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Performance implications of incremental transition and discontinuous jump between exploration and exploitation

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Abstract

Research Summary: Literature suggests that firms may approximate ambidexterity over time by alternating between periods of exploration and exploitation. We theorize and empirically test performance implications of two types of temporal transition between exploration and exploitation and their boundary conditions. We find that a discontinuous jump has a negative effect on firm performance while an incremental transition has a positive effect. We also find that the role of firm resources and particularly that of non-scale-free resources is critical in shaping the performance effects of the two types of temporal transition. Our findings indicate that the two types of temporal transition have distinct advantages and disadvantages.

Managerial Summary: Firms need to make use of old ideas and search for new ideas to remain competitive. We argue that firms take different approaches to achieve this goal. We find that firms that alternate between old and new ideas in an incremental and continuous manner perform better than firms that switch abruptly between old and new ideas. We also find that the performance effects of the two approaches are more pronounced for firms with limited resources. This finding warns managers of the danger of an abrupt and discontinuous jump between old and new ideas, especially for firms with limited resources.

KEYWORDS

ambidexterity, exploration and exploitation, firm performance, firm resources, temporal transition

1 | INTRODUCTION

Balancing between exploration and exploitation is essential for a firm's survival and competitive advantage (March, 1991; Tushman & O'Reilly, 1996). Strategy and organization learning scholars have debated over how firms balance exploration and exploitation and how such balancing affects firm performance. The two most widely discussed approaches in the literature are ambidexterity (i.e., simultaneous balancing) and a temporal transition (Gupta, Smith, & Shalley, 2006; Raisch & Birkinshaw, 2008; Raisch & Tushman, 2016; Tushman & O'Reilly, 1996; Zimmermann, Raisch, & Birkinshaw, 2015). Ambidexterity indicates that firms engage in exploration and exploitation simultaneously (Raisch, Birkinshaw, Probst, & Tushman, 2009). In contrast, a temporal transition indicates that firms alternate between exploration and exploitation over time (Nickerson & Nickerson & Zenger, 2002). These two approaches have often been considered alternative solutions for balancing exploration and exploitation (Gupta et al., 2006).

Recent studies, however, suggest that it may be overly simplistic and unrealistic to consider ambidexterity and a temporal transition as mutually exclusive alternatives (Lavie & Rosenkopf, 2006; Lavie, Stettner, & Tushman, 2010; Luger, Raisch, & Schimmer, 2018; Raisch et al., 2009; Raisch & Tushman, 2016; Rothaermel & Deeds, 2004). These studies observe that firms gradually and progressively change their focus between exploration and exploitation over time. According to this perspective, a temporal transition approach involves a series of incremental transitions between varying combinations of exploration and exploitation over time. Therefore, firms essentially remain ambidextrous (i.e., engage in exploration and exploitation simultaneously) even as they engage in dynamic adaptation between exploration and exploitation. These recent studies suggest that ambidexterity and a temporal transition are not mutually exclusive alternatives. Instead, firms integrate the two approaches to achieve a dynamic balance between exploration and exploitation over time.

Despite the conceptual appeal and empirical evidence supporting this integrative perspective, other studies describe temporal transition as *temporal separation* between exploration and exploitation (Gupta et al., 2006; Mudambi & Swift, 2014; Swift, 2016). This conceptualization illustrates a temporal transition as discontinuous jumps between exclusive periods of exploration and exploitation (Gupta et al., 2006; Mudambi & Swift, 2014; Swift, 2016). According to this perspective, ambidexterity and a temporal transition are separate and mutually exclusive concepts. The idea of temporal separation is rooted in the punctuated equilibrium theory (Burgelman, 2002; Romanelli & Tushman, 1994) and has been incorporated in modeling research on exploration and exploitation using a multi-armed bandit model (Lee & Puranam, 2016; Posen & Levinthal, 2012). Some recent studies also provide empirical evidence that is consistent with the idea of a temporal transition as discrete and discontinuous jumps between exploration and exploitation (Mudambi & Swift, 2014; Swift, 2016). Therefore, viewing a temporal transition approach as temporal separation has some theoretical and empirical validity.

The two perspectives on a temporal transition have advanced our understanding of how firms perform a temporal transition. However, they remain largely independent and unrelated research streams in the literature, even seemingly oblivious to the other perspective's theoretical arguments and findings. The separate progression of these two perspectives has left some unresolved questions. In this study, we attempt to bridge the two perspectives and address the unresolved questions: What is the difference between the two types of temporal transition? If firms indeed conduct different types of temporal transition (i.e., incremental transition vs. discontinuous jump), do they differ in performance effects? We find that a discontinuous jump has a negative effect on firm performance while an incremental transition has a positive effect. We further find that non-scale-free resources critically affect the firm's ability to alternate between exploration and exploitation and shape the performance implications of a discontinuous jump. In comparison, the performance implications of an incremental transition are significantly moderated by both scale-free and non-scale-free resources. We test our predictions on unbalanced panel data consisting of 32,880 time-series observations of US firms from 1983 to 2007.

As reflected in the opposing temporal transition views, there is some ambiguity and disagreement in the literature as to what a temporal transition is and how it is implemented by firms. In this study, we address this issue by explicitly distinguishing between the two types of temporal transition. We believe that our theoretical argument and empirical findings contribute to precision in temporal transition research and motivate future research to further investigate the differences between the two types of temporal transition. For example, they may differ not only in their performance implications but also in organizational and environmental antecedents. As such, our study highlights rich opportunities for future temporal transition research.

Our study highlights the importance of firm resources and particularly that of non-scale-free resources in a temporal transition. Resource availability is the fundamental constraint in balancing between exploration and exploitation (March, 1991; Tushman & O'Reilly, 1996). If firms are not limited in resources, balancing between exploration and exploitation may not pose a significant challenge. A recent stream of strategy research has highlighted the important difference between scale-free and non-scale-free resources as determinants and constraints of strategic decisions (Chen, Kaul, & Wu, 2019; Levinthal & Wu, 2010; Wu, 2013). While acknowledging the importance of firm resources in exploration and exploitation, the ambidexterity literature has not considered how the two types of resources may differently affect firms' ability to achieve ambidexterity. In this study, we explain why non-scale-free resources, which are subject to the opportunity cost and allocation problem, impose a particularly significant constraint on a firm's ability to alternate between exploration and exploitation and thus join the latest development on firm resources in the strategy literature to the ambidexterity literature.

Our study is closely related to a recent study by Luger et al. (2018) in that both studies examine how firms adapt exploration and exploitation over time and how such adaptation affects firm performance. However, the two papers differ in important aspects. Luger et al.'s (2018) research assumes that firms remain ambidextrous over time and focuses on the performance effects of more or less ambidexterity under different environmental conditions. In comparison, we assume that firms do not always remain ambidextrous. We start with the two opposite ends in the exploration-exploitation continuum and consider how a temporal transition between exploration and exploitation affects firm performance. Given that both ambidexterity and the transition between exploration and exploitation jointly constitute temporal adaptation, Luger et al. (2018) and our research together provide a more complete picture of temporal adaptation between exploration and exploitation.

2 | THEORY AND HYPOTHESES

Temporal transition suggests that firms may approximate organizational ambidexterity by alternating between exploration and exploitation (Brown & Eisenhardt, 1997; Kang, Kang, & Kim, 2017; Lavie & Rosenkopf, 2006; Rothaermel & Deeds, 2004). The literature indicates that firms take two distinct approaches to implement a temporal transition. One group of scholars defines a temporal transition as temporal separation between exploration and exploitation (Gupta et al., 2006; Mudambi & Swift, 2014; Swift, 2016). This conceptualization of a temporal transition describes it as discontinuous jumps between exclusive periods of exploration and exploitation. In contrast, the other group of scholars argues that a temporal transition should be described as gradual and progressive changes between exploration and exploitation over time (Lavie et al., 2010; Lavie & Rosenkopf, 2006; Luger et al., 2018; Raisch et al., 2009; Raisch & Tushman, 2016; Rothaermel & Deeds, 2004). According to this perspective, a temporal transition is a series of incremental transitions with varying combinations of exploration and exploitation, where firms remain effectively ambidextrous over time.

The two perspectives on temporal transition originate from different organization theory literature. Discontinuous jump is rooted in the punctuated equilibrium theory where firms are assumed to engage in stable periods of exploitation interspersed with sporadic episodes of exploration (Burgelman, 2002; Romanelli & Tushman, 1994). The key characteristic of firms pursuing punctuated equilibrium is sequential allocation of resources and attention to exploration and exploitation. The concept of a discontinuous jump can be further traced back to Cyert and March (1963: 199), who introduce the notion of sequential attention to goals: "Organizations resolve conflict among goals, in part, by attending to different goals at different times…the business firm is likely to resolve conflicting pressures to 'smooth production' and 'satisfy customers' by first doing one and then the other. The resulting time buffer between goals permits the organization to solve one problem at a time, attending to one goal at a time." The idea of temporal separation has been incorporated into the modeling research based on the multi-armed bandit model, which formalizes the idea that firms choose discrete policies with varying payoffs in each period (Lee & Puranam, 2016; Posen & Posen & Levinthal, 2012).

Viewing a temporal transition as an incremental transition is rooted in several organization theories that conceptualize organization change as a continuous process. The organizational routine literature argues that the rules, patterns of interaction, and standard operating procedures consisting of routines are resistant to change and can change only incrementally (March & Simon, 1958; Nelson & Winter, 1982). Similarly, the organizational ecology literature emphasizing the role of structural inertia describes organizational change as a continuous and incremental process (Hannan & Freeman, 1984). Normative standards, political coalitions, and historical investments in personnel, plants, and equipment promote structural inertia and discourage sudden disruption to the routines that support them (Nickerson & Nickerson & Zenger, 2002). Therefore, firms that engage in a temporal transition can only achieve a transition between exploration and exploitation in an incremental and gradual manner (Lavie & Rosenkopf, 2006). Modeling studies based on system dynamics and pendulum theory have conceptualized a temporal transition as an incremental transition (Boumgarden, Nickerson, & Zenger, 2012; Gulati & Puranam, 2009; Nickerson & Zenger, 2002).

We argue that the two types of temporal transition have diverging effects on firm performance. More precisely, we predict that a discontinuous jump has a negative effect on firm performance, while an incremental transition has a positive effect on firm performance. There are two reasons why a discontinuous jump has a negative effect on firm performance. First, when firms engage in a discontinuous jump, they face a formidable challenge of shifting between drastically opposed and conflicting routines and capabilities. A discontinuous jump indicates that firms engage in either exploration or exploitation exclusively during a time period. An exclusive pursuit of exploration (exploitation) leads to deterioration of the routines and capabilities for exploitation (exploration). As a result, when firms switch between exploration and exploitation, they have to revitalize and recreate routines and capabilities for exploration and exploitation. Regenerating unused routines and capabilities substantially reduces organizational efficiency and even threatens firm survival (Eisenhardt & Martin, 2000; Nelson & Winter, 1982; Teece, Pisano, & Shuen, 1997; Winter, 2003). It also significantly slows the execution speed of routines and capabilities (Nelson & Winter, 1982) and reduces the efficiency and performance of other interconnected routines and capabilities (Milgrom & Roberts, 1995; Porter, 1996; Rivkin, 2000).

Another major disadvantage of a discontinuous jump between exploration and exploitation is that it is prone to the path dependence problem (Lavie & Rosenkopf, 2006). When firms focus exclusively on exploration (exploitation) during a time period, their routines, capabilities, and even formal organizational structures are increasingly fortified toward exploration (exploitation), creating strong path dependence and promoting further exploration (exploitation) at a smaller marginal cost. This path dependence causes firms to continue to pursue exploration (exploitation) beyond optimal levels, resulting in over-exploration (over-exploitation) and making a subsequent transition to exploitation (exploration) more costly and disruptive (He & Wong, 2004; Lavie & Rosenkopf, 2006; Levinthal & March, 1993). In the exploration and exploitation literature, path dependence in exploration and exploitation and over-exploration and over-exploitation are considered a primary cause of declining firm performance (Kang et al., 2017; Lavie & Rosenkopf, 2006; Nickerson & Zenger, 2002; Wang & Li, 2008).

In contrast, we expect that an incremental transition has a positive effect on firm performance. In particular, an incremental transition between exploration and exploitation is not (or is much less likely to be) subject to these two disadvantages of a discontinuous jump because these disadvantages are rooted in temporal separation between exploration and exploitation. In an incremental transition, firms remain ambidextrous even as they engage in a temporal transition (Lavie et al., 2010; Lavie & Rosenkopf, 2006; Luger et al., 2018; Raisch et al., 2009; Raisch & Tushman, 2016; Rothaermel & Deeds, 2004). Therefore, firms pursuing an incremental transition continue to maintain ambidextrous and operate organizational routines and capabilities for both exploration and exploitation (Lavie & Rosenkopf, 2006; Luger et al., 2018). Thus, they do not face the challenge of revitalizing and regenerating unused routines and capabilities for exploration and exploitation.

An incremental transition also does not (or is much less likely to) suffer from the problem of path dependence. When firms engage in a discontinuous jump, they focus exclusively on exploration (exploitation) during a time period. As a result, their routines, capabilities, and even formal organizational structures are increasingly fortified toward exploration (exploitation), creating strong path dependence and inertia. In contrast, firms performing an incremental transition remain ambidextrous and engage in both exploration and exploitation simultaneously. The co-existence of exploration and exploitation in an incremental transition suppresses the emergence of path dependence caused by the exclusive pursuit of either exploration or exploitation in a discontinuous jump. Therefore, firms engaging in an incremental transition are unlikely (or much less likely) to suffer from the problem of path dependence and over-exploration and over-exploitation.

An incremental transition also has an important advantage. Firms engaging in an incremental transition essentially remain ambidextrous during the transition (Lavie et al., 2010; Lavie & Rosenkopf, 2006; Luger et al., 2018; Raisch et al., 2009; Raisch & Tushman, 2016; Rothaermel & Deeds, 2004). The simultaneous pursuit of exploration and exploitation creates a positive synergy (i.e., complementarity) between exploration and exploitation (Gupta et al., 2006; Raisch et al., 2009; Raisch & Birkinshaw, 2008; Raisch & Tushman, 2016). The outcome from simultaneous exploration and exploitation serves as further input for both activities and thus maximizes gains from the two activities. That is, new innovations and ideas generated from simultaneous exploration provide inputs for exploitation, while financial resources created from simultaneous exploitation serve as fuel for exploration. This positive feedback between simultaneous exploration and exploitation amplifies the performance of both activities. It is also an important benefit that distinguishes an incremental transition from a discontinuous jump. Firms that engage in a discontinuous jump engage exclusively in exploration (exploitation) during a certain period, and thus enjoy little or no complementarity between simultaneous exploration and exploitation. In the case of temporal separation, firms may still be able to create some complementarity from sequential interaction between exploration and exploitation, but the positive feedback between exploration and exploitation is delayed because these activities do not occur simultaneously and thus the magnitude of the synergy is limited compared to an incremental transition.

In sum, a discontinuous jump is subject to (a) the challenge of modifying and creating routines and capabilities and (b) the path dependence problem, resulting in a negative performance effect. In comparison, an incremental transition benefits from a positive synergy between simultaneous exploration and exploitation and is not subject to the two disadvantages of a discontinuous jump. Based on the differences between a discontinuous jump and incremental transition, we predict the following:

Hypothesis (H1) *A discontinuous jump between exploration and exploitation has a negative effect on firm performance, whereas an incremental transition between exploration and exploitation has a positive effect on firm performance.*

3 | MODERATING EFFECT OF FIRM RESOURCES ON A DISCONTINUOUS JUMP

Strategy scholars studying the role of firm resources on strategic decisions have distinguished between scale-free and non-scale-free resources (Chen et al., 2019; Levinthal & Wu, 2010; Winter & Szulanski, 2001; Wu, 2013). The scale-free property of resources indicates that “the value of resources is assumed to not be reduced as a result of the sheer magnitude of firm operations over which they are applied” (Levinthal & Wu, 2010: 781). Therefore, scale-free resources can be used indefinitely for other uses and always have excess capacity. In contrast, non-scale-free resources are subject to opportunity costs and are limited in usable quantity. That is, “these resources must be allocated among alternative activities and the use of these resources in one activity precludes their use in other settings” (Levinthal & Wu, 2010: 781).

In Hypothesis 1, the negative performance effect of a discontinuous jump is attributed to (a) the challenges of modifying and creating routines and capabilities and (b) the problem of path dependence. These two mechanisms are directly affected by the availability of resources and particularly that of non-scale-free resources. First, modification and creation of routines and capabilities consume substantial organizational resources (Nelson & Winter, 1982; Teece et al., 1997; Winter, 2003). Many firm resources needed for modification and creation of routines and capabilities are non-scale-free and subject to opportunity costs (Levinthal & Wu, 2010; Wu, 2013). For example, firms need non-scale-free resources such as an experienced management team, employees with specific skills and know-how, financial resources, and other tangible assets (e.g., equipment and facilities) to modify and create routines and capabilities. However, firms with limited non-scale-free resources cannot afford to set aside enough such resources for future modification and adaptation of routines and capabilities because of the opportunity costs of non-scale-free resources.[1] Therefore, for these firms, switching between exploration and exploitation will be significantly delayed and achieved only incompletely because of the shortage of non-scale-free resources needed to modify and create routines and capabilities. As a result, a discontinuous jump requiring routine modification and creation poses a more significant challenge to firms with limited non-scale-free resources.

The second challenge is that path dependence in a discontinuous jump poses a further barrier for firms with limited non-scale-free resources. As firms build up path dependence, they increase their investment in relevant fixed assets, skills, and knowhow (Nelson & Winter, 1982). When firms subsequently shift their strategic focus to a different goal, they need to redeploy and even remove these tangible and intangible assets (Anand & Singh, 1997; Helfat & Eisenhardt, 2004). Firms with limited non-scale-free resources are at a disadvantage in this regard. Firms with abundant non-scale-free resources can use unabsorbed non-scale-free resources to perform new tasks. In comparison, firms with limited non-scale-free resources must release non-scale-free resources from other current tasks and redeploy them to new tasks. However, redeployment of non-scale-free resources is highly challenging due to adjustment costs and conflict between competing internal demands (Helfat & Eisenhardt, 2004; Szulanski, 1996; Wu, 2013). Furthermore, path dependence and inertia cause strong resistance and a significant delay in this process, requiring more resources and efforts to achieve the redeployment and removal of past investment (Kelly & Amburgey, 1991; Leonard-Barton, 1992; Shimizu & Hitt, 2005). As a result, firms with limited non-scale-free resources will have greater difficulty with a discontinuous jump than firms with abundant non-scale-free resources.

The greater difficulty of firms with limited non-scale-free resources dealing with (a) the challenge of modifying and creating routines and capabilities and (b) the path dependence problem indicates that a discontinuous jump is a highly challenging and value-destroying task for these firms. Hence, we predict the following:

Hypothesis (H2a) *The negative performance effect of a discontinuous jump is more pronounced for firms with limited (non-scale free) resources.*

4 | MODERATING EFFECT OF FIRM RESOURCES ON AN INCREMENTAL TRANSITION

Simultaneous exploration and exploitation, which is the key characteristic of an incremental transition, help firms generate relevant resources required for exploration and exploitation,

[1]If resources required for modification and creation of routines and capabilities are mostly scale-free resources, firms will have no problem performing a discontinuous jump because scale-free resources are, by definition, not limited in utilizable quantity and thus modification and creation of routines following a discontinuous jump can be easily performed.

thus, enabling stable and sustained exploration and exploitation. The output of simultaneous exploration such as newly created invention and innovation (e.g., new patents) feeds into exploitation and enables more stable and sustained profit creation from exploitation. Also, the output of simultaneous exploitation (i.e., newly generated cash flow) helps firms finance and sustain exploration and maximize exploration performance. Simultaneous exploration and exploitation in an incremental transition enable stable and sustained exploration and exploitation and thus maximize the performance of exploration and exploitation and contribute to strong firm performance.

While we argue that non-scale-free resources are particularly critical for a discontinuous jump (Hypothesis 2a), we expect that both scale-free and non-scale-free resources play an important role in the relationship between an incremental transition and firm performance. This is because the complementarity between exploration and exploitation applies to scale-free resources as well. The complementarity in an incremental transition attributable to scale-free resources can be observed in technological resources. Firms generate scale-free technological resources (e.g., newly created inventions and patents) from exploration. These newly created inventions and patents from simultaneous exploration help firms sustain stable and continued exploitation and thus maximize the return from exploitation.

On the other hand, non-scale-free resources continue to play a critical role for an incremental transition. The complementarity in an incremental transition attributable to non-scale-free resources can be observed in financial resources. When firms engage in exploitation, they generate financial resources, which are non-scale-free in nature. Financial resources generated from simultaneous exploitation can be used to fuel exploration and thus enable stable and sustained exploration. Hence, we expect that both scale-free and non-scale-free resources matter for an incremental transition.

While both resource-rich and resource-constrained firms benefit from simultaneous exploration and exploitation, the benefits will be more pronounced for resource-constrained firms. Thus, the positive performance effect of an incremental transition will be clearer for resource-constrained firms. Resource-constrained firms run on a small margin of resources. As a result, if resource-constrained firms do not engage in simultaneous exploration and exploitation to create relevant resources for both processes, they are unlikely to sustain exploration and exploitation (Cao, Gedajlovic, & Zhang, 2009; Feigenbaum & Karnani, 1991; Ebben & Johnson, 2005; Van Looy, Martens, & Debackere, 2005). For example, if simultaneous exploration does not generate and supply new inventions and innovations to be used for exploitation, exploitation is less likely to be sustained. Similarly, if simultaneous exploitation does not generate and provide new cash flow to fuel exploration, exploration is less likely to be sustained. Therefore, for resource-constrained firms, the performance of exploration and exploitation will be significantly negatively affected in the absence of simultaneous exploration and exploitation. In other words, the presence (or absence) of simultaneous exploration and exploitation makes a clear performance difference for firms with limited resources.

This problem is less pronounced for firms with more abundant resources. Of course, simultaneous exploration and exploitation generate resources that help resource-rich firms sustain exploration and exploitation, as well. However, even when resource-rich firms do not engage in simultaneous exploration and exploitation, they can still sustain exploration and exploitation using their unused resources. Specifically, resource-rich firms can sustain exploitation using their larger reservoir of unutilized technological resources (e.g., uncommercialized patents) without engaging in simultaneous exploration. Similarly, resource-rich firms can sustain exploration using their unabsorbed financial resources without engaging in simultaneous exploitation.

Therefore, the presence (or absence) of simultaneous exploration and exploitation does not make a clear performance difference for firms with sufficient technological and financial resources. Hence, we predict that,

Hypothesis (H2b) *The positive performance effect of an incremental transition is more pronounced for firms with limited (scale free and non-scale free) resources.*

5 | METHODS

5.1 | Sample and data

We employ multiple data sources to construct our sample: COMPUSTAT, CRSP, and the patent database from the United States Patent and Trademark Office (USPTO). The COMPUSTAT and CRSP databases are used to calculate *Tobin's Q* and control variables that represent industry and firm characteristics. The USPTO patent data are used to measure the temporal transition between exploration and exploitation. We use the indices created by the National Bureau of Economic Research (NBER) to match assignees of patents to COMPUSTAT's firm index (i.e., GVKEY). After merging these data sources and removing observations with missing information, we are left with 32,880 firm-year observations of 4,181 firms from 1983 to 2007.

Our measure of a temporal transition between exploration and exploitation is based on patents, which are widely used to operationalize exploration and exploitation in empirical research (He & Wong, 2004; Jansen, Van Den Bosch, & Volberda, 2006; Katila & Ahuja, 2002; Rosenkopf & Nerkar, 2001; Wang & Li, 2008). Patents have several advantages as a measure of exploration and exploitation.[2] First, exploration and exploitation have been most closely conceptually related to and defined in terms of technological innovation in the literature (Andriopoulos & Lewis, 2009; He & Wong, 2004; Jansen et al., 2006; March, 1991; Rosenkopf & Nerkar, 2001; Tushman & O'Reilly, 1996; Wang & Li, 2008). Second, patents are objective and replicable measures of technological innovation, greatly enhancing the replicability of empirical findings (Griliches, 1990; Sampson, 2007). Third, patents are measures of technological innovation with clear performance implications (Bloom & Van Reenen, 2002; DeCarolis & Deeds, 1999; Griliches, 1990; Hall, Jaffe, & Trajtenberg, 2005).

5.2 | Measures

5.2.1 | Dependent variable

The dependent variable in this study is *Tobin's Q*. A market-based value such as *Tobin's Q* is considered particularly useful in ambidexterity research since the market-based value reflects both short-term performance and long-term performance prospects (Lavie et al., 2010;

[2]Simsek et al. (2009: 883) suggest that innovation-based measures such as patents are particularly effective measures to capture a temporal transition between exploration and exploitation because "a strong technological orientation is the most salient determinant of cyclical ambidexterity" and "cyclical ambidexterity is most strongly associated with innovative outcomes."

Lubatkin & Shrieves, 1986; Uotila, Maula, Keil, & Zahra, 2009).[3] Compared to accounting measures of profitability, *Tobin's Q* has the advantage of reflecting market expectations of competitiveness in terms of knowledge creation as measured by patents, which we use to operationalize exploration and exploitation (Levitas & McFadyen, 2009; Megna & Klock, 1993). Empirical economics research on patents and their performance implications has strongly preferred market-based measures such as *Tobin's Q* over accounting-based measures (Austin, 1993; Griliches, 1990; Griliches, Hall, & Pakes, 1991; Pakes, 1985). For example, Griliches (1990: 1682) explains that "The use of stock market values as an output indicator of the research process has one major advantage. All other indicators of success, such as profits or productivity, are likely to reflect it only slowly and erratically. On the other hand, when an event occurs that causes the market to reevaluate the accumulated output of a firm's research endeavors, its full effect on the expected present value of a firm's future net cash flows should be recorded immediately."

We compute *Tobin's Q* as:

$$Q_{it} = \frac{1}{AT_{it}} \cdot (PRCC_{it} * CSHO_{it} + PSTKL_{it} + LCT_{it} - ACT_{it} + INVT_{it} + DLTT_{it}),$$

where Q_{it} denotes *Tobin's Q* of firm i at time t; AT_{it} is the book value of total assets, $PRCC_{it}$ indicates share price, $CSHO_{it}$ captures the number of common stocks outstanding, and $PSTKL_{it}$ is the liquidating value of firm i's preferred stock at time t. LCT_{it} and ACT_{it}, respectively, represent short-term liabilities and short-term assets. $INVT_{it}$ indicates the book value of inventories and $DLTT_{it}$ denotes the book value of long-term debt of firm i at time t.

5.2.2 | Explanatory variable

Our two main explanatory variables are a *discontinuous jump* and an *incremental transition*. We first identify a *temporal transition* between exploration and exploitation and then further categorize it into a *discontinuous jump* and an *incremental transition*. To identify a *temporal transition*, we need to operationalize *exploration* and *exploitation* first. We operationalize *exploration* with the patents filed during a given year and in technical classifications for which the focal firm has not historically filed, and *exploitation* is operationalized with the patents filed in a year and in technical classifications for which the focal firm has historically filed (Ahuja & Lampert, 2001; Rosenkopf & Nerkar, 2001). Since firms often file both types of patents in a given year, we measure a firm's focus on exploration and exploitation as a ratio variable. When a firm filed more patents in new patent classes (i.e., not filed previously) than in previously filed classes at time t, we indicate that the firm has a focus on exploration at time t. A firm's *focus* is computed.

[3]Uotila et al. (2009: 223) explain that "Exploration and exploitation activities have been argued to influence company performance in different ways and over different time periods. This makes studying the effect of the balance between the two on company performance using accounting-based performance measures problematic, as the ultimate effects of exploration on company financials are more often distant, while exploitation has a more immediate effect. Consequently, instead of using accounting-based measures of performance, we use the market-based measure of Tobin's Q as our dependent performance variable. Market value-based measures such as Tobin's Q have the advantage of capturing short-term performance and long-term prospects (Allen, 1993; Lubatkin & Shrieves, 1986), allowing us to operationalize both short- and long-term performance effects using a single performance variable."

$$f_{it} = \frac{R_{it}}{TP_{it}} - \frac{T_{it}}{TP_{it}},$$

where f_{it} denotes firm i's innovation focus at time t; R_{it} and T_{it} are the number of firm i's patents identified as *exploration* and *exploitation* at time t, respectively. TP_{it} indicates the total number of patents filed at time t. Therefore, if R_{it} is larger than T_{it}, f_{it} has a positive value, meaning that the innovation focus of firm i is more toward *exploration* than *exploitation* at time t. If R_{it} is smaller than T_{it}, f_{it} has a negative value, meaning that the innovation focus of firm i is more toward *exploitation* than *exploration*. Hence, *focus* is a ratio indicating how much more exploratory or exploitative the portfolio of patents is.

Next, we measure the firm's strategic direction or orientation toward the exploration and exploitation in a given year using the *focus* measure over a 5-year window around each focal year. For example, if the focal year is 2003, we use 5-year observations of *focus* from 2001 to 2005 to measure the firm's strategic orientation toward exploration and exploitation in 2003. To measure the firm's strategic orientation or direction toward exploration and exploitation in 2003, we regress *focus* on *year* using the 2001–2005 data. The regression coefficient or the slope of the fitted regression line indicates the strategic orientation toward exploration and exploitation of the firm in a given year. Using this procedure, we estimate the regression coefficient of *focus* on *year* for all yearly observations of our sample firms. Then, we compare these regression coefficients of *focus* on *year* between year $t-1$ and t to decide if there is a *temporal transition* between exploration and exploitation. When the regression coefficient is positive for a given year, it indicates that the firm has a strategic orientation toward exploration. If the regression coefficient is negative, it indicates that the firm has a strategic orientation toward exploitation. Therefore, when there is a positive to negative or negative to positive change in the regression coefficients of *focus* on *year* between year $t-1$ and t, we assume that there is a temporal transition between exploration and exploitation between year $t-1$ and t.

Once we identify a *temporal transition* in a given year, we further examine whether it is a *discontinuous jump* or an *incremental transition*. A discontinuous jump is conceptualized as a discrete switch between exclusive periods of exploration and exploitation. To decide whether a *temporal transition* is a *discontinuous jump*, we observe the *focus* ratios. We consider that a *discontinuous jump* occurs when the *focus* ratio is −1 (i.e., all exploitation) in the previous two consecutive years (i.e., t–2 and t–1) and turns into 1 (i.e., all exploration) in year t, and vice versa.[4] For example, given that a *temporal transition* occurred in 2003, if the *focus* ratio was −1 in 2001 and 2002 and turned into 1 in 2003, we consider that a *discontinuous jump* occurred in 2003.

We consider that an *incremental transition* occurs when the *focus* ratios for *t-2*, *t-1* and *t* are greater than −1 and smaller than 1. A *focus* ratio that falls between −1 and 1 indicates that the firm engages in both exploration and exploitation in the given year. For example, given that a *temporal transition* occurred in 2003, if the *focus* ratio is −0.4 in 2001, −0.3 in 2002, and 0.2 in 2003, we consider that an *incremental transition* occurred between 2002 and 2003. Among 4,181 firms in our sample, 494 (11.82%) firms conduct incremental transitions, and 217 (5.19%) firms conduct discontinuous jumps.

[4]Alternatively, we operationalize a *discontinuous jump* in a more relaxed manner by comparing the *focus* ratios of year $t-1$ and t only. That is, on condition that there is a *temporal transition* between year $t-1$ and t, when the *focus* ratios are 1 (−1) in year $t-1$ and turns to −1 (1) in year t, the temporal transition is considered a *discontinuous jump*. The regression results based on this alternative measurement of discontinuous jump is almost identical to our reported regression results in terms of the regression coefficient value and statistical significance. We do the same for an *incremental transition* and our results remain the same.

Firm resources are our main moderator. We measure *firm resources* by considering both technological and financial resources. Given that our predictions for H2a and H2b are commonly based on non-scale-free resources, we look for empirical measures to capture non-scale-free resources. To measure technological resources, we use the R&D budget, which is subject to opportunity costs and limited in availability. If some of the R&D budget is used for an R&D activity, it cannot be used for other R&D activities. Hence, the R&D budget captures non-scale-free technological resources. To measure financial resources, we calculate free cash flow following Jensen (1986). Using the R&D budget and free cash flow, we identify a two-dimensional geometric space and measure the combination of technological and financial resources by computing the Euclidean distance from the origin. A greater Euclidean distance indicates that the firm has more non-scale-free technological and financial resources.

We consider several alternative measures of *firm resources*. First, we attempt to consider scale-free technological resources. As our theoretical argument for H2b also applies to scale-free resources, it is meaningful to examine if the moderation effect holds when we use a measure of technological resources with a scale-free property to construct the *firm resources* variable. With this aim, we use the total number of firm patents granted in the past 5 years as a proxy for scale-free technological resources. Patents are scale free resources, in that they are not subject to opportunity costs and can be used for multiple commercialization projects (Levinthal & Wu, 2010). We re-calculate the Euclidean distance measure of *firm resources* using the number of patents granted and free cash flow.

Second, we use *firm size* as a measure of firm resources. Lin, Yang, and Demirkan (2007: 1647, emphasis added) explain that "Firm size provides a parsimonious index to reflect the extent of a firm's *overall* resource constraints." Therefore, firm size may capture both scale-free and non-scale-free firm resources and serve as an alternative measure of firm resources. *Firm size* is measured by the total assets.

Third, we use patents alone to construct *firm resources*. As patents are scale-free technological resources, they can help us test our theoretical predictions more precisely. In H2a, we argue that the performance effects of a discontinuous jump depend on non-scale-free resources but not on scale-free resources. Therefore, if the performance effects of a discontinuous jump are not significantly moderated by this *firm resources* variable based on patents alone, it is consistent with our argument for H2a.[5] In comparison, in H2b, we argue that both scale-free and non-scale-free resources affect the performance effects of an incremental transition. Therefore, if our theoretical argument for H2b is valid, the performance effects of an incremental transition would still be significantly moderated by this patent-based *firm resources* variable.

5.2.3 | Control variables

We control for a number of industry- and firm-level characteristics including firm and year fixed effects. *Environmental munificence* is defined as "the scarcity or abundance of critical resources needed by firms operating within an environment" (Castrogiovanni, 1991: 542), and *environmental dynamism* as "the volatility and unpredictability of the firm's external environment" (Schilke, 2014: 191). Following the literature (Batjargal et al., 2013; Karim, Carroll, & Long, 2016; Keats & Hitt, 1988), we measure *environmental munificence* and *environmental dynamism* using the equation.

[5]However, we acknowledge that we cannot confirm the null hypothesis. That is, we cannot statistically confirm that scale-free resources *do not* affect a discontinuous jump.

$$R_{jt} = \alpha + \beta R_{jt-1} + \varepsilon_{jt},$$

where R_{jt} denotes the revenues generated by the firms in industry j (3-digit SIC code) in year t. In the regression equation, β indicates the extent to which industry revenue has grown over time. *Environmental munificence* is measured by the magnitude of β and *environmental dynamism* is measured by the standard error of β. *Industry Tobin's Q* is defined as the average *Tobin's Q* of firms in a given 3-digit SIC code.[6] *Market share* is calculated as the proportion of the focal firm's sales to the total sales of the industry. *Marketing intensity* is measured by marketing expenditures of the firm divided by sales. *Number of patents granted* is the total number of patents granted to the firm for the year. *R&D intensity* is computed by dividing R&D expenditures by total assets. *Firm age* is measured by taking the logarithm of the number of years since the IPO. We construct a measure of *firm resources* focusing on technological and financial resources. *Firm size* is measured by the total assets. *Prior Tobin's Q* is measured by the average of the focal firm's *Tobin's Q* over the past 3 years.[7] *Firm growth* is measured by the change in total assets. Specifically, firm growth is computed as.

$$GR_{it} = \frac{AT_{it} - AT_{it-1}}{AT_{it-1}},$$

where GR_{it} denotes firm growth of firm i at time t; AT_{it} and AT_{it-1}' respectively, indicate total assets of firm i at time t and time $t-1$.

Diversification is based on the Herfindahl–Hirshman Index (HHI), following the equation:

$$\mathrm{HHI}_{it} = \sum_{j \in i}^{n} p_{ijt,}^{2}$$

where HHI_{it} denotes the index of concentration of firm i's business portfolio at time t; p_{ijt} indicates that the proportion of sales in product-based segment j which firm i comprises at time t; and n is the total number of product-based segments of firm i at time t. Hence, a greater value of HHI_{it} indicates a lower level of diversification. We reverse code this variable by subtracting it from 1 for a more straightforward interpretation of regression coefficient. *Past transition experience* is defined as the total number of temporal transition events in the last 5 years.[8] Table 1 provides summary statistics including the correlation among our variables.

5.3 | Estimation model

We employ firm and year fixed effects regressions as the Hausman test suggests (χ^2 = 437.91, p = .000). Our regression models may be vulnerable to self-selection bias, to the extent that temporal transition decisions can be based on how such decisions will affect firm performance. That is, firms may make decisions on a temporal transition based on their understanding of how such decisions would affect firm performance. If so, firms that expect a positive effect of a

[6]Alternatively, we use the 4-digit SIC code. The result does not change.

[7]Alternatively, we use the average *Tobin's Q* in the past four and 5 years. The result does not change.

[8]We also use alternative moving windows (i.e., 3, 4, 6, 7, and 8 years) for *past transition experience* and find that the result remains consistent.

TABLE 1 Descriptive statistics

N = 32,880	Mean	SD	Min	Max	1	2	3	4	5	6	7	8	9	10
1. Tobin's Q	0.6957	0.4910	−0.9953	2.4983										
2. Environmental munificence	1.0487	0.0598	−0.2839	1.6435	0.0313									
3. Environmental dynamism	0.6312	0.8992	0.1253	84.1495	0.021	−0.0568								
4. Industry Tobin's Q	0.0043	0.0314	0.0001	2.5140	−0.0111	−0.0391	−0.0059							
5. Market share	0.0347	0.0969	0	1	0.0324	0.0128	0.1263	−0.0016						
6. Marketing intensity	0.0007	0.0111	0	1.1514	0.0055	−0.0029	−0.0041	0.0064	−0.0152					
7. Number of patents granted	5.3592	68.5668	0	2,495	−0.0257	0.0007	−0.0254	0.0011	0.1397	−0.0022				
8. R&D intensity	0.0478	0.0914	0	2.1040	0.0228	−0.0479	−0.1722	0.0265	−0.1312	0.0391	0.0092			
9. Firm age	12.2439	8.5682	3	58	−0.0959	−0.027	0.0052	0.0072	0.154	−0.0128	0.0761	−0.154		
10. Cash flow	42.1022	345.9942	0	16,847.61	0.0094	0.0127	0.0047	0.0123	0.1113	−0.005	0.0486	−0.0343	0.044	
11. Firm resources	60.6395	392.1253	0	16,847.91	−0.0084	0.0093	−0.0087	0.0145	0.1542	−0.0058	0.2368	−0.0179	0.0609	0.9187
12. Firm size	1861.3670	10,161.09	0.1	275,941	−0.0234	−0.0017	−0.0017	0.0145	0.2186	−0.0049	0.2501	−0.0487	0.0947	0.5717
13. Prior Tobin's Q	0.7097	0.4977	−0.9908	17.3511	0.7724	0.029	0.0092	−0.0111	0.0202	0.02	−0.027	0.0392	−0.1288	0.0037
14. Firm growth	0.1390	0.9721	−0.9804	89.7578	0.1007	0.0063	0.0012	0.0011	−0.0207	0.0315	−0.0073	0.0284	−0.0611	−0.0044
15. Diversification	0.7051	0.1812	0	1	−0.0738	−0.0832	−0.0577	0.0783	0.1269	0.009	0.037	0.0512	0.1515	0.1047
16. Past transition experience	0.2208	0.6245	0	5	−0.0219	−0.0016	−0.0602	−0.0066	0.0535	−0.0088	0.1288	0.055	0.1691	0.0339
17. Temporal transition	0.0527	0.2234	0	1	0.0139	0.0125	−0.0438	−0.0163	0.0196	−0.0011	0.0898	0.0339	0.0303	0.0093
18. Discontinuous jump	0.0072	0.0846	0	1	−0.0016	0.002	−0.0126	−0.0063	−0.0065	0.0044	0.0134	0.006	−0.0045	0.005
19. Incremental transition	0.0336	0.1803	0	1	0.0154	0.0075	−0.0361	−0.0127	0.0235	−0.0035	0.0924	0.0327	0.0366	0.0124

TABLE 1 (Continued)

N = 32,880	11	12	13	14	15	16	17	18
12. Firm size	0.7545							
13. Prior Tobin's Q	−0.0143	−0.0297						
14. Firm growth	−0.0087	−0.0158	0.2033					
15. Diversification	0.1266	0.1284	−0.0689	−0.0162				
16. Past transition experience	0.0693	0.0775	−0.0302	−0.0208	0.0759			
17. Temporal transition	0.0259	0.0249	0.0152	0.0026	−0.0223	0.2997		
18. Discontinuous jump	0.0056	0.0035	0.004	0.0029	−0.024	0.0873	0.3613	
19. Incremental transition	0.0297	0.0284	0.0128	0.0034	−0.0063	0.2301	0.7912	−0.0159

temporal transition on firm performance are more likely to perform a temporal transition, while other firms that do not expect a positive effect are less likely to perform a temporal transition. Therefore, this is a typical example of the endogeneity problem caused by self-selection (Hamilton & Nickerson, 2003; Shaver, 1998).

We employ self-selection correction to address this issue. We use the number of temporal transitions by other firms in the same region and different industries as our instrument variable, given that firms often consider other firms around them as their reference group when implementing a strategy (Cheng, Ioannou, & Serafeim, 2014; Henisz & Delios, 2001). This variable is labeled a *peer transition*. In the first-stage probit regression, we estimate the probability of a *temporal transition* of the focal firm using *peer transition* and other predictors. Table 2 shows that *peer transition* significantly and positively predicts a focal firm's temporal transition and thus is a relevant instrument ($\beta = .0651$, $p = .008$). We calculate the inverse Mills ratios based on the first-stage probit estimation and insert them as a control for self-selection in the second-stage regression.

We examine whether our instrument variable meets instrument relevance and exogeneity conditions. We conduct an F test as a formal test of instrument relevance (Staiger & Stock, 1997; Stock & Yogo, 2005), which indicates that our instrument is strong and relevant ($F = 7.40$, $p = .0065$). Compared to instrument relevance, instrument exogeneity is more difficult to confirm because there is no formal test of instrument exogeneity (Kennedy, 2003; Semadeni, Withers, & Certo, 2014; Wooldridge, 2010). However, although there are no formal tests of instrument exogeneity, we attempt to make a stronger case for instrument exogeneity. First, we include the instrument variable in the second-stage regression to see if it is significantly related to the second-stage dependent variable. We find that the instrument variable is not significantly related to the second-stage dependent variable ($\beta = .00163$, $p = .704$). Second, we regress an estimated error term of the second-stage regression on our instrument variable. We find that our instrument variable is not significantly related to the estimated error term of the second-stage model ($\beta = .000653$, $p = .810$).

We also use robust standard error as the Breusch–Pagan and Cook–Weisberg test suggests ($\chi^2 = 711{,}745.94$, $p < .0001$) (Breusch & Pagan, 1979; Cook & Weisberg, 1983).

6 | RESULTS

In Table 3, firm and year fixed effect regressions with self-selection correction are reported. As a base model, Model 1 includes only control variables. Model 2 includes a *temporal transition*. In Model 3, a *discontinuous jump* is added to Model 1, and Model 4 includes an *incremental transition* instead of a *discontinuous jump*. In Model 5, both variables are included.

As shown in Model 2, a *temporal transition* does not have a significant effect on *Tobin's Q* ($\beta = .00889$, $p = .276$). However, when we divide the *temporal transition* into a *discontinuous jump* and an *incremental transition* (Models 3–5), we find an interesting result. We find that a *discontinuous jump* has a negative effect on *Tobin's Q* ($\beta = -.0320$, $p = .068$, Model 3) and that an *incremental transition* has a positive effect on *Tobin's Q* ($\beta = .0219$, $p = .023$, Model 4). In Model 5, the result remains the same. Hence, this result supports Hypothesis 1. Hypotheses 2a and 2b predict that the performance effects of a *discontinuous jump* and an *incremental transition* are more pronounced for resource-constrained firms than resource-rich firms. Table 4 presents the moderation effects of firm resources. We split the samples using the median value of *firm resources*. We follow Hannan and Freeman (1984) in testing the firm resources moderation effect using split samples. Hannan and Freeman (1984) maintain that the organizational

TABLE 2 First-stage probit regression

Dependent variable	Temporal transition$_t$
Intercept	−1.042
	(0.386)
Environmental munificence	−0.115
	(0.358)
Environmental dynamism	−0.299
	(0.0486)
Industry Tobin's Q	−26.86
	(6.882)
Market share	0.269
	(0.161)
Marketing intensity	0.550
	(0.473)
Number of patents granted	0.00103
	(0.000157)
R&D intensity	0.189
	(0.122)
Firm age	−0.00770
	(0.00285)
Cash flow	0.000132
	(0.000188)
Firm resources	−9.41e-05
	(0.000220)
Firm size	−2.66e-06
	(5.11e-06)
Prior Tobin's Q	0.0471
	(0.0231)
Firm growth	0.00808
	(0.00714)
Diversification	−0.510
	(0.101)
Past transition experience	0.173
	(0.0227)
Peer transition	0.0651
	(0.0246)
Observations	32,880
Anderson LM test statistic (χ^2)	7.40
Cragg–Donald Wald *F* statistic	7.41
Sargan statistics	0.000

Note: All explanatory and control variables are measured at *t*; Robust standard errors in parentheses.

TABLE 3 Performance effect of an incremental transition and a discontinuous jump

Dependent variable: Tobin's $Qt + 1$					
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Intercept	0.415	0.415	0.415	0.415	0.415
	(0.0683)	(0.0683)	(0.0683)	(0.0683)	(0.0683)
Environmental munificence	−0.0230	−0.0232	−0.0231	−0.0231	−0.0233
	(0.0293)	(0.0292)	(0.0292)	(0.0293)	(0.0292)
Environmental dynamism	0.000282	0.000285	0.000280	0.000279	0.000277
	(0.00180)	(0.00180)	(0.00180)	(0.00180)	(0.00180)
Industry Tobin's *Q*	0.122	0.123	0.122	0.122	0.122
	(0.0311)	(0.0310)	(0.0311)	(0.0311)	(0.0311)
Market share	−0.0684	−0.0690	−0.0679	−0.0688	−0.0683
	(0.0351)	(0.0351)	(0.0351)	(0.0351)	(0.0351)
Marketing intensity	−0.476	−0.476	−0.475	−0.475	−0.474
	(0.321)	(0.321)	(0.320)	(0.320)	(0.320)
Number of patents granted	4.11e-05	3.95e-05	4.13e-05	3.71e-05	3.75e-05
	(1.73e-05)	(1.74e-05)	(1.74e-05)	(1.75e-05)	(1.76e-05)
R&D intensity	0.254	0.254	0.253	0.253	0.253
	(0.0598)	(0.0598)	(0.0598)	(0.0598)	(0.0598)
Firm age	−0.0059	−0.0059	−0.0059	−0.0059	−0.0059
	(0.00137)	(0.00137)	(0.00137)	(0.00137)	(0.00137)
Cash flow	9.30e-06	9.30e-06	9.36e-06	9.43e-06	9.48e-06
	(1.28e-05)	(1.28e-05)	(1.28e-05)	(1.28e-05)	(1.28e-05)
Firm resources	−1.07e-05	−1.07e-05	−1.06e-05	−1.08e-05	−1.08e-05
	(1.42e-05)	(1.42e-05)	(1.42e-05)	(1.42e-05)	(1.42e-05)
Firm size	−6.05e-08	−5.35e-08	−5.82e-08	−4.29e-08	−4.16e-08
	(2.62e-07)	(2.62e-07)	(2.62e-07)	(2.62e-07)	(2.62e-07)
Prior Tobin's *Q*	0.667	0.667	0.667	0.667	0.667
	(0.0565)	(0.0565)	(0.0565)	(0.0565)	(0.0565)
Firm growth	−0.0220	−0.0220	−0.0220	−0.0220	−0.0220
	(0.0149)	(0.0149)	(0.0149)	(0.0149)	(0.0149)
Diversification	−0.0204	−0.0204	−0.0206	−0.0204	−0.0205
	(0.0193)	(0.0193)	(0.0193)	(0.0193)	(0.0193)
Past transition experience	−0.000321	0.000129	−0.000570	0.000640	0.000368
	(0.00372)	(0.00371)	(0.00372)	(0.00372)	(0.00371)
Inverse Mills ratio	−0.00378	−0.00379	−0.00378	−0.00380	−0.00380
	(0.00426)	(0.00426)	(0.00426)	(0.00426)	(0.00426)
Temporal transition		0.00889			
		(0.00816)			

TABLE 3 (Continued)

Dependent variable: Tobin's $Qt + 1$					
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Discontinuous jump			−0.0320		−0.0292
			(0.0175)		(0.0176)
Incremental transition				0.0219	0.0209
				(0.00966)	(0.00969)
Firm and year FE	YES	YES	YES	YES	YES
Observations	32,880	32,880	32,880	32,880	32,880
R^2	0.712	0.712	0.712	0.712	0.712

Note: All explanatory and control variables are measured at *t*, Robust standard errors in parentheses.

differences are more clearly discernible around threshold levels of certain firm characteristics. This observation suggests that the performance effect of a discontinuous jump and an incremental transition may not change smoothly across all firm resources levels but is only discernibly different surrounding a threshold.[9] Table 4 shows that the negative effect of a discontinuous jump ($\beta = -.0356$, $p = .098$) and the positive effect of an incremental transition ($\beta = .0519$, $p = .002$) are both more pronounced for firms with limited non-scale-free resources.

We also use patents alone as a proxy for *firm resources* (Table 5, Columns 5 and 6). In our H2a and H2b, we argue that the performance effects of a discontinuous jump depend on non-scale-free resources (H2a), while the performance effects of an incremental transition depend on both scale-free and non-scale-free resources (H2b). When we split the sample using patents alone, the performance effects of a discontinuous jump are not significant in both sub-samples, whereas the performance effects of an incremental transition ($\beta = .0534$, $p = .005$) are significant only in the resource-constrained firm sub-sample. This result suggests that scale-free resources may not critically affect the performance effects of a discontinuous jump, while it critically affects the performance effects of an incremental transition. Hence, this result is consistent with our theoretical argument for H2a and H2b.

While our firm fixed effects regression, Heckman self-selection correction, and the 1-year lagged structure of our regression may help strengthen the causal inference based on our regression results, we try to establish a stronger case for the causality between our variables by examining the Granger causality between our variables (Granger, 1969). We find that the Granger causality test does not support the reverse direction of Granger causality for our explanatory variables (i.e., *Tobin's Q* does not precede either type of temporal transition) ($t = 0.61$, $p = .540$, for an incremental transition; $t = 0.90$, $p = .369$, for a discontinuous jump).

7 | DISCUSSION AND CONCLUSION

Two existing streams of literature on temporal transitions suggest that firms may alternate between exploration and exploitation either in a gradual and continuous manner or in a

[9]We also test the moderation effect using interaction terms with firm resources. We find that the interaction terms are not statistically significant, suggesting that the moderation effect of firm resources is more discernible around a threshold level (i.e., median) of firm resources.

TABLE 4 Moderation effect of firm resources

DV: Tobin's $Qt + 1$	All firms	Firms with abundant resources	Firms with limited resources
Variables			
Intercept	0.415	0.493	0.170
	(0.0683)	(0.0934)	(0.0480)
Environmental munificence	−0.0233	0.0385	−0.0302
	(0.0292)	(0.0532)	(0.0372)
Environmental dynamism	0.000277	−0.00529	0.00191
	(0.00180)	(0.00433)	(0.00145)
Industry Tobin's *Q*	0.122	0.105	0.111
	(0.0311)	(0.0510)	(0.0332)
Market share	−0.0683	−0.166	0.00726
	(0.0351)	(0.0488)	(0.0539)
Marketing intensity	−0.474	−1.498	−0.0324
	(0.320)	(0.481)	(0.113)
Number of patents granted	3.75e-05	3.61e-05	0.000101
	(1.76e-05)	(2.06e-05)	(0.000440)
R&D intensity	0.253	0.346	0.0132
	(0.0598)	(0.0794)	(0.119)
Firm age	−0.00593	−0.00846	−0.000759
	(0.00137)	(0.00218)	(0.000843)
Cash flow	9.48e-06	3.21e-05	−0.0144
	(1.28e-05)	(1.66e-05)	(0.0109)
Firm resources	−1.08e-05	−3.66e-05	0.0131
	(1.42e-05)	(1.83e-05)	(0.0109)
Firm size	−4.16e-08	4.91e-07	−4.56e-07
	(2.62e-07)	(3.37e-07)	(9.40e-07)
Prior Tobin's *Q*	0.667	0.512	0.904
	(0.0565)	(0.0736)	(0.0249)
Firm growth	−0.0220	−0.0325	0.00188
	(0.0149)	(0.0241)	(0.00496)
Diversification	−0.0205	−0.0408	0.00132
	(0.0193)	(0.0333)	(0.0225)
Past transition experience	0.000368	−0.00231	−0.000225
	(0.00371)	(0.00547)	(0.00524)
Inverse Mills ratio	−0.00380	−0.00306	−0.00125
	(0.00426)	(0.00611)	(0.00527)
Discontinuous jump	−0.0292	−0.0243	−0.0356
	(0.0176)	(0.0308)	(0.0215)

TABLE 4 (Continued)

DV: Tobin's $Qt + 1$	All firms	Firms with abundant resources	Firms with limited resources
Incremental transition	0.0209	0.00772	0.0519
	(0.00969)	(0.0125)	(0.0168)
Firm and year FE	YES	YES	YES
Observations	32,880	16,644	16,236
R^2	0.712	0.679	0.810

Note: All explanatory and control variables are measured at *t*, Robust standard errors in parentheses.

discrete and discontinuous manner. In this study, we investigate how different types of temporal transition between exploration and exploitation affect firm performance. Our empirical tests show that a discontinuous jump has a negative performance effect while an incremental transition has a positive effect on firm performance. We also find that the performance effects of a discontinuous jump and an incremental transition are more pronounced for firms with limited resources. We conclude our study by discussing the contributions to the temporal transition and ambidexterity literature, limitations, and future research implications.

Our primary contribution is to the growing literature on temporal transitions (Luger et al., 2018; Raisch & Tushman, 2016; Zimmermann et al., 2015). While a temporal transition has been considered an important mechanism to balance exploration and exploitation, there is some ambiguity as to how firms actually perform a temporal transition. Some studies consider a temporal transition to be a gradual transition between exploration and exploitation (Lavie & Rosenkopf, 2006; Luger et al., 2018; Rothaermel & Deeds, 2004), while other studies see it as a discontinuous jump between exclusive periods of exploration and exploitation (Gupta et al., 2006; Mudambi & Swift, 2014; Swift, 2016). In this study, we compare the two types of temporal transition, theorize their advantages and disadvantages, and predict and empirically test their performance implications. Our theoretical prediction and empirical finding inform future research on the importance of a clear conceptual and empirical definition of a temporal transition.

Understanding the difference between a discontinuous jump and an incremental transition is significant not only for the temporal transition literature, but also for the broader ambidexterity literature. Ambidexterity and temporal transition concepts have been often considered related but separate streams of literature (Gupta et al., 2006; Mudambi & Swift, 2014; Swift, 2016). In addition, the literature has often considered temporal transition and simultaneous balancing approaches to be mutually exclusive alternative approaches that cannot be combined (Gupta et al., 2006). Our study highlights that the distinction between ambidexterity and temporal transition concepts is not as clear as some previous studies suggest. An incremental transition indicates that firms can combine ambidexterity and temporal transition approaches to achieve a balance between exploration and exploitation (Lavie & Rosenkopf, 2006; Luger et al., 2018; Rothaermel & Deeds, 2004). Hence, firms may pursue a temporal transition and ambidexterity at the same time and thus these two approaches do not have to be mutually exclusive alternatives. This insight suggests that the way we conceptualize and distinguish between ambidexterity and temporal transition approaches may need to be revised.

In this paper, we attempt to join the latest development on firm resources in the strategy literature to the ambidexterity literature. Although the ambidexterity literature has long

TABLE 5 Moderation effect tests using alternative measures of firm resources

DV: Tobin's $Qt+1$	Column 1 Patents & free cash flow	Column 2	Column 3 Firm size	Column 4	Column 5 Patents	Column 6
Sample split criteria	**High**	**Low**	**High**	**Low**	**High**	**Low**
Intercept	0.503	0.200	0.449	0.196	0.273	0.371
	(0.992)	(0.0744)	(0.0871)	(0.0645)	(0.0811)	(0.0859)
Environmental munificence	−0.0146	0.00292	0.0259	−0.0289	0.0571	−0.0879
	(0.0443)	(0.0435)	(0.0390)	(0.0503)	(0.0438)	(0.0421)
Environmental dynamism	−0.00259	0.00218	0.00231	0.00165	−0.00271	0.00148
	(0.00427)	(0.00165)	(0.00368)	(0.00211)	(0.00383)	(0.00158)
Industry Tobin's Q	0.135	0.101	0.104	0.131	0.0809	0.165
	(0.0422)	(0.0906)	(0.0321)	(0.0848)	(0.0444)	(0.0436)
Market share	−0.102	−0.0573	−0.136	0.0840	−0.109	−0.00931
	(0.0512)	(0.0653)	(0.0384)	(0.109)	(0.0435)	(0.0554)
Marketing intensity	−0.406	0.397	−0.404	0.0312	−1.174	−0.217
	(0.339)	(0.577)	(0.283)	(1.284)	(0.523)	(0.389)
Number of patents granted	2.03e-05	0.000929	2.12e-06	−0.00571	−2.42e-06	2.93e-05
	(2.18e-05)	(0.0133)	(2.07e-05)	(0.00463)	(2.92e-05)	(0.000113)
R&D intensity	0.415	0.0321	0.657	0.0906	0.284	0.200
	(0.0809)	(0.113)	(0.131)	(0.0722)	(0.104)	(0.0813)
Firm age	−0.00668	−0.00162	−0.00496	0.000144	−0.00461	−0.00347
	(0.00198)	(0.00152)	(0.00148)	(0.00109)	(0.00183)	(0.00148)
Cash flow	3.16e-06	−0.00251	4.33e-06	−0.000445	−4.13e-06	0.00605
	(4.54e-06)	(0.00231)	(4.47e-06)	(0.00153)	(7.10e-06)	(0.00737)
Firm resources	−2.32e-07	0.00341	1.63e-08	8.94e-05	5.04e-06	4.81e-06
	(3.79e-06)	(0.00227)	(3.46e-06)	(0.000567)	(7.88e-06)	(4.89e-06)
Firm size	−2.24e-07	−5.95e-06	−7.15e-08	−0.000919	−4.01e-07	−1.99e-07
	(2.93e-07)	(6.77e-06)	(3.07e-07)	(0.000248)	(3.29e-07)	(4.80e-07)
Prior Tobin's Q	0.579	0.844	0.531	0.876	0.736	0.760
	(0.0762)	(0.0557)	(0.0882)	(0.0266)	(0.0713)	(0.0591)
Firm growth	−0.0870	0.0102	−0.0937	0.00207	−0.0548	0.00569
	(0.0317)	(0.00373)	(0.0337)	(0.00465)	(0.0366)	(0.00546)
Diversification	−0.0529	−0.0115	−0.0450	0.0115	−0.0205	−0.0225
	(0.0290)	(0.0255)	(0.0238)	(0.0267)	(0.0272)	(0.0262)
Past transition experience	−0.00401	−0.00205	−0.00414	0.00970	−0.00163	0.00270
	(0.00519)	(0.00678)	(0.00499)	(0.00582)	(0.00482)	(0.00701)
Inverse Mills ratio	−0.00537	−0.000432	−0.0109	0.00423	−0.00316	−0.00243
	(0.00623)	(0.00614)	(0.00627)	(0.00663)	(0.00583)	(0.00644)
Discontinuous jump	−0.0168	−0.0444	0.00274	−0.0527	−0.00286	−0.0254
	(0.0319)	(0.0220)	(0.0285)	(0.0220)	(0.0271)	(0.0245)

TABLE 5 (Continued)

DV: Tobin's $Qt+1$	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
	Patents & free cash flow		Firm size		Patents	
Sample split criteria	High	Low	High	Low	High	Low
Incremental transition	0.00980	0.0550	0.00446	0.0572	0.0103	0.0534
	(0.0118)	(0.0194)	(0.0118)	(0.0169)	(0.0114)	(0.0188)
Firm and year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16,626	16,254	16,707	16,173	16,465	16,415
R^2	0.708	0.796	0.712	0.776	0.741	0.773

Note: All explanatory and control variables are measured at *t*, Robust standard errors in parentheses.

recognized the importance of firm resources in balancing exploration and exploitation (March, 1991; Tushman & O'Reilly, 1996), it has not considered the difference between scale-free and non-scale-free resources (Chen et al., 2019; Levinthal & Wu, 2010; Wu, 2013). We consider this difference in our theoretical predictions and argue that while both types of resources are relevant for an incremental transition, non-scale-free firm resources are particularly important for a discontinuous jump. We believe that examining the possible distinct roles of the two types of firm resources in a temporal transition, both as antecedents and consequences, will provide rich opportunities for future ambidexterity research.

Our study has several limitations, which suggest avenues for future research. First, our empirical focus is limited to exploration and exploitation in technological innovation and knowledge search. Hence, our findings on the performance implications of a temporal transition may also be limited to the context of innovation. We call for future researchers to examine performance implications of a temporal transition in contexts other than innovation.

Second, our patent-based measure of exploration and exploitation has some limitations. Patents may be an outcome of individually-motivated research but have little to do with firm-level efforts to engage in exploration and exploitation. If there is a large number of such individually-motivated patents, a patent-based measure of exploration and exploitation may not accurately measure firm-level exploration and exploitation. Assuming that the tendency for individually-motivated research and patents are related to firm policy and culture (Baron & Hannan, 2002; Gwynne, 1997), we attempt to mitigate the systematic measurement error by controlling for firm-level fixed effects (Hall, Griliches, & Hausman, 1986). Although patents have been frequently used by previous studies as a measure of exploration and exploitation (Katila & Ahuja, 2002; Rosenkopf & Nerkar, 2001; Stuart & Podolny, 1996; Wadhwa & Kotha, 2006; Wadhwa, Phelps, & Kotha, 2009), we admit that the existence of individually-motivated patents is a serious issue to be more carefully considered by researchers. Another problem of the patent-based measure of exploration and exploitation is that there is a lag between exploration and exploitation and patent application. If there is a long lag between exploration and exploitation effort and patent application, researchers may not be able to identify timing of exploration and exploitation by using patent data. We also attempt to address this problem by controlling for firm-level fixed effects, given that the lag between research and patent application is often determined by firm-specific differences (Somaya, Williamson, & Zhang, 2007; Stasik, 2003). Furthermore, in an unreported supplementary analysis, we examine the lag between R&D expenditures and patent application to better understand this issue. In keeping with previous studies (Hall et al., 1986; Hausman, Hall, & Griliches, 1984; Pakes & Griliches, 1984), we find that R&D expenditure and patent application is dominated by the contemporaneous relationship. This finding suggests that, although there may be some time lag between R&D and patent application, still the time lag may not be very substantial or that most research effort is quickly translated into research output.

Yet, another issue with the patent data is that it is about invention, which often occurs at an early stage of the value chain, whereas exploration and exploitation often occur during the commercialization stage. Therefore, research using patents as measures of exploration and exploitation may not capture the tension among the routines and supporting activities for exploration and exploitation and the conflict in resource allocation during the commercialization process. In addition, since R&D and patenting are at an early stage of the firm value chain, their impact on firm performance as the dependent variable can be confounded by a number of internal and external factors in between. Therefore, we encourage future researchers to examine the performance implications of an incremental transition and a discontinuous jump using different measurement strategies.

Third, there may be yet another type of temporal transition not investigated in our study. For example, when firms engage in a discontinuous jump, a longer temporal gap between exploration and exploitation may exist. We expect that such a discontinuous jump with a longer temporal gap also have a negative effect on firm performance. We do not examine this type of discontinuous jump in our empirical analysis because identifying such a discontinuous jump poses an empirical challenge. The defining characteristic of such a discontinuous jump is that there is a long temporal gap during the transition between exploration and exploitation. The problem is that, for such a discontinuous jump, we are not able to identify when the transition has occurred. For example, if a firm finishes exploration in 2010 and starts exploitation in 2013, it is unclear which year (e.g., 2010, 2011, 2012, and 2013) we should identify as the transition year. Although we do not examine this type of discontinuous jump in our study, we believe that there may be some important differences between this type of temporal transition and those examined in our study. Studying a discontinuous jump with a long temporal gap provides a research opportunity for future researchers.

Our study intends to contribute to the literature on temporal transition and ambidexterity by more precisely defining a temporal transition, theorizing on the advantages and disadvantages of different types of temporal transition, and providing rare large-sample statistical evidence for the performance implications of a temporal transition. We hope that our study serves as the groundwork for further theoretical progress and empirical tests of a temporal transition approach. Given that we now understand the difference between a discontinuous jump and an incremental transition, we believe that the next step is to identify a more complete set of boundary conditions for different types of temporal transition. We expect that there are both internal and external contingencies that could explain when and under what circumstances firms may deal more effectively with a discontinuous jump and an incremental transition. We encourage future researchers to consider these interesting questions. Among others, examining senior management-related variables may provide particularly interesting questions and answers. A temporal transition approach requires careful attention and deliberation of different levels of organizational actors. Senior management, as the final decision makers of major strategic decisions of the firm, must have a critical effect on a successful temporal transition. When organizational contingencies prevent senior management from allocating sufficient attention and firm resources to a temporal transition, it can pose a greater organizational challenge. In addition, how senior management promotes the building of relevant organizational capabilities to deal with a temporal transition can be another relevant question for future research.

Another related issue is that a discontinuous jump can sometimes be difficult to avoid because there is an organizational tendency to continue what has been working well. Many firms commit all their energy and resources to successful exploitation until it becomes obsolete. Thus, firms start searching for new ideas only when the good idea becomes obsolete. These firms have failed to carefully and proactively plan exploration in a farsighted manner. Considering the natural organizational inclination for a discontinuous jump and the difficulty in resisting it, an interesting future research question would be to study how firms can avoid a discontinuous jump or examine what helps firms avoid it. Assuming that firms need farsighted planning to avoid it, it is possible that firms with more and better managerial resources may be more successful at avoiding a discontinuous jump. Research on the antecedents of a discontinuous jump and an incremental transition seems to be a promising future research avenue.

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REFERENCES

Ahuja, G., & Lampert, C. (2001). Entrepreneurship in the large corporation: A longitudinal study of how established firms create breakthrough inventions. *Strategic Management Journal*, *22*(6–7), 521–543.

Allen, F. (1993). Strategic management and financial markets. *Strategic Management Journal*, *14*(S2), 11–22.

Anand, J., & Singh, H. (1997). Asset redeployment, acquisitions and corporate strategy in declining industries. *Strategic Management Journal*, *18*(S1), 99–118.

Andriopoulos, C., & Lewis, M. W. (2009). Exploitation-exploration tensions and organizational ambidexterity: Managing paradoxes of innovation. *Organization Science*, *20*(4), 696–717.

Austin, D. H. (1993). An event-study approach to measuring innovative output: The case of biotechnology. *The American Economic Review*, *83*(2), 253–258.

Baron, J. N., & Hannan, M. T. (2002). Organizational blueprints for success in high-tech start-ups: Lessons from the Stanford project on emerging companies. *California Management Review*, *44*(3), 8–36.

Batjargal, B., Hitt, M. A., Tsui, A. S., Arregle, J. L., Webb, J. W., & Miller, T. L. (2013). Institutional polycentrism, entrepreneurs' social networks, and new venture growth. *Academy of Management Journal*, *56*(4), 1024–1049.

Bloom, N., & Van Reenen, J. (2002). Patents, real options and firm performance. *The Economic Journal*, *112*(478), C97–C116.

Boumgarden, P., Nickerson, J. A., & Zenger, T. R. (2012). Sailing into the wind: Exploring the relationships among ambidexterity, vacillation, and organizational performance. *Strategic Management Journal*, *33*(6), 587–610.

Breusch, T. S., & Pagan, A. R. (1979). A simple test for heteroskedasticity and random coefficient variation. *Econometrica*, *47*(5), 1287–1294.

Brown, S. L., & Eisenhardt, K. M. (1997). The art of continuous change: Linking complexity theory and time-paced evolution in relentlessly shifting organizations. *Administrative Science Quarterly*, *42*(1), 1–34.

Burgelman, R. A. (2002). Strategy as vector and the inertia of Coevolutionary lock-in. *Administrative Science Quarterly*, *47*(2), 325–357.

Cao, Q., Gedajlovic, E., & Zhang, H. (2009). Unpacking organizational ambidexterity: Dimensions, contingencies, and synergistic effects. *Organization Science*, *20*(4), 781–796.

Castrogiovanni, G. J. (1991). Environmental munificence: A theoretical assessment. *Academy of Management Review*, *16*(3), 542–565.

Chen, M., Kaul, A., & Wu, B. (2019). Adaptation across multiple landscapes: Relatedness, complexity, and the long run effects of coordination in diversified firms. *Strategic Management Journal*, *40*(11), 1791–1821.

Cheng, B., Ioannou, I., & Serafeim, G. (2014). Corporate social responsibility and access to finance. *Strategic Management Journal*, *35*(1), 1–23.

Cook, R. D., & Weisberg, S. (1983). Diagnostics for Heteroskedasticity in regression. *Biometrika*, *70*(1), 1–10.

Cyert, R. M., & March, J. G. (1963). *A behavioral theory of the firm*. Englewood Cliffs, NJ: Prentice-Hall.

DeCarolis, D. M., & Deeds, D. L. (1999). The impact of stocks and flows of organizational knowledge on firm performance: An empirical investigation of the biotechnology industry. *Strategic Management Journal*, *20*(10), 953–968.

Ebben, J. J., & Johnson, A. C. (2005). Efficiency, flexibility, or both? Evidence linking strategy to performance in small firms. *Strategic Management Journal*, *26*(13), 1249–1259.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, *21*(10/11), 1105–1121.

Feigenbaum, A., & Karnani, A. (1991). Output flexibility: A comparative advantage for small firms. *Strategic Management Journal*, *12*(2), 101–114.

Granger, C. (1969). Investigating causal relations by econometric models and cross spectral methods. *Econometrica*, *37*(3), 424–438.

Griliches, Z. (1990). Patent statistics as economic indicators: A survey. *Journal of Economic Literature*, *XXVIII*(4), 1661-1707.

Griliches, Z., Hall, B. H., & Pakes, A. (1991). R&D, patents, and market value revisited: Is there a second (technological opportunity) factor? *Economics of Innovation and New Technology*, *1*(3), 183–201.

Gulati, R., & Puranam, P. (2009). Renewal through reorganization: The value of inconsistencies between formal and informal organization. *Organization Science*, *20*(2), 422–440.

Gupta, A. K., Smith, K. G., & Shalley, C. E. (2006). The interplay between exploration and exploitation. *Academy of Management Journal*, *49*(4), 693–706.

Gwynne, P. (1997). Skunk works, 1990s-style. *Research-Technology Management*, *40*(4), 18–23.

Hall, B., Griliches, Z., & Hausman, J. (1986). Patents and R and D: Is there a lag? *International Economic Review*, *27*(2), 265–283.

Hall, B. H., Jaffe, A., & Trajtenberg, M. (2005). Market value and patent citations. *The Rand Journal of Economics*, *36*(1), 16–38.

Hamilton, B. H., & Nickerson, J. A. (2003). Correcting for endogeneity in strategic management research. *Strategic Organization*, *1*(1), 51–78.

Hannan, M. T., & Freeman, J. (1984). Structural inertia and organizational change. *American Sociological Review*, *49*(2), 149–164.

Hausman, J. A., Hall, B. J., & Griliches, Z. (1984). Econometric models for count data with an application to the patents R and D relationship. *Econometrica*, *52*(4), 909–938.

He, Z., & Wong, P. (2004). Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis. *Organization Science*, *15*(4), 481–494.

Helfat, C. E., & Eisenhardt, K. M. (2004). Inter-temporal economies of scope, organizational modularity, and the dynamics of diversification. *Strategic Management Journal*, *25*(13), 1217–1232.

Henisz, W. J., & Delios, A. (2001). Uncertainty, imitation, and plant location: Japanese multinational corporations, 1990-1996. *Administrative Science Quarterly*, *46*(3), 443–475.

Jansen, J. J. P., Van Den Bosch, F. A. J., & Volberda, H. W. (2006). Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators. *Management Science*, *52*(11), 1661–1674.

Jensen, M. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American Economic Review*, *76*(2), 323–329.

Kang, J., Kang, R., & Kim, S.-J. (2017). An empirical examination of vacillation theory. *Strategic Management Journal*, *38*(6), 1356–1370.

Karim, S., Carroll, T. N., & Long, C. P. (2016). Delaying change: Examining how industry and managerial turbulence impact structural realignment. *Academy of Management Journal*, *59*(3), 791–817.

Katila, R., & Ahuja, G. (2002). Something old, something new: A longitudinal study of search behavior and new product introduction. *Academy of Management Journal*, *45*(6), 1183–1194.

Keats, B. W., & Hitt, M. A. (1988). A causal model of linkages among environmental dimensions macro organizational characteristics and performance. *Academy of Management Journal*, *31*(3), 57–98.

Kelly, D., & Amburgey, T. L. (1991). Organizational inertia and momentum: A dynamic model of strategic change. *Academy of Management Journal*, *34*(3), 591–612.

Kennedy, P. (2003). *A guide to econometrics* (5th ed.). Cambridge, MA: The MIT Press.

Lavie, D., & Rosenkopf, L. (2006). Balancing exploratin and exploitation in alliance formation. *Academy of Management Journal*, *49*(4), 797–818.

Lavie, D., Stettner, U., & Tushman, M. L. (2010). Exploration and exploitation within and across organizations. *The Academy of Management Annals*, *4*(1), 109–155.

Lee, E., & Puranam, P. (2016). The implementation imperative: Why one should implement even imperfect strategies perfectly. *Strategic Management Journal*, *37*(8), 1529–1546.

Leonard-Barton, D. (1992). Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal*, *13*(S1), 111–125.

Levinthal, D. A., & March, J. G. (1993). The myopia of learning. *Strategic Management Journal*, *14*(S2), 95–112.

Levinthal, D. A., & Wu, B. (2010). Opportunity costs and non-scale free capabilities: Profit maximization, corporate scope, and profit margins. *Strategic Management Journal*, *31*(7), 780–801.

Levitas, E., & McFadyen, M. (2009). Managing liquidity in research-intensive firms: Signaling and cash flow effects of patents and alliance activities. *Strategic Management Journal*, *30*(6), 659–678.

Lin, Z., Yang, H., & Demirkan, I. (2007). The performance consequences of ambidexterity in strategic alliance formations: Empirical investigation and computational theorizing. *Management Science*, *53*(10), 1645–1658.

Lubatkin, M. H., & Shrieves, R. E. (1986). Towards reconciliation of market performance measures to strategic management research. *Academy of Management Review*, *11*(3), 497–512.

Luger, J., Raisch, S., & Schimmer, M. (2018). Dynamic balancing of exploration and exploitation: The contingent benefits of ambidexterity. *Organization Science*, *29*(3), 449–470.

March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization Science*, *2*(1), 71–87.

March, J. G., & Simon, H. A. (1958). *Organizations*. New York: John Wiley & Sons.

Megna, P., & Klock, M. (1993). The impact of intangible capital on Tobin's q in the semiconductor industry. *The American Economic Review*, *83*(2), 265–269.

Milgrom, P., & Roberts, J. (1995). Complementarities and fit strategy, structure, and organizational change in manufacturing. *Journal of Accounting and Economics*, *19*(2), 179–208.

Mudambi, R., & Swift, T. (2014). Knowing when to leap: Transitioning between exploitative and explorative R&D. *Strategic Management Journal*, *35*(1), 126–145.

Nelson, R. R., & Winter, S. G. (1982). *An evolutionary theory of economic change*. Cambridge, MA: Harvard University Press.

Nickerson, J. A., & Zenger, T. R. (2002). Being efficiently fickle: A dynamic theory of organizational choice. *Organization Science*, *13*(5), 547–566.

Pakes, A. (1985). On patents, R and D, and the stock market rate of return. *Journal of Political Economy*, *93*(2), 390–409.

Pakes, A., & Griliches, Z. (1984). Patents and R&D at the firm level: A first look. In Z. Griliches (Ed.), *R&D, patents and productivity* (pp. 55–72). Chicago, IL: University of Chicago Press.

Porter, M. E. (1996). What is strategy? *Harvard Business Review*, *74*(6), 61–78.

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

Raisch, S., & Birkinshaw, J. (2008). Organizational ambidexterity: Antecedents, outcomes, and moderators. *Journal of Management*, *34*(3), 375–409.

Raisch, S., Birkinshaw, J., Probst, G., & Tushman, M. L. (2009). Organizational ambidexterity: Balancing exploration and exploitation for sustained performance. *Organization Science*, *20*(4), 685–695.

Raisch, S., & Tushman, M. L. (2016). Growing new corporate businesses: From initiation to graduation. *Organization Science*, *27*(5), 1237–1257.

Rivkin, J. W. (2000). Imitation of complex strategies. *Management Science*, *46*(6), 824–844.

Romanelli, E., & Tushman, M. L. (1994). Organizational transformation as punctuated equilibrium: An emprical test. *Academy of Management Journal*, *37*(5), 1141–1166.

Rosenkopf, L., & Nerkar, A. (2001). Beyond local search: Boundary-spanning, exploration, and impact in the optical disk industry. *Strategic Management Journal*, *22*(4), 287–306.

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.

Sampson, R. C. (2007). R&D alliances and firm performance: The impact of technological diversity and alliance organization on innovation. *Academy of Management Journal*, *50*(2), 364–386.

Schilke, O. (2014). On the contingent value of dynamic capabilities for competitive advantage: The nonlinear moderating effect of environmental dynamism. *Strategic Management Journal*, *35*(2), 179–203.

Semadeni, M., Withers, M. C., & Certo, S. T. (2014). The perils of endogeneity and instrumental variables in strategy research: Understanding through simulations. *Strategic Management Journal*, *35*(7), 1070–1079.

Shaver, J. M. (1998). Accounting for endogeneity when assessing strategy performance: Does entry mode choice affect FDI survival? *Management Science*, *44*(4), 571–585.

Shimizu, K., & Hitt, M. A. (2005). What constrains or facilitates divestitures of formerly acquired firms? The effects of organizational inertia. *Journal of Management*, *31*(1), 50–72.

Simsek, Z., Heavey, C., Veiga, J. F., & Souder, D. (2009). A typology for aligning organizational ambidexterity's conceptualizations, antecedents, and outcomes. *Journal of Management Studies*, *46*(5), 864–894.

Somaya, D., Williamson, I. O., & Zhang, X. (2007). Combining patent law expertise with R&D for patenting performance. *Organization Science*, *18*(6), 922–937.

Staiger, D., & Stock, J. (1997). Instrumental variables regression with weak instruments. *Econometrica*, *65*(3), 557–586.

Stasik, E. (2003). *Patent or perish*: *A guide for gaining and maintaining competitive advantage in the knowledge economy*. Fuquay Varina: Althos Pub.

Stock, J., & Yogo, M. (2005). Testing for weak instruments in linear IV regression. In D. W. K. Andrews (Ed.), *Identification and inference for econometric models* (pp. 80–108). New York: Cambridge University Press.

Stuart, T., & Podolny, J. M. (1996). Local search and the evolution of technological capabilities. *Strategic Management Journal*, *17*(S1), 21–38.

Swift, T. (2016). The perilous leap between exploration and exploitation. *Strategic Management Journal*, *37*(8), 1688–1698.

Szulanski, G. (1996). Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic Management Journal*, *17*(S2), 27–43.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, *18*(7), 509–533.

Tushman, M. L., & O'Reilly, C. A. (1996). Ambidextrous organizations: Managing evolutionary and revolutionary change. *California Management Review*, *38*(4), 8–29.

Uotila, J., Maula, M., Keil, T., & Zahra, S. A. (2009). Exploration, exploitation, and financial performnace: Analysis of SandP 500 corporations. *Strategic Management Journal*, *30*(2), 221–231.

Van Looy, B., Martens, T., & Debackere, K. (2005). Organizing for continuous innovation: On the sustainability of ambidextrous organizations. *Creativity Innovation Management*, *14*(3), 208–221.

Wadhwa, A., & Kotha, S. (2006). Knowledge creation through external venturing: Evidence from the telecommunications equipment manufacturing industry. *Academy of Management Journal*, *49*(4), 819–835.

Wadhwa, A., Phelps, C., & Kotha, S. (2009). Creating exploratory innovations by learning from entrepreneurial ventures. *New Frontiers in Entrepreneurship*, *26*(3), 147–173.

Wang, H., & Li, J. (2008). Untangling the effects of overexploration and overexploitation on organizational performance: The moderating role of environmental dynamism. *Journal of Management*, *34*(5), 925–951.

Winter, S. G. (2003). Understanding dynamic capabilities. *Strategic Management Journal*, *24*(10), 991–995.

Winter, S. G., & Szulanski, G. (2001). Replication as strategy. *Organization Science*, *12*(6), 730–743.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. Cambridge, MA: The MIT Press.

Wu, B. (2013). Opportunity costs, industry dynamics, and corporate diversification: Evidence from the cardiovascular medical device industry, 1976-2004. *Strategic Management Journal*, *34*(11), 1265–1287.

Zimmermann, A., Raisch, S., & Birkinshaw, J. (2015). How is ambidexterity initiated? The emergent charter definition process. *Organization Science*, *26*(4), 1119–1139.

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