal & Mitchell, 2015) and new business entry (Ref & Shapira, 2017).

In the context of make-or-ally choices for NPIs, this view suggests that a firm that has achieved above-aspiration alliance performance is likely to engage in slack search for its future NPIs. For example, slack search may lead the firm to consider alternative ways of introducing new products that help it make better use of its underutilized resources. More specifically, a firm with above-aspiration alliance performance may come to believe that it has acquired the critical product-market knowledge needed to operate independently in the considered business area (Dussauge & Garrette, 1997). Put differently, strong alliance performance tends to boost managers' confidence in the newly acquired knowledge (Mulotte et al., 2013). A firm with above-aspiration performance is thus likely to examine how it can make better use of the product-market knowledge. Other possible resources that may be underutilized in an alliance include technologies, R&D skills, specialized human resources, and financial resources (Alcacer & Oxley, 2014; Rothaermel & Deeds, 2004). In addition, firms with above-aspiration alliance performance might begin benchmarking their performance against that of best-in-class performers instead of the industry average (Hu, Blettner, & Bettis, 2011). Independent NPIs offer an attractive way to achieve this ambitious benchmark, as they offer the possibility of higher payoffs than alliance NPIs, even though they are also more resource-demanding and riskier (Castañer, Mulotte, Dussauge, & Garrette, 2014). Given these reasons, we predict that a firm that has achieved *above-aspiration alliance performance* is *less likely to ally in the future* and may introduce new products independently, compared with a firm whose alliance performance has approximated its aspirations.

Overall, our theorizing suggests that firms that have achieved performance below or above aspirations within past alliances are likely to switch to independent operations insubsequent NPIs, whereas firms that have achieved performance that falls close to their aspirations within past alliances are likely to ally again. Thus, we predict that the relationship between a firm's prior alliance performance and its likelihood of pursuing independence in a subsequent NPI follows a U-shaped curve. This logic leads to our first hypothesis:

> **Hypothesis H1.** *A firm's past alliance performance has a U-shaped effect on its likelihood of undertaking a subsequent NPI through independent operations.*

2.2 | The influence of competitive intensity on the performance–switch relationship

We next examine this relationship in further detail, considering an important environmental moderator inferred from the BTOF literature: competitive intensity. Extant research suggests that when firms perceive their operating environment as competitive and threatening rather than opportunity-laden, they are driven to seek more cost-efficient ways of operating or new sources of differentiation, although this entails greater risk-taking. For instance, Voss, Sirdeshmukh, and Voss (2008) argue that when perceived environmental threats increase, firms favor product exploration over product exploitation (provided they have sufficient financial slack) despite its riskier nature. Boyd and De Nicolo (2005) show that banks intentionally take on more risks as the number of their competitors increases.

These arguments help us understand how competitive intensity influences the propensity of firms that have introduced new products via the alliance mode to switch to independent NPIs. First, we argue that when a business area involves greater competitive intensity, firms with below-aspiration alliance performance perceive their position as highly vulnerable. They are thus even more motivated to search for drastic solutions to their problems. In turn, they are likely to consider new ways of operating—for instance, new modes of introducing new products. As competition increases, firms with below-aspiration alliance performance thus become more likely to switch to independent NPIs, expecting this drastic strategic change to put them back on track. In parallel, as we have mentioned, firms with above-aspiration performance become even more prone to engaging in slack search as the environment becomes more threatening. When applied to NPIs, this view suggests that as competition increases, firms with above-aspiration alliance performance will become even more likely to use their underutilized slack resources to engage in future-oriented risk-taking activities that may help them sustain their advantage. This may, notably, drive them to switch to independent NPIs, a mode associated with higher payoffs despite being riskier and more resource-demanding (Castañer et al., 2014). Overall, we argue that when prior alliance performance falls either below or above aspirations, firms are even more likely to switch to independent operations for future NPIs as competitive intensity increases. Hence, the following hypothesis.

> **Hypothesis H2.** *The U-shaped relationship between a firm's past alliance performance and its likelihood of undertaking a subsequent NPI through independent operations becomes steeper as levels of competitive intensity increase.*

2.3 | Subsequent performance implications of switching from alliance to independence

As discussed, firms with alliance performance that falls below or above their aspirations are more likely to switch to independent NPIs, with an eye toward attaining breakthrough performance. To what extent, if at all, can firms achieve this ambitious goal? We now examine the performance consequences of this switch.[1]

[1]To better explain the mechanisms and effects, we focus on the first post-switch NPI and discuss only the short-term performance implications. Future research may explore the long-term performance implications. We thank an anonymous reviewer for this valuable suggestion.

To begin, we posit that firms with below-aspiration alliance performance are unlikely to greatly benefit from switching to independent operations, for at least two reasons. First, they are likely to confront the challenge of organizational unlearning of some of the unsuccessful routines that led to the poor alliance performance. The learning of new knowledge and skills and the development of new routines will require the unlearning of the old ones the firm acquired during its prior alliances (Bettis & Prahalad, 1995). These firms will also need to undertake the entire NPI process alone, without benefiting from productive exchanges with partners and other synergistic interactions made possible by alliances. Second, the switch to independent operations may not be a voluntary choice for some firms. Those that have achieved below-aspiration performance in prior alliances may be, or at least may be perceived as, underqualified partners. Such firms will find it more difficult to remain in existing alliances or enter new ones, so they may have no other option but to switch to independent operations to introduce new products if they are to continue in the business. They are thus unlikely to achieve post-switch breakthrough performance. This is not to say that these firms cannot do reasonably well after independence, only that they are in a weaker position to make breakthroughs.

Firms with above-aspiration alliance performance that switch to independent NPIs are in a much stronger position to achieve post-switch breakthrough performance, for several reasons. First, their performance indicates that they are likely to have acquired valuable knowledge about the market and technology through their alliances (Inkpen & Tsang, 2007; Wan & Wu, 2017). This product-related knowledge is critical for market success, but it is not specific to a mode of governance (Helfat & Raubitschek, 2000). Thus, independent operations may allow these firms to achieve the same level of product-market success without engaging in alliances. Second, research has shown that although the alliance mode allows firms to pool their resources, it entails significant coordination costs (Aggarwal et al., 2011; Gulati & Singh, 1998; Rothaermel & Deeds, 2004). By switching to independent operations, alliance partners with above-aspiration performance can do away with these costs, thus improving the performance of their future products. Taken together, these factors suggest that "going solo" gives firms with above-aspiration alliance performance the advantage of utilizing the knowledge acquired through their alliances without the burden of significant coordination costs, thereby increasing their chance of achieving breakthrough performance.

Third and perhaps more importantly, self-selection (Anand et al., 2016) plays a role here, as not all firms with above-aspiration alliance performance will switch to independent operations. BTOF suggests that because of their sound performance in the alliance mode, some firms might be reluctant to go it alone (Cyert & March, 1963; Greve, 1998), despite the potentially higher payoff. Only those firms that have developed a high enough level of confidence and motivation to overcome such hesitation will switch. Firms without such lofty expectations about their future success are more likely to continue in the alliance mode. Indeed, prior research indicates that partners do not benefit equally from the synergies created by an alliance. The sources of differential benefits include the differentials in each partner's resource endowments and congestion, market scope, absorptive capacity, and learning capabilities (Aggarwal, 2020; Arslan, 2018). Those well-endowed firms, be it with bountiful technological resources or extensive market coverage, are likely to offer more to the alliance but gain less from it than others (Stuart, 2000). Similarly, relative to technologically weak firms, firms that are stronger in technology might benefit less from its alliance portfolio, due to competency trap and a strong desire to protect its own technologies (Srivastava & Gnyawali, 2011). Hence, more resourceful or technologically stronger firms in an alliance may select themselves into independent operations, as they have the confidence and motivation to do so. On the heels of breaking free from the

alliance that constrained their capabilities, these switching firms are, therefore, in a better position to unleash their potential and deliver breakthrough performance.

Overall, these arguments provide the logic for the last hypotheses:

Hypothesis H3a. *Firms with below-aspiration alliance performance that switch to independent operations in their subsequent NPI are less likely to achieve breakthrough performance than if they continue in an alliance.*

Hypothesis H3b. *Firms with above-aspiration alliance performance that switch to independent operations in their subsequent NPI are more likely to achieve breakthrough performance than if they continue in an alliance.*

3 | EMPIRICAL ANALYSIS

3.1 | Data sample and data sources

The empirical setting of this study is the global aircraft manufacturing industry since WWII. We considered the population[2] of NPIs undertaken by aircraft manufacturers from non-communist countries between 1944 and 2000 in the fighter, turboprop, helicopter, and jet areas of business. During this period, 159 firms introduced 437 aircraft models, among which 65 firms introduced only one product throughout the period and 95 aircraft models were the initial entry of those multi-product firms. Because we were focusing on how performance affects *subsequent* decisions, we excluded these 160 observations from our data analysis after using the information to generate related variables. The sample we used for our analysis thus includes 277 products introduced by 94 incumbent firms.[3]

We drew our data from an extensive archival study of secondary sources. We first examined all of Jane's *All the World's Aircraft* yearbooks published between 1944 and 2000 (Jane's, various years; Jane's Information Group, 1944-2000). These annual volumes described, by manufacturer, all the aircraft models in production during a given year, the dates of the program's major milestones (e.g., the maiden flight and initial deliveries), and technical specifications such as maximum payload, range, and speed. Jane's yearbooks also contain information on the manufacturers themselves, such as their major shareholders and where their headquarters are located. We then examined the Aerospace Systems Group Library (FI/DMS, 2000), a database that consists of individual reports on each aircraft model commercialized since WWII. These reports provide project details including cumulative production, estimated price, major suppliers, and customers. They also identify the firms that undertook each project and, if applicable, the licensees and firms sharing primary contractorship. These two sources are the traditional data sources used by strategy scholars studying the aircraft manufacturing industry (Anand et al., 2016; Castañer et al., 2014; Garrette et al., 2009).

[2]For data reliability reasons, we excluded from the data set all firms located in China and in former COMECON countries (including Russia).

[3]There were 94 multiproduct firms in our data set. For one firm, we excluded two projects that were both introduced in the initial year when the firm started its operations in the industry.

3.2 | NPI modes in the aircraft industry

Reports in the Aerospace Systems Group Library database enabled us to unambiguously capture the governance modes used by manufacturers for each new aircraft project they undertook. Under the "Contractor" heading, the reports list a single firm for independent projects and all the primary contractors for joint developments. If an aircraft type was licensed to other manufacturers, the name of each licensee is listed under the heading "Licensees."

We classified an aircraft project undertaken by a single prime contractor as an independent NPI. Boeing, for example, introduced all its B707, B727, B737, B747, B757, B767, B777, and B787 airliners through what we classify as an independent NPI. Among the 277 products in our data set, 169 were launched independently. We classified as alliance NPIs all aircraft introductions in which at least two firms carried out the tasks related to market research, product design, manufacturing, and sales. Alliance NPIs thus include both joint NPIs and licensed NPIs. Joint NPIs are instances in which a firm shares prime contractor responsibility with at least one other firm. For instance, Concorde was jointly developed by Aerospatiale (France) and British Aircraft Corporation (UK). If a firm buys for a lump sum and royalties the rights to manufacture and commercialize an aircraft initially developed by another manufacturer, this is referred to as a licensed NPI. For example, the CF-116 fighter aircraft produced by Canadair was a license-built version of the Northrop F-5 fighter aircraft. In our dataset, 108 of the 277 products were launched through alliance NPIs, including 56 joint NPIs and 52 licensed NPIs.

3.3 | Variables

3.3.1 | Dependent variables

The dependent variable used to test Hypotheses H1 and H2 is a binary variable, *Subsequent Independent NPI*, which takes the value of 1 if an aircraft model was brought to market through an independent NPI and 0 if it was an alliance NPI. Hypotheses H3a and H3b examine the subsequent performance implications of switching from the alliance mode to an independent NPI. The dependent variable we used to test these hypotheses is *Subsequent NPI Performance*, measured by the cumulative number of units sold over the lifecycle of the firm's next product. Owing to the high fixed costs of initiating an aircraft project, sales volume is the traditional measure of product performance used in studies of the aircraft industry (Castañer et al., 2014; Mulotte, 2014). While this measure refers to the firm's immediate next product, it captures some long-term performance elements since in the aircraft manufacturing industry, one model's production run commonly lasts several decades. It is also noteworthy that most aircraft manufacturers generally manufacture very few aircraft models of the same type (e.g., fighter, prop, jet) at the same time. This means that a commercial failure of one of these models often has drastic consequences on the firm's presence in the relevant business area. For example, Lockheed fully withdrew from the commercial aircraft business in 1984 because of the commercial failure of its L-1011 TriStar airliner. We considered an NPI to have achieved breakthrough performance when its performance fell in the 85th, 90th, or 95th percentile of all products' performance.

3.3.2 | Independent variables

The independent variable used to test H1 and H2 is *Alliance Performance*, which measures the performance of previous products a firm has launched through alliances, relative to the firm's aspiration levels. Following earlier behavioral research (Eggers & Kaul, 2018; Greve, 2003), we built this variable by blending social and historical comparisons. Social comparison involves measuring a product's performance against the average sales of all products in the same business domain that were introduced in the same year. Historical comparison involves measuring alliance products' performances against the firm's historical performance with independent NPIs.

We used a three-step procedure to generate the *Alliance Performance* variable. First, for a product introduced in year T, we calculated the average sales of all products launched in the same business domain (fighters, propeller aircraft, jet transport aircraft, and helicopters) in the same year and the previous 3 years, labeling this as the product's industry benchmark. We then divided the product's sales by its industry benchmark to assess the extent to which the focal product's performance deviated from the benchmark. This deviation took the following form:

$$D_{i,m,T} = \frac{S_{i,m,T}}{\left(\sum_{t=T-3}^{T}\sum_{m=1}^{M}\sum_{i=1}^{I} S_{i,m,t}\right) / \left(\sum_{t=T-3}^{T}\sum i * \sum m\right)}, \tag{1}$$

where $S_{i,m,T}$ is the unit sales of product i of firm m introduced in year T, and the denominator denotes the average sales of all products introduced between $T - 3$ and T in the same business domain.

Second, for a product that firm m introduced in year T, we identified all prior products that firm m introduced through the alliance mode (i.e., alliance NPIs) before T and averaged their deviations:

$$AD_{c,m,T-1} = \frac{\sum_{t=t_0}^{T-1}(D_{i,m,t} * C_{i,m,t})}{\sum_{t=t_0}^{T-1} C_{i,m,t}} \text{ if } \sum_{t=t_0}^{T-1} C_{i,m,t} > 0$$

$$= 0 \text{ if } \sum_{t=t_0}^{T-1} C_{i,m,t} = 0, \tag{2}$$

where $AD_{c,m,T-1}$ denotes the average deviation of all prior products firm m introduced through the alliance mode before year T, t_0 is the year of entry of firm m, and $C_{i,m,t}$ is a dummy variable that takes the value of 1 if product i introduced by firm m in year t was launched through the alliance mode, and 0 otherwise. We repeated the calculation for all prior products which include both alliance NPIs and independent NPIs. The average deviation of all prior products of firm m before year T is given by the following formula:

$$AD_{i,m,T-1} = \frac{\sum_{t=t_0}^{T-1} D_{i,m,t}}{N_{m,T-1}}, \tag{3}$$

where $N_{m,\ T-1}$ is the total number of products introduced by firm m before year T. $N_{m,T-1}$ is always greater than 0 because all the firms in our sample had introduced at least one product before year T.

Third, for product i that firm m introduced in year T, we constructed the product's prior alliance performance through dividing the average deviation of all prior alliance NPIs by that of all prior products, as follows:

$$\text{Alliance Performance}_{i,m,T-1} = \frac{AD_{c,m,T-1}}{AD_{i,m,T-1}} \tag{4}$$

A higher result for this measure indicates better performance of prior alliance NPIs. This measure not only compares a product's performance with the industry average, but also compares alliance NPIs' performance to independent NPIs' performance. For the latter comparison, we used the average deviation of all prior products as the denominator in Equation (4), instead of the average deviation of all prior independent NPIs, because a firm might have never introduced a product independently before year T. In other words, this setup ensures that the denominator of Equation (4) is not zero.

To test H3a and H3b, our independent variable is *Alliance to Independence*, a binary variable that takes the value of 1 if a former alliance partner undertakes its next NPI through independent development and 0 otherwise. For instance, Saab (Sweden) developed the turboprop regional aircraft by allying with Fairchild (The United States) but subsequently unveiled its own regional aircraft, the Saab 2000. In this case, *Alliance to Independence* was coded as 1 for the Saab 2000 product. By contrast, the Dutch firm Fokker manufactured license-built versions of British and U.S. fighters for more than 20 years and then left the industry without having independently developed a fighter. Thus, for any products of Fokker, *Alliance to Independence* was coded as 0.

3.3.3 | Moderating variables

In Hypothesis H2, we tested the moderating effect of the *Competitive Intensity* variable. Competition becomes more intense when the number of firms in a business area rises. Following Sorenson, McEvily, Ren, and Roy (2006), we measured *Competitive Intensity* as the number of firms that produced and sold aircraft models of the considered type (fighter, turboprop, helicopter, and jet) in a given year. This variable accounts for the intensity of competition in each area of business at the time of product introduction.

In H3a and H3b, we posit that the effect of switching from alliance to independence on the likelihood of achieving breakthrough performance depends on a firm's pre-switch alliance performance. To measure the interaction effects, we created a dummy variable, *Underperforming Alliance Partner*, which equals 1 if an alliance partner's prior alliance performance is less than 1—meaning its past alliance NPIs performed below aspirations in that they were worse than its past independent NPIs relative to their respective benchmarks—and 0 otherwise. We also created the dummy variable *Overperforming Alliance Partner*, which equals 1 if an alliance partner's prior alliance performance is greater than 1, and 0 otherwise. In other words, *Overperforming Alliance Partner* takes the value of 1 if the firm's past alliance NPIs performed above aspirations in that they deviated to a lesser extent from their industry benchmark than did the firm's past independent NPIs.

3.3.4 | Control variables

We controlled for several factors at the product, firm, and environmental levels that may influence firms' decisions to engage in an independent NPI. At the product level, we controlled for the main purpose of the aircraft via the dummy variable *Military Design*. Military aircraft may benefit from greater governmental support than commercial aircraft, in the form of financial subsidies or direct access to advanced technology. Thus, they may be more likely to be independently produced than commercial aircraft. We also controlled for the resource requirements of the envisioned aircraft, which we measured by technical complexity (Frenken & Leydesdorff, 2000). Our *Technical Complexity* variable is the logarithm of the product of an aircraft's maximum range, speed, and takeoff weight (Garrette et al., 2009). We also controlled for the effects of four business domains by adding three dummy variables (treating *Jets* as the baseline category): *Fighter*, *Helicopter*, and *Turboprop*. We did this because resource requirements might vary systematically between these domains, and the likelihood of an alliance NPI versus independent NPI might vary accordingly. To test H3a and H3b, we included a *Joint Development* dummy variable, which equals 1 if the subsequent NPI uses the joint development mode rather than engaging in licensing or switching to independence. This variable helps us account for possible performance differences between firms that continue with joint development and firms that continue with licensing.

At the firm level, we entered a *Business Size* variable, which we measured by constructing a revenue proxy by business area (jet, fighter, turboprop, or helicopter). We obtained our revenue proxy—by business area and by year—by summing the annual sales of all the aircraft of a given type that the focal firm manufactured during the year. We estimated revenues in this way because it is almost impossible to gather actual business unit sales—rather than overall firm sales, including non-aerospace sales—for firms originating in 20 different countries over a period of 57 years. We also added a *State-Owned Firm* dummy variable that is equal to 1 if the focal firm was at least 50% owned by a national government and 0 otherwise. State-owned firms may have privileged access to government resources, such as subsidies and contracts. They may also be encouraged to ally for political reasons. We also controlled for the firm's experience with alliance NPIs and independent NPIs. *Alliance Experience* is the number of times a firm introduced products through the alliance mode before the focal product's introduction year. *Independence Experience* is the number of times a firm used independent NPIs before the focal product's introduction year. Furthermore, research has indicated that firms with longer market incumbency might be more reluctant to make changes, likely due to structural inertia resulting from entrenched routines (Tripsas & Gavetti, 2000) or cognitive inertia in the form of a competency trap (Levinthal & March, 1993; Lourdes, 2013). We thus added a *Market Incumbency* variable that captures the number of years the firm has operated actively in the industry. In addition, firms may enter an industry with different levels of knowledge and capability; this pre-industry knowledge and capability might exert a persistent influence on their subsequent choices and performance (Ingram & Baum, 1997). We thus controlled for variations of firms' initial capability by including a *Congenital Capability* variable that equals 1 if a firm's very first product was launched independently, and 0 otherwise.

At the environmental level, we included a *Home Country Size* variable that captures the logarithm of the GDP of the firm's home country (Maddison, 2003), as it might be easier for firms located in larger countries to access the resources needed for independent NPIs (e.g., technological, financial, and specialized human resources). Moreover, as the aircraft industry is a globalized one, we also included the *Economic Climate* variable, which captures

the average world GDP growth in the 3 years prior to each new product's introduction (Maddison, 2003). Finally, the *Year* variable indicates the year of commercialization of the focal product.

3.4 | Statistical methods

To examine the relationship between alliance performance and subsequent NPI independence (H1), we used the following functional form:

$$\begin{aligned}&\text{Prob}\left(\text{Subsequent NPI Independence}_{i,m,t}=1|Z1\right)\\&=\Phi\left(\beta_0+\beta_1\text{Alliance Performance}_{i,m,t-1}+\beta_2\text{Alliance Performance}^2_{i,m,t-1}+W\tau\right)\end{aligned}\tag{5}$$

where W includes the *Competitive Intensity* moderating variable and a vector of control variables that might influence the likelihood of pursuing a subsequent independent NPI, τ is a coefficient vector, *Z1* includes W and the independent variables *Alliance Performance* and its squared term, and $\Phi(\cdot)$ is the cumulative distribution function of the standard normal distribution. As the functional form indicates, our unit of analysis is product i of firm m in year t. We estimated this functional form using a probit model. To account for the possibility that error terms are correlated for observations involving the same firm, we reported robust standard errors clustered at the firm level. We interacted *Alliance Performance* and its squared term with *Competitive Intensity* to test Hypothesis H2.

To test H3a and H3b, we compared the performance of alliance partners that switched to an independent NPI with the performance of partners that allied again. We estimated how the decision to switch from the alliance mode to independence affected the likelihood of achieving breakthrough performance (meaning performance in the 85th, 90th, and 95th percentiles of all products) in a subsequent NPI. Because we were interested in determining the drivers of extreme performance outcomes, we estimated a quantile regression model in which the qth quantile is represented by the following formula:

$$\begin{aligned}&Q_q\left(\text{Subsequent NPI Performance}_{i,m,t}|Z2\right)=\gamma_{q,0}+\gamma_{q,1}\text{Alliance to Independence}_{i,m,t,}+W\omega_q\\&q=(0.85,0.90,0.95)\end{aligned}\tag{6}$$

where $\gamma_{q,0}$,$\gamma_{q,1}$, and ω_q denote qth-quantile–specific coefficients for the constant term, the *Alliance to Independence* binary independent variable, and the vector of controls, W, and *Z2* includes W and the independent variable *Alliance to Independence*. We clustered our standard errors at the firm level to make sure our standard errors and t-statistics were asymptotically valid under heteroscedasticity and possible misspecification of the quantile regression function (Parente & Santos, 2016). We interacted *Alliance to Independence* with *Underperforming Alliance Partner* to test Hypothesis H3a, and with *Overperforming Alliance Partner* to test Hypothesis H3b.

4 | RESULTS

4.1 | Main results

Table 1 provides the descriptive statistics and a correlation matrix. We present our results for H1 and H2 in Table 2. Model 1 examines the effects of the control variables on *Subsequent NPI Independence*. As expected, we find that firms that have more revenues in the business domain, possess more experience with independent NPIs, and are headquartered in larger countries are more likely to choose independence in the subsequent NPI. Conversely, firms that are state-owned, have more experience using the alliance mode for NPIs, develop technologically advanced aircraft projects, and face more favorable global economic climates are more inclined to favor the alliance mode over independence.

Compared with Model 1, Model 2 adds *Alliance Performance* and its squared term and tests Equation (5). The direct effect of *Alliance Performance* on *Subsequent NPI Independence* is significantly negative ($\beta_1 = -1.796$, $p = .004$), and the effect of the squared term is positive and significant ($\beta_2 = 0.498$, $p = .074$). This suggests that *Alliance Performance* affects *Subsequent NPI Independence* in a U-shaped manner. To confirm the U-shaped performance–switch relationship, we followed the recommendation of Haans, Pieters, and He (2016) for nonlinear specifications and computed the turning point as $\frac{\beta_1}{2\beta_2} = 1.796/(2 * 0.498) = 1.804$.[4] This turning point is located comfortably within [0, 2.48], the data range of the variable *Alliance Performance*.[5] We further aided the test with a graphic presentation. Figure 1 plots the predicted probability of *Subsequent NPI Independence* as the function of *Alliance Performance*. Overall, the U-shaped relationship between alliance performance and subsequent NPI independence supports H1.

In Model 3, we interacted *Alliance Performance* and its squared term with *Competitive Intensity*. As we predicted, the coefficient of *Alliance Performance* × *Competitive Intensity* is negative and significant (coefficient = −0.132, $p = .032$), and the coefficient of *Alliance Performance*^{2} × *Competitive Intensity* is positive and significant (coefficient = 0.120, $p = .014$). The signs and significance of both coefficients suggest that the U-shaped relationship between the performance of a firm's past alliance products and its subsequent NPI independence becomes stronger in a more competitive environment, supporting our Hypothesis H2.

To further demonstrate how the U-shaped relationship between alliance performance and subsequent NPI independence varies with *Competitive Intensity*, we conducted a subsample analysis. We first split the sample into two subsamples: NPIs in environments with above-average *Competitive Intensity* ($N = 149$) and those in environments with below-average *Competitive Intensity* ($N = 128$). Next, we ran the regression analysis of Model 2 in each subsample and reported the analysis results of the two subsamples in Models 4 and 5, respectively. As shown in Model 4, in the subsample of below-average *Competitive Intensity*, the coefficients of *Alliance*

[4]According to Haans et al. (2016), the computation of the turning point for probit is the same as for OLS.

[5]The 95% confidence interval of the turning point is [0.942, 2.666], the upper bound of which is *slightly* greater than 2.48, the maximum value of *Alliance Performance*. This is primarily because we included all cases where firms have no alliance experience (*Alliance Experience* = 0) and thus zero alliance performance. After removing all cases of no alliance experience, we still found support for our results in the subsample, as reported in the second robustness check of our "robustness tests" subsection. In the subsample ($N = 137$), the turning point is 1.448, of which the 95% confidence interval is [1.063, 1.834]. This 95% confidence interval lies comfortably within the range of the *Alliance Performance* variable, which in the subsample ranges from 0.03 to 2.48.

TABLE 1 Descriptive statistics and correlation matrix ($N = 277$)

	Variables	Mean	*SD*	Max	Min	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	Subsequent NPI Independence	0.61	0.49	0	1	1.00																					
2	Alliance performance	0.51	0.59	0	2.47	−0.50	1.00																				
3	Competitive intensity	21	7.75	1	34	−0.03	−0.01	1.00																			
4	Subsequent NPI performance	−1.34	1.33	−5.81	2.15	0.17	−0.24	−0.11	1.00																		
5	Alliance to Independence	0.11	0.31	0	1	0.28	0.34	0.01	−0.12	1.00																	
6	Underperforming Alliance partners	0.65	0.48	0	1	0.42	−0.76	−0.04	0.30	−0.43	1.00																
7	Overperforming Alliance partners	0.10	0.30	0	1	−0.11	0.52	−0.09	−0.03	0.20	−0.45	1.00															
8	Military design	0.69	0.46	0	1	−0.04	0.07	0.27	−0.09	0.03	−0.05	−0.15	1.00														
9	Technical complexity	4.38	1.02	2.26	6.60	0.01	−0.08	0.09	0.05	−0.16	0.20	−0.05	−0.01	1.00													
10	Joint development	0.20	0.40	0	1	−0.63	0.27	−0.09	0.11	−0.18	−0.05	0.26	−0.17	0.08	1.00												
11	Fighter vs. jet	0.45	0.50	0	1	0.01	0.04	0.49	0.01	0.01	−0.02	−0.10	0.61	0.30	−0.19	1.00											
12	Helicopter vs. jet	0.18	0.39	0	1	−0.12	0.12	−0.46	0.03	0.04	−0.16	0.10	−0.00	−0.64	0.09	−0.43	1.00										
13	Turboprop vs. jet	0.21	0.41	0	1	0.07	−0.11	0.23	−0.17	−0.01	0.05	−0.02	−0.26	−0.19	0.00	−0.47	−0.25	1.00									
14	Business size	0.39	0.67	0	4.83	0.27	−0.30	0.11	0.24	−0.09	0.29	−0.06	0.05	0.11	−0.12	0.19	−0.04	−0.19	1.00								
15	State-owned firm	0.29	0.46	0	1	−0.32	0.35	0.03	−0.15	0.11	−0.34	0.19	−0.01	−0.26	0.21	0.12	0.21	0.05	−0.16	1.00							
16	Alliance experience	0.96	1.27	0	6	−0.45	0.69	−0.03	−0.14	0.21	−0.53	0.28	0.15	−0.17	0.24	0.07	0.27	−0.21	−0.23	0.33	1.00						
17	Independence experience	1.86	1.94	0	9	0.19	−0.16	0.06	0.25	−0.17	0.41	0.16	0.05	0.19	0.14	0.17	−0.08	−0.15	0.34	−0.17	−0.14	1.00					
18	Market incumbency	16.48	11.52	2	57	−0.18	0.20	0.03	0.02	−0.05	0.04	0.23	−0.02	0.11	0.37	0.03	0.08	−0.15	0.02	0.10	0.40	0.55	1.00				
19	Congenital capability	0.05	0.22	0	1	−0.02	−0.09	0.09	0.06	−0.03	0.17	−0.08	0.15	0.05	0.09	0.25	−0.11	−0.12	0.11	−0.04	0.05	0.32	0.20	1.00			
20	Home country size	−0.17	1.19	−4.09	2.07	0.26	−0.30	−0.22	0.22	−0.12	0.37	−0.00	−0.22	0.04	0.09	−0.29	0.16	0.05	0.26	−0.29	−0.24	0.32	0.30	−0.07	1.00		
21	Economic climate	0.04	0.01	0.01	0.07	0.02	−0.17	−0.05	0.11	−0.07	0.06	−0.18	0.19	0.06	−0.11	0.13	−0.09	−0.07	0.04	−0.06	−0.15	−0.13	−0.43	0.02	−0.19	1.00	
22	Year	1973	13.76	1948	2000	−0.22	0.25	−0.05	−0.11	0.02	−0.10	0.26	−0.31	−0.08	0.39	−0.39	0.17	0.17	−0.22	0.24	0.29	0.21	0.76	−0.04	0.30	−0.51	1.00

TABLE 2 Probit models: Impact of alliance performance on subsequent NPI independence (H1 and H2)

	Model 1	Model 2	Model 3	Model 4	Model 5
Dependent variable	**Subsequent NPI independence**	**Subsequent NPI independence**	**Subsequent NPI independence**	**Subsequent NPI independence**	**Subsequent NPI independence**
Alliance performance		−1.796 [*.004*] (0.632)	1.181 [*.463*] (1.610)	−0.478 [*.596*] (0.903)	−2.508 [*.006*] (0.909)
Alliance performance^2		0.498 [*.074*] (0.279)	−2.156 [*.068*] (1.183)	−0.531 [*.309*] (0.522)	1.048 [*.012*] (0.416)
Alliance performance × competitive intensity			−0.132 [*.032*] (0.062)		
Alliance performance^2 × competitive intensity			0.120 [*.014*] (0.049)		
Competitive intensity	−0.025 [*.169*] (0.018)	−0.040 [*.031*] (0.018)	−0.036 [*.107*] (0.022)	−0.104 [*.010*] (0.041)	−0.039 [*.254*] (0.034)
Military design	0.182 [*.526*] (0.286)	0.209 [*.492*] (0.304)	0.265 [*.385*] (0.305)	0.668 [*.172*] (0.489)	−0.275 [*.564*] (0.476)
Technical complexity	−0.399 [*.026*] (0.180)	−0.427 [*.020*] (0.184)	−0.395 [*.033*] (0.186)	−0.677 [*.061*] (0.362)	−0.325 [*.252*] (0.198)
Fighter (vs. jet)	0.025 [*.960*] (0.500)	0.367 [*.478*] (0.517)	0.179 [*.751*] (0.564)	0.051 [*.951*] (0.827)	0.489 [*.374*] (0.550)
Helicopter (vs. jet)	−1.027 [*.063*] (0.553)	−1.162 [*.060*] (0.619)	−1.297 [*.046*] (0.651)	−2.477 [*.047*] (1.248)	0.000[a] (omitted)
Turboprop (vs. jet)	−0.041 [*.929*] (0.459)	0.075 [*.882*] (0.502)	−0.089 [*.863*] (0.518)	−0.189 [*.797*] (0.736)	0.000[a] (omitted)
Business size	0.644 [*.001*] (0.196)	0.538 [*.006*] (0.195)	0.522 [*.006*] (0.191)	−0.146 [*.634*] (0.306)	0.949 [*.002*] (0.313)
State-owned firm	−0.381 [*.073*] (0.213)	−0.227 [*.298*] (0.218)	−0.245 [*.275*] (0.224)	0.368 [*.204*] (0.290)	−0.396 [*.222*] (0.324)
Alliance experience	−0.293 [*.014*] (0.119)	0.095 [*.504*] (0.143)	0.095 [*.489*] (0.137)	0.090 [*.595*] (0.169)	0.048 [*.846*] (0.247)
Independence experience	0.125 [*.034*] (0.059)	0.125 [*.046*] (0.062)	0.116 [*.075*] (0.065)	0.279 [*.012*] (0.111)	0.043 [*.587*] (0.080)
Market incumbency	−0.022 [*.301*] (0.021)	−0.036 [*.106*] (0.022)	−0.035 [*.127*] (0.023)	−0.028 [*.379*] (0.032)	−0.049 [*.127*] (0.032)
Congenital capability	−0.553 [*.050*] (0.281)	−0.923 [*.001*] (0.274)	−0.871 [*.002*] (0.278)	0.000 [a] (omitted)	−0.311 [*.495*] (0.456)
Home country size	0.221 [*.078*] (0.126)	0.197 [*.107*] (0.122)	0.192 [*.116*] (0.122)	0.555 [*.013*] (0.223)	0.079 [*.573*] (0.139)
Economic climate	−13.992 [*.020*] (6.029)	−18.999 [*.007*] (7.085)	−21.200 [*.006*] (7.741)	−30.377 [*.006*] (11.087)	−19.299 [*.103*] (11.843)
Year	−0.011 [*.463*] (0 .015)	−0.003 [*.828*] (0.016)	−0.004 [*.825*] (0.017)	−0.016 [*.448*] (0.021)	0.002 [*.936*] (0.023)
Constant	25.004 [*.390*] (29.097)	11.360 [*.712*] (30.815)	12.098 [*.720*] (33.707)	38.223 [*.352*] (41.029)	1.233 [*.979*] (45.981)
Observations	277	277	277	128	149

TABLE 2 (Continued)

Dependent variable	Model 1 Subsequent NPI independence	Model 2 Subsequent NPI independence	Model 3 Subsequent NPI independence	Model 4 Subsequent NPI independence	Model 5 Subsequent NPI independence
Clusters (firm)	94	94	94	54	58
Wald χ^2 (*df*)	86.25 [*.000*] (15)	117.47 [*.000*] (17)	––	78.51 [*.000*] (16)	66.14 [*.000*] (15)
Log pseudo-likelihood	−132.532	−122.722	−121.168	−48.762	−62.243

Note: Standard errors in parentheses and *p*-values in brackets and italics. Heteroscedasticity-adjusted robust standard errors are clustered at firm level.
[a]The coefficients of the three variables are zero with omitted standard errors because they do not display variations within the subsample.

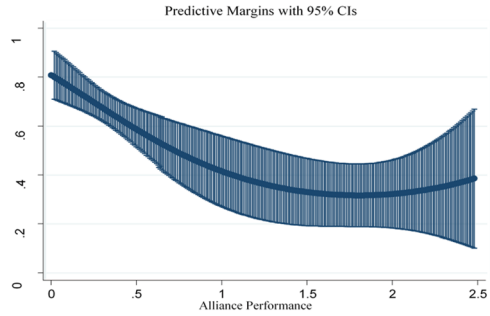

FIGURE 1 Predicted likelihood of subsequent NPI independence by levels of alliance performance. Figure 1 is generated from the results of Model 2. The vertical lines are the adjusted predictions with 95% confidence intervals at each level of alliance performance

Performance and its squared term are not significant ($\beta_1 = -0.478$, $p = .596$; $\beta_2 = -0.531$, $p = .309$). Model 5 presents the results of the subsample of above-average *Competitive Intensity*. By contrast, the coefficient of *Alliance Performance* is negative and significant ($\beta_1 = -2.508$, $p = .006$) and the effect of the squared term of *Alliance Performance* is positive and significant ($\beta_2 = 1.048$, $p = .012$), suggesting a U-shaped relationship. The turning point was computed as $\frac{\beta_1}{2\beta_2} = 2.508/(2 * 1.048) = 1.197$. The 95% confidence interval of the turning point, [0.874, 1.520] lies comfortably in [0, 2.24], the data range of the *Alliance Performance* variable in the subsample of above-average *Competitive Intensity*.

We used the subsample analysis results to generate two graphs to further illustrate the moderating effect of competitive intensity. Figure 2 shows that the U-shaped relationship becomes steeper in the subsample with above-average competitive intensity, but in the other subsample, the relationship is not as salient as in the full sample. The additional evidence in Figure 2 lends further support to Hypothesis H2.

To examine H3a and H3b, we compared two groups of firms: (a) firms that switched to independence after introducing at least one alliance NPI, and (b) firms that introduced at least one alliance NPI and continued to collaborate for their next product. To better understand the effect of switching to independence on the likelihood of achieving breakthrough performance, we focused on whether certain products are more likely to perform better than 85%, 90%, or 95% of the rest of the products, as indicated in Equation (6).[6] Table 3 presents the results of the quantile regression analysis for the 85th, 90th, and 95th quantiles of product performance. The Parente–Santos Silva test statistics confirmed the need to account for intra-cluster (firm) correlation for the quantile regression models. In Models 6–8, the coefficients of the independent variable *Alliance to Independence* are consistently positive and significant ($\gamma_{0.85,1} = 0.804$, $p = .018$; $\gamma_{0.90,1} = 0.565$, $p = .047$; $\gamma_{0.95,1} = 0.615$, $p = .000$), suggesting that switching to independence increases the probability of achieving extremely high performance.

[6]We also ran quantile regressions for the 10th, 20th, 30th, 40th, 50th, 60th, 70th, and 80th quantiles to examine whether the effect of switching to independence differed for various quantiles of the *Subsequent NPI Performance* dependent variable. Appendix A provides the coefficient estimates of the *Alliance to Independence* independent variable for the 11 quantiles examined, and Appendix B plots the coefficients and their 95% confidence intervals. The results show that the effects of *Alliance to Independence* are not significant for smaller quantiles but become significant after the 50th percentile.

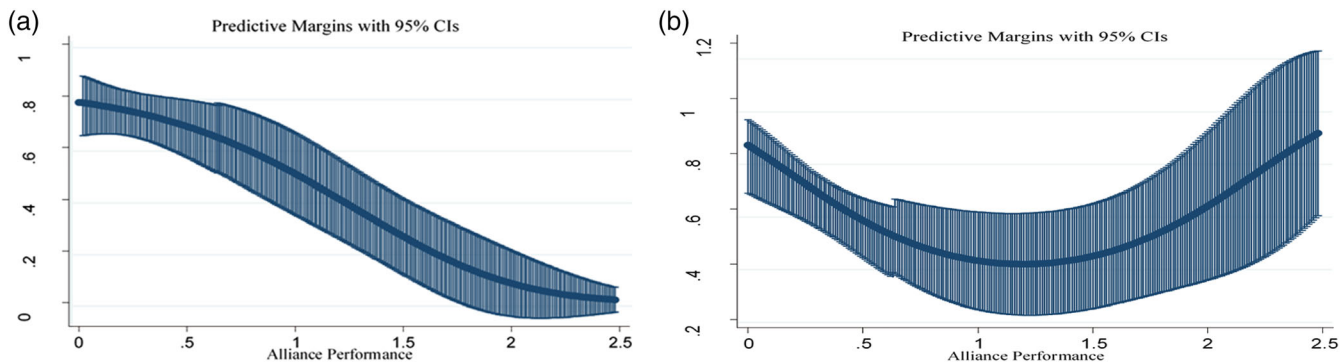

FIGURE 2 Predicted likelihood of subsequent NPI independence by levels of alliance performance: Low-competition subsample versus high-competition subsample. Figure 2 is generated from the results of two subsample analyses: Panel (a) shows the relationship in the subsample of below-average competitive intensity (Model 4) and Panel (b) shows the relationship in the subsample of above-average competitive intensity (Model 5). The vertical lines are the adjusted predictions with 95% confidence intervals at each level of alliance performance

TABLE 3 Quantile regression analysis: Impact of switching from alliance to independence on subsequent NPI's *breakthrough* performance (H3a and H3b)

	Model 6	Model 7	Model 8	Model 9	Model 10
Dependent variable	Subsequent NPI performance (85th quantile)	Subsequent NPI performance (90th quantile)	Subsequent NPI performance (95th quantile)	Subsequent NPI performance (90th quantile)	Subsequent NPI performance (90th quantile)
Alliance to independence	0.804 [*.018*] (0.333)	0.565 [*.047*] (0.280)	0.615 [*.000*] (0.148)	1.065 [*.000*] (0.220)	0.857 [*.041*] (0.413)
Underperforming alliance partners				0.497 [*.015*] (0.200)	
Alliance to independence × underperforming alliance partners				−1.876 [*.001*] (0.540)	
Overperforming alliance partners					−0.968[*.010*] (0.368)
Alliance to independence × overperforming alliance partners					1.658 [*.000*] (0.397)
Military design	−0.373 [*.562*] (0.640)	−1.136 [*.007*] (0.409)	−1.140 [*.000*] (0.146)	−0.718 [*.000*] (0.174)	−0.906 [*.080*] (0.511)
Technical complexity	−0.224 [*.363*] (0.245)	−0.336 [*.038*] (0.160)	−0.394 [*.000*] (0.094)	0.138 [*.334*] (0.14)	0.027 [*.949*] (0.416)
Joint development	1.573 [*.000*] (0.418)	1.345 [*.000*] (0.313)	1.072 [*.000*] (0.142)	0.969 [*.001*] (0.270)	2.454 [*.001*] (0.695)
Fighter (vs. jet)	−0.493 [*.563*] (0.850)	−0.264 [*.727*] (0.755)	−1.218 [*.001*] (0.354)	−0.402 [*.510*] (0.607)	0.659 [*.561*] (1.131)
Helicopter (vs. jet)	−0.609 [*.508*] (0.917)	−0.688 [*.302*] (0.663)	−1.615 [*.000*] (0.391)	0.561 [*.356*] (0.604)	1.191 [*.364*] (1.306)
Turboprop (vs. jet)	−0.493 [*.665*] (1.135)	−0.258 [*.792*] (0.976)	−0.859 [*.042*] (0.415)	0.082 [*.900*] (0.649)	0.901 [*.271*] (0.813)
Business size	−0.057 [*.956*] (1.030)	−0.327 [*.616*] (0.651)	0.214 [*.366*] (0.236)	0.086 [*.821*] (0.378)	−0.368[*.564*] (0.636)
State-owned firm	−0.258 [*.325*] (0.261)	−0.038 [*.832*] (0.178)	−0.129 [*.201*] (0.100)	0.250 [*.197*] (0.192)	−0.084 [*.867*] (0.502)
Market incumbency	0.051 [*.087*] (0.029)	0.071 [*.001*] (0.020)	0.090 [*.000*] (0.009)	0.048 [*.009*] (0.018)	0.025 [*.519*] (0.038)
Congenital capability	−0.348 [*.642*] (0.744)	−0.521 [*.165*] (0.372)	−0.789 [*.000*] (0.187)	0.230 [*.687*] (0.568)	−0.216 [*.662*] (0.493)
Competitive intensity	−0.018 [*.634*] (0.037)	−0.010 [*.788*] (0.036)	0.013 [*.268*] (0.012)	−0.009 [*.758*] (0.029)	−0.026 [*.515*] (0.040)

TABLE 3 (Continued)

	Model 6	Model 7	Model 8	Model 9	Model 10
Home country size	0.033 [*.782*] (0.120)	0.147 [*.196*] (0.113)	0.144 [*.004*] (0.049)	−0.055 [*.747*] (0.169)	−0.116 [*.642*] (0.248)
Economic climate	5.494 [*.659*] (12.406)	11.141 [*.245*] (9.513)	30.712 [*.000*] (4.374)	17.303 [*.007*] (6.250)	5.897 [*.685*] (14.494)
Year	−0.065 [*.029*] (0.029)	−0.082 [*.000*] (0.021)	−0.080 [*.000*] (0.006)	−0.068 [*.000*] (0.018)	−0.060 [*.093*] (0.036)
Constant	128.130 [*.029*] (57.830)	162.592 [*.000*] (42.216)	158.385 [*.000*] (12.844)	130.711 [*.000*] (35.995)	117.642 [*.100*] (70.677)
# of clusters (firm)	47	47	47	47	47
Observations/R^2	103/.344	103/.269	103/.241	103/.291	103/.303
Parente–Santos Silva test[a]	1.839 [*.066*]	1.973 [*.048*]	6.571 [*.000*]	0.082 [*.935*]	−0.047 [*.963*]

Note: Standard errors in parentheses and *p*-values in brackets and italics. Heteroscedasticity-adjusted robust standard errors are clustered at the firm level.

[a]The Parente-Santos Silva test statistics indicate whether there exists intra-cluster correlation for the quantile regression. If there does (as indicated by the *p*-values), then the cluster-robust standard errors must be used.

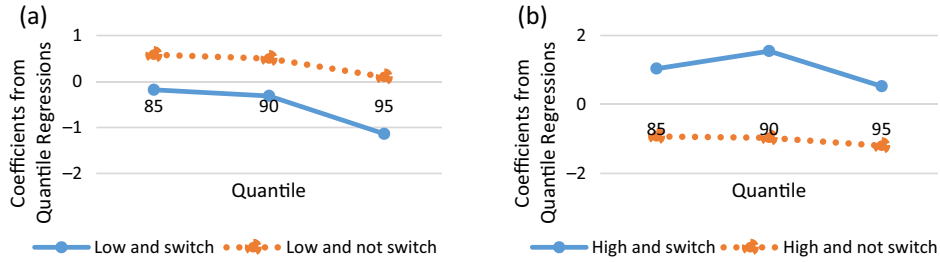

FIGURE 3 Post-switch NPI performance: Underperforming vs. overperforming alliance partners. Panel (a) of Figure 3 compares underperforming alliance partners (i.e., alliance partners with below-aspiration alliance performance) that switch to independence with others that do not switch. Panel (b) compares overperforming alliance partners (i.e., alliance partners with above-aspiration alliance performance) that switch to independence with others that do not switch. The results show that for the 85th, 90th, and 95th quantiles, underperforming (overperforming) alliance partners that switch to independent operations in their subsequent NPI are less (more) likely to achieve breakthrough performance in their subsequent NPI than those that do not switch.

However, further examination shows that such post-switch breakthrough performance does not occur for underperforming alliance partners (i.e., partners whose performance of prior alliance NPIs is below aspirations); such an effect exists only for overperforming alliance partners (i.e., alliance partners with above-aspiration prior alliance performance). In Model 9, we interacted *Alliance to Independence* with the *Underperforming Alliance Partner* variable and presented the results for the 90th quantile by including the interaction effect. Holding other regressors constant, partners with below-aspiration alliance performance are less likely to achieve breakthrough performance if they switch to independence (=1.065 + 0.497–1.876 = −0.314) than if they continue allying (=0.497), in support of H3a. Symmetrically, we examined the *Alliance to Independence* × *Overperforming Alliance Partner* interaction in the 90th quantile model (Model 10). Holding other regressors constant, alliance partners with above-aspiration alliance performance that switch to independence are more likely to achieve breakthrough performance (=0.857–0.968 + 1.658 = 1.547) than if they ally again (=−0.968), lending support to H3b.

The analysis for the 85th and 95th quantiles produced the same results. Figure 3 plots the computed effects of *Alliance to Independence* on *Subsequent NPI Performance* for the 85th, 90th, and 95th quantiles by comparing (a) underperforming alliance partners that switch to independence with those that continue to ally and (b) overperforming alliance partners that switch to independence with those that continue allying. The results suggest (as illustrated by Figure 3) that our breakthrough performance argument holds only for overperforming alliance partners that switch to independence in their subsequent endeavor.

4.2 | Robustness tests

We conducted several robustness tests. First, to make sure our data analysis results were not driven by some potential outliers, we used DFBETA techniques to produce three diagnostic statistics that may help detect outliers.[7] In our sample, we found no observation that has a leverage value greater than 0.177 (which is three times 0.059, the average value of leverage), an absolute value of Pearson residuals greater than 2, and an absolute value of deviance residuals greater

than 2, suggesting no outliers are present. We also used the STATA command LDFBETA, another type of diagnostic statistics that concern how much each observation influences each parameter estimate. Based on the scatterplot generated by LDFBETA, we identified two observations that are farther away from most of the data points. We re-ran our analysis by removing these two potential outliers, and our results still held. Moreover, to further ensure our results were not driven by some influential outliers, we winsorized our independent variable, *Alliance Performance*, at the top 1% and bottom 1% of the data range. We also winsorized this variable at the top 5% and bottom 5% of the data range. Our results were robust when we re-ran all models with the winsorized *Alliance Performance* variable.

Second, in the main results, we have included all cases where firms have no alliance experience (*Alliance Experience* = 0); these observations are extremely valuable because these firms may not have engaged in alliance but do possess varying levels of experience with independent NPIs (referring to the variable *Independence Experience*). To ensure our results were not driven by the observations with no alliance experience, we re-ran our analysis by removing the cases of *Alliance Experience* = 0. Our results for H1 still held. For the moderating effect of *Competitive Intensity* in H2, the interaction of the squared term of *Alliance Performance* and *Competitive Intensity* remains significant (coefficient = 0.139, $p = .092$), but the interaction of *Alliance Performance* and *Competitive Intensity* is no longer significant (coefficient = −0.149, $p = .377$). We thus split the smaller sample into a low-competition subsample (i.e., below-average competitive intensity) and a high-competition subsample (i.e., above-average competitive intensity) and conducted two subsample analyses.[8] All the evidence provides support for H2, even when we removed the cases of no alliance experience.

Third, for H1 and H2, we used two alternative measures of *Alliance Performance*: (a) the average sales of all products during the current year, *T*, as the industry benchmark; and (b) the average sales of all products in the past 5 years as the industry benchmark. Our results held with these two alternative measures. Fourth, we measured *Competitive Intensity* as the logged values of the number of competitors in a given year and found consistent results. Fifth, our results remained unchanged when we used the logged values of *Market Incumbency*.

Sixth and finally, we tested H3a and H3b using different definitions of continued alliance and switching to independence. Group 1 used a strict definition of post-switch independent NPI: When a firm became independent in a subsequent NPI after engaging in the alliance mode, we included any such product in this group. Group 2 used a broad definition of post-switch independent NPI, which included all the products of Group 1. Moreover, when a firm stayed independent through several consecutive products after switching from the alliance mode, we also included all those products in Group 2. Group 3 used a strict definition of repetitive alliance NPIs: If a firm kept using the alliance mode for a subsequent product, we included any such product in this group. Group 4 used a broad definition of repetitive alliance NPIs: It included all products of Group 3, and if a firm switched to independence and then switched

[7]The traditional DFBETA command in STATA was written for OLS, which cannot be directly applied to our probit regression models. We therefore used the STATA command written for logit regressions to produce three basic diagnostic statistics: leverage, Pearson residual, and deviance residual. To determine whether a particular observation is a potential outlier, the rule-of-thumb cutoffs for the three diagnostic statistics are: leverage >2 or 3 times the average of leverage, the absolute value of Pearson residuals >2, and the absolute value of deviance residuals >2.

[8]The coefficients of *Alliance Performance* and its squared term are significant with the right signs only in the high-competition subsample. A graphical illustration shows that the U-shaped relationship between *Alliance Performance* and *Subsequent NPI Independence* is only present in the high-competition subsample; by contrast, the relationship in the low-competition subsample is more like a monotonically decreasing one.

back to alliance, we included the subsequent alliance NPIs in Group 4. For the results reported in Table 3, we compared Group 1 and Group 3. Our results are robust to various specifications of post-switch independent and repetitive alliance products.[9]

5 | DISCUSSION AND CONCLUSION

Our study contributes to the alliance literature in two ways. First, our article fills an important gap in the research on the outcome of alliances (Heimeriks & Duysters, 2007; Zollo et al., 2002). Past research has focused on the termination of alliances through dissolution (Dussauge et al., 2000; Pangarkar, 2009) and on the reconfiguration of alliances through changes in partners or activities (Bae & Gargiulo, 2004; Kavusan & Frankort, 2019; Reuer et al., 2002). By contrast, we examined another key outcome of alliances: the switch to independent operations. Whereas dissolution and reconfiguration characterize the fate of the alliance itself, the switch to independent operations speaks to how alliances influence capability development and subsequent strategy choices of participating firms (Wan & Wu, 2017). More specifically, the switch to independent operations can be seen as a way to infer capability development through alliances. Dussauge et al. (2000) captured such alliance capability development via the reorganization of alliances, whereas Sampson (2005) used firms' post-alliance patenting behavior to do so. We capture capability development through the switch from alliance to independent operations, which could lead to interesting new insights into how firms from emerging economies move up the supply chain to enter more value-creating activities (Alcacer & Oxley, 2014; Kale & Anand, 2006; Kim, 1998; Wan & Wu, 2017).

Second, we add to the alliance literature that has theorized about the drivers of make-or-ally choices. We show that alliance partners that have achieved below-aspiration alliance performance often switch to independent operations for subsequent activities. This echoes the need-and-opportunity view of alliance formation put forth by Ahuja (2000). This perspective suggests that the firms that create the most alliances are those that face resource constraints and have opportunities for collaboration through their connections in the industry network of interfirm ties. Firms with poor alliance performance are likely to appear undesirable to others looking for partners and thus have little choice but to switch to independent operations when they seek to pursue novel business opportunities. However, our results also suggest that the performance they achieve with independent operations often proves disappointing, probably stemming from the fact that these firms have failed to acquire all the necessary knowledge of technology and markets through their prior unsuccessful alliances. Their initial resource constraints are thus likely to persist, resulting in the poor performance of their activities undertaken through independent operations.

Our study also extends the NPI literature (Chen et al., 2022; Helfat & Raubitschek, 2000; Joseph & Gaba, 2015), particularly the strand that has examined product innovation via alliances (Rothaermel & Deeds, 2004).[10] Rothaermel and Deeds (2004) argue that as firms grow and acquire more resources, they tend to decrease the reliance on alliances and prefer to develop new products internally, because such a change helps minimize the risk of expropriation. We extend these studies by considering under what conditions firms may use alliances to

[9]The robustness test results and figures are not presented to conserve space. All of them are available from the authors upon request.

[10]We thank an anonymous reviewer for the suggestion on our contributions to the NPI literature.

introduce new products as a temporary strategy before switching to independent operations for subsequent NPIs. Our study also shows that such a two-step trajectory is not accessible to all firms and, perhaps even more strikingly, is beneficial only to those firms with above-aspiration alliance performance. We thus contribute to the NPI literature by suggesting several promising NPI trajectories for firms: Firms with satisfactory alliance performance may stick to the alliance mode, while those with above-aspiration alliance performance may consider undertaking independent NPIs after introducing new products through alliances.

More fundamentally, our study contributes to the BTOF literature in three important ways. First, our study is one of the first applications of the BTOF perspective to discrete choices, each associated with different payoffs. We believe this is a notable contribution to the BTOF literature, in which past research (Iyer & Miller, 2008; Joseph & Gaba, 2015; Kuusela et al., 2017; Vidal & Mitchell, 2015) had primarily examined decisions that are continuous in nature (e.g., number of NPIs or number of acquisitions).[11] The decision to undertake a given activity with more or less intensity (a continuous variable) and the decision to switch from one strategy to another (a discrete variable) are likely to follow different logics, due to the greater and somewhat irreversible risks associated with the latter. In this study, we examine how performance feedback on a prior choice influences a firm's propensity to persist with that choice or to switch to an alternative one. In so doing, we address a crucial dilemma firms face[12] when making binary choices, which is essentially absent in continuous processes. On one hand, persisting with a strategy will provide the benefits of experience (Mulotte, 2014) and make it possible to leverage already-existing capabilities (Anand et al., 2016; Kaul & Wu, 2016). On the other hand, switching to a new strategy may result in higher payoffs, albeit with more risks (Wu et al., 2014).

Second, we add to BTOF by specifying the causal link between the performance-driven search processes, the decisions to persist with a current strategy or switch to a new one, and subsequent performance implications. Among the three types of search processes, we show that while local search leads to strategy persistence, both problemistic search and slack search lead to a switch in strategy. Interestingly, same decisions lead to different outcomes. Although both problemistic and slack searches foster a change in strategy, we show that only a switch in strategy produced by slack search appears to result in superior performance. We suggest that this stems from the fact that slack search arises from a firm's confidence that its underutilized resources can be used to achieve better performance with a new strategy. By contrast, a switch in strategy following problemistic search appears as a last resort to avoid even more serious trouble (Posen et al., 2018) and can be interpreted as a kind of swan song.

Third, we highlight the value of BTOF in explaining phenomena that are difficult to make sense of in a profit-maximizing approach. Our study suggests that switching is indeed a rational profit-maximizing decision for firms with above-aspiration alliance performance. However, we also find that firms with below-aspiration alliance performance tend to switch to independent operations as well, even though they would have fared better by persisting with the alliance mode. For these firms, the profit-maximizing decision would thus have been to persist with the

[11]Like our research, Baum, Rowley, Shipilov, and Chuang (2005) and Kavusan and Frankort (2019) also used the BTOF perspective to examine firms' alliance activities. However, they measured performance at the firm level (not at the alliance level) and focused on within-mode adjustments—that is, on changes of partners or activities within the alliance mode. As a result, they overlooked the possibility that a firm might switch to another governance mode following a successful or unsuccessful alliance.

[12]The dilemma of whether to stay or to leave in an alliance or relationship is a common one for individuals too, as exemplified in Henrik Ibsen's "*A Doll's House*," and for other social and national units.

alliance mode. Intriguingly, these firms decided to switch strategy. BTOF provides an explanation for such a suboptimal move: When the performance shortfall is large, firms tend to engage in problemistic search, which leads them to consider radically different ways of doing things, in the hope that this will help them regain support from major stakeholders (e.g., investors and employees). Overall, by exploring the search processes, we show that BTOF can explain actions that are usually inconsistent with the predictions of the rational profit-maximizing model.

As with all studies, ours has limitations that suggest several directions for future research. First, research suggests that firms with more slack resources engage more intensely in search processes, which take the form of problemistic search for firms with below-aspiration performance (Lungeanu, Stern, & Zajac, 2016) and slack search for firms with above-aspiration performance (Kavusan & Frankort, 2019). By acting as a buffer, slack resources minimize the risk of bankruptcy if the implemented change eventually results in failure (Singh, 1986). When applied to make-or-ally decisions, this line of reasoning suggests that relative to alliance partners with limited slack, partners with more slack are more likely to switch to independent operations, whether they have achieved performance below or above aspirations. This implies that the U-shaped relationship between a firm's past alliance performance and its likelihood of undertaking NPIs through independent operations should become steeper as the firm's slack resources increase. We welcome future research investigating how slack resources influence persist-or-switch decisions for firms that have achieved both below-aspiration and above-aspiration performance.

Second, the decision to switch or not may have distinct short-term versus long-term performance implications. In our context, we focused only on the first post-switch product to discuss the short-term performance implications. Future research can examine, both theoretically and empirically, the long-term performance implications of the switch. For example, alliance partners with below-aspiration alliance performance may encounter the difficulty of "unlearning" alliance routines during the switch to independent operation in their first post-switch NPI. However, when such difficulty is overcome, they may be able to better manage independent operations and do well in their second, third, and fourth NPIs.

Third, we acknowledge that the aircraft industry is specific, notably because of national security concerns. We controlled for several key characteristics of the industry, such as the military or commercial nature of products and state ownership of firms, and thus do not expect industry specificities to drive our findings. Nevertheless, studies examining these issues in other empirical contexts would more clearly demonstrate the generalizability of our findings.

Fourth and finally, we focus on alliances only in the NPI context. This context is featured by less ambiguous performance measures (e.g., number of units sold, revenues), which allow partners to easily assess the success or failure of their alliance. Moreover, the level of mutual interdependence among NPI partners is likely to decrease over time because it is possible for firms to learn from partners and acquire their technological and marketing capabilities (Rothaermel & Deeds, 2004). Because supply chain alliances share these features of NPI alliances, we expect our findings to hold for supply chain alliances, as evidenced by the studies of Alcacer and Oxley (2014) and Wan and Wu (2017). We do not expect the pattern to be seen in service alliances where service quality can only be subjectively perceived and partners are constantly constrained by a high level of mutual interdependence (Bourdeau, Cronin Jr, & Voorhees, 2007). Future research can further explore the decision of switching to independence in other contexts such as service alliances.

The results of our study also have implications for managers and business practitioners. We propose the idea that firms may form alliances as a transitional strategy before switching to

independent operations. However, our results suggest that firms may end up trapped by their alliance experience, notably when they achieve alliance performance close to their aspirations. Our study shows that alliance partners that are most likely to switch to independent operations are those that have achieved significant success or failure with their alliances. Our results also reveal that the firms that achieve the greatest post-switch performance are those that switched to independent operations following superior alliance performance. All these insights have clear managerial implications; they can help managers decide when to switch strategy and when to persist with the current strategy in order to enhance performance.

In conclusion, this article examines how the performance of a firm's prior alliances influences its propensity to persist with the alliance mode or switch to independent operations in the context of NPIs. We find a U-shaped relationship between past alliance performance and make-or-ally decisions. We also show that even though all switching firms aspire to achieve breakthrough performance, the firms that extract the greatest benefit from switching strategies are those with the strongest pre-switch performance. Overall, we offer a better understanding of the causal relationships between past performance, search processes, persist-or-change decisions, and subsequent performance. In doing so, our study extends the alliance research, contributes to the BTOF literature, and aids in understanding how firm performance influences subsequent strategy choices.

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REFERENCES

Aggarwal, V. A. (2020). Resource congestion in alliance networks: How a firm's partners' partners influence the benefits of collaboration. *Strategic Management Journal*, *41*(4), 627–655. https://doi.org/10.1002/smj.3109

Aggarwal, V. A., Siggelkow, N., & Singh, H. (2011). Governing collaborative activity: Interdependence and the impact of coordination and exploration. *Strategic Management Journal*, *32*(7), 705–730. https://doi.org/10.1002/smj.900

Ahuja, G. (2000). The duality of collaboration: Inducements and opportunities in the formation of interfirm linkages. *Strategic Management Journal*, *21*(3), 317–343. https://doi.org/10.1002/(SICI)1097-0266(200003)21:3<317::AID-SMJ90>3.0.CO;2-B

Alcacer, J., & Oxley, J. (2014). Learning by supplying. *Strategic Management Journal*, *35*(2), 204–223. https://doi.org/10.1002/smj.2134

Anand, J., Mulotte, L., & Ren, C. (2016). Does experience imply learning? *Strategic Management Journal*, *37*(7), 1395–1412. https://doi.org/10.1002/smj.2401

Argote, L., & Greve, H. R. (2007). A behavioral theory of the firm—40 years and counting: Introduction and impact. *Organization Science*, *18*(3), 337–349. https://doi.org/10.1287/orsc.1070.0280

Arslan, B. (2018). The interplay of competitive and cooperative behavior and differential benefits in alliances. *Strategic Management Journal*, *39*(12), 3222–3246. https://doi.org/10.1002/smj.2731

Audia, P. G., Locke, E. A., & Smith, K. G. (2000). The paradox of success: An archival and a laboratory study of strategic persistence following radical environmental change. *Academy of Management Journal*, *43*(5), 837–853. https://doi.org/10.5465/1556413

Bae, J., & Gargiulo, M. (2004). Partner substitutability, alliance network structure, and firm profitability in the telecommunications industry. *Academy of Management Journal*, *47*(6), 843–859. https://doi.org/10.2307/20159626

Baum, J. A., Rowley, T. J., Shipilov, A. V., & Chuang, Y. T. (2005). Dancing with strangers: Aspiration performance and the search for underwriting syndicate partners. *Administrative Science Quarterly*, *50*(4), 536–575. https://doi.org/10.2189/asqu.50.4.536

Beckman, C. M., Haunschild, P. R., & Phillips, D. J. (2004). Friends or strangers? Firm-specific uncertainty, market uncertainty, and network partner selection. *Organization Science*, *15*(3), 259–275. https://doi.org/10.1287/orsc.1040.0065

Bettis, R. A., & Prahalad, C. K. (1995). The dominant logic: Retrospective and extension. *Strategic Management Journal*, *16*(1), 5–14. https://doi.org/10.1002/smj.4250160104

Bourdeau, B. L., Cronin, J. J., Jr., & Voorhees, C. M. (2007). Modeling service alliances: An exploratory investigation of spillover effects in service partnerships. *Strategic Management Journal*, *28*(6), 609–622. https://doi.org/10.1002/smj.617

Boyd, J. H., & De Nicolo, G. (2005). The theory of bank risk taking and competition revisited. *Journal of Finance*, *60*(3), 1329–1343. https://doi.org/10.1111/j.1540-6261.2005.00763.x

Castañer, X., Mulotte, L., Dussauge, P., & Garrette, B. (2014). Governance mode vs. governance fit? Performance implications of make-or-ally choices for product innovation in the worldwide aircraft industry, 1942–2000. *Strategic Management Journal*, *35*(9), 1386–1397.

Chang, S. J., Chung, J., & Moon, J. J. (2013). When do wholly owned subsidiaries perform better than joint ventures? *Strategic Management Journal*, *34*(3), 317–337.

Chen, L., Zhang, P., Li, S., & Turner, S. (2022). Growing pains: The effect of generational product innovation on mobile games performance. *Strategic Management Journal*, *43*(4), 792–821. https://doi.org/10.1002/smj.3338

Cyert, R., & March, J. (1963). *A behavioral theory of the firm*. Englewoods, NY: Prentice-Hall.

Dussauge, P., & Garrette, B. (1997). Anticipating the evolutions and outcomes of strategic alliances between rival firms. *International Studies of Management & Organization*, *27*(4), 104–126. https://doi.org/10.1080/00208825.1997.11656720

Dussauge, P., Garrette, B., & Mitchell, W. (2000). Learning from competing partners: Outcomes and durations of scale and link alliances in Europe, North America and Asia. *Strategic Management Journal*, *21*(2), 99–126. https://doi.org/10.1002/(SICI)1097-0266(200002)21:2<99::AID-SMJ80>3.0.CO;2-G

Eggers, J. P., & Kaul, A. (2018). Motivation and ability? A behavioral perspective on the pursuit of radical invention in multi-technology incumbents. *Academy of Management Journal*, *61*(1), 67–93. https://doi.org/10.5465/amj.2015.1123

FI/DMS. (2000). *Aerospace systems group library*. Newtown, CN: FI/DMS.

Frenken, K., & Leydesdorff, L. (2000). Scaling trajectories in civil aircraft (1913–1997). *Research Policy*, *29*(3), 331–349. https://doi.org/10.48550/arXiv.1001.1312

Garrette, B., Castañer, X., & Dussauge, P. (2009). Horizontal alliances versus autonomous production: The choice of product expansion modes in the worldwide aircraft industry 1945–2000. *Strategic Management Journal*, *30*(8), 885–894.

Gavetti, G., Greve, H. R., Levinthal, D. A., & Ocasio, W. (2012). The behavioral theory of the firm: Assessment and prospects. *Academy of Management Annals*, *6*(1), 1–40. https://doi.org/10.5465/19416520.2012.656841

Greve, H. R. (1998). Performance, aspirations, and risky organizational change. *Administrative Science Quarterly*, *1*, 58–86. https://doi.org/10.5465/ambpp.1996.4980460

Greve, H. R. (2003). A behavioral theory of R&D expenditures and innovations: Evidence from shipbuilding. *Academy of Management Journal*, *46*(6), 685–702. https://doi.org/10.2307/30040661

Gulati, R. (1995). Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances. *Academy of Management Journal*, *38*(1), 85–112. https://doi.org/10.5465/256729

Gulati, R., & Singh, H. (1998). The architecture of cooperation: Managing coordination costs and appropriation concerns in strategic alliances. *Administrative Science Quarterly*, *43*(4), 781–814. https://doi.org/10.2307/2393616

Haans, R., Pieters, C., & He, Z. L. (2016). Thinking about U: Theorizing and testing U- and inverted U-shaped relationships in strategy research. *Strategic Management Journal*, *37*(7), 1177–1195. https://doi.org/10.1002/smj.2399

Heimeriks, K. H., & Duysters, G. (2007). Alliance capability as a mediator between experience and alliance performance: An empirical investigation into the alliance capability development process. *Journal of Management Studies*, *44*(1), 25–49. https://doi.org/10.1111/j.1467-6486.2006.00639.x

Helfat, C. E., & Raubitschek, R. S. (2000). Product sequencing: Co-evolution of knowledge, capabilities and products. *Strategic Management Journal*, *20*, 961–979. https://doi.org/10.1002/1097-0266(200010/11)21:10/11<961::AID-SMJ132>3.0.CO;2-E

Hoang, H., & Rothaermel, F. (2005). The effect of general and partner-specific alliance experience on joint R&D project performance. *Academy of Management Journal*, *48*(2), 332–345. https://doi.org/10.5465/amj.2005.16928417

Hu, S., Blettner, D., & Bettis, R. A. (2011). Adaptive aspirations: Performance consequences of risk preferences at extremes and alternative reference groups. *Strategic Management Journal*, *32*(13), 1426–1436. https://doi.org/10.1002/smj.960

Ingram, P., & Baum, J. A. (1997). Opportunity and constraint: organizations' learning from the operating and competitive experience of industries. *Strategic Management Journal*, *18*, 75–98. https://doi.org/10.1002/(SICI)1097-0266(199707)18:1+<75::AID-SMJ922>3.0.CO;2-6

Inkpen, A. C., & Tsang, E. W. (2007). Learning and strategic alliances. *Academy of Management Annals*, *1*(1), 479–511. https://doi.org/10.5465/078559815

Iyer, D. N., & Miller, K. D. (2008). Performance feedback, slack, and the timing of acquisitions. *Academy of Management Journal*, *51*(4), 808–822. https://doi.org/10.2307/20159540

Jane's Information Group. (1944-2000). *All the world's aircraft*. London: Jane's Publishing Company Ltd.

Joseph, J., & Gaba, V. (2015). The fog of feedback: Ambiguity and firm responses to multiple aspiration levels. *Strategic Management Journal*, *36*(13), 1960–1978. https://doi.org/10.1002/smj.2333

Kale, P., & Anand, J. (2006). The decline of emerging economy joint ventures: The case of India. *California Management Review*, *48*(3), 62–76. https://doi.org/10.2307/41166350

Kale, P., Dyer, J. H., & Singh, H. (2002). Alliance capability, stock market response, and long-term alliance success: The role of the alliance function. *Strategic Management Journal*, *23*(8), 747–767. https://doi.org/10.1002/smj.248

Kavusan, K., & Frankort, H. T. (2019). A behavioral theory of alliance portfolio reconfiguration: Evidence from pharmaceutical biotechnology. *Strategic Management Journal*, *40*(10), 1668–1702. https://doi.org/10.1002/smj.3041

Kaul, A., & Wu, B. (2016). A capabilities-based perspective on target selection in acquisitions. *Strategic Management Journal*, *37*(7), 1220–1239. https://doi.org/10.1002/smj.2389

Kim, L. (1998). Crisis construction and organizational learning: Capability building in catching-up at Hyundai motor. *Organization Science*, *9*(4), 506–521. https://doi.org/10.1287/orsc.9.4.506

Ketchen, D. J., Jr., & Palmer, T. B. (1999). Strategic responses to poor organizational performance: A test of competing perspectives. *Journal of Management*, *25*(5), 683–706. https://doi.org/10.1177/014920639902500504

Kuusela, P., Keil, T., & Maula, M. (2017). Driven by aspirations, but in what direction? Performance shortfalls, slack resources, and resource-consuming vs. resource-freeing organizational change. *Strategic Management Journal*, *38*(5), 1101–1120. https://doi.org/10.1002/smj.2544

Levinthal, D. A., & March, J. G. (1981). A model of adaptive organizational search. *Journal of Economic Behavior & Organization*, *2*, 307–333. https://doi.org/10.1016/0167-2681(81)90012-3

Levinthal, D. A., & March, J. G. (1993). The myopia of learning. *Strategic Management Journal*, *14*(S2), 95–112. https://doi.org/10.1002/smj.4250141009

Lourdes, S. M. (2013). Decoupling market incumbency from organizational prehistory: Locating the real sources of competitive advantage in R&D for radical innovation. *Strategic Management Journal*, *34*(2), 245–255. https://doi.org/10.1002/smj.2012

Lungeanu, R., Stern, I., & Zajac, E. J. (2016). When do firms change technology-sourcing vehicles? The role of poor innovative performance and financial slack. *Strategic Management Journal*, *37*(5), 855–869. https://doi.org/10.1002/smj.2371

Maddison, A. (2003). *The world economy: Historical statistics*. Paris: OECD.

March, J. G., & Shapira, Z. (1992). Variable risk preferences and the focus of attention. *Psychological Review*, *99*(1), 172–183. https://doi.org/10.1037/0033-295X.99.1.172

Mowery, D. C., Oxley, J. E., & Silverman, B. S. (1998). Technological overlap and interfirm cooperation: Implications for the resource-based view of the firm. *Research Policy*, *27*(5), 507–523. https://doi.org/10.1016/S0048-7333(98)00066-3

Mulotte, L. (2014). Do experience effects vary across governance modes? *Organization Science*, *25*(3), 757–775. https://doi.org/10.1287/orsc.2013.0862

Mulotte, L., Dussauge, P., & Mitchell, W. (2013). Does pre-entry licensing undermine the performance of subsequent independent activities? *Strategic Management Journal*, *34*(3), 358–372. https://doi.org/10.1002/smj.2003

Nohria, N., & Gulati, R. (1996). Is slack good or bad for innovation? *Academy of Management Journal*, *39*(5), 1245–1264. https://doi.org/10.2307/256998

Pangarkar, N. (2009). Do firms learn from alliance terminations? An empirical examination. *Journal of Management Studies*, *46*, 982–1004. https://doi.org/10.1111/j.1467-6486.2009.00844.x

Parente, P. M., & Santos, S. J. (2016). Quantile regression with clustered data. *Journal of Econometric Methods*, *5*(1), 1–15. https://doi.org/10.1515/jem-2014-0011

Posen, H. E., & Levinthal, D. A. (2012). Chasing a moving target: Exploitation and exploration in dynamic environments. *Management Science*, *58*(3), 587–601. https://doi.org/10.1287/mnsc.1110.1420

Posen, H. E., Keil, T., Kim, S., & Meissner, F. D. (2018). Renewing research on problemistic search—A review and research agenda. *Academy of Management Annals*, *12*(1), 208–251. https://doi.org/10.5465/annals.2016.0018

Ref, O., & Shapira, Z. (2017). Entering new markets: The effect of performance feedback near aspiration and well below and above it. *Strategic Management Journal*, *38*(7), 1416–1434. https://doi.org/10.1002/smj.2561

Ren, C., & Guo, C. (2011). Middle managers' strategic role in the corporate entrepreneurial process: Attention-based effects. *Journal of Management*, *37*(6), 1586–1610. https://doi.org/10.1177/0149206310397769

Reuer, J. J., & Ariño, A. (2002). Contractual renegotiations in strategic alliances. *Journal of Management*, *28*(1), 47–68. https://doi.org/10.1177/014920630202800104

Reuer, J. J., Zollo, M., & Singh, H. (2002). Post-formation dynamics in strategic alliances. *Strategic Management Journal*, *23*(2), 135–151. https://doi.org/10.1002/smj.214

Robertson, T. S., & Gatignon, H. (1998). Technology development mode: A transaction cost conceptualization. *Strategic Management Journal*, *19*(6), 515–531. https://doi.org/10.1002/(SICI)1097-0266(199806)19:6<515::AID-SMJ960>3.0.CO;2-F

Rothaermel, F. T., & Deeds, D. L. (2004). Exploration and exploitation alliances in biotechnology: A system of new product development. *Strategic Management Journal*, *25*(3), 201–221. https://doi.org/10.1002/smj.376

Sampson, R. C. (2005). Experience effects and collaborative returns in R&D alliances. *Strategic Management Journal*, *26*(11), 1009–1031. https://doi.org/10.1002/smj.483

Shimizu, K. (2007). Prospect theory, behavioral theory, and the threat-rigidity thesis: Combinative effects on organizational decisions to divest formerly acquired units. *Academy of Management Journal*, *50*(6), 1495–1514. https://doi.org/10.5465/amj.2007.28226158

Singh, J. V. (1986). Performance, slack, and risk taking in organizational decision making. *Academy of Management Journal*, *29*(3), 562–585. https://doi.org/10.5465/256224

Sorenson, O., McEvily, S., Ren, C., & Roy, R. (2006). Niche width revisited: Organizational scope, behavior and performance. *Strategic Management Journal*, *27*, 915–936. https://doi.org/10.1002/smj.550

Srivastava, M. K., & Gnyawali, D. R. (2011). When do relational resources matter? Leveraging portfolio technological resources for breakthrough innovation. *Academy of Management Journal*, *54*(4), 797–810. https://doi.org/10.5465/AMJ.2011.64870140

Stuart, T. E. (2000). Interorganizational alliances and the performance of firms: A study of growth and innovation rates in a high-technology industry. *Strategic Management Journal*, *21*(8), 791–811. https://doi.org/10.1002/1097-0266(200008)21:8<791::AID-SMJ121>3.0.CO;2-K

Tripsas, M., & Gavetti, G. (2000). Capabilities, cognition, and inertia: Evidence from digital imaging. *Strategic Management Journal*, *21*(10-11), 1147–1161. https://doi.org/10.1002/1097-0266(200010/11)21:10/11<1147::AID-SMJ128>3.0.CO;2-R

Tuggle, C. S., Sirmon, D. G., Reutzel, C. R., & Bierman, L. (2010). Commanding board of director attention: Investigating how organizational performance and CEO duality affect board members' attention to monitoring. *Strategic Management Journal*, *31*(9), 946–968. https://doi.org/10.1002/smj.847

Vidal, E., & Mitchell, W. (2015). Adding by subtracting: The relationship between performance feedback and resource reconfiguration through divestitures. *Organization Science*, *26*(4), 1101–1118. https://doi.org/10.1287/orsc.2015.0981

Voss, G. B., Sirdeshmukh, D., & Voss, Z. G. (2008). The effects of slack resources and environmental threat on product exploration and exploitation. *Academy of Management Journal*, *51*(1), 147–164. https://doi.org/10.5465/amj.2008.30767373

Wan, Z., & Wu, B. (2017). When suppliers climb the value chain: A theory of value distribution in vertical relationships. *Management Science*, *63*(2), 477–496. https://doi.org/10.1287/mnsc.2015.2356

Wiseman, R. M., & Bromiley, P. (1996). Toward a model of risk in declining organizations: An empirical examination of risk, performance and decline. *Organization Science*, *7*(5), 524–543. https://doi.org/10.1287/orsc.7.5.524

Wu, B., Wan, Z., & Levinthal, D. A. (2014). Complementary assets as pipes and prisms: Innovation incentives and trajectory choices. *Strategic Management Journal*, *35*(9), 1257–1278. https://doi.org/10.2139/ssrn.1777241

Zollo, M., Reuer, J. J., & Singh, H. (2002). Interorganizational routines and performance in strategic alliances. *Organization Science*, *13*(6), 701–713. https://doi.org/10.1287/orsc.13.6.701.503

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