Three Essays on Organizational Learning in Multibusiness Firms

By

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ABSTRACT

In this dissertation, I examine the process and consequence of organizational learning in multibusiness firms by developing three interrelated empirical essays. In essay 1, I examine how multibusiness firms respond to social and historical performance comparison by internal and external restructuring, operationalized as business unit recombination and acquisition of external units or firms respectively. I build a theory on when multibusiness firms are more likely to rely on recombination to respond to performance feedback by highlighting the roles of the opportunity to restructure internally. In essay 2, I shift attention to examine how multibusiness firms respond to internal performance comparison between business units. I argue that multibusiness firms have two tendencies to respond to internal performance comparison—*problem solving* and *winner rewarding*. I also identify the conditions under which multibusiness firms are more problem solving or winner rewarding to respond to internal performance comparison. I highlight the roles of the business units' attention capturing and the multibusiness firms' risk aversion that jointly determine multibusiness firms' problem solving and winner rewarding tendencies. In essay 3, I investigate the influence of pre-entry learning on the performance of new entrants. This essay is the first step of my inquiry of how learning in multibusiness firms influences industry evolution and entrepreneurship. Focusing on the experience accumulated via learning before entry, I examine the relationship between pre-entry experience and new venture performance by conducting a meta-analysis.

INTRODUCTION

This dissertation includes three empirical essays that examine the process and consequence of organizational learning in multibusiness firms. Organizational learning is one of the most studied constructs in the strategic management field, as the ability to learn and adapt is critical for firms to achieve and sustain competitive advantages in uncertain and competitive environments (Argote & Miron-Spektor, 2011; Crossan & Berdrow, 2003; Teece, Pisano, & Shuen, 1997). In the behavioral theory of the firm (BTOF), firms are assumed to be bounded rational and have no perfect knowledge of the environment (Cyert & March, 1963). As such, they rely on performance feedback to learn whether their strategies and practices are effective. In particular, if firm performance is lower than aspiration level, the standards for what level of performance is desired (Greve, 2003a), firms learn that their current strategies or practices may not work (Posen, Keil, Kim, & Meissner, 2018). Accordingly, they search for alternative ones to address the performance shortfall. Extensive studies on BTOF have examined how firms learn from performance feedback, which in turn influences their search and organizational changes (e.g., Chen, 2008; Greve, 2003b; Iyer & Miller, 2008; Kuusela, Keil, & Maula, 2017; Xu, Zhou, & Du, 2019).

These studies provide important insights on how firms learn from performance feedback based on firm performance comparison relative to historical and/or social aspiration. However, by focusing on the overall firm performance in the comparison process, the extant studies have implicitly treated the firm, even a multibusiness firm, as a cohesive single-business entity. Consequently, the internal structure of the firm is often overlooked. This overlook is unfortunate, as one of the advocates of the BTOF is that the firm is a political coalition of different members and subunits (Cyert & March, 1963; Gavetti, Greve, Levinthal, & Ocasio, 2012). Thus, rather than treating all members and subunits as a whole, it is important to understand how firms deal with the coalition members to respond to overall firm performance shortfall, and how firms respond to internal performance comparison between internal coalition members or subunits.

In particular, I argue that the overlook of the internal structure of the firm has at least three important implications to our understanding of the process and consequence of organizational learning. First, the overlook constrains our understanding of how firms adjust internal structure to respond to performance shortfall. The existing literature has examined a series of search activities and organizational changes that firms can exploit to respond to performance shortfall (Posen et al., 2018). These activities and organizational changes include, for instance, R&D search (Chen & Miller, 2007; O'Brien & David, 2014), marketing search (Vissa, Greve, & Chen, 2010), innovation (Greve, 2003b; Gaba & Bhattacharya, 2012), new product introduction (Gaba & Joseph, 2013; Parker, Krause, & Covin, 2017), and acquisition and divestiture (Desai, 2016; Iyer & Miller, 2008; Kuusela et al., 2017). However, most of the search activities and organizational changes either happen or are aggregated at the firm level. While firms can respond to performance feedback by making changes at the firm level, they can also respond by making changes to internal structure. For instance, structural reconfiguration literature suggests that firms may recombine different units to address performance decline (Carroll & Karim, 2009). As firms are bounded rational, changing internal structure may be more available to them than other types of organizational changes (e.g., acquisition). Therefore, by overlooking internal structure, the existing literature provides an incomplete picture on what firms can do to respond to performance feedback.

Second, the overlook of the internal structure of the firm prevents us from inquiring how firms respond to one important form of performance comparison—the internal performance comparison between different subunits. As recent literature has suggested, not only subunits and individuals of a firm compare their performance with the performance of their sister subunits and colleagues in the same firm (Baumann, Eggers, & Stieglitz, 2019; Hu, He, Blettner, & Bettis, 2017; Kacperczyk, Beckman, & Moliterno, 2015; Nickerson & Zenger, 2008), but also the firm compares the performance of their subunits or employees (Knott & Turner, 2019). While the subunits or individuals whose performance is lower than that of other units or colleagues are motivated to search, the firms of the subunits and employees have to make a decision on which subunits or employees they should pay more attention and provide more support to. Do the firms

provide a helping hand to the underperforming or over performing subunits, and why? To what extent can the BTOF explain the decision of the firm to respond to the internal performance comparison between its subunits? Such inquiries are important for us to understand the behavior of the firm that learns from the internal performance comparison. Unfortunately, these inquiries are unable to be addressed unless we break up the firm and examine its internal structure.

Third, the overlook of internal structure limits our understanding of the broader implications of where learning occurs to industry evolution and entrepreneurship. While extant studies have suggested that pre-entry learning is critical to entrepreneurial entry and success (Chen, Croson, Elfenbein, & Posen, 2018; Ganco & Agarwal, 2009; Klepper, 2001), the internal structure in which pre-entry learning occurs is rarely examined. To what extent does internal performance comparison influence a multibusiness firm to diversify into new segments? If an employee has worked only in a single unit of a multibusiness firm, is she more likely to quit the firm and establish a new firm than her colleagues who have worked in multiple units? If so, how does the unit-specific pre-entry learning influence the performance of the new ventures? To address these questions, the internal structure of multibusiness firms need to be seriously considered.

Across all three essays, this dissertation examines both the process and consequence of organizational learning. In my first two essays, I focus on the process of organizational learning from performance feedback in multibusiness firms. Specifically, I study how multibusiness firms respond to firm performance shortfall by recombining internal business units and acquiring external business units or firms (essay 1). I also study how multibusiness firms respond to internal performance comparison between existing business units (essay 2). By focusing on the internal structure of multibusiness firms, the two essays jointly complement the emerging studies in the BTOF literature that have shown the importance of examining the cross-level interaction of performance feedback between headquarter and business units (Rhee, Ocasio, & Kim, 2019), and the performance comparison between units (Hu et al., 2017). The third essay focuses on the consequence of organizational learning. I aim to study how learning via internal performance

comparison influences the diversification of multibusiness firms and how employees' learning in a multibusiness firm influences their decisions to start a new venture and the performance of the new venture. As the first step of the inquiry, I examine the performance implications of the pre-entry learning by a meta-analysis. This essay advances our understanding of when learning in prior firms can benefit the performance of a new entrant. In the following section, I will provide an overview of each essay.

In the first essay, I examine how firm performance shortfall relative to aspiration level influences the search and organizational changes via corporate restructuring. In contrast to prior studies showing that performance shortfall can lead to greater extent of external restructuring (e.g., acquisition and divestiture), I argue that performance shortfall can instead lead to greater extent of internal restructuring via the recombination of internal business units. Because firms tend to initiate local search before distance search, the relationship between performance shortfall and internal restructuring could be greater than the relationship between performance shortfall and external restructuring. The extent to which a firm may shift attention from internal to external restructuring depends on the opportunities to restructure internally or externally. The more opportunities a firm has to restructure internally, the higher the chance of the firm responding to performance shortfall by internal restructuring, and the lower the chance of the firm responding by external restructuring. Empirically, I examine one type of external restructuring, i.e., acquisition, and one type of internal restructuring, i.e., recombination of internal business units. I use the data from the bank holding companies (BHCs) in the U.S. between 1986 and 2018 to examine the arguments. The results show that a greater extent of performance shortfall leads to a greater extent of business unit recombination, but to a lesser extent of acquisition. The relationship between performance shortfall and recombination is stronger when there are more opportunities for organizational changes via internal restructuring, which is measured by the count of affiliated banks. The relationship between performance shortfall and the annual share of recombinations on the total activities of recombination and acquisition is also strengthened by the count of affiliated banks. However, the relationship between performance shortfall and acquisition is not weakened by the count of banking subsidiaries.

This essay contributes to the BTOF by identifying internal restructuring as an important way of search and organizational changes in addition to external restructuring. In doing so, this essay advances our understanding of when firms switch the direction of search or organizational changes (Greve, 2018; Posen et al., 2018) by highlighting the roles of opportunity sets of a particular type of search and organizational change. Accordingly, this essay enhances our understanding of how and when performance shortfall influences the internal and external restructuring activities of the firm.

In the second essay, I shift attention from a firm's response to social and historical performance comparison, which is the focus of the first essay, to a firm's response to internal performance comparison. I argue that a firm's response to internal performance comparison is different from a firm's response to social and historical performance comparison. The traditional studies on BTOF have argued that firms are *problem solving* to respond to social and historical performance comparison. That is, as firm performance is below social or historical aspiration level, a problem occurs. Firms are motivated to search for solutions to address the problem. This process is essentially to search for solutions to fix the *weak part* of the firm. I argue that, to respond to internal performance comparison, firms can not only fix the weak part of the firm, which are often the underperforming units, but also strengthen the strong part of the firm, which are often the over performing units. As such, firms can be either *problem solving*—providing more support to search activities in the underperforming units, or *winner rewarding*—providing more support to the search activities in the over performing units—to respond to internal performance comparison. I then argue that the relative extent of problem solving and winner rewarding depends on two factors: (1) the risk aversion of the firm (March & Shapira, 1992) and (2) the extent to which the underperforming (over performing) units attract top managers' attention. Drawing upon the social cognition literature (Fiske & Taylor, 2013), I represent the attention capturing effect of a business unit by the prevalence of external star products from other firms in the same industry segment of the unit. Empirically, I examine the arguments in the global pharmaceutical context during 1999-2017. Results based on multilevel data from both the firms and business units suggest that multibusiness firms can use both the problem solving and the winner rewarding manner to respond to

internal performance comparison: both underperforming and over performing units can receive support to their search and organizational changes from firms under the condition that such units can attract the attention of the firm. Moreover, the relative extent of problem solving and winner rewarding is influenced by firm performance comparison: when firm performance is above firm level aspiration, the firm is more likely to provide a helping hand to the underperforming units that can capture attention; however, when firm performance is below firm level aspiration, the firm is more likely to provide a helping hand to the over performing units that can capture attention, but less likely to the underperforming units that can capture attention.

This essay contributes to the BTOF by highlighting a different pattern of a firm's response to internal performance comparison from a firm's response to social and historical performance comparison. It also enriches our understanding of when firms provide more support to the underperforming vs. over performing units to their search activities and organizational changes. The findings add to the inquiry "when and how top decision-makers influence individual units' problemistic search" (Rhee et al., 2019: 51) by articulating two pathways by which top managers can influence the search in the business units. The findings also complement the emerging studies in BTOF that examine the business units' response to internal social comparison (e.g., Hu et al., 2017; Kacperczyk et al., 2015). Taken together, this essay suggests a necessity to break up the firm and examine how firms respond to internal performance comparison.

The third essay represents the first step of my inquiry to understand (1) how pre-entry learning in a single unit vs. multiple units of a multibusiness firm influences an employee to establish a new venture, (2) how a multibusiness firm's learning from internal performance comparison influences its decision to diversify into new segments, and (3) how pre-entry learning influences the performance of the diversiyfing entrants and new ventures. In this essay, we focus on the performance implications of pre-entry learning and conduct a quantitative meta-analysis on the relationship between pre-entry experience, which represents the results of pre-entry learning, and new venture performance. Drawing upon the organizational learning literature,

we argue that the relationship between pre-entry experience and new venture performance is moderated by the level of pre-entry experience (firm and founder level) and the environmental context of the new venture. Based on empirical results from 130 papers, we find a low correlation (0.06) between pre-entry experience and new venture performance in the raw sample. However, once we account for the moderating effects, we find high correlations in several different scenarios. For instance, we find that firm-level pre-entry experience deployed in a high-technology context has a 0.19 correlation with new venture performance, and founder-level entrepreneurial experience deployed in a low-technology context has a 0.25 correlation with new venture performance. The findings provide strong evidence of the importance of pre-entry learning to the success of new ventures, and articulate boundary conditions to the relationship between pre-entry experience and new venture performance.

In sum, the three essays collectively examine the process and consequence of organizational learning in multibusiness firms. The first two essays advance our understanding of the process of organizational learning from performance feedback, particularly on how firms respond to social and historical performance comparison by altering internal structure, and how firms respond to internal performance comparison by providing support to the underperforming (problem solving) and over performing units (winner rewarding). The third essay highlights the importance of pre-entry learning in one firm for the success of new entrants, paving the way to study the effect of pre-entry learning in multibusiness firms on entrepreneurial entry and success. Taken together, by examining the process and consequence of organizational learning in multibusiness firms, the three essays jointly shed new light on how firms learn from performance feedback and how organizational learning has broader implications.

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ESSAY 1: REJUVENATING THE EXISTING BUSINESS UNITS OR ACQUIRING NEW ONES? A BEHAVIORAL EXPLANATION

ABSTRACT

This essay examines the relationship between performance shortfall and corporate restructuring in terms of recombination of internal business units (internal restructuring) and acquisition of external firms or business units (external restructuring). By linking the literature on problemistic search and structural reconfiguration, this essay shows that the opportunities or constraints to exercise certain types of search affects the relative effect of performance shortfall on recombination and acquisition. I argue that not every type of search or organizational change is equally exercisable by a particular firm. Thus, the types of search or organizational change that face stronger barriers are less likely to be conducted to respond to performance shortfall. In contrast, the types of search or organizational change that have more opportunities to exercise are more likely to be initiated. Empirically, I test the arguments by using data from 1,365 bank holding companies (BHCs) during 1986-2018. The results suggest that higher performance shortfall leads to a greater extent of recombination, but to a lesser extent of acquisition. The relationship between performance shortfall and the extent of recombination is stronger when there are more opportunities to conduct internal restructuring, measured by the count of banking subsidiaries. So is the relationship between performance shortfall and the annual share of recombinations on the total activities of recombination and acquisition. Interestingly, the relationship between performance shortfall and acquisition is not weakened by the count of banking subsidiaries. In sum, the essay contributes to our knowledge and understanding of how multibusiness firms leverage internal and external restructuring to respond to performance shortfall.

INTRODUCTION

How firms respond to performance shortfall relative to aspiration level is one of the central questions in the problemistic search literature (Cyert & March, 1963; Posen, Keil, Kim, & Meissner, 2018). The behavioral theory of the firm (BTOF) suggests that lower performance than aspiration level indicates a problem, and firms search for solutions to address the problem. Extensive studies have examined this argument, and found that performance shortfall leads to greater intensity of search or organizational change in terms of, for instance, R&D (Chen, 2008; Greve, 2003) and marketing search (Vissa, Greve, & Chen, 2010).

Recent studies have started examining how performance shortfall influences search or organizational change via corporate restructuring. These studies have concentrated on external restructuring, i.e., "exit, entry and market share change" (Disney, Haskel, & Heden, 2003: 666), and examined the relationship between performance shortfall and acquisition (Greve, 2011; Iyer & Miller, 2008; Kuusela, Keil, & Maula, 2017) and divestiture (Desai, 2016; Kuusela et al., 2017; Shimizu, 2007; Vidal & Mitchell, 2015). However, firms can search or make organizational change not only by external restructuring, but also by internal restructuring. As Bowman and Singh (1993: 6) have argued, corporate restructuring involves a wide range of activities, including "selling lines of business or making significant acquisitions, changing capital structure through infusion of high levels of debt, and *changing the internal organization of the firm*". Concentrating on the reconfiguration of business units, Karim (2006) categorizes corporate restructuring as unit addition, deletion, and recombination. Compared to unit addition and deletion (external restructuring), unit recombination (internal restructuring) dissolves boundaries between units and reshuffles activities and resources from one unit to another (Karim & Kaul, 2015). Such recombination can streamline business units' organization and capital structure, thus improving operational efficiency and performance (Choi & Han, 2013; Disney et al., 2003). Therefore, in addition to external restructuring, internal restructuring in terms of unit recombination is an important way for firms to address performance shortfall.

Why have prior studies not paid adequate attention to internal restructuring as a way to respond to performance shortfall? The studies on BTOF have traditionally argued that firms compare their current performance to their own past performance and to the performance of their peers (Cyert & March, 1963; Greve, 2003a). As such, scholars have focused on the aggregated performance of the firm by implicitly treating the firm and its business units as a whole. This treatment has made scholars focus on search activities or organizational changes by restructuring corporate portfolios at the firm level (e.g., acquisition, divestiture) but neglect the restructuring by altering the relationships of the existing business units. Because firms tend to start from local search before distant search, they "should initiate search by examining operating and strategic actions to turn around *existing businesses* and *subsequently* will consider *changes in their portfolios* if business-level turnaround efforts are insufficient" (Iyer & Miller, 2008: 810). As such, the neglect of internal restructuring may underestimate the intensity of local search. It also constrains our understanding of the direction of search to respond to performance shortfall (Greve, 2018; Posen et al., 2018): *When are firms more likely to conduct internal restructuring rather than external restructuring to respond to performance shortfall?*

I argue that one of the core mechanisms that drives a firm to shift from internal to external restructuring, or vice versa, is the opportunities or constraints to exercise search via internal restructuring. Though a series of organizational responses can be potentially initiated by performance shortfall (Greve, 2003a: 76), not every type of response is equally exercisable by a particular firm. Some types of search could face strong barriers due to, for instance, resources constraints (Kuusela et al., 2017), activity interdependency (Lenox, Rockart, & Lewin, 2007), and organizational structure (Gaba & Joseph, 2013). Firms are less likely to initiate the type of search or organizational change facing more constraints. In contrast, they may seek alternative types of search or organizational change that encounter few constraints and have more opportunities to exercise to address performance shortfall. Following this reasoning, I argue that multibusiness firms are more likely to use recombination to respond to performance shortfall when there are more opportunities to restructure internally. However, they may conduct less internal restructuring via

recombination if fewer such opportunities exist. In this case, they may seek to search by external restructuring, acquisition in particular.

I test the arguments by examining the response of U.S. bank holding companies (BHCs) to performance shortfall by internal (recombining affiliated banks) and external restructuring (acquiring external banks or BHCs). As an important form of multibusiness firm (Knott & Turner, 2019), BHCs have strong pressure to search and make organizational changes to address performance shortfall. Based on data from 1,365 public BHCs from 1986-2018, I find that performance shortfall is positively associated with recombination, but negatively associated with acquisition. The relationship is contingent on the opportunities to exercise internal restructuring, measured by the number of bank subsidiaries of BHCs. When the number of bank subsidiaries is higher, lower performance than aspiration level leads to greater extent of recombination. So is the relationship between performance shortfall and the yearly share of recombination on the total activities of recombination and acquisition. Interestingly, the opportunities to exercise search or organizational change internally do not weaken the relationship between performance shortfall and acquisition. Please note that the findings are robust to the inclusion of variables representing alternative explanations such as economies of scale, brand awareness, management quality, strategic momentum, and market competition.

The contribution of this study is threefold. First, it contributes to the BTOF literature by identifying internal restructuring as an important way other than external restructuring to respond to performance shortfall. This study shows that, with the option of recombination, firms tend to recombine their business units rather than acquire external business units to address performance shortfall.

Second, it contributes to the BTOF literature by addressing the direction of search or organizational change (Posen et al., 2018; Greve, 2018). While a firm can respond to performance shortfall by multiple types of search or organizational change, it is theoretically unclear why and when firms choose one type rather than

another. Prior studies have argued that factors such as slack resources, alternative goals, power, cognition, and environmental changes may matter for the direction of search or organizational change (Greve, 2018; Kuusela et al., 2017). This study adds that not every type of search or organizational change is equally exercisable by a particular firm, and the opportunities or constraints to exercise certain types of search or organizational change matter for the direction.

Third, it contributes to the structural reconfiguration literature (Albert, 2018; Karim, 2006; Karim et al., 2016) by showing a more nuanced relationship between performance shortfall and structural reconfiguration. The structural reconfiguration literature has pointed out that poor performance may drive firms to reconfigure organizational structure (Carroll & Karim, 2009). By distinguishing structural reconfiguration as internal and external restructuring, this study extends the literature by showing that lower firm performance can lead to higher extent of internal but lower extent of external restructuring.

The rest of this essay is organized as follows. First, the literature on BTOF and structural reconfiguration will be reviewed. Following that, the hypotheses on the relationship between performance shortfall and recombination and acquisition, and the boundary conditions of the relationship will be developed. Subsequently, the empirical context will be introduced, and measures of main variables will be discussed. After that, the results will be reported. The paper concludes with discussion of the theoretical contribution and limitations and future directions of research.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Internal Restructuring is an Important Way to Respond to Performance Shortfall

The BTOF has long argued that, as a firm's performance is lower than aspiration level, it tends to search for solutions or make organizational changes to address the performance shortfall (Cyert & March, 1963). The existing literature has identified multiple ways that a firm can use to search. For instance, to respond to performance shortfall, a firm can search or make organizational changes by investing more in R&D (Bromiley & Washburn, 2011; Chen & Miller, 2007; Eggers & Kaul, 2018; Gaba & Joseph, 2013; Joseph & Gaba, 2015), marketing (Vissa, Greve, & Chen, 2010), and exporting activities (Chittoor, Aulakh, & Ray, 2019; Gubbi, Aulakh, & Ray, 2015). These activities seem different from each other. However, they all happen without changing the corporate structure of the firm, though such search is influenced by the existing corporate structure (Gaba & Joseph, 2013; Gubbi et al., 2015; Vissa et al., 2010).

Recent studies suggest that altering corporate structure is one way to respond to performance shortfall or decline. Corporate restructuring involves a range of activities including financial restructuring (e.g., change in capital structure), portfolio restructuring (e.g., acquisition and divestiture), and operational restructuring (e.g., reorganization and retrenchment) (Bowman & Singh, 1993; Gibbs, 1993; Hoskisson & Turk, 1990). Many studies have shown that firms conduct more corporate restructuring activities after they experience performance decline (Chang, 1996; Denis & Kruse, 2000; John, Lang, & Netter, 1992). Thus, it is natural for scholars in BOTF to link performance shortfall and corporate restructuring. In reviewing the literature on structural reconfiguration, which focuses on the addition, deletion, and recombination of business units, Carroll and Karim (2009) find that changes in firm performance, both positive and negative, can lead to structural changes. Linking structural reconfiguration and BTOF, they argue that "negative performance

likely leads to structural reconfiguration, and though positive performance and subsequent growth also may result in reconfiguration, we expect that it will be to a lesser extent."

In the BTOF literature, several studies have started examining the relationship between performance shortfall and corporate restructuring, particularly portfolio restructuring. Iyer and Miller (2008), for instance, argue that the likelihood of a firm's acquisition increases as its performance falls below aspiration. However, by examining the acquisition hazard between U.S. manufacturing firms during 1980-2000, they find that, for firms whose performance is below aspiration level, they conduct more acquisition activities as performance increases (less distant from aspiration level). The number of acquisition activities falls when firm performance is above aspiration level. Similar results are obtained by Greve (2011), which shows that firms invest less in acquisition activities when firm performance is further below aspiration level in the shipping industry. Kuusela et al. (2017), in the context of the public U.S. ICT sector between 1992 and 2014, find that greater performance gap from but lower than aspiration level leads to lower acquisition rate. Such findings are inconsistent with the problemistic search argument that further performance decreases relative to aspiration level leads to more acquisition activities. Studies have shown that both firm size (Greve, 2011) and financial slack (Kuusela et al., 2017) may partially explain why lower performance than aspiration level does not lead to more acquisition activities.

In addition to acquisition, a firm may also use divistiture to respond to performance shortfall. According to BTOF, one could argue that the lower the firm performance relative to aspiration level, the higher the extent of divestiture activities. Several studies have found support for this argument. Kuusela et al. (2017), for instance, examine the relationship between performance shortfall and divestiture in the U.S. ICT industry. They find that higher divestment rate is associated with the increases of performance shortfall. Desai (2016) investigates the relationship between performance shortfall and service line divestiture in California for-profit hospitals between 2005 and 2011. Though he finds no significant relationship between performance shortfall and divestiture, the relationship is significant when board size is larger. Vidal and Mitchell (2015)

study the relationship between performance decline and the extent of divestiture activity in the U.S. public pharmaceutical industry during 1999-2009. In contrast to the expectation from BTOF, they find that declining firm performance does not significantly affect divestiture activities. In contrast, a positive performance gap relative to aspiration level is positively associated with divestiture. Focusing on the performance of acquired business units rather than firm performance, Shimizu (2007) shows that U.S. public firms are more likely to divest formerly acquired business units when these firms experience failure to improve unit performance and a unit's losses are relatively small.

These studies significantly enhance our understanding of the relationship between performance feedback and corporate restructuring. However, most of them focus on acquisition and divestiture, or the addition of new units and exit of poor performing units, which are classified as external restructuring by Disney et al. (2003). Firms can search not only by external restructuring, but also by internal restructuring. Disney et al. (2003: 666) define internal restructuring as changes within the existing firms such as organizational structure changes. Bowman and Singh (1993: 6) also highlight that "changing the internal organization of the firm" is an important aspect of corporate restructuring. Galunic and Eisenhardt (1996) suggest that multibusiness firms can reallocate business charters across different divisions to adapt to the hypercompetitive contexts. Recently, Karim (2006: 799) has argued that, in addition to adding and deleting business units (external restructuring), firms can recombine their internal business units "such that resources and activities are still retained by the organization." Some studies have shown that internal recombination is beneficial to firm performance improvement (Brickley & Van Drunen, 1990; Choi & Han, 2013; Disney et al., 2003). Therefore, in addition to external restructuring, internal restructuring is another important way to address performance shortfall.

Internal restructuring is important not only in theory but also in practice. In the pharmaceutical industry, Karim and Mitchell (2004) have documented the evolution of the business units of *Johnson & Johnson* between 1975 and 1997. They find that internal recombination is an important way that this company

restructured its business units. In the banking industry, bank holding companies (BHCs) often merge their subsidiary banks to improve efficiency and reduce cost (O'Keefe, 1996; Wheelock & Wilson, 2004). Indeed, Sushka and Bendeck (1988) find that, while merger of external banks not affiliated to a BHC is associated with negative returns, merger of internal banks affiliated to the same BHC is associated with normal returns.

In sum, internal restructuring is an important way, both theoretically and practically, for firms to improve performance. As such, we would expect that firms may seek to leverage internal restructuring to respond to performance shortfall. While internal restructuring may include various activities, I follow structural reconfiguration literature (e.g., Carroll & Karim, 2009; Karim, 2006) and focus on the recombination of business units in the discussion of internal restructuring. Accordingly, I propose:

> *Hypothesis 1: As a firm's performance relative to aspiration level is lower, it is more likely to recombine internal business units.*

Based on prior studies and Hypothesis 1, performance shortfall relates to both external and internal restructuring. However, the relationship of performance shortfall with external restructuring may not be equal to the relationship with internal restructuring. Though firms can potentially conduct both internal and external restructuring, they often do not initiate both simultaneously. Instead, firms may initiate internal restructuring first. Take *First Interstate Bancorp* for example. This bank holding company ran into severe performance declines in the late 1980s and early 1990s due to the real estate loans crisis in Texas and the economic recession in California. To respond to the performance decline, this company could potentially acquire new banks or recombine existing subsidiary banks. However, it concentrates "on rebuilding and rejuvenating its existing operations rather than acquiring new ones" by recombining several affiliated banks

together.[1] Why did *First Interstate Bancorp* conduct internal restructuring rather than acquisition to address performance shortfall?

The BOTF provides an explanation. According to BTOF, firms are bounded rational. As such, when they search for solutions to respond to performance shortfall, they start from local search (Cyert & March, 1963). If satisfactory solutions cannot be identified via local search, firms then start to search for more distant possibilities. I argue that performance shortfall relates to internal restructuring more strongly than external restructuring because the former represents a type of local search whereas the latter represents a type of distant search. Internal restructuring, unit recombination in particular, involves the examining of the strategic actions around the *existing business*. Even with such restructuring, the resources are still retained in the firm (Karim et al., 2016.; Karim & Kaul, 2015). Thus, it represents a type of relatively incremental change to the firm. In contrast, external restructuring, acquisition in particular, involves the search of potential targets and the changing of the portfolio of the firm. Thus, the scope of search is broader and more distant, and the changes are more radical in external restructuring than in internal restructuring. Therefore, internal restructuring is a type of organizational change that is more local than external restructuring. As a result, when firms search for solutions to address performance shortfall, internal restructuring is more likely to be chosen than external restructuring.

While external restructuring includes both acquisition and divestiture, I focus on acquisition, which is easier to observe and measure in my empirical context. Therefore, I examine the comparison of acquisition and recombination, and propose the following hypothesis:

[1] https://en.wikipedia.org/wiki/First_Interstate_Bancorp

Hypothesis 2: On average, the relationship between performance shortfall and unit recombination is stronger than the relationship between performance shortfall and acquisition of external units or firms.

Moderating Effect of the Opportunities to Restructure Internally

Though both recombination and acquisition, as two representative types of internal and external restructuring activities, relate to performance shortfall, under which conditions is organizational change directed more towards recombination than acquisition, or vice versa? This directional question is an important inquiry in the BTOF. BTOF has traditionally argued that lower firm performance than aspiration level leads to more intensive search or organizational change. However, the theory does not specify which type of search or organizational change a firm would conduct. Instead, the theory suggests that performance functions as a "master switch" that "controls a range of organizational responses to problems" (Greve, 2003a: 75). Consequently, which type of organizational response is more likely to be activated is rarely addressed. In reviewing over 200 papers on problemistic search, Posen et al. (2018: 225) find that "current theorizing is largely unable to explain the direction of search and change in response to performance shortfalls." Similarly, Greve (2018) argues that "most research so far has emphasized search initiated by performance relative to aspiration levels on goals that are too broad to justify directing search toward the form of strategic change selected for investigation." He then argues that unobservable multiple subgoals, power of decision makers, managerial cognition, and environment can provide clues for the direction of search. In explaining the direction between acquisition and divestiture, Kuusela et al. (2017) show that firms' slack resources make the resources-consuming type of search (i.e., acquisition) more likely.

In this study, I add that the direction of search can also be impacted by the opportunities or constraints to exercise certain types of search or organizational change. This mechanism sounds obvious, but it is not

based on the existing theory. Although BTOF suggests that various types of search or organizational change can be initiated by performance shortfall, it is important to recognize that not all types of search or organizational change are equally exercisable by a particular firm. As pointed out by Lenox, Rockart, and Lewin (2007: 602), "Difficulty in imitation and search is also fundamental to Nelson and Winter's (1982a, b) evolutionary economics and behavioral theories of the firm (Simon 1961, Cyert and March 1963)." They argue that firms often encounter strong barriers to search when interdependent and complementary activities are present. As such, the extent to which a certain type of search or organizational change is initiated to address performance shortfall is contingent on the *opportunities or constraints to exercise such search*.

In particular, I argue that, among the various types of potential search or change, actual search or change is more likely to be directed towards those that have more opportunities to exercise than those that face more constraints. If certain types of search or change have more constraints due to, for instance, resource constraints (Kuusela et al., 2017) or corporate structure (Gaba & Joseph, 2013), they are less likely to be continued and satisfactory solutions are less likely to be identified. For instance, Gaba and Joseph (2013) argue that the search activity of business units via investment in new programs will be constrained when corporate level performance is declining. Rhee, Ocasio, and Kim (2019) argue that a firm's R&D search is less likely to be supported when R&D as a solution is less cognitively accessible to managers in the parent business group of the firm. In both cases, the constraints to exercise new problem search and R&D search make the actual search less directed towards the two types of search. In contrast, the actual search or change is more likely to be directed towards other types of search that have more opportunities to exercise. In Gaba and Joseph's (2013), for example, firms may shift the direction of search towards discretionary spending cutting and employee layoff.

Following this reasoning, whether internal or external restructuring is more likely to be leveraged to respond to performance shortfall depends on the constraints or opportunities to exercise internal or external

restructuring. For instance, a multibusiness firm may have a large number of business units.[2] Many of these units can potentially generate more innovation (Karim & Kaul, 2015) or improve efficiency (Choi & Han, 2013) when they are combined together. In this case, there are many opportunities to exercise internal restructuring via recombination, and firms are more likely to leverage recombination to respond to performance shortfall. In contrast, if a multibusiness firm has only a very limited number of business units, and the heterogeneity of the underlying resources base makes the option of recombination almost impossible to generate value, the opportunities to exercise recombination are limited. In this case, the multibusiness firm is more likely to leverage alternative types of search, such as acquisition, to address performance shortfall.

In sum, I argue that the opportunities to exercise certain types of search or change is critical to the direction of actual search or change. When there are more (fewer) opportunities to exercise internal restructuring, firms are more likely to use recombination (acquisition) to address performance shortfall. Therefore, I propose the following two hypotheses:

Hypothesis 3: As the opportunities to exercise internal restructuring increase, multibusiness firms are more likely to search via unit recombination to respond to performance shortfall.

Hypothesis 4: As the opportunities to exercise internal restructuring increase, multibusiness firms are less likely to search via acquisition to respond to performance shortfall.

[2] In Johnson & Johnson, there were 88 business units during 1975-1997 (Karim & Mitchel, 2004).

METHODS

Empirical Context and Data

The empirical setting of this essay is the U.S. bank holding companies (BHCs) during 1986-2018.[3] As a type of multibusiness firm, BHCs consist of one or more subsidiary banks. Thus, BHCs can not only acquire external banks but also recombine their subsidiary banks. In particular, since the 1980s, states in the U.S. have gradually lifted the strict regulation of banking, making both interstate and intrastate bank acquisition possible. As the pass of the Riegle–Neal Interstate Banking and Branching Efficiency Act in 1994, banking organizations were allowed to acquire banks in almost all states. Consequently, there have been extensive acquisition activities in the U.S. banking industry in the past three decades.

Among these acquisition transactions, a majority happened when BHCs acquired other banking organizations. For instance, Ly, Liu, and Opong (2017) found that about 98% of all U.S. acquisitions during 1997 and 2012 were conducted by BHCs. A BHC can acquire not only independent banks not owned by any other banking institution (type 2 in Figure 1.1), but also other BHCs (type 3 in Figure 1.1). It can also merge its subsidiaries, making one subsidiary bank acquire another one (type 1 in Figure 1.1). Although all three types can be called "acquisition", only types 2 and 3 are acquisitions involving external banking institutions, or the real acquisitions. In contrast, type 1 is about the recombination of internal business units, which is the interest of this study. O'Keefe (1996) finds that, between 1984 and 1995, about 49.7% of all bank acquisition transactions happened between banks within the same BHC, and the other 50.3% happened between banks not affiliated to the same BHC. In Wheelock and Wilson's (2004) sample, among the 2, 363 acquisitions made by BHCs between 1987 and 1999, about 26.6% (629) happened between banks in the same BHC. Thus, it seems that recombination is an important restructuring activity other than acquisition of external banking institutions.

[3] The year 1986 is chosen because the FR Y9-C data of BHCs are available from Q3 1986. The year 2018 is the last year of observation when the project is initiated.

[Insert Figure 1.1 about here]

To identify the recombination and acquisition transactions of BHCs, I took two main steps. First, to get the list of the BHCs, I followed prior studies (e.g., Erel, Nadauld, & Stulz, 2014; Goetz et al., 2016) and focused on BHCs that are publicly traded in the United States. I used the CRSP-FRB link (2018 version) prepared by the New York Federal Reserve Bank (FRB) to identify the public BHCs and their unique identifiers in CRSP (*permco*) and FRB (*rssd id*).[4]

Second, I used two databases to get the recombination and acquisition transactions of the public BHCs: (1) the merger (MERG) database in the Research Information System of FDIC, which provides a complete list of the acquisitions between banks, and the unique identifier assigned to these banks by the FDIC (*cert*) and Federal Reserve (*rssd id*). With such identifiers, I can match the parent bank holding companies, if any, of these banks in the transactions; (2) the Transformations (TRANS) database in the National Information Center of FFIEC, which details mergers and acquisitions between the financial institutions regulated by the Federal Reserve.[5] The two databases are not mutually exclusive. Because the MERG database lists the acquisitions *between banks* and the TRANS database lists the acquisitions not only between banks but also *between BHCs*, the two databases share many acquisitions between banks. When merging the two databases, I excluded the record in the TRANS database that is already contained in the MERG database. Because bank acquisitions can happen because of the merger of their parent BHCs, I also excluded the acquisitions between banks whose parent BHCs also merged at the same time or some time ahead of the bank acquisition.[6] Eventually, I identified all acquisition transactions made by both the BHCs and their

[4] https://www.newyorkfed.org/research/banking_research/datasets.html
5 https://www.ffiec.gov/npw/FinancialReport/DataDownload
[6] In the MERG database, the number of acquired institutions include the following types: state nonmember banks (39.46%), national member banks (35.73%), state stock savings and loans (11.94%), state member banks (8.47%), savings banks and savings and loans (5.19%), and others. In the TRANS database, the acquired institutions include the following types: holding company only (67.29%), other non-depository institutions (24.19%), and others.

subsidiary banks, and coded the nature of these transactions (whether they are recombination or real acquisitions).

After identifying the recombination and acquisition activities of the BHCs, I then collected the financial and corporate structure information of the BHCs. I used the CRSP-FRB link to match both the data from CRSP/Compustat Merged database in WRDS and the data of FR Y-9C (Consolidated Financial Statements for Holding Companies). Since the unit of analysis of this study is BHC-year but the data from FR Y-9C is quarterly, I keep only the Q4 data of FR Y-9C each year. Results using data from other quarters remain similar. To collect the finance data of the subsidiary banks of the BHCs (e.g., average geographical distance, median loan output), I use the unique identifiers of the BHCs to match their subsidiary banks in the financial time series (FTS) database in the Research Information System of FDIC.

In total, I identified 1,365 bank holding companies with 5,573 deals of subsidiary bank recombination and 6,318 deals of acquisition of external banking institutions. To show the pattern of the changes of recombination and acquisition deals over time, I plotted the changes of the deals during 1986-2018. As shown in Figure 1.2, the number of the recombination and acquisition deals both peaks in the late 1990s (1997 and 1998 respctively). The temporal trend of acquisition is consistent with prior studies (e.g., Doukas & Zhang, 2016; Neale, Drake, & Clark, 2010).[7] In these studies, the number of acquisitions in U.S. banking industry also peaked at 1998, right prior to the passage of the Gramm-Leach-Bliley (GLB) Act 1999, which allows BHCs to engage in non-banking financial activities by, for instance, acquisition. Figure 1.2 also suggests that, while both the recombination and acquisition activities have a decreasing trend after the year 2000, the number of acquisition deals increases whereas the number of recombination deals keeps decreasing after the 2009 economic crisis.

[7] See Panel A of Figure 1 in Neale, Drake, & Clark (2010), and Panel A of Table 1 (Bank mergers) in Doukas & Zhang (2016).

[Insert Figure 1.2 about here]

Dependent Variables

Number of subsidiary bank recombination. I calculate the number of subsidiary bank recombinations (*num_recombine*) by the number of acquisitions between banks in the same bank holding company. To assess whether two banks belong to the same bank holding company, I matched their highest-level parent BHCs, each of which has a unique identification number assigned by the Federal Reserve. If two banks have the same parent firm, the acquisition between the two banks is classified as one recombination.

Number of bank acquisitions. Since a BHC can acquire both independent banks and other BHCs, I calculate the number of bank acquisitions of a BHC (*num_acqu*) as the number of acquisitions of independent banks (*num_inde_banks*) and the number of acquisitions of other BHCs (*num_acqu_BHC*). Here, independent banks are those that have no parent BHCs at acquisition. For robustness check, I use *num_inde_banks* and *num_acqu_BHC* as two separate dependent variables.

Relative share of recombination. To estimate the relative effect of performance shortfall on recombination and acquisition, I create another dependent variable, the relative share of recombination on the total number of the transactions of recombination and acquisition. Following prior studies (e.g., Kuusela et al., 2017), I measure this variable by the ratio of the number of recombination transactions to the total number of recombination and acquisition transactions, i.e., *num_recombine*/(*num_recombine* + *num_acqu*). As Kuusela et al. (2017) did, if both *num_recombine* and *number_acqu* are zero in a particular year, the relative share of recombination is coded as 0.5, meaning that both types of activities have equal chance to happen.

Independent Variables

Performance of BHC. Cyert and March (1963: 40-42) have identified five performance goals that firms aim to satisfy: production, inventory, sales, market share, and profit. Accordingly, the existing behavioral literature has identified several performance metrics that one can use to assess firm performance, such as profit (e.g., Audia & Greve, 2006; Chen, 2008; Greve, 2003b), sales (e.g., Ben-Oz & Greve, 2015; Joseph, Klingebiel, & Wilson, 2016), and market share (e.g., Joseph & Gaba, 2015). In this essay, I follow prior studies (e.g., Greve, 2003b; Kuusela et al., 2017) and focus on ROA (*ROA_BHC*), which is the most frequently used performance measure in studies examining performance feedback (Shinkle, 2012), to assess the performance of BHCs. To facilitate interpretation, I multiply 100 to the ratio of net income to total assets to create *ROA_BHC*. Alternative measures of performance such as ROE are also used in robustness checks.

Aspiration levels. As a firm can compare its performance to both historical performance and the performance of other firms in the referent group, I create two aspiration levels, i.e., historical aspiration and social aspiration. Historical aspiration is constructed as a moving average of the past performance of a firm. Let HA_t denote the historical aspiration at time *t*. Then HA_t is calculated as $HA_t = \alpha HA_{t-1} + (1 - \alpha)P_{t-1}$, where P_{t-1} is the firm performance at *t-1* and α is the adjustment parameter. The parameter α is initially set as 0.75, as prior studies did (e.g., Kuusela et al., 2017), and repeated with different values of α (from 0.50-0.90). I report the results with the value of 0.75, but the results are robust with other values of α. Social aspiration is constructed by the average performance of all other firms in the same industry. Let SA_t denote the social aspiration at time *t*. Since the firms in this essay are BHCs, I calculate SA_t as the average ROA of other BHCs at time *t-1*.

While one can combine HA_t and $SA_t$to form a composite measure of aspiration level, Bromiley and Harris (2014) suggest separating the two aspiration levels. Accordingly, I seperate the two measures, and create two types of performance shortfall based on each of the two aspiration levels.

Performance shortfall. Performance shortfall is constructed by the difference between firm performance and aspiration level. Following the extant behavioral studies (e.g., Greve, 2003b; Iyer & Miller, 2008), I implement a spline function by splitting the performance variable into two variables: performance below (*neg_ROA_BHC*) and above aspiration level (*pos_ROA_BHC*). Accordingly, performance shortfall is denoted as *neg_ROA_social* (*neg_ROA_hist*) if firm performance is compared to social (historical) aspiration level. In particular, if firm performance (*ROA_BHC*) is below social (historical) aspiration, *neg_ROA_social* (*neg_ROA_hist*) is measured by $SA_t - ROA\_BHC_t$ ($HA_t - ROA\_BHC_t$); otherwise, *neg_ROA_social* (*neg_ROA_hist*) equals zero. Thus, the values of *neg_ROA_social* and *neg_ROA_hist* are always equal to or greater than zero, and the higher the value of *neg_ROA_social* or *neg_ROA_hist*, the worse the firm performance relative to social and historical aspiration level respectively.

Moderating Variables

Opportunities to recombine. Since not all BHCs have equal opportunities to recombine their subsidiary banks, I measure the opportunities to recombine by the count of the bank subsidiaries (*bank_count*), a variable that is derived by the Federal Reserve (i.e., RSSD 9146). It is intuitive that a BHC with more bank subsidiaries has more opportunities to recombine its subsidiary banks than those with fewer. Meanwhile, the more subsidiaries that a BHC owns, the more complex the organizational structure (Avraham, Selvaggi, & Vickery, 2012), making the management of the BHC more challenging. Such BHCs may have stronger motivation to recombine to simplify the organizational structure as a way to respond to performance shortfall.

Control Variables

I have controlled the effect of a series of control variables to address the alternative explanations of a firm's recombination and acquisition activities. Such alternative explanations include economies of scale, brand recognition, management quality, strategic momentum, and market competition.

A BHC can recombine its affiliated banks to increase economies of scale and brand recognition and improve management efficiency. To address these explanations, I control for the effect of the (1) median loan output, (2) concentration of deposits, (3) the average geographical distance, (4) median market share, and (5) the median cost inefficiency of the subsidiary banks of the BHCs. If the loan outputs of a BHC's subsidiary banks are relatively small, the recombination of these banks could make the BHC have higher economies of scale. However, if most deposits or assets of a BHC are concentrated on one or few subsidiary banks, or most subsidiary banks are co-located within a short geographical distance, there is less need for recombination to improve economies of scale. I use the median of the logarithm of loan output to measure BHCs' concern of scale of economies (*log_median_lnoutput*), the Herfindahl-Hirschman Index (HHI) to measure deposit concentration (*dep_concentration*), and the zip code of each bank, which is then translated into longitude and latitude, to calculate the average geographical distance between the subsidiary banks of a BHC (*avg_geo_dist*, in thousand miles). Similar to economies of scale, if the brand recognition (measured by market share, *median_mkt_share*) of a BHC's banks is weak, recombination of the subsidiary banks can raise brand awareness of the BHC. While it is difficult to assess the management quality of the BHC, poorly managed BHCs tend to have higher cost inefficiency (Berger & DeYoung, 1997; Wheelock & Wilson, 2000). Thus, I use the median cost inefficiency (*median_cost_ineff*) of subsidiary banks to measure the management quality of BHCs. I employ the same method as prior management and finance studies (e.g, Chen, Delmas, & Lieberman, 2015; DeYoung & Hasan, 1998; Knott & Posen, 2005; Wu & Knott, 2006) to calculate cost inefficiency. See Knott and Posen (2005) for more details.

Due to path dependence, a firm's behavior can also be impacted by strategic momentum (Amburgey & Miner, 1992; Yu, Minniti, & Nason, 2019). To address this concern, I control for the effect of the strategic momentum of recombination and acquisition. Following prior studies (e.g., Amburgey & Miner, 1992; Turner, Mitchell, & Bettis, 2013), I measure the two types of strategic momentum by the cumulative number of prior recombination (*num_recombine_prior*) and acquisition activities (*num_acqu_prior*), respectively. When estimating the relative share of recombination, I use the ratio of *num_recombine_prior* to the sum of *num_recombine_prior* and *num_acqu_prior* to control for strategic momentum.

Market competition is another factor that impacts a BHC's bank recombination activities. As a BHC faces stronger competition, it is more likely to recombine subsidiary banks to improve efficiency. Thus, it is important to control market competition. In the U.S. banking industry, a market is defined as a state (Knott & Posen, 2005; Knott & Posen, 2009). Focusing on the state of the headquarters of each BHC, I use five variables to measure competition. The deregulation of the banking industry in each market allows more entrants, intensifying the competition in each market. Accordingly, following prior finance studies (e.g., Cornaggia, Mao, Tian, & Wolfe, 2015; Goetz, Laeven, & Levine, 2013) that utilize the different timing of banking and branching deregulation in different states, I create two variables to measure competition: *post dereg inter*, which equals one if a state allows banking across states and zero otherwise, and *post dereg intra*, which equals one if a state allows branching within it and zero otherwise. I also create three other traditional measures of competition: (1) a Herfindahl index of industry concentration (*HHI*), (2) number of banks in a state (*num_banks_st*), and (3) number of branches in a state (*num_branches_st*).

Because diversified firms tend to be more active in acquisitions (Kuusela et al., 2017; Maksimovic & Phillips, 2008), I control the diversification of the BHC. Following the finance literature (e.g., Bhat, Ryan, & Vyas, 2019; Goetz, Laeven, & Levine, 2016; Laeven & Levine, 2007), I measure the diversification of BHC by (1) income diversity, (2) asset diversity, and (3) activity complexity. Income diversity measures the extent to which a bank holding company's income is diversified between interest and noninterest income.

It is measured by $1 - \left|\frac{Net\ intrest\ income - net\ \ noninterest\ \ income}{Total\ operating\ income}\right|$, where total operating income includes net interest income, net fee income, net trading income, and net commission income. Asset diversity measures the extent to which a bank holding company's asset is diversified across different types of asset (e.g., loans, securities). It is measured by $1 - \left|\frac{Net\ loans - Other\ earning\ assets}{Total\ \ earning\ assets}\right|$, where other earning assets include investments and securities. Activity complexity measures the extent to which the activities of a BHC outside the traditional business of banking with material credit-extending nonbank subsidiaries or debt outstanding to the general public. Following Bhat et al. (2019), I use the Federal Reserve's Bank Holding Company Complexity Indicator (RSSD 9057) to measure activity complexity. Activity complexity is coded as one if the indicator is 1 or 3-8; otherwise, it is coded as zero.

At the BHC level, I control for the slack resources of the firm, which is an important factor in impacting a firm's search activity, particularly in terms of acquisition (Iyer & Miller, 2008; Kuusela et al., 2017). Following Kuusela et al. (2017), I focus on *financial slack* on leverage and measure the slack by the ratio of market value of equity to total liabilities. I also control the number of divestitures, which may impact BHC's decision of acquisition and recombination. In addition, as a firm's higher performance than aspiration may also influence its restructuring activities, I control for the effect of firm performance above aspiration, which is calculated by the same method as performance shortfall. That is, if firm performance (*ROA_BHC*) is above social (historical) aspiration, *pos_ROA_social* (*pos_ROA_hist*) is measured by $ROA\_BHC_t - SA_t$ ($ROA\_BHC_t - HA_t$); otherwise, *pos_ROA_social* (*pos_ROA_hist*) equals zero.

Moverover, I control for the economic conditions of the state of the headquarters of each BHC. In line with the extant studies (e.g., Posen & Chen, 2013), I use three variables to measure the economic conditions in each state: (1) the logarithm of the total number of housing permits (*log_permits*), (2) the personal income per capita (*avg_income*, in thousand $), and (3) *population* (in million). I also control for time effects by including year dummies in all estimations.

The descriptive statistics and the correlation matrix between all variables except the year dummies are shown in Table 1.1. We observe a high correlation between *neg_ROA_social* and *neg_ROA_hist* (0.74), between *pos_ROA_social* and *pos_ROA_social* (0.84), and between *num_recombine_prior* and *num_acqu_prior* (0.64). However, for each regression estimation, only one variable from each pair is included. Thus, the high correlations in the three pairs are not a concern. For the correlations of the rest variables, most are below or around 0.5, with one exception, i.e., the correlation between *log_permits* and *population* (0.68). The results with any variable excluded remain consistent. As such, both variables are kept in the analysis.

[Insert Table 1.1 about here]

Analytical Approach

Because there are two types of dependent variables, i.e., count variable and continuous variable, I used two approaches to estimate the regression equations. In all models, I used clustered-robust standard errors at the firm (BHC) level to account for errors both not equally distributed across firms and correlated within firms across time (Petersen, 2009).

Because the dependent variables *num_recombine* and *num_acqu* are count data and take nonnegative integer values, the assumptions of ordinary least squares (OLS) estimation are violated. To model count data, alternative estimators such as Poisson and negative binomial regression should be considered. I decided to use fixed effects Poisson with cluster robust standard errors to estimate the regression models. While the negative binomial estimator is more efficient in handling overdispersion, it suffers from the "incidental parameters problem" when multiple panel fixed effects are included (Cameron & Trivedi, 2013: 354). That is, as sample size increases, the number of individual fixed effects (viewed as incidental

parameters) also increases, making the estimates of real interests—the slope coefficients—inconsistent. Thus, the negative binomial model "does not have a true conditional fixed effect specification" (Gaba & Greve, 2019: 656). In contrast, there is no incidental parameters problem for the Poisson fixed effects model (Greene, 2012: 722). Moreover, though overdispersion is indeed a concern, Wooldridge (2010: 763) argues that the fixed effects Poisson estimator "has very strong robustness properties for estimating the parameters in the conditional mean" and "there can be overdispersion or underdispersion in the latent variable model." Cameron and Trivedi (2010: 627) argue that "the Poisson panel estimators rely on weaker distributional assumptions—essentially, correct specification of the mean—and it may be more robust to use the Poisson panel estimators with cluster-robust standard errors." Because of the advantages of fixed effects Poisson regression, it has been employed in several studies on BTOF (e.g., Desai, 2016; Gaba & Greve, 2019; Gaba & Joseph, 2013; Tyler & Caner, 2016).

Because the dependent variable *the relative share of recombination* is continuous, I used the fixed-effects linear estimators to estimate the regression equations. I choose not to use random effects estimators because fixed-effects models can control for the effect of the time-invariant variables (Greene, 2012). Such time-invariant variables will disappear by differencing.

RESULTS

The results for hypothesis testing are shown in Tables 1.2-1.4, with Table 1.2 focusing on the results of the main effect of performance shortfall on recombination and acquisition, Table 1.3 focusing on the results predicting the relative share of recombination, and Table 1.4 focusing on the results of the moderating effects of bank count. The rest of the tables are results of robustness analysis. All models include year dummies, but the results are not reported due to the limit of space. I start the discussion of the results of the hypothesis testing, and then discuss the results of alternative explanations. I conclude this section with a discussion of the results of robustness analysis.

Hypothesis Testing Results

The results of Hypotheses 1 and 2 are shown in Table 1.2. Before discussing the main results, it is interesting to discuss the effects of control variables, which generally behave as expected. In particular, the number of subsidiary banks (*bank_count*) of BHCs has a significant and positive effect on subsidiary bank recombination ($p<0.001$), but a non-significant effect on acquisition ($p>0.10$). This is consistent with one of my key arguments that more opportunities to exercise search via internal restructuring makes subsidiary bank recombination more likely. Consistent with prior findings (e.g., Kuusela et al., 2017), I find that financial slack has a positive and significant relationship with acquisition ($p<0.001$). However, it has a non-significant relationship with recombination. Two diversification measures, i.e., income and asset diversification, have a non-significant relationship with both recombination and acquisition. The third diversification measure, activity complexity, is positively related to recombination ($p<0.05$), but non-significantly related to acquisition. Though the performance above aspiration level (*pos_ROA_social* and *pos_ROA_hist*) is an important variable in predicting a firm's search behavior, the coefficients on both *pos_ROA_social* and *pos_ROA_hist* are non-significant in this empirical context.

[Insert Table 1.2 about here]

In the first set of hypotheses, I predicted that, the further a firm's performance is below aspiration level, it is more likely to engage in subsidiary bank recombination (Hypothesis 1), and the effect of performance shortfall on recombination is stronger than on acquisition (Hypothesis 2). In Models 1 and 2 in Table 1.2, the coefficients on *neg_ROA_social* and *neg_ROA_hist* are positive and significant at 0.01 and 0.05 level respectively, suggesting that greater discrepancy to both social and historical aspiration level leads to greater recombination activities. The results provide support for Hypothesis 1. To provide the economic magnitude of the regression coefficients, I converted the coefficients to incidence rate ratios (IRRs). The IRRs of *neg_ROA_social* and *neg_ROA_hist* are 1.207 and 1.227 in Models 1 and 2, respectively. The results indicate that a one-standard-deviation increase in performance shortfall relative to social (historical) aspiration level is related to 23.4 (32.5) percent increase in recombination activities. This provides further evidence for the positive association between performance shortfall and recombination.

In Models 3 and 4 in Table 1.2, the coefficients on *neg_ROA_social* and *neg_ROA_hist* are negative and significant at 0.01 and 0.05 level respectively, suggesting that greater discrepancy to both social and historical aspiration level leads to fewer acquisition activities. These results are consistent with the findings in prior studies (e.g., Greve, 2011; Iyer & Miller, 2008), and offer preliminary support for Hypothesis 2. The converted IRRs of the two coefficients on *neg_ROA_social* and *neg_ROA_hist* are 0.660 and 0.821, respectively. The results suggest that a one-standard-deviation increase in performance shortfall relative to social (historical) aspiration level is related to a 37.2 (23.8) percent decrease in external bank acquisition activities. The results offer further support for the negative association between performance shortfall and acquisition.

To formally test Hypothesis 2, I follow Kuusela et al. 's (2017) method by regressing the relative share of recombination on performance shortfall. The linear fixed-effect regression results are shown in Table 1.3.

Models 1 and 2 in Table 1.3 display the results of performance shortfall relative to social and historical aspiration level on the relative share of recombination. The constant term in, for instance, Model 1 is 0.675, suggesting that, on average, recombination activities account for 67.5% of the total activities of acquisition and recombination. The coefficients on *neg_ROA_social* and *neg_ROA_hist* are both positive and significant ($p<0.001$) in Models 1 and 2. The results suggest that, as performance shortfall relative to social (historical) aspiration level increases by one-standard-deviation, the relative share of recombination increases by 0.03 (0.028). Thus, performance shortfall leads to a greater extent increase in recombination than in acquisition. Thus, Hypothesis 2 is strongly supported.

[Insert Table 1.3 about here]

Taken together, the results provide strong support for the key argument that, in the context in which the opportunities to exercise recombination exist, firms respond to performance shortfall by recombining their subsidiary units. In particular, firms are more likely to rely on recombination to respond to performance shortfall than on acquisition.

Hypothesis 3 predicted that the relationship between performance shortfall and recombination is stronger when there are more opportunities to restructure internally. The results with *bank_count* as the moderator in predicting recombination are shown in Models 1 and 2 in Table 1.4. In both models, the coefficients on the interaction terms between *bank_count* and performance shortfall relative to social and historical aspiration are both positive and significant at 0.001 level. The results suggest that, the more subsidiary banks a BHC owns, the more likely the BHC responds to performance shortfall by recombining these banks. Thus, Hypothesis 3 is strongly supported.

[Insert Table 1.4 about here]

To further interpret the moderating effect of *bank_count*, I provide graphical presentations. I plot the percentage change of recombination activities due to 1 S.D. increase in performance shortfall at all available values of *bank_count* (see Figure 1.3).[8] Plot *a* (*b*) of Figure 1.3 shows the results relative to social (historical) aspiration based on Model 1 (Model 2) of Table 1.3. As shown in plot *a*, 1 S.D increase in performance shortfall relative to social aspiration only leads to 21% increase in recombination activities when *bank_count* is 10, but leads to about 78% increase when *bank_count* is 30. Similar results can also be observed in plot *b*. Thus, the opportunities to restructure internally measured by the number of subsidiary banks (*bank_count*) is indeed an important factor in influencing a firm's recombination as a response to performance shortfall. The more such opportunities, the more recombination activities firms conduct to address performance shortfall. The results provide further support for Hypothesis 3.

[Insert Figure 1.3 about here]

Hypothesis 4 predicted that the relationship between performance shortfall and acquisition is weaker when there are more opportunities to search via internal restructuring. The results are shown in Models 3 and 4 in Table 1.4. The coefficient on the interaction term between *neg_ROA_social* and *bank_count* is positive and significant in Model 3 ($p<0.05$), whereas the coefficient on the interaction term between *neg_ROA_hist* and *bank_count* is marginally significant in Model 4 ($p<0.10$). In neither case, higher value of *bank_count* leads to a weaker relationship between performance shortfall and acquisition. Thus, Hypothesis 4 is not supported. Thus, it seems that more opportunities to search via internal restructuring may even increase search or organziational change in an alternative direction. The question then is, do such opportunities contribute equally to recombination and acquisition?

[8] I did not provide the plot of the average marginal effect because, in fixed effect Poisson estimation, there is no constant term.

The results in Models 3 and 4 in Table 1.3 shows that the higher value of *bank_count* leads to stronger relationship between performance shortfall and the relative share of recombination. The coefficients on the interaction terms between *bank_count* and *neg_ROA_social* and *neg_ROA_hist* are positive and significant at 0.10 and 0.05 level, respectively. To interpret the results, I provide graphical representations in Figure 1.4, with plots *a* and *b* showing the moderating results in Models 3 and 4, respectively. In both plots, the slope of the line with high bank count is higher than that with a low bank count. This provides further evidence of the greater effect of bank count in influencing the relationship between performance shortfall and recombination than the relationship between performance shortfall and acquisition.

[Insert Figure 1.4 about here]

Alternative Explanations

This essay provides a behavioral explanation to firms' recombination and acquisition activities. However, it is obsevious that there are several alternative explanations. I have identified five of them and controlled their confounding effect by adding corresponding control variables to all regression estimations. The behavioral explanation is significant even though these control variables are included. Nevertheless, I still observe the effects of four of the five alternative explanations, as shown in the results of the control variables in Table 1.2. The only alternative explanation that has received no support is the brand recognition explanation, as the coefficient on *median_mkt_share* is non-significant in all models in Table 1.2.

The alternative explanation of the scale of economies has received significant support. The results suggest that the scale of economies plays an important role in impacting a firm's decision of recombination rather than acquisition. The coefficients on both *log_median_lnoutput* and *dep_concentration* are negative and significant at 0.001 level in Models 1 and 2 in Table 1.2. The results suggest that, as a BHC has lower

pressure to increase scale of economies (i.e., higher median loan output, higher deposit concentration), it is less likely to recombine subsidiary banks.

The explanation of management quality has received support in predicting recombination. The coefficient on *median_cost_ineff* is negative and significant at 0.01 level in Model 1. The results indicate that, as a BHC has a higher concern of its management quality (higher cost inefficiency), they may conduct fewer recombination activities, which often require high management skills.

The alternative explanation of strategic momentum has received mixed support. The coefficient on *num_recombine_prior* is positive and significant at 0.05 level in both Models 1 and 2 of Table 1.2. The results suggest that, the more recombination activites a BHC has conducted before, the more likely it keeps doing so. However, strategic momentum explanation has received no support to predict acquisition, as the coefficient on *num_acqu_prior* is negative and significant in Models 3 and 4 of Table 1.2 ($p<0.001$). Thus, the more acquisitions a HBC has done previously, the fewer they would do so now.

Regarding the alternative explanation of market competition, it seems that the number of banks in a particular market, i.e., *num_banks_st*, plays important roles in influencing both recombination and acquisition. The coefficients on *num_banks_st* are positive and significant in Models 1-4 in Table 1.2. The results indicate that, as more banks exist in a state, BHCs tend to conduct more recombination and acquisition activities. The more banks in the same state put competitive pressure on BHCs to recombine to improve efficiency. Meanwhile, more banks mean more opportunities to expand by acquisition.

Robustness Analysis

I have done a series of analyses to examine the robustness of the results. First, I changed the measure of dependent variables. The current dependent variables, such as *num_recombine* and *num_acqu*, focus on the number of deals but do not account for the size of the deals. To address this issue, I created two variables, intensity of recombination and acquisition, which are measured by the sum of the assets of the closed or acquired banks in a year divided by the total assets of the BHC in that year. The measure is in line with the measure of R&D intensity in traditional BTOF studies. Because the financial information of many closed banks is not available, I have many missing values in the two variables. Nevertheless, the results are largely consistent. As shown in Table 1.5a, though the coefficients of performance shortfall are non-significant in Models 1 and 2, they are negative and significant in Models 3 and 4. Thus, performance shortfall negatively influences the intensity of acquisition. In Table 1.5b, though the coefficients on the interaction terms between performance shortfall and *bank_count* are non-significant in Models 3 and 4, they are positive and significant in Models 1 and 2. The results suggest that the number of subsidiary banks strengthens the relationship between performance shortfall and the intensity of recombination.

[Insert Tables 1.5a and 1.5b about here]

Second, I used alternative measures and specifications of the independent variables. Rather than using ROA, I used alternative measures such as ROE. In formulating historical aspiration, I changed the weight of prior aspiration from 0.75 to a series of other values such as 0.90 and 0.50. All results remain consistent.

Third, because negative binomial fixed effects estimators suffer from incidental parameters, I follow Kuusela et al. (2017) and used negative binomial random effects estimators to estimate the models. The results remain unchanged with the new estimation approach.

DISCUSSION

This essay examines the direction of corporate restructuring as a response to the performance shortfall of multibusiness firms. Focusing on both internal (recombination of internal business units) and external restructuring (acquisition of external firms or business units), this essay shows that a greater discrepancy to aspiration level leads to a greater extent of recombination. The influence of performance shortfall on recombination is even stronger than on acquisition. In particular, when there are more opportunities to restructure internally, multibusiness firms tend to respond to performance shortfall with a relatively higher share of recombination.

Implications for Theory

This study has several important implications to both the BTOF literature (e.g., Cyert & March, 1963; Greve, 2003a) and the literature on structure reconfiguration (e.g., Karim, 2006). First, this study extends the BTOF by recognizing internal restructuring in terms of recombination of internal business units as an important alternative direction of corporate restructuring. Several studies on BTOF have argued and found that, as firm performance is lower than aspiration level, firms tend to search or make changes more intensively by corporate restructuring in terms of M&A and divestiture (Desai, 2016; Iyer & Miller, 2008; Kuusela et al., 2017; Shimizu, 2007; Vidal & Mitchell, 2015). However, these studies mainly focus on external restructuring, i.e., the exit of poor performing units and the addition of new units, rather than internal restructuring by recombining internal business units. If firms have the options to search or change via internal recombination, they may not seek external restructuring. This is because external restructuring such as acquisition represents a type of distant search, but firms typically begin search by looking for local solutions that turn around the existing business units. Therefore, firms, particularly those with multiple business units, may first check the possibilities of recombining their business units.

Second, this study contributes to the BTOF literature by identifying a condition (i.e., opportunities or constraints to exercise certain types of search) under which a multibusiness firm is more likely to search or change via recombination versus acquisition to respond to performance shortfall. BTOF has posed "few limitations on what behaviors can change in response to performance feedback" (Greve, 2003a: 76). As such, extant studies have adopted various types of search or organizational changes, such as R&D search, marketing search, and acquisition and divestiture. These different types of search have generated important findings for us to understand BTOF. However, they suffer from a common issue, i.e., they have not considered whether and when firms use one type of search rather than another, i.e., the direction of the strategic actions, to respond to performance shortfall (Greve, 2018; Kuusela et al., 2017; Posen et al., 2018). As such, it "seems worthwhile to develop and test theory on how organizations direct search and choose between alternative actions when performance is below aspiration levels on a broad goal" (Greve, 2018: 93). Kuusela et al. (2017), for instance, have argued that a firm's slack resources play important roles in determining the extent to which a firm uses resources-consuming actions (i.e., acquisition) versus resources-freeing actions (i.e., divestiture).

In this study, I simultaneously examine internal and external corporate restructuring as two types of organizational change and find that performance shortfall has different effects on the two types of corporate restructuring. In particular, while performance shortfall is positively associated with the recombination of business units, it negatively relates to acquisition. The direction of search between recombination and acquisition is impacted by the opportunities to restructure internally. This finding is important to BTOF because it suggests that not every type of search is equally exercisable to a particular firm, with some types of search facing stronger barriers than other types. Though BTOF has argued that performance shortfall can act as a master switch that influences a series of organizational responses or actions (Greve, 2003a), I argue that not all types of organizational responses are equally exercisable in all firms. For instance, in this study, for some firms that have only few subsidiary banks, it leaves limited opportunities to recombine, and performance shortfall has marginal influences on this type of search. Thus, this study adds to the BTOF by

highlighting the importance of the opportunities to exercise search in determining the direction of search as a response to performance shortfall.

Third, this study contributes to the structure reconfiguration literature by articulating the relationship between performance discrepancy and structure reconfiguration. It is not surprising to the literature that changes in performance are closely related to structure reconfiguration. Indeed, as Carroll and Karim (2009: 86) have argued, "negative performance likely leads to structural reconfiguration, and though positive performance and subsequent growth also may result in reconfiguration, we expect that it will be to a lesser extent." However, structural configuration is a multidimensional construct, and according to Karim (2006), it consists of unit addition (M&A), deletion (divestiture), and recombination. As such, when a firm encounters negative or positive performance, which type of structural configuration will it conduct? This study adds to the literature by showing that, while *positive* performance relative to aspiration level has non-significant influences on both unit addition (acquisition) and recombination, *negative* performance relative to aspiration level leads to more unit recombination activities than unit addition (acquisition). The relationship between negative performance and unit addition and recombination depends on the opportunities to recombine. Therefore, this study provides a more nuanced understanding of the relationship between performance changes and structural reconfiguration to the structure reconfiguration literature.

Limitations and Future Research

Several limitations exist in this study, which opens the venues for future research. First, I examine the hypotheses in the banking context and focus on a particular type of multibusiness firms—bank holding companies (BHCs). BHCs have several important characteristics that can help address alternative explanations. For instance, the technologies in different business units (affiliated banks) are basically identical other than scale and efficiency (Knott & Turner, 2019), and the interdependence between the units

is relatively low. Firms in other industries such as pharmaceutical (Karim & Mitchell, 2004) may not share these characteristics. To what extent our findings can be generalized to other industries thus remains both a theoretical and empirical question. In addition to the opportunities to recombine, other moderators such as technology heterogeneity and interdependence may play important roles in impacting the relationship between performance shortfall and the choice of different types of corporate restructuring. Future research can examine the effects of such boundary conditions and extend our findings in non-banking contexts.

Second, this study focuses only on the comparison between acquisition and recombination. As Kuusela et al. (2017) have argued, firms may also have the option of divestiture. We have controlled the number of divestitures in all our models. However, it is also interesting to investigate to what extent firms use divestiture rather than recombination and acquisition to respond to performance shortfall. If not, when are firms more likely to rely on divestiture? In addition to financial slack identified in Kuusela et al. (2017) and opportunities to recombine identified in this study, what are other potential factors impacting the decision? Future research could address the question to contribute to not only the BTOF literature, but also the divestiture literature.

Third, this study has examined the magnitude of recombination, i.e., how many recombination deals each year, as a response to performance shortfall. An interesting question is to study how the business units are recombined. In reviewing the literature on the effect of performance feedback on divestiture, Greve (2018: 93) commented that "it would be of interest to not only examine when organizations choose divestment, but also to explore which business segment they choose to divest". The same comment applies here. It would be interesting not only to know when firms recombine business units, but also to study which units firms choose to recombine. For instance, in addressing the "how" question, Karim (2006) has found that firms tend to recombine acquired units together. In addition to this way of recombination, one could also inquire the extent to which firms recombine high performing units with low performing units (strong-weak), recombine high performing units with high performing units (strong-strong), and recombine low

performing units with low performing units (weak-weak). Since BTOF has recently started examining the performance comparison between units (e.g., Baumann, Eggers, & Stieglitz, 2019; Hu, He, Blettner, & Bettis, 2017; Kacperczyk, Beckman, & Moliterno, 2015), it seems valuable to study the relationship between performance shortfall and different modes of recombination.

Finally, this study treats the decision makers at the headquarter or top level of multibusiness firms. The underlying assumption is that the decision to acquire or recombine is made or approved by the top managers (Zhang & Greve, 2019). However, it is also true that, in many cases, the acquisition proposals or the decision to search is initiated by the managers of the business units. According to Gaba and Joseph (2013), which study the response in terms of new product introduction in the mobile device industry, the effect of performance shortfall at the corporate level is different from the effect of performance shortfall at the business unit level. As such, it is interesting to understand when the decision to recombine or acquire is consistent between the top level and unit level. Future research could do so by shifting the level of analysis from the corporate level to the business unit level and comparing the findings from different levels of analysis.

Conclusion

In sum, this study examines the corporate restructuring decisions to respond to performance shortfall. While firms can restructure both externally (acquisition) and internally (recombination), I argue that the opportunities to exercise search via internal restructuring can potentially shift the choice between recombination and acquisition. The overall empirical results indicate that firms are likely to use recombination as a way to address performance shortfall, particularly when the opportunities to recombine is high. Future research is necessary to investigate more thoroughly the relationship between performance shortfall and the different modes of corporate restructuring.

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Figure 1.1. Three Types of Acquisitions Conducted by Bank Holding Companies: An Illustration

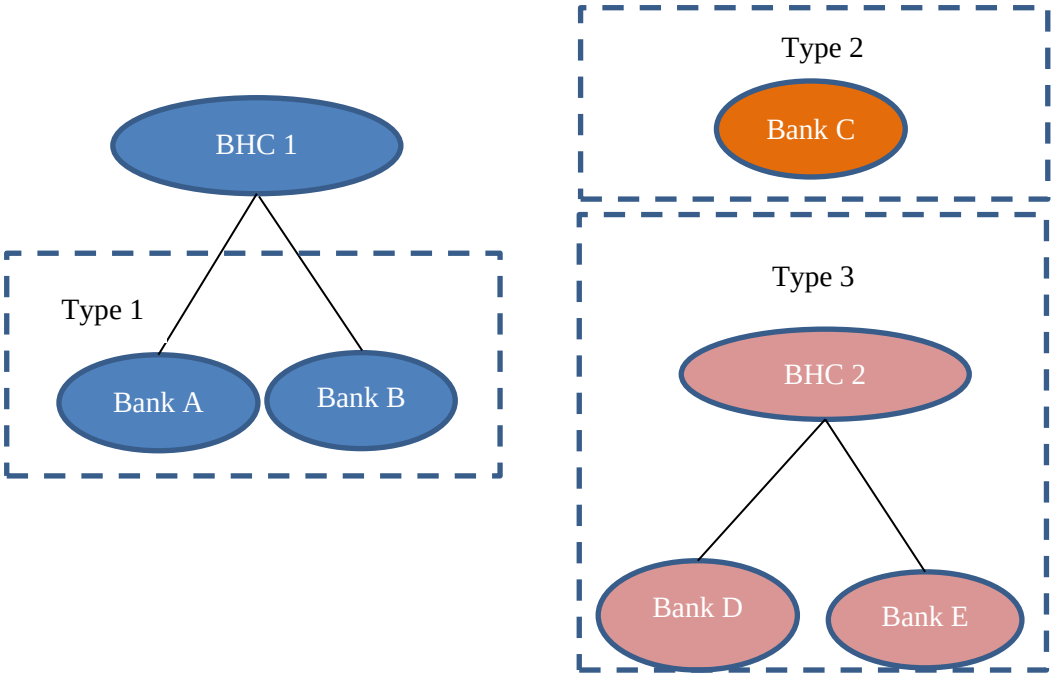


Figure 1.2. Patterns of Recombination and Acquisition Activities of Bank Holding Companies

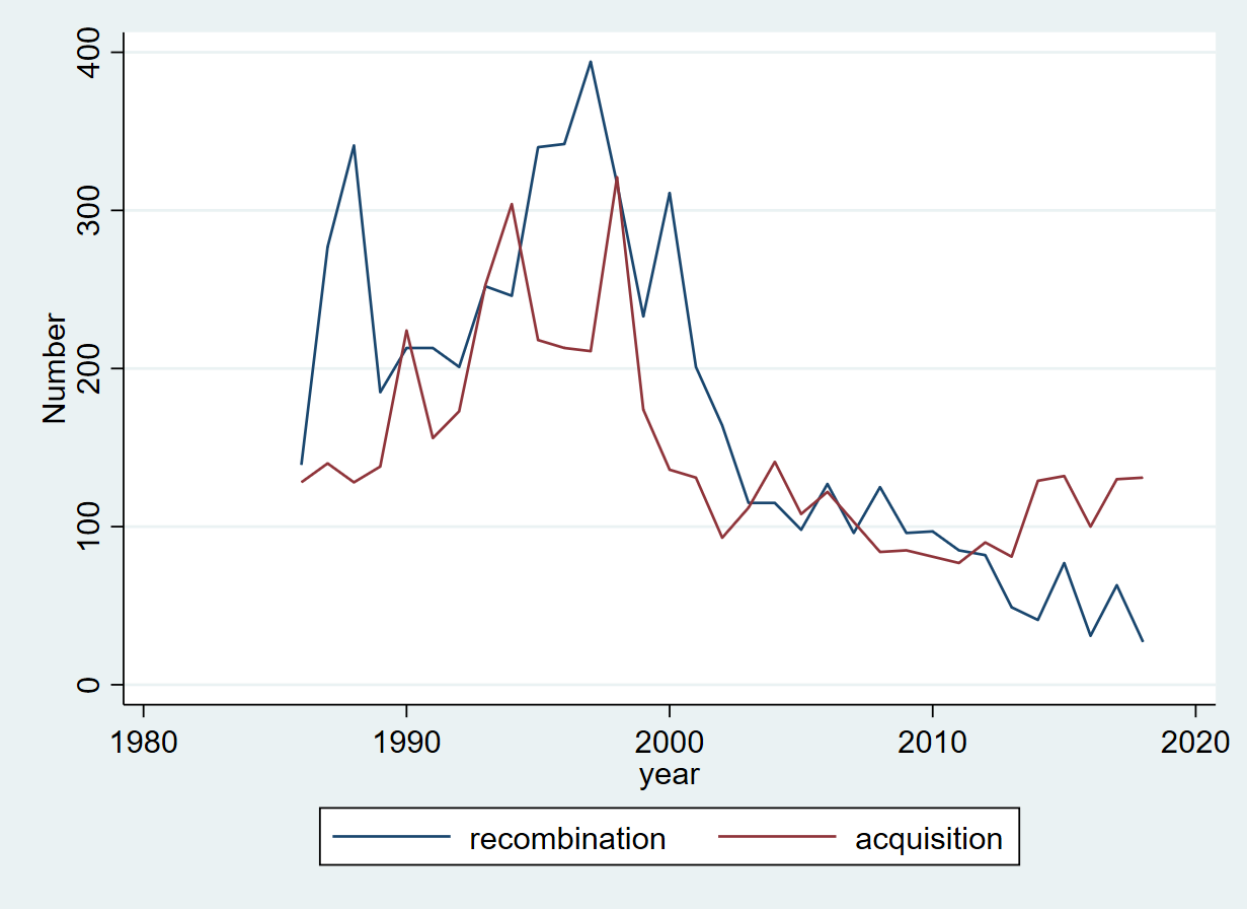


Figure 1.3. Increase of Recombination Activities due to 1 S.D. Increase of Performance Shortfall

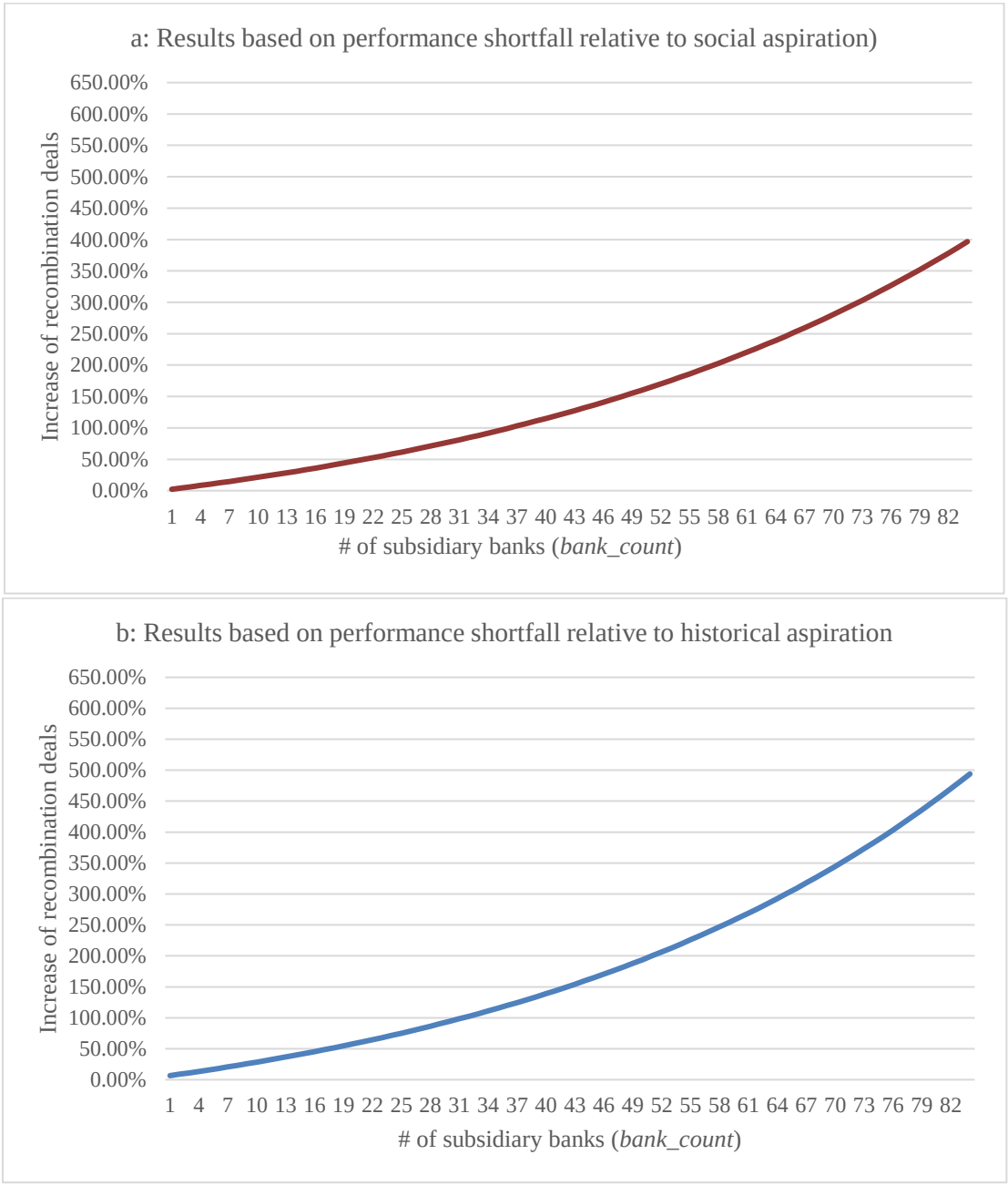
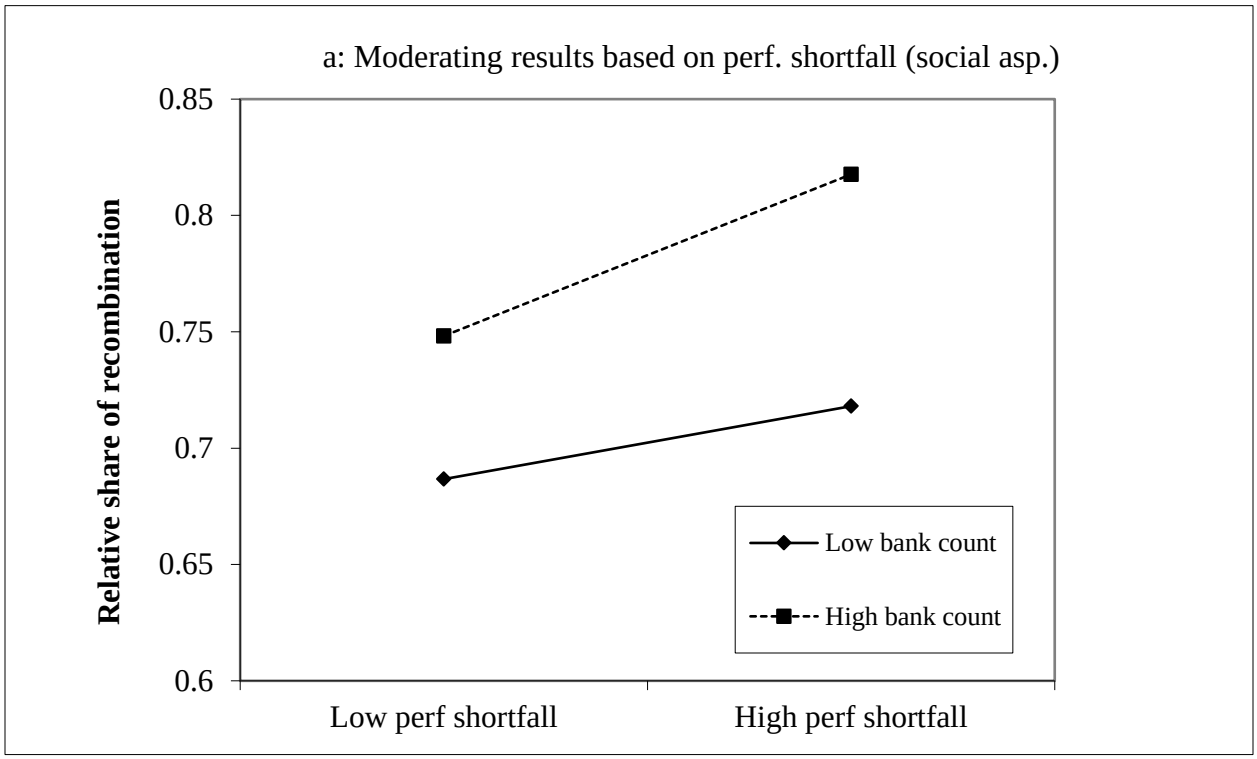


Figure 1.4. Illustration of the Moderating Effects of Bank Cout



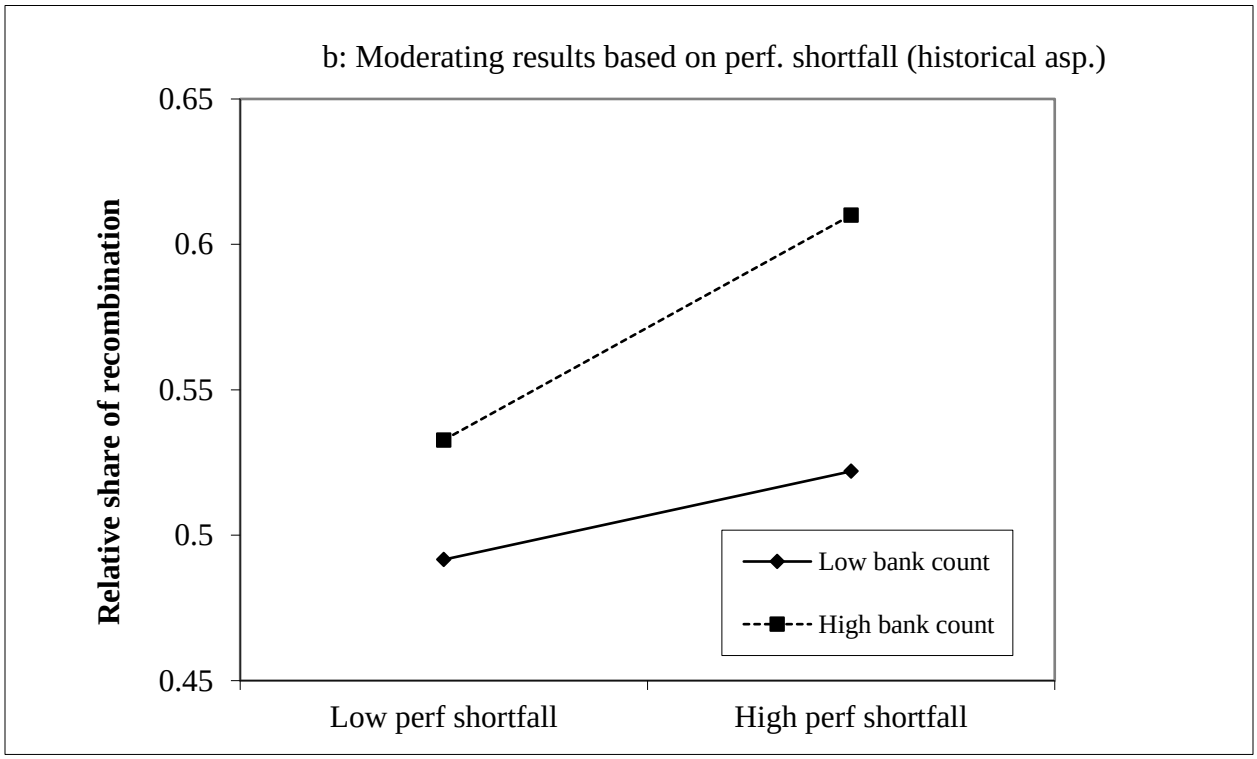


Table 1.1. Basic Statistics and Correlation Matrix

	Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) *num_recombine*	0.36	1.95	1.00															
(2) *num_acqu*	0.30	1.00	0.32	1.00														
(3) *num_divest*	0.04	0.40	0.24	0.14	1.00													
(4) *neg_ROA_social*	0.31	1.12	-.002	-0.04	-0.01	1.00												
(5) *neg_ROA_hist*	0.21	1.38	0.001	-0.02	0.002	0.74	1.00											
(6) *pos_ROA_social*	0.34	2.50	-0.01	-0.02	-.003	-0.04	0.03	1.00										
(7) *pos_ROA_hist*	0.27	2.55	-0.01	-0.01	-.001	-0.01	-0.02	0.84	1.00									
(8) *bank_count*	2.80	5.48	0.36	0.28	0.12	-0.01	-0.01	-0.01	-0.02	1.00								
(9) *log_median_lnoutput*	13.78	1.57	0.06	0.11	0.08	-0.05	.004	0.02	0.00	-0.23	1.00							
(10) *dep_concentration*	0.95	0.15	-0.33	-0.31	-0.12	0.03	0.01	-0.01	0.01	-0.51	0.03	1.00						
(11) *avg_geo_dist*	0.08	0.22	0.25	0.19	0.18	-0.02	0.01	0.08	0.01	0.27	0.23	-0.46	1.00					
(12) *median_mkt_share*	0.005	0.02	0.03	0.08	0.02	-0.02	-0.02	0.01	0.04	-0.01	0.13	-0.07	0.06	1.00				
(13) *median_cost_ineff*	0.23	0.21	0.02	-0.01	0.03	0.17	0.13	0.11	0.07	-0.02	0.10	0.02	0.19	-0.01	1.00			
(14) *num_recombine_prior*	4.29	20.6	0.44	0.18	0.19	-0.03	-0.01	-0.01	-0.01	0.17	0.34	-0.20	0.41	0.01	0.06	1.00		
(15) *num_acqu_prior*	3.22	8.36	0.30	0.39	0.18	-0.05	-0.02	-0.02	-0.01	0.15	0.54	-0.26	0.41	0.05	0.08	0.64	1.00	
(16) *post dereg inter*	0.98	0.15	-0.02	-0.02	-.002	-0.01	0.01	-0.01	0.00	-0.19	0.13	-0.03	-0.02	-0.06	-0.02	0.03	0.05	1.00
(17) *post dereg intra*	0.98	0.16	-0.07	-0.02	-0.04	-0.04	-0.02	0.01	0.00	-0.29	0.19	.004	-0.03	-0.01	0.01	0.01	0.04	0.39
(18) *HHI*	0.13	0.13	-0.02	-0.02	0.01	0.04	0.03	-0.01	0.02	-0.13	0.18	0.06	-0.02	-0.02	0.05	0.07	0.12	0.10
(19) *num_banks_st*	0.28	0.23	0.12	0.08	0.04	0.01	.002	.001	-.002	0.29	-0.17	-0.05	0.11	-0.04	0.01	0.03	-0.01	-0.21
(20) *num_branches_st*	3.24	2.66	0.04	0.01	0.03	0.01	0.01	0.01	-.003	-0.03	0.11	0.04	0.05	-0.07	0.06	0.09	0.10	0.00
(21) *income diversity*	0.63	0.16	0.16	0.12	0.09	-0.01	-0.02	-0.06	-0.04	0.23	0.07	-0.20	0.27	0.11	0.06	0.24	0.24	-0.12
(22) *asset diversity*	0.73	0.19	0.08	0.07	0.04	0.02	0.00	-0.06	0.01	0.19	-0.12	-0.11	0.10	0.11	0.00	0.08	0.08	-0.14
(23) *activity complexity*	0.19	0.39	0.24	0.20	0.12	-0.04	-0.01	-0.01	-0.01	0.25	0.30	-0.37	0.41	0.09	0.10	0.31	0.39	-0.02
(24) *financial slack*	0.27	1.93	-0.01	-0.02	-0.01	-0.02	0.04	0.44	0.06	-0.02	-0.02	-0.01	0.04	0.00	0.11	-0.01	-0.02	0.00
(25) *log_permits*	10.31	0.99	0.05	0.03	0.03	-0.03	-0.03	0.00	-0.01	0.03	0.00	0.05	0.05	-0.16	-0.02	0.05	0.03	0.02
(26) *avg_income*	34.08	12.05	-0.10	-0.11	-0.03	0.05	0.05	0.02	0.02	-0.27	0.38	0.19	-0.07	-0.16	0.05	0.03	0.03	0.23
(27) *population*	11.39	9.25	0.01	-0.02	0.01	0.02	0.03	0.03	0.01	-0.05	0.13	0.09	0.06	-0.09	0.07	0.06	0.00	0.03

			(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
(18) *HHI*	0.13	0.13	0.12	1.00									
(19) *num_banks_st*	0.28	0.23	-0.30	-0.30	1.00								
(20) *num_branches_st*	3.24	2.66	0.07	0.38	0.26	1.00							
(21) *income diversity*	0.63	0.16	-0.15	-0.09	0.21	0.04	1.00						
(22) *asset diversity*	0.73	0.19	-0.16	-0.13	0.28	0.05	0.29	1.00					
(23) *activity complexity*	0.19	0.39	-0.06	0.01	0.07	0.04	0.31	0.14	1.00				
(24) *financial slack*	0.27	1.93	0.01	-0.03	-0.02	-0.02	-0.14	-0.06	-0.02	1.00			
(25) *log_permits*	10.31	0.99	0.05	-0.05	0.41	0.48	-0.04	0.10	0.04	0.01	1.00		
(26) *avg_income*	34.08	12.05	0.24	0.21	-0.38	-0.08	-0.41	-0.47	-0.13	0.04	-0.09	1.00	
(27) *population*	11.39	9.25	0.08	-0.07	0.33	0.50	-0.19	0.01	-0.03	0.01	0.68	0.17	1.00

Table 1.2. Fixed Effects Poisson Regression Results for Recombination and Acquisition

	Recombination		Acquisition	
	Model 1	Model 2	Model 3	Model 4
neg_ROA_social $_{(t-1)}$	0.188**		-0.416**	
	(0.060)		(0.153)	
neg_ROA_hist $_{(t-1)}$		0.204*		-0.197*
		(0.086)		(0.099)
pos_ROA_social $_{(t-1)}$	-0.215		0.004	
	(0.181)		(0.118)	
pos_ROA_hist $_{(t-1)}$		-0.004		0.047
		(0.101)		(0.080)
bank_count $_{(t-1)}$	0.026***	0.029***	-0.001	-0.003
	(0.007)	(0.009)	(0.010)	(0.010)
log_median_lnoutput $_{(t-1)}$	-0.344***	-0.359***	-0.009	0.011
	(0.089)	(0.061)	(0.042)	(0.053)
dep_concentration $_{(t-1)}$	-1.434***	-1.282***	-0.766**	-0.931**
	(0.294)	(0.308)	(0.271)	(0.314)
avg_geo_dist $_{(t-1)}$	0.001	0.058	-0.385	-0.525
	(0.306)	(0.311)	(0.365)	(0.379)
median_mkt_share $_{(t-1)}$	-4.902	-6.830	-0.126	-1.024
	(4.626)	(5.164)	(1.168)	(1.729)
median_cost_ineff $_{(t-1)}$	-0.586**	-0.328	-0.258	-0.240
	(0.214)	(0.239)	(0.224)	(0.251)
num_recombine_prior $_{(t-1)}$	0.004*	0.004*		
	(0.002)	(0.002)		
num_acqu_prior $_{(t-1)}$			-0.034***	-0.032***
			(0.009)	(0.010)
post dereg inter $_{(t-1)}$	0.070	-0.731+	0.009	-0.179
	(0.423)	(0.435)	(0.312)	(0.433)
post dereg intra $_{(t-1)}$	0.390+	0.172	0.272	0.369
	(0.202)	(0.218)	(0.228)	(0.267)
HHI $_{(t-1)}$	0.155	0.765	-0.258	-0.462
	(0.633)	(0.701)	(0.516)	(0.616)
num_banks_st $_{(t-1)}$	1.846**	1.070+	0.942+	1.231+
	(0.604)	(0.619)	(0.517)	(0.656)
num_branches_st $_{(t-1)}$	0.032	-0.016	0.044	0.047
	(0.033)	(0.041)	(0.032)	(0.040)
income diversity $_{(t-1)}$	-0.626	-0.486	0.028	0.099
	(0.897)	(0.925)	(0.375)	(0.424)
asset diversity $_{(t-1)}$	-0.322	-0.398	-0.354	-0.463
	(0.272)	(0.341)	(0.234)	(0.315)
activity complexity $_{(t-1)}$	0.380*	0.594*	0.082	0.187
	(0.162)	(0.231)	(0.133)	(0.153)
financial_slack $_{(t-1)}$	-0.148	-0.204	3.916***	5.049***
	(0.128)	(0.147)	(1.019)	(0.694)
log_permits $_{(t-1)}$	-0.404**	-0.334+	-0.189	-0.229
	(0.146)	(0.172)	(0.161)	(0.180)
avg_income $_{(t-1)}$	0.064*	0.090+	-0.014	-0.022
	(0.033)	(0.046)	(0.026)	(0.032)

population $_{(t-1)}$	0.090	0.006	-0.052	-0.063
	(0.096)	(0.097)	(0.048)	(0.062)
num_divest $_{(t-1)}$	-0.030	-0.035	0.001	-0.010
	(0.039)	(0.042)	(0.037)	(0.040)
N	5508	3738	6715	4605

Year dummies included in all models but not reported here.

Standard errors in parentheses (clustered at firm level); $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed)

Table 1.3. Fixed-effects Regression Results for the Relative Share of Recombination

	Model 1	Model 2	Model 3	Model 4
neg_ROA_social $_{(t-1)}$	0.026***		0.022***	
	(0.005)		(0.005)	
neg_ROA_hist $_{(t-1)}$		0.020***		0.016**
		(0.005)		(0.005)
neg_ROA_social × *bank_count* $_{(t-1)}$			0.002+	
			(0.001)	
neg_ROA_hist × *bank_count* $_{(t-1)}$				0.002*
				(0.001)
pos_ROA_social $_{(t-1)}$	-0.015		-0.015	
	(0.011)		(0.011)	
pos_ROA_hist $_{(t-1)}$		-0.009		-0.009
		(0.006)		(0.006)
bank_count $_{(t-1)}$	0.003+	0.003	0.003	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
log_median_lnoutput $_{(t-1)}$	-0.033***	-0.034***	-0.033***	-0.034***
	(0.007)	(0.007)	(0.007)	(0.007)
dep_concentration $_{(t-1)}$	-0.036	0.080+	-0.034	0.083+
	(0.044)	(0.049)	(0.044)	(0.049)
avg_geo_dist $_{(t-1)}$	0.120*	0.122**	0.120*	0.123**
	(0.051)	(0.046)	(0.050)	(0.046)
median_mkt_share $_{(t-1)}$	-0.195	-0.531	-0.197	-0.539
	(0.197)	(0.396)	(0.198)	(0.396)
median_cost_ineff $_{(t-1)}$	0.002	-0.014	0.004	-0.013
	(0.024)	(0.027)	(0.024)	(0.027)
ratio_recombine_prior$_{(t-1)}$	-0.179***	-0.222***	-0.180***	-0.223***
	(0.020)	(0.026)	(0.020)	(0.025)
post dereg inter$_{(t-1)}$	0.013	-0.030	0.015	-0.028
	(0.037)	(0.057)	(0.037)	(0.057)
post dereg intra $_{(t-1)}$	-0.027	-0.082	-0.026	-0.079
	(0.040)	(0.052)	(0.040)	(0.052)
HHI $_{(t-1)}$	-0.020	0.040	-0.020	0.040
	(0.051)	(0.060)	(0.051)	(0.059)
num_banks_st $_{(t-1)}$	0.107	0.105	0.102	0.103
	(0.077)	(0.119)	(0.076)	(0.118)
num_branches_st $_{(t-1)}$	0.009*	0.007	0.009*	0.007
	(0.004)	(0.004)	(0.004)	(0.004)
income diversity $_{(t-1)}$	0.031	0.002	0.030	0.002
	(0.042)	(0.049)	(0.041)	(0.048)
asset diversity $_{(t-1)}$	0.005	0.012	0.005	0.011
	(0.026)	(0.034)	(0.026)	(0.033)
activity complexity $_{(t-1)}$	0.025+	0.029+	0.025+	0.029+
	(0.013)	(0.015)	(0.013)	(0.015)
financial_slack $_{(t-1)}$	-0.034	-0.031	-0.034	-0.032
	(0.026)	(0.031)	(0.026)	(0.031)
log_permits $_{(t-1)}$	0.002	0.015	0.003	0.016
	(0.018)	(0.023)	(0.018)	(0.023)
avg_income $_{(t-1)}$	0.001	0.005	0.001	0.005

	(0.003)	(0.004)	(0.003)	(0.004)
population $_{(t-1)}$	0.013^{+}	0.012	0.013^{+}	0.011
	(0.007)	(0.008)	(0.007)	(0.008)
num_divest $_{(t-1)}$	0.013**	0.012**	0.013**	0.012**
	(0.004)	(0.004)	(0.004)	(0.004)
constant	0.675**	0.496^{+}	0.669**	0.481^{+}
	(0.236)	(0.281)	(0.235)	(0.280)
N	9002	6261	9002	6261

Year dummies included in all models but not reported here.

Standard errors in parentheses (clustered at firm level); $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed)

Table 1.4. Fixed Effects Poisson Regression Results of the Moderating Effect of Bank Count

	Recombination		Acquisition	
	Model 1	Model 2	Model 3	Model 4
neg_ROA_social $_{(t-1)}$	0.003		-0.571***	
	(0.064)		(0.155)	
neg_ROA_social × *bank_count* $_{(t-1)}$	0.017***		0.019*	
	(0.004)		(0.008)	
neg_ROA_hist $_{(t-1)}$		0.031		-0.287**
		(0.089)		(0.101)
neg_ROA_hist × *bank_count* $_{(t-1)}$		0.015***		0.012+
		(0.005)		(0.007)
pos_ROA_social $_{(t-1)}$	-0.146		0.006	
	(0.165)		(0.116)	
pos_ROA_hist $_{(t-1)}$		0.001		0.046
		(0.093)		(0.080)
bank_count $_{(t-1)}$	0.026***	0.030***	-0.002	-0.004
	(0.007)	(0.009)	(0.010)	(0.010)
log_median_lnoutput $_{(t-1)}$	-0.332***	-0.353***	-0.006	0.013
	(0.089)	(0.060)	(0.043)	(0.053)
dep_concentration $_{(t-1)}$	-1.411***	-1.288***	-0.765**	-0.936**
	(0.303)	(0.316)	(0.270)	(0.314)
avg_geo_dist $_{(t-1)}$	-0.024	0.032	-0.369	-0.525
	(0.294)	(0.302)	(0.358)	(0.378)
median_mkt_share $_{(t-1)}$	-5.090	-6.984	-0.191	-1.134
	(4.572)	(5.132)	(1.178)	(1.719)
median_cost_ineff $_{(t-1)}$	-0.576**	-0.328	-0.257	-0.232
	(0.209)	(0.246)	(0.222)	(0.246)
num_recombine_prior$_{(t-1)}$	0.004+	0.004*		
	(0.002)	(0.002)		
num_acqu_prior$_{(t-1)}$			-0.034***	-0.032***
			(0.009)	(0.010)
post dereg inter$_{(t-1)}$	0.177	-0.462	0.042	-0.136
	(0.356)	(0.396)	(0.299)	(0.400)
post dereg intra $_{(t-1)}$	0.383*	0.187	0.294	0.378
	(0.193)	(0.227)	(0.230)	(0.269)
HHI $_{(t-1)}$	0.386	0.943	-0.236	-0.462
	(0.623)	(0.686)	(0.517)	(0.618)
num_banks_st $_{(t-1)}$	1.845**	1.231*	0.989+	1.296*
	(0.565)	(0.609)	(0.517)	(0.653)
num_branches_st $_{(t-1)}$	0.029	-0.019	0.043	0.047
	(0.032)	(0.041)	(0.032)	(0.040)
income diversity $_{(t-1)}$	-0.469	-0.129	0.027	0.111
	(0.878)	(0.845)	(0.374)	(0.420)
asset diversity $_{(t-1)}$	-0.410	-0.504	-0.362	-0.463
	(0.267)	(0.334)	(0.235)	(0.316)
activity complexity $_{(t-1)}$	0.395*	0.591*	0.081	0.188
	(0.162)	(0.230)	(0.131)	(0.152)
financial_slack $_{(t-1)}$	-0.142	-0.194	3.921***	5.069***
	(0.115)	(0.119)	(1.022)	(0.698)

log_permits $_{(t-1)}$	-0.482**	-0.399*	-0.224	-0.255
	(0.147)	(0.172)	(0.160)	(0.176)
avg_income $_{(t-1)}$	0.076*	0.108*	-0.012	-0.020
	(0.033)	(0.045)	(0.026)	(0.032)
population $_{(t-1)}$	0.097	0.008	-0.047	-0.057
	(0.094)	(0.095)	(0.047)	(0.060)
num_divest$_{(t-1)}$	-0.030	-0.035	0.002	-0.010
	(0.038)	(0.041)	(0.037)	(0.041)
N	5508	3738	6715	4605

Year dummies included in all models but not reported here.

Standard errors in parentheses (clustered at firm level); $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed)

Table 1.5a. Fixed Effects Regression Results for the Intensity of Recombination and Acquisition

	Recombination intensity		Acquisition intensity	
	Model 1	Model 2	Model 3	Model 4
neg_ROA_social $_{(t-1)}$	0.018		-0.006***	
	(0.012)		(0.001)	
neg_ROA_hist $_{(t-1)}$		0.004		-0.004***
		(0.003)		(0.001)
constant	0.242**	0.324**	0.170**	0.172*
	(0.079)	(0.105)	(0.058)	(0.069)
Control variables	<YES>	<YES>	<YES>	<YES>
N	8047	5538	8176	5649

All control variables are identical with those in Table 1.2 but are not reported here.

Standard errors in parentheses (clustered at firm level); $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed)

Table 1.5b. Fixed Effects Regression Results for the Moderating Effect of Bank Count

	Recombination intensity		Acquisition intensity	
	Model 1	Model 2	Model 3	Model 4
neg_ROA_social $_{(t-1)}$	0.009		-0.006***	
	(0.013)		(0.001)	
neg_ROA_social × *bank_count* $_{(t-1)}$	0.003**		0.000	
	(0.001)		(0.000)	
neg_ROA_hist $_{(t-1)}$		-0.005*		-0.004**
		(0.002)		(0.001)
neg_ROA_hist × *bank_count* $_{(t-1)}$		0.004***		-0.000
		(0.001)		(0.000)
bank_count $_{(t-1)}$	0.001	0.000	-0.001***	-0.001**
	(0.001)	(0.001)	(0.000)	(0.000)
constant	0.232**	0.309**	0.172**	0.172*
	(0.075)	(0.097)	(0.057)	(0.068)
Control variables	<YES>	<YES>	<YES>	<YES>
N	8047	5538	8176	5649

All control variables are identical with those in Table 1.2 but are not reported here.

Standard errors in parentheses (clustered at firm level); $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed)

ESSAY 2: HOW DO MULTIBUSINESS FIRMS RESPOND TO INTERNAL PERFORMANCE COMPARISON? THE ROLES OF FIRM PERFORMANCE COMPARISON AND EXTERNAL STAR PRODUCTS

ABSTRACT

This study examines how multibusiness firms respond to internal performance comparison between business units. A majority of studies on the behavioral theory of the firm have argued that firms are *problem solving* to respond to social and historical performance comparison—searching for solutions to address the *weak part* of the firm. I propose, however, multibusiness firms can respond to internal performance comparison by not only addressing the weak part—underperforming units (problem solving), but also strengthening the strong part—over performing units (winner rewarding). The extent to which multibusiness firms are problem solving or winner rewarding are contingent on the relative support top managers provide to the underperforming units. Using multilevel data from U.S. and European pharmaceutical firms, I found that the problem solving and winner rewarding tendency is jointly determined by (1) whether firm performance is above firm level aspiration, and (2) whether the business units attract adequate top managers' attention. Specifically, when firm performance is below firm level aspiration, multibusiness firms provide more support to the over performing units that attract more attention from top managers, measured by the prevalence of star products from other firms in the industry segment of the units, but provide less support to underperforming units that attract more attention from top managers. The findings are opposite when firm performance is above firm level aspiration. I discuss the implications of the findings to the behavioral theory of the firm.

INTRODUCTION

A key theme of the behavioral theory of the firm (BTOF) is the important roles of performance comparison in guiding firm behavior and organizational change (Cyert & March, 1963; Greve, 2003a; Posen, Keil, Kim, & Meissner, 2018). Extensive studies have examined how the comparison of a firm's overall performance relative to both social and historical aspiration level influences various types of search and organizational change (e.g., Greve, 1998, 2003b; Harris & Bromiley, 2007; Iyer & Miller, 2008; Moliterno, Beck, Beckman, & Meyer, 2014). These studies represent important progress in understanding the implications of performance comparison. However, a majority of these studies have treated the firm, even a multibusiness firm, as a cohesive single-business entity and focused on the performance comparison to one's historical reference points (historical aspiration) and/or external reference points (social aspiration). This treatment, however, may not be well-suited to explain the behavior of the multibusiness firm with a headquarter and multiple semi-autonomous business units.

In particular, it overlooks the fact that, in addition to historical and social performance comparison, performance comparison also exists within a firm. The business units within a multibusiness firm will compare their performance not only to their historical performance and the performance of external rivals, but also to the performance of their sister units in the same firm (e.g., Baumann, Eggers, & Stieglitz, 2019; Hu, He, Blettner, & Bettis, 2017; Kacperczyk, Beckman, & Moliterno, 2015). The headquarters of the multibusiness firms will also conduct performance comparison between their business units (Knott & Turner, 2019). If we assume that business units are independent, the BTOF suggests that the units that underperform in internal performance comparison strengthen search to address the performance shortfall. However, the behaviors of the business units are often not independent but constrained by the corporate structure of the multibusiness firm (Gaba & Joseph, 2013). As such, the attention and support from top managers in the headquarters play important roles in influencing the search at the business unit level.

This study seeks to understand how multibusiness firms respond to internal performance comparison. The existing literature suggests that, when firm performance is below aspiration level in social or historical comparison, firms are *problem solving*—searching for solutions to improve firm performance. The process is essentially to find solutions to fix the *weak part* of the firm that leads to performance shortfall. However, the existing literature provides inconsistent arguments on whether firms are *problem solving* to respond to internal performance comparison. On one hand, it is suggested that top managers may pay more attention to the underperforming units (Sullivan, 2010) and provide more support to such units (Arrfelt, Wiseman, & Hult, 2013). Because the underperforming units are the weak parts of the firms, the more attention and support from the top managers to these units are to fix the weak parts of the firms. Thus, the top managers are acting as *problem solving* in this case. On the other hand, it is suggested that top managers may pay more attention to the over performing units that are strategically important (Bouquet & Birkinshaw, 2008; Gaba & Joseph, 2013), and provide more support to such units. Since the over performing units are often not the weak parts of the firms, the top managers are not acting as problem solving but as *winner rewarding*. Thus, it seems unclear whether the top managers are *problem solving* or *winner rewarding* to respond to internal performance comparison.

By integrating BTOF and the social cognition literature, I argue that two factors could shift top managers' attention and support to the underperforming (over performing) units, strengthening the *problem solving* (*winner rewarding*) behavior of the multibusiness firm. The first factor is firm performance comparison relative to social and historical aspiration level. The BTOF suggests that whether top managers in the headquarters pay more attention to the underperforming or over performing units is impacted by the performance comparison of the firm. If the performance of a multibusiness firm is lower than firm level aspiration, BTOF suggests that the firm is more likely to take risks (Desai, 2008; Greve, 2011; March & Shapira, 1992). As such, if we assume that the provision of support to the underperforming units is more risky than the provision of support to the over performing units, we could argue that poor firm performance may shift top managers' attention more towards the underperforming units, making the *problem solving*

tendency of the multibusiness firms stronger. In contrast, higher firm performance may shift top managers' attention more towards the over performing units, making the *winner rewarding* tendency stronger.

The second factor is the prevalence of star products from other firms of the industry segment of the focal business unit. Star products are those products with extreme business success, such as blockbuster comics (Taylor & Greve, 2006), movies, and drugs. Social cognition literature suggests that decision makers' attention is more likely to be attracted to the salient or extreme events (Fiske & Taylor, 2013). Indeed, as pointed out by Ahuja and Novelli (2017: 2464), decision-makers "may remember much more saliently the extreme outliers". Similarly, Makino and Chan (2017: 1724) argue that "practitioners pay more attention to actions that lead to extremes than to actions that lead to average performance." Following this reasoning, since star products are a type of extreme salient event, they can attract the attention of not only their producers but also other players in the same industry. Thus, if more star products are emerging from other firms in the industry segment of a focal business unit, the focal unit can attract more attention from the top managers of the firm. So do the own star products of the focal unit.

Empirically, this study examines the arguments using both firm and business unit level data from global pharmaceutical firms. Though a business unit can search in various ways, this study focuses on the search via acquisition. Acquisition has been identified as an important way of search in the existing literature (e.g., Greve, 2011; Iyer & Miller, 2008; Kuusela, Keil, & Maula, 2017; Zhang & Greve, 2019). Because acquisition could potentially add new knowledge, capabilities, and products to the acquirer (Ahuja & Katila, 2001; Karim & Mitchell, 2000; Puranam, Singh, & Chaudhuri, 2009), the multibusiness firm or its business units can search for solutions by seeking acquisitions. As a resource-consuming activity (Kuusela et al., 2017), acquisition can represent one of the most important forms of support provided by top managers to a business unit.

Based on data from 241 business units in 35 pharmaceutical firms in 1999-2017, I find that multibusiness firms on average do not show a stronger pattern of problem solving than winner rewarding, i.e., firms do not provide more attention and support to underperforming than over performing units. However, they provide more support to the underperforming and over performing units with more external star products in the industry segment of the units. In particular, when firm performance is poor (below aspiration level), the multibusiness firm provides more support to the over performing units that attract more attention from top managers, i.e., more star products from other firms are prevalent in the industry segment of the units, but provide less support to the underperforming units that attract more attention from top managers. In contrast, when firm performance is high (above aspiration level), the multibusiness firm provides more support to the underperforming units that attract more attention from top managers. The results suggest that the multibusiness firm may be risk averse (taking) when its performance is poor (high), as more support is provided to the over performing (underperforming) units that attract more attention from top managers. This is inconsistent with the BTOF which suggests that firms are risk taking when performance is lower than aspiration. Please note that the findings are robust to alternative explanations such as self-enhancing, external performance comparison, strategic momentum, the attractiveness of the business segment of the focal unit, and poor performance of R&D pipeline.

This study contributes to BTOF in three important ways. First, it enhances our understanding of how firms respond to internal performance comparison. Because extant studies on BTOF have implicitly treated the firm, even a multibusiness firm, as a single-business entity, the focus in these studies has been on social and historical performance comparison. In such comparison, it is suggested that firms are problem solving, i.e., searching for solutions to fix the weak part of the firm. In contrast, this study suggests that, to address internal performance comparison, multibusiness firms can also do winner rewarding, i.e., providing more support to the strong rather than the weak part of the firm. This study shows that whether firms' behavior shifts to problem solving or winner rewarding depends on both the risk aversion of the multibusiness firm

and the attention capturing of the business units. As such, this study highlights the different behaviors that firms may take to respond to internal versus external performance comparison.

Second, this study enriches our understanding of the cross-level effect of performance feedback (Rhee, Ocasio, and Kim, 2019). As pointed out by Rhee et al. (2019: 51), "neither the behavioral theory of the firm nor empirical studies on performance feedback systematically account for when and how top decision-makers influence individual units' problemistic search." This study has enriched this inquiry by focusing on a potential tradeoff that top managers have to make: to strengthen the underperforming or over performing units, and when? By specifying two potential behaviors, which are called problem solving and winner rewarding, this study articulates the pathway through which top managers could potentially influence the search at the business unit level.

Third, this study contributes to the attention-based view literature (e.g., Joseph & Ocasio, 2012; Ocasio, 1997) by identifying salient performance outliers (star products) as important attention triggers. It suggests that a multibusiness firm's behavior can be influenced by not only the overall performance of the business units, but also by the extreme performance outliers. Thus, we may not exclude extreme performance outliers but account for their effects in future research.

The rest of the paper is organized as follows. First, the literature on BTOF will be briefly reviewed. Second, hypotheses on the relationship between internal performance comparison and search at the business unit level, and the moderating effects of firm performance comparison and the prevalence of external star products will be developed. Following that, the empirical context and the description of the main variables will be introduced, and the main results and robustness analysis will be presented. This paper concludes with a discussion about the theoretical contribution and future research directions.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

A Brief Review of Problemistic Search in the BTOF

The problemistic search literature in the BTOF has long studied how the overall firm performance relative to aspiration level influences firm behavior and organizational change (Cyert & March, 1963; Greve, 2003a; Posen et al., 2018).[9] In particular, the literature focuses on two sources of aspiration: (1) historical aspiration derived from a firm's own historical performance, and (2) social aspiration derived from the performance of the external firms in the referent group (Bromiley & Harris, 2014; Washburn & Bromiley, 2012). While scholars have the freedom to either combine the two sources of aspiration as one or treat them separately, they generally agree with the core argument of the literature. That is, as firm performance is below aspiration level, a problem occurs, and firms need to search to address the problem. In line with the argument, extensive studies have examined how the performance below and above aspiration level influences search activities (Chen & Miller, 2007; Vissa et al., 2010) and organizational changes such as acquisition (Iyer & Miller, 2008), divestiture (Desai, 2016), and market entry and expansion (Barreto, 2012; Lim, 2019).

The argument that lower firm performance than aspiration level leads to greater extent of search and organizational change is important and insightful. However, this argument concentrates on the overall firm performance and its comparison with social and historical aspiration levels. By focusing on the overall firm performance, most studies in the literature have implicitly treated the firm, even the multibusiness firm, as a cohesive single-business entity.[10] This simplified treatment overlooks the fact that, in addition to social and historical comparison, internal performance comparison also exists in the multibusiness firm with a

[9] See Posen et al. (2018) for a more comprehensive review of the problemistic search literature.
[10] An exception is Gaba and Joseph (2013) that starts breaking the firm up and examines the problemistic search of business units.

headquarter and multiple semi-autonomous business units. In such a multibusiness firm, not only business units will compare their performance against each other (Gartenberg & Wulf, 2017; Hu et al., 2017; Kacperczyk et al., 2015; Nickerson & Zenger, 2008), but also the headquarter will compare the performance between the internal business units (Arrfelt et al., 2013). Knott and Turner (2019) argue that one important function of headquarters is to compare the performance of business units and share good practices to facilitate innovation and growth. One good example is Banc One, a bank holding company that can improve the returns on assets of acquired banks by 40-70% on average. This company had a monthly peer report that listed the financial information of all affiliated banks and ranked the affiliated banks. Internal performance comparison provides important information for the headquarter of the multibusiness firm to make decisions such as resource allocation (Baumann et al., 2019). However, it is theoretically unclear how a multibusiness firm responds to internal social comparison.

The extant studies that examine the search activities in the multibusiness context are rare but emerging. Gaba and Joseph (2013), for instance, examine how a business unit's search in terms of new product introduction is impacted by not only the shortfall of the business unit performance, but also the shortfall of the multibusiness firm performance. They find that, while business unit performance shortfall leads to greater extent of search, firm performance shortfall leads to less extent of search. However, this paper does not discuss internal performance comparison but focuses on a particular unit (Mobile Device). In contrast, several other studies have recognized that internal social comparison provides an important component to the formulation of a business unit's aspiration level (Aranda et al., 2014, 2017; Hu et al., 2017; Mezias et al., 2002). For instance, both Vissa et al. (2010) and Rhee et al. (2019) have incorporated internal social aspiration as an important component of the composite aspiration of the affiliated firms (business units) of business groups (multibusiness firms). They have investigated how the performance of an affiliated firm within a business group relative to the composite aspiration influences the affiliated firm's search activities. However, because these studies combined different types of aspiration and treated internal performance

comparison equivalent to social and historical comparison, their focus is also not about how multibusiness firms respond to internal performance comparison.

In addressing this issue, some other studies have modeled internal social comparison separately from other types of comparison. For example, in their computation model, Baumann et al. (2019) make the internal business units respond to both internal performance comparison and historical comparison. The simulation results suggest that, in most cases, firm performance, which is the aggregation of unit performance, is better when the units respond to internal social comparison than to historical comparison. In the context of the U.S. mutual fund, Kacperczyk et al. (2015) examine how a mutual fund manager compares her fund's performance to internal social aspiration constructed by the performance of other funds within the same firm. They find that mutual fund managers take less risk when performance relative to internal social aspiration increases. Hu et al. (2017) argue that internal and external social comparison may provide inconsistent feedback. Using the data from the German magazine industry, they show that consistent feedback from internal and external social comparison makes the internal units allocate more attention to own experience when forming future aspiration, whereas inconsistent feedback makes them allocate more attention to the social aspiration, either internal or external, that they underperform when forming future aspiration.

These studies are important and insightful in helping us understand the search in the multibusiness context. However, they typically focus on the search of the business units, or, in Joseph and Ocasio's (2012: 634) words, "decentralized behavior." In contrast, how the headquarter of a multibusiness firm responds to internal performance comparison is often overlooked. As a result, we still have limited knowledge of how multibusiness firms respond to internal performance comparison. An exception is Arrfelt, Wiseman, and Hult (2013), which argues that multibusiness firms tend to overinvest in underperforming units. Using data from COMPUSTAT, they find that lower business unit performance relative to internal social aspiration leads to the multibusiness firm's overinvestment in that unit, whereas higher business unit performance

relative to internal social aspiration has no significant relationship with the underinvestment of the multibusiness firm in that unit. The findings suggest that multibusiness firms are problem solving, as they devote more resources to strengthen the weak part of the firm. As I will articulate soon, problem solving is only one potential response of multibusiness firms to internal performance comparison. In addition to problem solving, firms may also respond to internal performance comparison by winner rewarding.

In the following sections, I will discuss how the headquarter of a multibusiness firm responds to internal performance comparison by problem solving or winner rewarding. I will also investigate the conditions under which the firm provides more attention and support to underperforming vs. over performing units.

A Multibusiness Firm's Response to Internal Performance Comparison: Problem Solving vs. Winner Rewarding

In a multibusiness firm, not every unit receives equal attention and support from the top managers (Gaba & Joseph, 2013). As internal performance comparison reveals the relative performance of the business units, how top managers respond to the relative performance by allocating attention and providing support is an important question. According to the attention based view of the firm (Joseph & Ocasio, 2012; Ocasio, 1997), if a unit can receive more attention, it may receive more support and thus conduct greater extent of search activities and organizational changes to improve its performance. However, the existing literature provides inconsistent arguments on whether underperforming or over performing units attract more attention from top managers.

On one hand, it is argued that underperforming units may receive more attention and support from top management. As firms are bounded rational, the BTOF suggests that firms are "goal directed, history dependent, and determined by simple rules" (Chen, 2008: 609). They are backward-looking and act by

responding to performance feedback (Gavetti & Levinthal, 2000). In particular, firms intensify response when performance is below aspiration level but make less response when performance is above aspiration level. This argument suggests that bounded rational firms pay more attention to fixing their weak parts from which poor performance results but limit their attention to the strong parts that lead to high performance. As underperforming units are often the weak parts of the firm, firms have a tendency to provide support to such units to help them improve performance. In this study, I call the tendency to pay more attention and provide more support to the weak part of the firm, which often relates to the underperforming units, as *problem solving*.

The problem solving tendency, however, does not mean that every underperforming unit can receive equal attention and support. In contrast, firms may pay more attention only to some underperforming units. Specifically, following the reasoning of BTOF, we can argue that the larger the extent of underperforming, the more attention and support the unit could receive. This argument works only when the firm does not plan to divest the severely underperforming units, as several studies have shown that firms are more likely to divest the underperforming units (e.g., Kolev, 2016; Shimizu, 2007) to, for instance, release resources (Kuusela et al., 2017). If the multibusiness firms are motivated to divest the underperforming units, they are less likely to provide a helping hand to the underperforming units. In particular, a high extent of underperforming could result from the past allocation choice of the firm. If a multibusiness firm plans to divest some units, they may increasingly focus on a few other units and allocate more resources to these units. In this case, the underperformance of the peripheral units may not attract the attention of the top managers, as the results expect.

Nevertheless, the existing literature does show that firms have a relatively strong tendency of problem solving. Many studies have argued that, in addition to opportunities and threats, problems, which occur when performance is below aspiration level, attract decision makers' attention (Ocasio, 1997). Particularly, the more significant and urgent the problems are, the more attention can be attracted (Haas, Criscuolo, &

George, 2015; Sullivan, 2010). At the individual level, the underperforming units can attract more attention because "individuals are generally motivated by the desire to reduce negative discrepancies between current outcomes and desired outcomes" (Audia & Brion, 2007: 256). Empirically, Arrfelt et al. (2013) show that multibusiness firms invest more in the underperforming units than they should to correct the performance deficiency in the underperforming units.

Therefore, if we assume that firms do not have an *ex ante* intention to divest certain units, they are more likely to provide a helping hand to the underperforming units before eventually divesting the severely underperforming units. Accordingly, the underperforming units may conduct more search activities to improve performance. Therefore, I propose:

> *Hypothesis 1a (H1a): The further a business unit's performance is lower than its sister business units' performance, the greater the support it receives from the multibusiness firm to conduct search and organizational change.*

In contrast to the problem solving tendency proposed by the BTOF, one could argue that the multibusiness firm may also have a tendency to provide a helping hand to the over performing rather than underperforming units. I call this tendency *winner rewarding*. One important function of a multibusiness firm is to allocate resources to the units that will have higher returns in the future (Chandler, 1962; Williamson, 1975). However, because firms are bounded rational, it is challenging for them to identify the units that can generate high returns in the future (Harford, Wang, & Zhang, 2017; Scharfstein & Stein, 2000). Firms with bounded rationality may instead use historical performance to predict future performance. Thus, current high performance in a business unit may foreshadow a high performance in the same unit in the near future. Consequently, if a unit has better performance than other units, it is more likely to be regarded as

strategically important and become the "center of excellence" for other units to learn from (Ghoshal & Bartlett, 1990; Knott & Turner, 2019), thus attracting more attention and support from top management.

The tendency of winner rewarding is different from self-enhancement, which refers to "the desire to protect their self-image from negative evaluations" (Audia & Brion, 2007: 256). Self-enhancement can make the multibusiness firm focus on what they are good at, thus making the firm provide more attention and help to the over performing units. However, self-enhancement typically occurs when the overall performance of the multibusiness performance is low, in which case protecting the good self-image is necessary (Audia, Brion, & Greve, 2015; Jordan & Audia, 2012). If firm performance is above aspiration level, the self-image is already good, and there is less necessity to revise performance evaluation to enhance the self-image. In contrast, the tendency of winner rewarding is also possible when there is less need of self-enhancement, because in this case bounded rational firms still need to allocate resources to the over performing units that they believe may generate higher returns.

It is worth noticing that not all over performing units can receive equal attention. Typically, the greater the extent of over performing of a business unit, the more attention and support it receives. However, some studies have suggested that firms may have a behavioral bias of even distribution resources (Bardolet, Brown, & Lovallo, 2017; Bardolet, Fox, & Lovallo, 2011). Thus, if a unit's performance is extremely high, firms subject to even distribution bias pay reduce support to the unit. Moreover, if the high performance of a unit results from the deliberate resource allocation to strengthen this unit, it may capture less attention as the high performance is expected.

Nevertheless, the existing literature does suggest that multibusiness firms have a relatively strong tendency of *winner rewarding*, and firms pay more attention and support to the over performing units. Bouquet and Birkinshaw (2008), for instance, have argued that a subsidiary's weight, whose key components are the strategic importance of the market and the strength of the subsidiary within the multinational enterprise

(MNE) network, influences the headquarter's attention on it. The higher the weight, the more attention the subsidiary can receive. Similarly, Gaba and Joseph (2013) have argued that more strategically important units are able to garner greater corporate attention. They find that the search activities in strategically important units, measured by the ratio of operating income, are more likely to receive support from top management of multibusiness firms. Accordingly, I propose:

> *Hypothesis 1b (H1b): The further a business unit's performance is higher than its sister business units' performance, the greater the support it receives from the multibusiness firm to conduct search and organizational change.*

The Moderating Effect of Firm Performance Comparison

Though multibusiness firms can be problem solving and winner rewarding to respond to internal performance comparison, it is important to understand the conditions under which the firms are more likely to respond in a problem solving or winner rewarding manner. I argue that two conditions are essential to determine whether a firm is more problem solving or winner rewarding.

First, according to BTOF (Cyert & March, 1963; Greve, 2003a), a firm's behavior is influenced by the feedback of the comparison of its performance and social and/or historical aspiration level. Therefore, a multibusiness firm's response to internal performance comparison is also influenced by social and historical comparison. Lower firm performance than social and historical aspiration levels makes the multibusiness firms more likely to take risks (March & Shapira, 1987, 1992) and a helping hand to the underperforming units may be riskier than to the over performing units.

Second, even if a multibusiness is more likely to be problem solving (winner rewarding), they may not pay equal attention to all underperforming (over performing) units. Instead, they may pay more attention to the underperforming (over performing) units that can attract extra attention other than the attention based on the overall performance of the units. Social cognition literature (Fiske & Taylor, 2013) suggests that decision makers pay more attention to salient stimuli. Thus, top managers in multibusiness firms may pay more attention to an underperforming (over performing) unit around which salient stimuli are present (e.g., emergence of star products in other firms in the same industry segment). I will discuss the moderating effects of the two factors in the following sections.

As the BTOF has suggested, depending on whether the performance of a multibusiness firm is below or above aspiration level, the multibusiness firm may show a stronger tendency of problem solving or winner rewarding. In particular, I argue that the lower performance of a multibusiness firm than its aspiration level strengthens the problem solving tendency but weakens the winner rewarding tendency. The BTOF suggests that, when firm performance is below aspiration, firms are generally motivated to take risks to address the performance shortfall (March & Shapira, 1987, 1992; Desai, 2008).[11] Compared to providing a helping hand to the over performing units, providing support to the underperforming units seems more uncertain and risky. While the search in the underperforming units may generate satisfactory solutions to improve the performance of the units and subsequently the performance of the firm, such result is uncertain. As Wiseman and Bromiley (1996: 524) have found, business units' search activities may "fall into a trap of taking unprofitable risks that ultimately exacerbates the decline." In contrast, investment in the over performing units is less risky. The current high performance in the over performing units is very likely to last for a period of time unless there are large environmental changes. Therefore, providing support to over performing units is less risky than that to underperforming units.

[11] Studies also show the opposite is possible: firms with poor performance may become more conservative and try to avoid risky activities (Staw, Sandelands, & Dutton, 1981).

Because firms are risk taking when their performance is lower than aspiration level, and investment in underperforming units is more risky, I argue that the multibusiness firms are more likely to provide a helping hand to the underperforming units than over performing units when their performance is poor. That is, the multibusiness firms show a stronger problem solving tendency than winner rewarding tendency. Therefore, I propose the following two hypotheses:

> *Hypothesis 2a (H2a): The influence of an underperforming business unit's performance gap on the search and organizational changes is strengthened by the lower performance of the multibusiness firm relative to the firm's aspiration level.*

> *Hypothesis 2b (H2b): The influence of an over performing business unit's performance gap on the search and organizational changes is weakened by the lower performance of the multibusiness firm relative to the firm's aspiration level.*

In contrast, if a multibusiness firm's performance is above aspiration level, the BTOF suggests that the firm becomes risk averse and inert (Desai, 2008; Miller & Chen, 2004). In this case, the multibusiness firms are more likely to avoid changes, particularly those risky ones. As we have discussed, the investment in the over performing units is less risky than the investment in the underperforming units. Thus, when multibusiness firms have higher performance than aspiration level, they tend to provide more attention and support to the over performing units than to the underperforming units. That is, the multibusiness firms show a stronger winner rewarding tendency than problem solving tendency. Therefore, I propose the following two hypotheses:

> *Hypothesis 3a (H3a): The influence of an underperforming business unit's performance gap on the search and organizational changes is weakened by the higher performance of the multibusiness firm relative to the firm's aspiration level.*

Hypothesis 3b (H3b): The influence of an over performing business unit's performance gap on the search and organizational changes is strengthened by the higher performance of the multibusiness firm relative to the firm's aspiration level.

The Moderating Effect of Prevalence of Star Products in Other Firms of the Same Segment

Even though a multibusiness firm is problem solving (winner rewarding), it may not be able to allocate equal attention to all underperforming (over performing) units. In contrast, if an underperforming (over performing) unit can attract more attention from top managers, the priorities and investments of the firm may be tuned more favorably towards the unit (Gaba & Joseph, 2013). Thus, it is important to identify the attention triggers other than the overall performance of the unit that make a unit attract more corporate level attention.[12]

The social cognition literature (Fiske & Taylor, 2013; Higgins, 1996) suggests that a stimulus (or individual, subject) can attract more attention when it is more *socially salient*, i.e., it has a higher probability to stand out relative to other stimuli in its environment. Kiesler and Sproull (1982: 556) argue that "people attend to and encode salient material—events that are unpleasant, deviant, extreme, intense, unusual, sudden, brightly lit, colorful, alone, or sharply drawn." Fiske and Taylor (2013: 70) argue that "salience makes a stimulus stand out relative to other stimuli in that context". Likewise, Barreto and Patient (2013: 689) argue that "managers are likely to focus on aspects of an external shock that are most salient to their cause-effect beliefs." Lehman, Hahn, Ramanujam, and Alge (2011: 1617) argue that "attention is most likely to be focused on that which is most salient." Thus, if something salient happens around a business unit, that unit may attract more attention.

[12] Per our discussion in prior sections, lower performance than other units in internal performance comparison can also attract top managers' attention.

One such salient factor is the extreme performance outlier. Some studies have highlighted the importance of extreme outliers in capturing attention. In particular, it is argued that practitioners pay more attention to subjects or activities that lead to extremes than to those that lead to average performance. Ahuja and Novelli (2017: 2464), for instance, have argued that decision-makers "may remember much more saliently the extreme outliers". As a result, firms may invest highly in R&D because of the existence of extreme outliers even though the return to R&D investment may be very low. Likewise, Andriani and McKelvey (2009: 1053), for instance, have argued that "what is important to most managers are the extremes they face". Since the performance of a unit is the sum of the performance of its products, whose distribution may not be normal, it is very likely that some products have extremely high or low performance. These products can easily stand out relative to other products, thus attracting more top managers' attention.

Though I could focus on the products with both extremely high and low performance, I focus on the former because managers may want to have more such products to improve firm performance. I define the products with extremely high performance as *star products* (Elberse, 2008; Taylor & Greve, 2006). Star products are an important phenomenon in practice. For instance, in the movie industry, the blockbuster movies often contribute significantly to the performance of a movie company (Andriani & McKelvey, 2007). In the pharmaceutical industry, the blockbuster drugs contribute tremendously to the performance of pharmaceutical companies.

As salient performance outliers, star products can attract the attention of not only their own producers but also other players in the industry. For top managers of multibusiness firms, they pay attention to both their own star products and other star products in the industry. Because star products are rare, if a business unit contains some star products, this unit is very likely to be an over performing unit. Thus, the attention capture effect of a business unit's star products is highly correlated with the attention capture effect of the overall performance of the unit. As we have already discussed that firms have the winner rewarding tendency to

pay attention to over performing units, we do not discuss the effect of a unit's own star products. Instead, we discuss the effect of the star products from other firms in the same industry segment (hereafter, external star products).

While external star products can potentially attract top managers' attention, it is not always the case. The emergence of star products is often unpredictable and can be attributed to randomness. If this is the case, external star products may have minimal effect in attracting decision makers' attention. In contrast, if external star products are prevalent in the industry segment of a business unit, this industry segment is more likely to attract decision makers' attention. Thus, it is important to analyze the effect of the *prevalence of external star products*, rather than a single external star product.

As external star products are more prevalent in the same industry segment of a business unit, the unit can attract more attention from top managers. As the social cognition literature suggests, though the top managers of a multibusiness firm monitor multiple industry segments, they are more likely to pay attention to the industry segments in which many external star products are present. They may regard the industry segment as fertile areas from which star products are more likely to emerge. Using analogical reasoning (Gavetti, Levinthal, & Rivkin, 2005), the top managers may think that they have a high chance to gain a star product by investing in these industry segments. Therefore, top managers are more willing to invest in the business units whose industry segment have more external star products.

In particular, if an underperforming unit is in an industry segment with more external star products, this unit is more visible to the top managers. When the top managers respond to internal performance comparison, they are more likely to provide a helping hand to these visible business units that are underperforming, thus strengthening the search in the underperforming units with more external star products. Similarly, if an over performing unit is in an industry segment with more external star products,

the top managers may also be willing to provide support to this type of over performing units and strengthen the search in these units.

In sum, I argue that the attention capture effect of the prevalence of external star products in the same industry segment will apply to both the underperforming and over performing units. The prevalence of external star products in an industry segment makes the business units in that industry segment, be it underperforming or over performing, more visible. Thus, these units can attract more attention from top managers. The bounded rational top managers may consider the emergence of star products in the same industry segment as path-dependent and expect more star products to emerge from their units in the same industry segment. As such, they are more willing to provide support to the units in the industry segment in which external star products are more prevalent.

Accordingly, I propose:

> *Hypothesis 4a (H4a): The influence of an underperforming business unit's performance gap on the search and organizational changes is strengthened by the prevalence of external star products in the same industry segment of the underperforming unit.*

> *Hypothesis 4b (H4b): The influence of an over performing business unit's performance gap on the search and organizational changes is strengthened by the prevalence of external star products in the same industry segment of the over performing unit.*

The Joint Effect of Firm Performance Comparison and External Star Products

As we have discussed, two conditions are critical for determining the problem solving and winner rewarding tendency of the multibusiness firm, i.e., the comparison of firm performance to social and historical aspiration and the prevalence of external star products in the same industry segment. Thus, in addition to influencing the problem solving and winner rewarding tendency of the multibusiness firm individually, the two factors can influence the problem solving and winner rewarding tendency jointly. Because top managers of multibusiness firms have limited attention, they could not pay attention to all units equally. As such, their problem solving and winner rewarding tendencies are more likely to target the units that are frequently visible to them, i.e., the units whose industry segments have more external star products. When multibusiness firms' performance is below (above) their aspiration level, the strengthened problem solving (winner rewarding) tendencies are also more likely to target the underperforming (over performing) units whose industry segments have more external star products. Therefore, I propose the following hypotheses:

Hypothesis 5a (H5a): The influence of an underperforming business unit's performance gap on the search and organizational changes is strengthened by the lower performance of the multibusiness firm relative to the firm's aspiration level, particularly for the underperforming units whose industry segments have more external star products.

Hypothesis 5b (H5b): The influence of an over performing business unit's performance gap on the search and organizational changes is weakened by the lower performance of the multibusiness firm relative to the firm's aspiration level, particularly for the over performing units whose industry segments have more external star products.

Hypothesis 6a (H6a): The influence of an underperforming business unit's performance gap on the search and organizational changes is weakened by the higher performance of the

multibusiness firm relative to the firm's aspiration level, particularly for the underperforming units whose industry segments have more external star products.

Hypothesis 6b (H6b): The influence of an over performing business unit's performance gap on the search and organizational changes is strengthened by the higher performance of the multibusiness firm relative to the firm's aspiration level, particularly for the over performing units whose industry segments have more external star products.

DATA AND METHODS

Empirical Context and Data Description

This study examines the proposed hypotheses based on the data from the pharmaceutical companies developing prescription drugs in the United States and Europe. The pharmaceutical context has three attractive features for the hypothesis test.

First, it is widely known that the development of prescription drugs is not only uncertain and lengthy but also costly (Gassmann & Reepmeyer, 2005). In a recent study, DiMasi, Grabowski, and Hansen (2016) estimate that the average cost per approved new compound is $1.395 billion. The high R&D cost makes top managers in this industry pay particular attention to resource allocation across different units (Pammolli, Magazzini, & Riccaboni, 2011; Sharpe & Keelin, 1998). Indeed, as Needleman (2001: 41) has suggested, "Because no company has an unlimited budget for research, laser beam-like focus is critical. It is impossible to work in every therapeutic area, and a good R&D leader chooses those areas where success is most probable and then continues to build on that platform."

Second, acquisition activities are frequent in the pharmaceutical industry (Achilladelis & Antonakis, 2001; Danzon, Epstein, & Nicholson, 2007; Higgins & Rodriguez, 2006) and many acquisitions are for specific units. According to Kumar (2012: 3), there are 1345 announcements of mergers and acquisitions of pharmaceutical assets and firms from 1999-2009. Because prescription drugs will lose a large proportion of market share after patent expiration, pharmaceutical firms often acquire some product lines or small companies to complement the product pipelines of particular units. Thus, this industry provides a nice context to examine the frequency of acquisitions for different business units.

Third, the definition of star products is agreed by most, if not all, firms in the pharmaceutical industry. While star products are qualitatively defined as products with extremely well performance, firms may have different interpretations of what kind of performance is "extremely well". Fortunately, such ambiguity does not exist in the pharmaceutical industry. Most pharmaceutical firms define blockbuster drugs, whose annual sales are greater than $1 billion, as star products (Li, 2004; 2009). Blockbuster drugs are important for the revenues of pharmaceutical companies (Grabowski & Vernon, 2000). Based on the data from IMS Health, Cutler (2007) shows that blockbuster drugs account for between 28 and 36 percent of total global sales between 2000 and 2005. Thus, blockbuster drugs are more salient than other drugs and thus may capture more top managers' attention. Even if many industry experts, economists, and analysts have warned the potential unsustainability of too much reliance on blockbuster drugs (e.g., Chesbrough & Chen, 2015; Kessel, 2011; Service, 2004), current pharmaceutical firms still pursue blockbuster drugs. For instance, on the 2018 Ionis Pharmaceuticals Investor Day, its CFO argues that "SPINRAZA is obviously an excellent example of that, a blockbuster medicine... we have 3 out of the 4 medicines … have the potential to be blockbuster medicines, and therefore, generate substantial royalty revenue to Ionis." [13] Thus, the pharmaceutical industry provides an ideal context to examine the effect of star products.

The data from 1999 to 2017 were collected from five main sources. I start with 1999 because, before 1999, few firms released sales and product information at the business unit level, which is the key data needed to examine the hypotheses. I manually coded the sales of each unit and the sales of the main products in each unit from the *annual reports* (10-K or 20-F). If such information was not available from an annual report, I used the *Cortellis Competitive Intelligence* database to code the sales of the main, if not all, products and aggregate the product sales as the sales of the unit. Following prior studies (e.g., Kaul, 2012; Kuusela et al., 2017), I used the *Securities Data Company (SDC) Platinum* to collect the data on the acquisition activities of each firm and verify the data against the acquisition activities in the annual report. In addition, I used the

[13] Ionis Pharmaceuticals Inc Investor Day - Final, December 7, 2018, FD (Fair Disclosure) Wire

Compustat dataset to get the financial data of each firm, the *Pharmaprojects* dataset (e.g., Adegbesan & Higgins, 2011; Hoang & Rothaermel, 2010; Kapoor & Klueter, 2015) to track the R&D data of the pharmaceutical data, the *Approved Drug Products with Therapeutic Equivalence Evaluations* (FDA's orange book) to collect the product and patent information, and the *Lex Machina* to collect the litigation data of the patents underlying the drugs.

Dependent Variable

This study used a count of acquisition activities that a multibusiness firm made for each business unit (*num_acqu_unit*) as the dependent variable. A business unit can search and make organizational changes in multiple ways, such as R&D search (Rhee et al., 2019), new product introduction (Gaba & Joseph, 2013), and acquisition. This study focused on the search via acquisition, which has been identified as an important type of search (e.g., Greve, 2011; Iyer & Miller, 2008; Kuusela et al., 2017; Zhang & Greve, 2019). As a resource-consuming activity (Kuusela et al., 2017), acquisition can represent one of the important forms of support provided by top managers to a business unit.

To decide whether an acquisition can be classified into a unit and, if so, into which unit (e.g., oncology, cardiovascular, neuroscience), I carefully reviewed the synopsis of each acquisition deal in SDC. If the synopsis did not provide adequate information to judge, I searched for the annual report and LexisNexis for more details of the acquisition activities. For instance, while SDC indicated that Merck & Co acquired Aton Pharma in 2004, by searching LexisNexis, I can judge that this acquisition is mainly for the oncology unit, as Aton Pharma focuses on the development of novel treatments for cancer. To avoid the omission of any acquisition activity for a business unit, I also reviewed the annual report of each firm each year and checked the news report in LexisNexis. Any missed activity was added to the dataset.

To assist coding, I developed three coding protocols. First, I excluded the mega acquisition activities (e.g., Pfizer's acquisition of Warner-Lambert Co, Pharmacia Corp, and Wyeth, Merck & Co's acquisition of Schering-Plough) because the purpose of such acquisition activities are not for a specific unit but to improve the market power of the whole firm. Second, I excluded the acquisitions that cannot be classified into any unit, such as the acquisition of a manufacturing facility, the acquisition of a new technology that can be applied to all units, or the acquisition of a new business not included in existing units. However, since these acquisitions may have an impact on the attention allocation of the top managers, I controlled for them in the estimation. Third, I assigned the rest of the acquisition activities to the units that matched the targets of the acquisition. For example, SDC indicated that King Pharmaceuticals acquired "the AVINZA product line of Ligand Pharmaceuticals Inc" on September 07, 2006. Since AVINZA is used to treat moderate to severe pain by affecting the central nervous system (CNS), I coded this acquisition as 1 for the Neuroscience unit. Likewise, SDC indicated that Eli Lilly & Co acquired "CoLucid Pharmaceuticals Inc, a Cambridge-based manufacturer of acute treatment of *migraine headaches*". Thus, this acquisition is coded as 1 for the Neuroscience unit. After the coding process, I calculate the number of acquisition activities for each unit in each year (*num_acqu_unit*).

Independent Variables

Business unit performance. Cyert and March (1963: 41-42) have identified five main indicators of firm performance: production, inventory, sales, market share, and profit. While extensive behavioral studies have focused on profit (e.g., Audia & Greve, 2006; Chen & Miller, 2007; Iyer & Miller, 2008; Ref & Shapira, 2017), other studies have focused on, for instance, sales (e.g., Ben-Oz & Greve, 2015; Joseph, Klingebiel, & Wilson, 2016; Kotlar, De Massis, Fang, & Frattini, 2014), market share (Joseph & Gaba, 2015), and product quality (Parker, Krause, & Covin, 2017). In the pharmaceutical industry, data on the profit measures of a business unit are unavailable. As such, I followed prior studies and relied on sales as a measure of performance. Specifically, I used the sales of the unit (in million dollars) reported in the annual

reports to measure the performance of the unit. If some firms did not report unit performance in some years, I coded unit performance by aggregating the sales of all products of that unit based on the product sales data from the Cortellis dataset. Given that acquisitions may take years to happen, I followed prior studies (e.g., Iyer & Miller, 2008; Kuusela et al., 2017) and lagged one year of sales in the estimation to reflect the effect of business unit performance.

Internal social aspiration. Following extant behavioral studies (e.g., Arrfelt et al., 2013; Hu et al., 2017; Kacperczyk et al., 2015), I constructed internal social aspiration to conduct internal performance comparison. I measured internal social aspiration (*asp_internal*) by the mean performance of all business units except the focal one in the same firm.

Performance-internal social aspiration gap. The performance gap is defined as the difference between unit performance (*perf_unit*) and internal social aspiration (*asp_internal*). The extant behavioral studies (e.g., Audia & Greve, 2006; Chen, 2008; Gaba & Joseph, 2013; Greve, 2003b) suggest we enter separate variables, i.e., performance below and above aspiration level, by using a spline specification. Thus, I created two variables to measure the distance of a unit's performance to internal social aspiration, i.e., *perf_unit below asp_internal* and *perf_unit above asp_internal*. In particular, *perf_unit below asp_internal* equals $asp\_internal - perf\_unit$ if $perf\_unit < asp\_internal$, and zero otherwise; *perf_unit above asp_internal* equals $perf\_unit - asp\_internal$ if $perf\_unit \geq asp\_internal$, and zero otherwise. Thus, both *perf_unit below asp_internal* and *perf_unit above asp_internal* are equal to or greater than zero, representing a positive, if not zero, distance to internal social aspiration from current business unit performance.

Moderatoring Variables

This study focuses on two types of moderators: (1) firm performance comparison, and (2) the prevalence of external star products in the same industry segment (*external star*). To measure firm performance comparison, I followed the extant studies on BTOF (e.g., Greve, 2003b) by creating two aspiration levels: historical (*hist_corp*) and social aspiration (*social_corp*). Historical aspiration was calculated as $hist\_corp_t = \alpha\ hist\_corp_{t-1} + (1-\alpha)\ perf\_corp_{t-1}$, where *perf_corp* is the performance of the multibusiness firm, measured by returns on asset (ROA) and α is the weight that represents the importance of prior historical aspiration relative to current performance. In line with prior studies (e.g., Kuusela et al., 2017), I used a relative high value of α (0.75) and examined the robustness by changing the value from 0.5 to 0.9. Social aspiration was calculated as the mean performance (ROA) of other firms in my sample. I did not use the mean performance of all other firms in the same industry, as many firms in my sample explicitly designated other firms in my sample as their referent firms in their annual report. For instance, in their annual report (2006: 86), AstraZeneca stated that it "selected peer group of 12 other pharmaceutical companies for the same period. These companies are: Abbott Laboratories, Bristol-Myers Squibb, Eli Lilly, GlaxoSmithKline, Johnson & Johnson, Merck, Novartis, Pfizer, Roche, Sanofi-Aventis, Schering-Plough and Wyeth."

With historical and social aspiration at the multibusiness firm level, I then calculated firm performance above and below each aspiration using a spline function. Specifically, I calculated *perf_corp below hist_corp* (*social_corp*) as $hist\_corp\ (social\_corp) - perf\_corp$ if $perf\_corp < hist\_corp\ (social\_corp)$, and zero otherwise. Similarly, I calculated *perf_corp above hist_corp* (*social_corp*) as $perf\_corp - hist\_corp\ (social\_corp)$ if $perf\_corp \geq hist\_corp\ (social\_corp)$, and zero otherwise. Thus, both *perf_corp below hist_corp* (*social_corp*) and *perf_corp above hist_corp* (*social_corp*) are equal to or greater than zero, representing a positive, if not zero, distance from current firm performance to firm level aspirations.

To measure the prevalence of external star products (*external star*), my second set of moderators, I compared the annual sales of each drug against the benchmark of the blockbuster drugs (i.e., $1 billion) for each business unit each year, and coded *external star* as the mean number of drugs in the same business area (excluding the focal unit) whose annual sales is above the benchmark. Consistent results can be derived by using the total number rather than the mean number of blockbuster drugs.

Control Variables

I control for a series of variables that could potentially confound the proposed relationships between internal performance comparison and the search activities at the business unit level. A multibusiness firm may provide more attention and support to the underperforming and over performing units due to several alternative explanations. First, a business unit can receive more attention or support because of its high growth rate and the attractiveness of the industry segment of the unit. Thus, I controlled *unit growth*, measured by the ratio of the difference of the unit performance between current and prior periods to the unit performance in the prior period. I also controlled *segment attractiveness* by the total number of late stage R&D projects, i.e., phase 2 and phase 3 clinical trials (Higgins, 2007; Higgins & Rodriguez, 2006; Nishimura & Okada, 2014), in the industry segment of a unit. This measure is based on the assumption that, the more attractive an industry segment, the more R&D projects will be initiated in that segment by firms in the same industry, and the more R&D progress in that segment.

Second, a business unit can receive more attention or support because of firm strategy, as firms may intentionally strengthen or weaken certain units. To address this explanation, I controlled for the prior support received by a unit by the total number of prior acquisitions made for the unit (*num_acqu_unit_prior*). This variable also reflects the strategic momentum of a firm (Amburgey & Miner, 1992).

Third, a business unit can receive more attention or support because of the self-enhancing motives of the decision makers (Audia & Brion, 2007; Jordan & Audia, 2012). Firms are more likely to invest in a unit that can help maintain the good self-image of top managers. If a business unit has more star products, top managers are more likely to invest in the unit because star products attract industry-wide attention and make a good self-image of the top managers. Thus, I controlled for the self-enhancement by the number of star products of a business unit (*internal star*).

Fourth, a firm may pay more attention and support to a business unit due to its R&D pipeline performance relative to that of external rivals. Thus, I included a variable, *R&D_perf_diff*, which is measured by the difference between the number of later stage R&D projects of a business unit and the mean number of later stage R&D projects in all other external firms.

Fifth, a firm may pay attention to a business unit due to the extent of intellectual property protection in the unit. In the pharmaceutical industry, patents are the main type of intellectual property. If the patents in a business unit are soon to expire, or less well protected, it is urgent for the firm to help the unit to search for new products or solutions. To address this concern, I controlled two variables: (1) *protection length*, measured by the maximum number of years a unit's products are to be protected by their patents; (2) *num of litigation*, measured by the total number of litigation cases a unit's patents have been involved in.

Finally, a firm may provide more attention or support to a business unit if it has high interdependence with other units. If a unit is highly interdependent with other units, lower performance of that unit may indicate a severe problem for the firm and thus capture more firm level attention. I followed the methods in Ganco (2013) to measure *unit interdependence*. Specifically, I first tabulate the co-occurrence frequencies for all unit combinations for all drugs in the Pharmaprojects dataset, which includes most, if not all, launched drugs and drugs under investigation. I then calculate the interdependence of unit *i* as

$$\sum_j \frac{count\ of\ drugs\ in\ units\ i\ and\ j}{count\ of\ drugs\ in\ unit\ i} \quad ,$$

where *j* belongs to all units except unit *i*.

In addition, I have controlled for a series of variables at the multibusiness firm level that are commonly used in the extant studies on BTOF. These variables included: (1) *financial slack*, calculated by the ratio of equity to debt; (2) R&D intensity, measured by *R&D/sales*; (3) marketing intensity, measured by *advertising/sales*; (4) *bankruptcy risk*, measured by Altman's Z score (Kuusela et al., 2017; Miller & Chen, 2004); (5) *free cash flow*, calculated by the sum of net cash flow for investing and operating activities; (6) *number of divestitures* of the firm; (7) number of other acquisitions that cannot be assigned to a particular unit (*num_acqu_corp_other*); (8) number of business units of a multibusiness firm (*number of units*); (9) logarithm of the number of patents (*log_num_patents*); (10) year dummies to reflect unobservable time effects. I did not include total asset (log form) because it is highly correlated with the number of units (r = 0.72).

Analytical Approach

Following prior studies (e.g., Desai, 2016; Gaba & Joseph, 2013; Tyler & Caner, 2016), I used the conditional fixed-effects Poisson regression model for panel data with robust standard errors adjusted to estimate the regression models. Because the dependent variable is count data, ordinary least squares (OLS) estimation does not work as its assumption is violated. While both Poisson and negative binomial estimation are possible choices, I did not use negative binomial specification, for two reasons. First, while negative binomial estimation is efficient in addressing overdispersion, overdispersion is not serious in this study, as the values of mean and variance of the dependent variable are 0.12 and 0.13 respectively. Second, negative binomial estimator is subject to "incidental parameter problem" (Cameron & Trivedi, 2013: 354), i.e., the estimates of coefficients of interest are inconsistent as the number of panel fixed effects are included. Thus,

the negative binomial estimation "does not have a true conditional fixed effect specification" (Gaba & Greve, 2019: 656). In contrast, the fixed-effects Poisson estimator is free of "incidental parameter problem" (Greene, 2012: 722).

As a firm may divest a unit with poor performance rather than provide a helping hand, it is important to control for the risk or probability that a unit is potentially divested. I could have adopted a Heckman type of estimation (Heckman, 1979). However, in my sample, there are only 14 out of 241 units being divested (2,496 observations in total), making the estimation of the divestiture risk very difficult. Moreover, the small number of divestitures makes the concern of divestiture risk minimal. Therefore, I did not control the divestiture risk of the business units in my estimation.

RESULTS

I present the empirical results in this section. I start with the descriptive statistics. I then present the estimates of the relationship between internal performance comparison and acquisition at business unit level, and the moderating effect of firm performance comparison and the prevalence of external star products. I conclude this section with a discussion of endogeneity and robustness analysis.

Table 2.1 shows the descriptive statistics and correlations between all variables. We can observe a high correlation (0.80) between *perf_corp below hist_corp* and *perf_corp below social_corp*. Because the two variables are not present in the same regression estimation, the high correlation is not a concern. The absolute values of most other correlations are below or around 0.50, except the correlations between *perf_corp below social_corp* and ***R&D/sales*** (0.64), *perf_corp above social_corp* and *bankruptcy risk* (0.65), *unit interdependence* and *number of units* (0.69). When I drop one variable from each pair, the results remain unchanged. Thus, all variables are kept in the estimation models.

[Insert Table 2.1 about here]

Before delving into the statistical examination of the effect of performance feedback based on internal social comparison, I present the overall trend of the relationship between a unit's performance and its firm's acquisitions for it by averaging the two variables of the same unit in different firms. In Figure 2.1, I averaged the sales performance of the, for instance, oncology unit and the acquisitions made for the unit across all firms. The results show that sales performance and the number of acquisitions show a syncing pattern in the oncology, neuroscience, cardiovascular, respiratory, and infection unit. As a unit's performance is high (low), the number of acquisitions made for the unit is also high (low).

While Figure 2.1 shows the absolute performance of a unit, Figure 2.2 shows the relative performance of a unit in a multibusiness firm. In Figure 2.2, I averaged the sales performance of the unit with the same rank in different firms and the number of acquisitions the firms made for the unit. For the six best performing (lowest rank number) units, the higher the unit performance, the greater the number of acquisitions made for them. This seems to suggest that multibusiness firms have a *winner rewarding* tendency. Figure 2.2 also shows that some lower performing units (rank number = 7 and 10) have a large number of acquisitions. This could be due to either the *problem solvin*g tendency of the firm, or the small number of observations in calculating the number of acquisitions (note that the size of the circle represents the number of observations). Thus, more detailed analysis as follows is needed.

[Insert Figures 2.1 and 2.2 about here]

Hypothesis Testing Results

The results testing the problem solving and winner rewarding tendency of the multibusiness firms are shown in Table 2.2. We start the discussion from the results of the control variables, which are to examine the alternative explanations and confounding effects. The results on the control variables are basically as expected. As shown in Model 1 of Table 2.2, the coefficient on *segment attractiveness* is positive and significant (β= 0.008, p<0.05), suggesting that acquisitions are more likely to be conducted in a unit whose industry segment is more attractive and promising. The coefficient on *num_acqu_unit_prior* is negative and significant (β = -1.043, p<0.001), and the coefficient on *num_acqu_corp_other* is positive and marginally significant (β= 0.108, p<0.10). The results indicate that, more prior acquisitions in a unit leads to fewer, rather than more acquisitions in the same unit. However, acquisitions not assigned to a unit are positively related to acquisitions in that unit. Thus, it seems that multibusiness firms do not keep conducting acquisitions continuously in a unit. The coefficient on *internal star* is negative and marginally significant

(β= -0.312, p<0.10), suggesting that more star products in a unit lead to fewer rather than more acquisitions in that unit. It is possible that, if a unit has more star products, it is less necessary to strengthen the unit by acquisition. The coefficient on *protection length* is positive and marginally significant (β= 0.019, p<0.10). Thus, the longer a unit's products can be protected by the patents, the more acquisitions will be made for the unit. The coefficient on *R&D/sales* is negative and marginally significant (β= -1.767, p<0.10). It seems that the two types of search, R&D search and acquisition, have a substitute relationship: higher intensity of R&D search leads to fewer acquisitions.

We now discuss the relationship between internal performance comparison and acquisition. As the results in Model 1 of Table 2.2 show, neither the coefficient on *perf_unit below asp_internal* (β= -0.002, p>0.10) nor the coefficient on *perf_unit above asp_internal* (β= 0.281, p>0.10) are significant. Thus, it seems that, on average, the multibusiness firms show neither a problem solving nor a winner rewarding tendency, and Hypotheses 1a and 1b are not supported. However, as later results show, firms do show problem solving and winner rewarding tendencies under particular conditions.

[Insert Table 2.2 about here]

Models 2-6 of Table 2.2 show the results of the moderating effects of firm performance comparison and the prevalence of external star products. In Models 2 and 3, I present the results of the moderating effects of *perf_corp below hist_corp* and *perf_corp above hist_corp.* However, the coefficients on the interaction terms between the two variables measuring firm performance below and above historical aspiration and *perf_unit below asp_internal* and *perf_unit above asp_internal* are not significant. Thus, it seems that the performance conditions of the multibusiness firm relative to historical aspiration have not statistically significant impact on the problem solving and winner rewarding tendency. Models 4 and 5, which show the results of the moderating effects of firm performance relative to social aspiration, show similar results to

those in Models 2 and 3. The coefficient on the interaction term, *perf_corp below social_corp*×*perf_unit above asp_internal*, is negative and marginally significant in Model 4 (β= -3.979, p<0.10). Thus, it seems that, as a multibusiness firm's performance is further below than social aspiration, it provides less support to acquisitions in the over performing units. Nevertheless, the results are not robust, as the interaction term *perf_corp below hist_corp* × *perf_unit above asp_internal* is not significant in Model 2. Therefore, Hypotheses 2a, 2b, 3a, and 3b are not supported. However, as we will find soon, the effects of the firm performance comparison are significant when they interact with the prevalence of external star products.

Unlike the non-significant moderating effects of firm performance comparison, the moderating effects of the prevalence of external star products are significant. As shown in Model 6 of Table 2.2, the coefficients of both *external star* × *perf_unit below asp_internal* (β= 1.280, p<0.001) and *external star* × *perf_unit above asp_internal* (β= 1.195, p<0.001) are positive and significant at 0.001 level. Thus, the prevalence of external star products positively moderates the relationships between *perf_unit below asp_internal* and *perf_unit above asp_internal* and acquisition. Thus, both Hypotheses 4a and 4b, which argues for positive moderating effects of the prevalence of external star products, are supported. In particular, the coefficients on *perf_unit below asp_internal* and *perf_unit above asp_internal* are -1.114 (p<0.01) and -0.561 (p<0.05), suggesting that, when the number of external star products in the same industry segment is 0, a one-standard-deviation increase in internal performance shortfall (increase) leads to 67.9 (39.6) percent decrease in acquisition activities. However, when the number of external star products is 1, a one-standard-deviation increase in *perf_unit below asp_internal* (*perf_unit above asp_internal*) leads to 18.4 (76.9) percent increase in acquisition activities. Therefore, a multibusiness firm shows a strong problem solving (winner rewarding) tendency when an underperforming (over performing) unit has more external star products in its industry segment.

[Insert Tables 2.3a and 2.3b about here]

Though firm performance comparison individually has nonsignificant influence on the relationship between internal performance comparison and acquisition, results in Tables 2.3a and 2.3b show that its joint effect with the prevalence of external star products are significant. As shown in Model 1 of Table 2.3a, the coefficient on the interaction term *perf_corp below hist_corp* × *perf_unit below asp_internal* × *external star* is negative and significant (β= -17.551, p<0.05). The results indicate that, as a multibusiness firm's performance is below historical aspiration level, there are few acquisition activities in the underperforming units with more external star products in the same industry segment. This result is the opposite of Hypothesis 5a, which argues that more acquisition activities will happen in the underperforming units with more external star products in the same industry segment when firm performance is below historical aspiration level. As three-way interaction is difficult to interpret, I calculated the marginal effects of eight cases when the values of *perf_corp below hist_corp, perf_unit below asp_internal,* and *external star* are either high or low. The results are shown in Table 2.4. As a firm's performance is further below historical aspiration (0.09, mean + S.D.), the lowest predicted number of acquisition is 0.01 (p = 0.699), which happens when the value of *perf_unit below asp_internal* is high (6) and the number of external star products is high (1). In contrast, the highest predicted number of acquisitions is 1.07 (p = 0.000), which happens when the value of *perf_unit below asp_internal* is low (0) and the number of external star products is high (1). Thus, when firm performance is below historical aspiration level, they provide less support to underperforming units with more external star products in their industry segment.

[Insert Table 2.4 about here]

In contrast, Model 2 of Table 2.3a shows that the coefficient on the interaction term *perf_corp below hist_corp* × *perf_unit above asp_internal* × *external star* is positive and significant (β= 16.573, p<0.01). The results indicate that, when a multibusiness firm's performance is below historical aspiration level, more acquisitions happen in the over performing units with more external star products in the same industry

segment. The result is opposite to the prediction of Hypothesis 5b, which suggests that fewer acquisitions will happen in the over performing units with more external star products in the same industry segment. Thus, Hypothesis 5b is not supported.

The results in Models 3 and 4 of Table 2.3a show the joint effects of *perf_corp above hist_corp* and *external star*. In Model 3, the interaction term *perf_corp above hist_corp* ×*perf_unit below asp_internal* × *external star* is positive and significant (β= 10.564, p<0.05). The results indicate that, when a multibusiness firm's performance is above historical aspiration level, more acquisitions happen in the underperforming units with more external star products in their industry segment. This result is the opposite of the prediction of Hypothesis 6a, which suggests that fewer acquisitions happen in underperforming units with more external star products in their industry segment when firm performance is above historical aspiration level. Thus, Hypothesis 6a is not supported. While Hypothesis 6b argues that more acquisitions happen in the over performing units with more external star products in their industry segment when firm performance is above historical aspiration level, the interaction term *perf_corp above hist_corp* ×*perf_unit above asp_internal* × *external star* is non-significant in Model 4 of Table 2.3a. Thus, Hypothesis 6b is not supported.

Table 2.3b shows the results of the joint effect of the prevalence of external star products and firm comparison relative to social aspiration level. The results in Table 2.3b are consistent with those in Table 2.3a. The coefficient on the interaction term *perf_corp below social_corp* × *perf_unit below asp_internal* × *external star* is negative and significant (β = -20.904, p<0.05), on *perf_corp below social_corp* × *perf_unit above asp_internal* × *external star* is positive and significant (β = 12.431, p<0.05), and on *perf_corp above social_corp* × *perf_unit below asp_internal* × *external star* is positive and marginally significant (β = 10.155, p<0.10). However, the coefficient on the interaction term *perf_corp above social_corp* ×*perf_unit above asp_internal* × *external star* is nonsignificant. The results suggest that, when a multibusiness firm's performance is below social aspiration level, more acquisitions happen in the over

performing units with more external star products in their industry segment, and fewer acquisitions happen in the underperforming units with more external star products in their industry segment. However, when a multibusiness firm's performance is above social aspiration level, more acquisitions happen in the underperforming units with more external star products in their industry segment.

In sum, regardless of whether a multibusiness firm compares its performance to historical or social aspiration level, lower performance than aspiration level makes the firm more risk averse, leading to fewer acquisitions in the underperforming units with more external star products in their industry segment, but more acquisitions in the over performing units with more external star products in their industry segment. The underperforming units with more external star products in their industry segment conduct more acquisitions only when the performance of the multibusiness firm is above firm-level aspiration.

Endogeneity and Robustness Checks

To address the endogeneity bias of the findings, I have considered various alternative explanations, such as segment attractiveness, strategic choices, self-enhancing, R&D pipeline performance, intellectual property protection, and unit interdependence. The findings are robust with the inclusion of the control variables representing these alternative explanations.

In addition to endogeneity analysis, I have done a series of analyses to examine the robustness of the results and find consistent results. First, rather than using the mean performance, I also used the median performance to calculate the internal social aspiration. Second, in addition to set the weight α as 0.75 in constructing historical aspiration, I also set a series of values to α, ranging from 0.5 to 0.9. Third, instead of using the average number of external star products to measure *external star*, I also used the total number

of external star products to measure the variables. Finally, rather than using the number of acquisitions as the dependent variable, I also created a dummy variable and estimated the models using probit regression.

DISCUSSION

The primary objective of this study is to understand how a multibusiness firm with a headquarter and multiple semi-autonomous business units responds to internal performance comparison in the form of acquisition. By focusing on the comparison between overall firm performance and social and historical aspiration levels, most extant studies on BTOF assume the firm, even a multibusiness firm, as a cohesive single-business entity. By extending the assumption, I argue that multibusiness firms may respond to internal performance comparison not only in a *problem solving* manner, which is suggested by the existing literature in the BTOF, but also in a *winner rewarding* manner. I also argue that the extent to which multibusiness firms are more problem solving or winner rewarding is influenced by both firm performance comparison and the prevalence of external star products in the industry segment of the business units. Using data from global pharmaceutical firms, I find that, on average, multibusiness firms do not provide strong support to the search and organizational changes in the underperforming units (problem solving) nor to the search and organizational changes in the over performing units (winner rewarding). Nevertheless, the firms provide more support to both the underperforming and over performing units with more external star products in their industry segment. The winner rewarding and problem solving tendency shown in the units with greater external star products is contingent on firm performance comparison: when firm performance is below aspiration level, greater (less) extent of search and organizational changes happens in the over performing (underperforming) units with more external star products, whereas when firm performance is above aspiration level, greater extent of search and organizational changes happens in the underperforming units with more external star products.

Implications for Theory

This study offers several contributions to the BTOF. First, it enhances our understanding of how firms respond to internal performance comparison. Implicitly assuming the multibusiness firm as a cohesive single-business entity, the extant studies in the BTOF rarely discuss how firms respond to internal performance comparison between its business units. Instead, most studies have discussed how firms respond to firm performance comparison relative to historical and social aspiration. For the emerging studies examining the effect of internal performance comparison, many of them focus on the perspective of the business units—how the internal performance comparison motivates the business units to search (e.g., Hu et al, 2017; Kacperczyk et al., 2015). Few studies focus on the perspective of the headquarters of multibusiness firms and examine their responses to internal performance comparison (Arrfelt et al., 2013 is an exception).

By highlighting that multibusiness firms respond not only to social and historical comparison but also to internal performance comparison, this study shows that the way multibusiness firms respond to internal performance comparison may be different from the way they respond to social and historical comparison. In particular, the existing literature on BTOF argues that firms are *problem solving* to respond to performance comparison relative to historical and social aspiration level: lower firm performance than aspirational level motivates firms to search for solutions to improve performance. This process is essentially to search for solutions to fix the weak part of the firm. In contrast to this wisdom, I argue that, for a multibusiness firm, it has two options to respond to internal performance comparison. On one hand, it can respond in a *problem solving* manner by providing attention and support to fix the weak part of the firm—often the underperforming units. On other other hand, it can respond in a *winner rewarding* manner by providing attention and support to strengthening the strong part of the firm—often the over performing units. The results suggest that multibusiness firms' response to internal performance comparison is influenced by both the risk aversion (whether firm performance is above social or historical aspiration) and

the attention allocation of top managers (whether a unit can attract adequate attention). Thus, this study provides a better understanding of multibusiness firms' response to internal performance comparison.

Second, this study extends our knowledge of the cross-level effect of performance feedback (Rhee et al., 2019). Performance feedback and search activities have been typically conceptualized at the same level by the same subject in the BTOF, i.e., a firm search for solutions to address *its own* performance shortfall. With the hierarchy element revived in recent behavioral studies, scholars are interested in understanding how top-level factors influence business unit level performance feedback and search. However, as pointed out by Rhee et al. (2019: 51), "neither the behavioral theory of the firm nor empirical studies on performance feedback systematically account for when and how top decision-makers influence individual units' problemistic search." Several studies have discussed how corporate structure may influence the relationship between performance feedback and search at the business unit level (e.g., Gaba & Joseph, 2013; Rhee et al., 2019; Vissa et al., 2010). However, these studies are interested in the influence of performance feedback of a unit on the unit's search: if unit A has poor performance, when do top managers facilitate or deter the search of unit A? They rarely examine how top managers respond to the competing demands from both the underperforming and over performing units to search. This study adds to this literature by articulating a pathway by which top managers can simultaneously influence not only one unit's performance feedback, but also multiple potentially competing units' performance feedback. In particular, if both underperforming and over performing units ask for the limited attention and support from top managers, how do top managers address the competing demands from these units? This study partially addresses this issue by highlighting the important roles of joint effects of firm performance comparison and the prevalence of external star products.

Third, this study also contributes to the literature on the attention-based view (e.g., Joseph & Ocasio, 2012; Ocasio, 1997) by identifying the performance outlier, i.e., star products, as an important attention trigger. In the attention-based view literature, business unit performance is an important situational factor that can

attract top level decision makers' attention (Bouquet & Birkinshaw, 2008; Gaba & Joseph, 2013; Stevens et al., 2015; Sullivan, 2010; Tuggle et al., 2010). The extant studies typically focus on the overall performance of the unit, overlooking the roles of performance outliers in capturing attention. This study adds to the literature by highlighting the roles of positive performance outliers, operationalized as *star products*, in influencing the attention allocation of top-level decision makers. In particular, I argue that the prevalence of external star products may influence attention allocation by the analogy mechanisms (Gavetti et al., 2005). I find support for the positive effect of the prevalence of external star products in the same industry segment of both underperforming and over performing units. These findings provide important evidence to the roles of star products and echo the call for research of extreme events (e.g., Andriani & McKelvey, 2007; 2009; Crawford, Aguinis, Lichtenstein, Davidsson, & McKelvey, 2015). Therefore, performance outliers such as star products may not be excluded from the analysis but taken seriously in future research.

Limitations and Future Research

This study is subject to several limitations, which suggest important areas for future research. First, the generalizability of the findings needs to be further examined. I examine the performance comparison between different business units operationalized as therapeutic areas in the pharmaceutical firms. As therapeutic areas differ from each other in many important aspects (e.g., technology complexity, customer demands, R&D costs), the comparison between the therapeutic areas in the same firm is akin to the comparison between apples and oranges. This type of comparison may not be applied to another type of multibusiness firm in which most units are similar—e.g., chains (Knott & Turner, 2019)—and the comparison is more like apple-to-apple comparison. Future research could examine the findings in another context or examine the moderating effects of the differences between the units.

Second, due to the lack of performance data of the external units based on which a unit's performance can be assessed, I focus on only internal performance comparison to study the multibusiness firms' response to internal performance comparison. It is possible that a unit is a winner in internal performance comparison, but a loser in external social comparison simultaneously, and *vice versa*. How the multibusiness firms respond to internal performance comparison when they receive inconsistent performance feedback from internal and external performance comparison remains an interesting question to be examined. In this study, in addition to internal sales performance comparison, I have examined how the comparison of R&D pipeline performance between a focal unit and external units or firms influences the search in the focal unit. However, it is important to use the same performance measure to construct internal and external performance comparison to study the question.

Third, this study focuses only on acquisition as a measure of search. The existing literature has identified various possible measures of search, such as R&D search, CEO turnover, and the divestiture of assets. Though acquisition is an appropriate measure of search in this study, it is important to understand when the multibusiness firm may adopt other types of search, as highlighted by the existing literature (Greve, 2018; Posen et al., 2018). Future research may study how multibusiness firms respond to internal performance comparison in other forms of search. Moreover, as many acquisitions in the pharmaceutical industry are for product lines that can generate revenues immediately, many other acquisitions are for drugs in development, which have no revenue or profitability impact for a long time. Future research can distinguish the two types of acquisition to expand the findings in this study.

Conclusion

In sum, understanding how multibusiness firms respond to internal performance comparison is important to understand firms' search behavior. The multibusiness firms have two options to respond to internal performance comparison—providing a helping hand to the underperforming units (*problem solving*) and to the over performing units (*winner rewarding*). As such, it is critical to understand why and when firms are more problem solving or winner rewarding to respond to internal performance comparison. This study is one step in this direction by focusing on the attention allocation of firm level decision makers triggered by extreme performance outliers (i.e., star products) and the performance comparison of the multibusiness firms. More work is needed to deepen our understanding of how multibusiness firms respond to internal performance comparison by managing the conflicting aspirations and outcomes across their units.

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Figure 2.1. Acquisition Rate and Sales in Different Therapeutic Areas

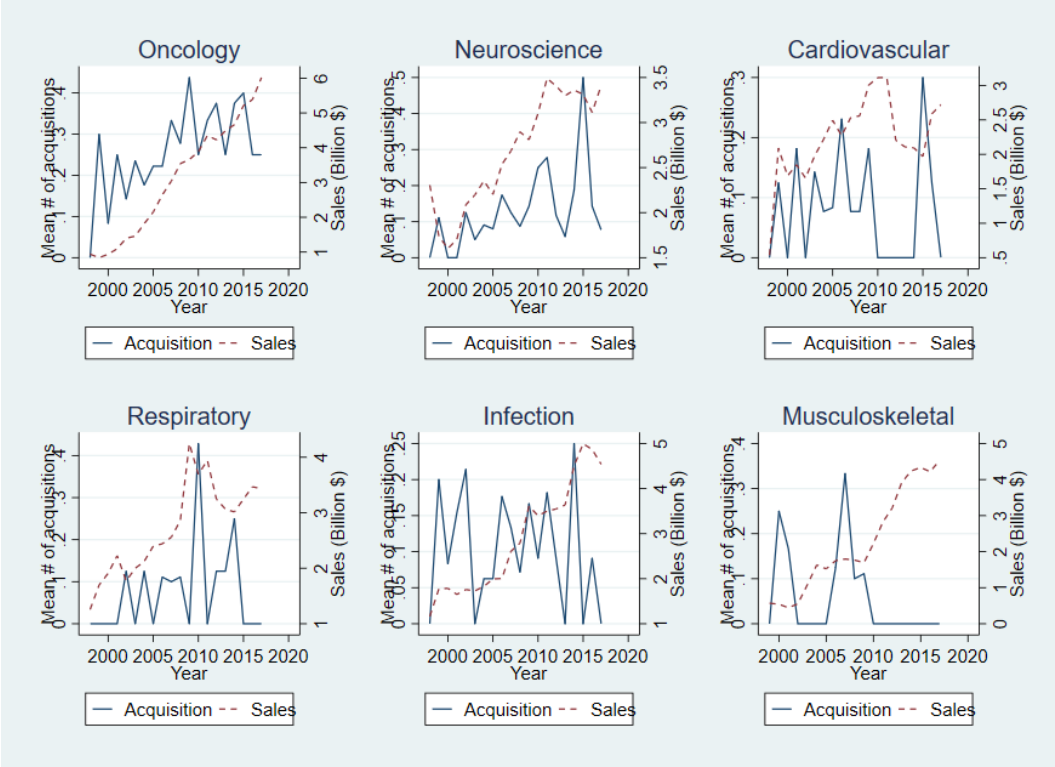

Figure 2.2. Acquisition Rate and Unit Performance Ranking in the Same Firm

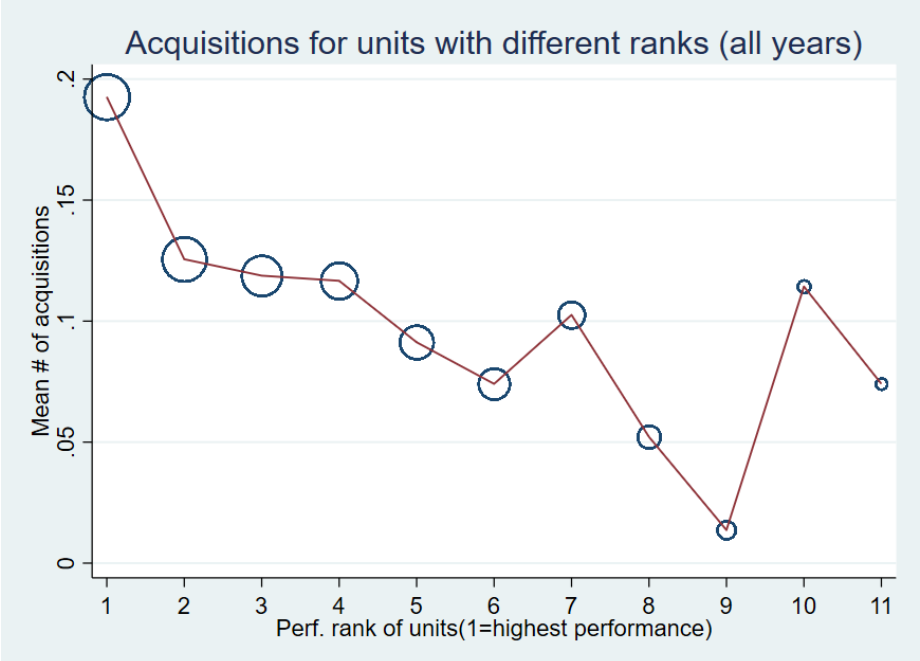

Table 2.1. Summary Statistics and Correlation Matrix

	Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) *num_acqu_unit*	0.12	0.36	1.00														
(2) *perf_unit below asp_internal*	0.62	1.02	-0.05	1.00													
(3) *perf_unit above asp_internal*	0.62	0.9	0.08	-0.43	1.00												
(4) *perf_corp below hist_corp*	0.03	0.06	0.01	-0.02	-0.02	1.00											
(5) *perf_corp below social_corp*	0.03	0.07	0.01	0.00	-0.02	0.80	1.00										
(6) *perf_corp above hist_corp*	0.03	0.06	0.05	0.12	0.11	-0.22	-0.10	1.00									
(7) *perf_corp above social_corp*	0.05	0.07	-0.06	0.01	0.01	-0.27	-0.27	0.29	1.00								
(8) *external star*	0.66	0.47	0.10	-0.11	0.11	0.03	0.05	-0.01	-0.16	1.00							
(9) *unit growth*	0.4	2.92	0.00	0.04	0.01	0.02	0.01	0.05	0.06	-0.02	1.00						
(10) *segment attractiveness*	101.88	81.73	0.18	-0.06	0.08	0.01	0.04	0.00	-0.24	0.49	-0.04	1.00					
(11) *num_acqu_unit_prior*	0.87	1.52	0.39	-0.16	0.20	-0.01	-0.01	0.03	-0.12	0.34	-0.04	0.55	1.00				
(12) *internal star*	0.65	1.01	0.07	-0.36	0.53	-0.05	-0.10	-0.09	0.08	0.19	-0.05	0.20	0.29	1.00			
(13) *R&D_perf_diff*	1.39	2.4	0.13	-0.12	0.08	-0.03	-0.07	-0.11	-0.08	0.22	-0.05	0.44	0.27	0.33	1.00		
(14) *protection length*	12.85	17.88	0.08	-0.28	0.35	-0.01	-0.02	-0.03	0.03	0.09	-0.02	0.15	0.14	0.38	0.30	1.00	
(15) *num of litigation*	0.64	2.00	0.09	-0.14	0.17	-0.01	0.01	-0.02	-0.11	0.10	-0.03	0.22	0.09	0.18	0.20	0.37	1.00
(16) *unit interdependence*	0.57	0.42	-0.07	-0.03	-0.15	-0.02	-0.03	-0.22	-0.16	-0.06	-0.04	-0.09	-0.13	-0.05	0.11	-0.09	-0.01
(17) *financial slack*	1.11	0.83	0.01	0.12	0.14	-0.13	-0.10	0.11	0.07	-0.11	0.06	-0.18	-0.13	-0.09	-0.13	-0.07	-0.04
(18) *R&D/sales*	0.19	0.17	0.04	0.06	0.04	0.50	0.64	0.03	-0.16	0.03	0.05	0.02	0.02	-0.05	-0.04	-0.06	-0.03
(19) *advertising/sales*	0.02	0.03	-0.01	0.00	0.00	0.06	0.07	-0.01	-0.05	-0.03	-0.02	-0.02	0.00	0.00	0.01	0.05	-0.03
(20) *bankruptcy risk*	3.2	1.58	-0.04	0.07	0.08	-0.28	-0.40	0.17	0.65	-0.20	0.04	-0.23	-0.12	0.05	-0.10	0.01	-0.09
(21) *free cash flow*	0.02	3.79	0.01	-0.01	-0.01	-0.07	-0.04	0.02	0.05	-0.03	0.00	-0.01	-0.08	0.01	-0.04	0.04	0.01
(22) *number of divestitures*	1.12	1.61	0.02	-0.04	-0.05	0.05	0.00	-0.18	-0.13	0.03	-0.04	0.01	0.00	0.08	0.17	0.16	0.06
(23) *num_acqu_corp_other*	0.63	1.16	0.01	-0.02	-0.03	-0.04	-0.05	-0.15	-0.10	0.05	-0.03	0.00	0.01	0.05	0.13	0.13	0.07
(24) *number of units*	6.99	2.85	-0.08	-0.11	-0.11	-0.04	-0.13	-0.34	-0.13	0.04	-0.05	-0.01	-0.12	0.05	0.25	0.09	0.03
(25) *log_num_patents*	4.35	1.14	-0.08	-0.11	-0.11	-0.13	-0.29	-0.33	0.16	0.00	-0.04	0.02	-0.06	0.18	0.24	0.08	0.02

			(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
(17) *financial slack*	1.11	0.83	-0.12	1.00								
(18) *R&D/sales*	0.19	0.17	-0.13	0.01	1.00							
(19) *advertising/sales*	0.02	0.03	0.13	-0.06	-0.05	1.00						
(20) *bankruptcy risk*	3.2	1.58	-0.23	0.25	-0.17	-0.02	1.00					
(21) *free cash flow*	0.02	3.79	0.03	0.04	-0.08	-0.03	0.07	1.00				
(22) *number of divestitures*	1.12	1.61	0.31	-0.08	-0.10	0.20	-0.18	-0.03	1.00			
(23) *num_acqu_corp_other*	0.63	1.16	0.30	0.00	-0.09	0.01	-0.15	-0.02	0.27	1.00		
(24) *number of units*	6.99	2.85	0.69	-0.24	-0.25	0.13	-0.20	0.05	0.38	0.24	1.00	
(25) *log_num_patents*	4.35	1.14	0.31	-0.31	-0.26	-0.14	0.14	0.03	0.22	0.14	0.51	1.00

N=1,933

Table 2.2. Results of Conditional Fixed-effects Poisson Regression (Two-way Interaction Included)

DV = *num_acqu_unit*	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
perf_unit below asp_internal $_{(t-1)}$	-0.002	0.107	-0.103	0.085	-0.301	-1.114**
	(0.287)	(0.291)	(0.288)	(0.313)	(0.374)	(0.376)
perf_unit above asp_internal $_{(t-1)}$	0.281	0.373	0.318	0.373	0.331	-0.561*
	(0.235)	(0.236)	(0.241)	(0.246)	(0.245)	(0.276)
perf_corp below hist_corp $_{(t-1)}$		-1.950	-5.876+			-6.310*
		(3.842)	(3.150)			(2.962)
perf_corp above hist_corp $_{(t-1)}$		0.956	1.879			2.739
		(1.826)	(3.344)			(1.730)
perf_corp below social_corp $_{(t-1)}$				3.789	-0.686	
				(3.434)	(3.083)	
perf_corp above social_corp $_{(t-1)}$				4.026*	3.589	
				(1.674)	(2.743)	
external star $_{(t-1)}$	0.069	0.074	0.046	0.020	0.086	-1.664**
	(0.407)	(0.388)	(0.400)	(0.385)	(0.391)	(0.538)
perf_corp below hist_corp × *perf_unit below asp_internal* $_{(t-1)}$		-5.856				
		(5.450)				
perf_corp below hist_corp × *perf_unit above asp_internal* $_{(t-1)}$		-3.988				
		(2.781)				
perf_corp above hist_corp × *perf_unit below asp_internal* $_{(t-1)}$			1.213			
			(1.972)			
perf_corp above hist_corp × *perf_unit above asp_internal* $_{(t-1)}$			-0.620			
			(1.017)			
perf_corp below social_corp × *perf_unit below asp_internal* $_{(t-1)}$				-5.373		
				(4.414)		
perf_corp below social_corp × *perf_unit above asp_internal* $_{(t-1)}$				-3.979+		
				(2.186)		
perf_corp above social_corp × *perf_unit below asp_internal* $_{(t-1)}$					2.861	
					(2.196)	
perf_corp above social_corp × *perf_unit above asp_internal* $_{(t-1)}$					-0.761	
					(1.236)	
external star × *perf_unit below asp_internal* $_{(t-1)}$						1.280***
						(0.332)
external star × *perf_unit above asp_internal* $_{(t-1)}$						1.195***
						(0.360)
unit growth $_{(t-1)}$	-0.124	-0.131	-0.186	-0.117	-0.195	-0.117
	(0.119)	(0.113)	(0.135)	(0.116)	(0.143)	(0.106)
segment attractiveness $_{(t-1)}$	0.008*	0.008*	0.008*	0.009*	0.008*	0.009**

	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
num_acqu_unit_prior $_{(t-1)}$	-1.043***	-1.036***	-1.054***	-1.053***	-1.045***	-1.080***
	(0.188)	(0.196)	(0.194)	(0.187)	(0.187)	(0.179)
internal star $_{(t-1)}$	-0.312+	-0.345+	-0.340+	-0.356+	-0.324+	-0.406*
	(0.180)	(0.182)	(0.187)	(0.182)	(0.181)	(0.190)
R&D_perf_diff $_{(t-1)}$	0.014	0.016	0.017	0.015	0.016	0.018
	(0.038)	(0.038)	(0.037)	(0.040)	(0.039)	(0.037)
protection length $_{(t-1)}$	0.019+	0.021*	0.020*	0.018+	0.018*	0.019*
	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
num of litigation $_{(t-1)}$	0.021	0.024	0.020	0.022	0.016	0.029
	(0.024)	(0.025)	(0.025)	(0.025)	(0.025)	(0.026)
unit interdependence $_{(t-1)}$	-0.469	-0.364	-0.337	-0.388	-0.350	-0.498
	(0.788)	(0.767)	(0.757)	(0.757)	(0.732)	(0.740)
financial slack $_{(t-1)}$	0.103	0.106	0.099	0.119	0.140	0.018
	(0.158)	(0.165)	(0.159)	(0.160)	(0.164)	(0.163)
R&D/sales $_{(t-1)}$	-1.767+	-0.080	-0.467	-0.698	-1.247	-0.011
	(0.911)	(1.203)	(1.038)	(1.476)	(1.030)	(1.110)
advertising/sales $_{(t-1)}$	3.620	3.242	2.837	5.463	5.316	8.586
	(8.818)	(8.057)	(8.403)	(8.249)	(8.422)	(8.152)
bankruptcy risk $_{(t-1)}$	-0.139	-0.163	-0.180	-0.257+	-0.239+	-0.153
	(0.125)	(0.128)	(0.129)	(0.134)	(0.142)	(0.123)
free cash flow $_{(t-1)}$	0.004	-0.004	-0.025	-0.012	-0.018	-0.066
	(0.199)	(0.206)	(0.201)	(0.194)	(0.193)	(0.209)
number of divestitures $_{(t-1)}$	-0.011	0.004	-0.004	-0.017	-0.026	-0.015
	(0.056)	(0.062)	(0.061)	(0.058)	(0.057)	(0.059)
num_acqu_corp_other $_{(t-1)}$	0.108+	0.111+	0.114+	0.108+	0.111+	0.092
	(0.061)	(0.060)	(0.060)	(0.064)	(0.062)	(0.069)
number of units $_{(t-1)}$	-0.103	-0.112	-0.120	-0.110	-0.118	-0.143
	(0.124)	(0.129)	(0.128)	(0.122)	(0.124)	(0.135)
log_num_patents $_{(t-1)}$	-0.064	-0.059	-0.065	-0.095	-0.073	-0.169
	(0.214)	(0.223)	(0.226)	(0.220)	(0.225)	(0.225)
Observations	1105	1105	1105	1105	1105	1105

Year dummies included in all models but not reported here.

Robust standard errors in parentheses; $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed)

Table 2.3a. Results of Conditional Fixed-effects Poisson Regression (Historical)

DV = *num_acqu_unit*	Model 1	Model 2	Model 3	Model 4
perf_unit below asp_internal $_{(t-1)}$	-0.762^{+}	-0.045	-0.397	-0.085
	(0.451)	(0.291)	(0.472)	(0.281)
perf_unit above asp_internal $_{(t-1)}$	0.243	-0.020	0.286	-0.448
	(0.223)	(0.272)	(0.236)	(0.284)
perf_corp below hist_corp $_{(t-1)}$	-13.447	0.819	-6.800*	-5.931^{+}
	(9.139)	(5.979)	(3.435)	(3.140)
perf_corp above hist_corp $_{(t-1)}$	1.357	1.662	6.043	6.459
	(2.014)	(1.821)	(4.346)	(5.852)
external star $_{(t-1)}$	-0.255	-0.740	0.226	-0.830
	(0.455)	(0.490)	(0.586)	(0.565)
perf_corp below hist_corp × *perf_unit below asp_internal* $_{(t-1)}$	7.671			
	(5.754)			
perf_corp below hist_corp × *perf_unit above asp_internal* $_{(t-1)}$		-17.655**		
		(5.648)		
perf_corp above hist_corp × *perf_unit below asp_internal* $_{(t-1)}$			-6.356	
			(4.483)	
perf_corp above hist_corp × *perf_unit above asp_internal* $_{(t-1)}$				0.793
				(1.562)
external star × *perf_unit below asp_internal* $_{(t-1)}$	0.985*		0.293	
	(0.404)		(0.448)	
external star × *perf_unit above asp_internal* $_{(t-1)}$		0.545^{+}		1.075**
		(0.325)		(0.409)
external star × *perf_corp below hist_corp* $_{(t-1)}$	10.233	-7.022		
	(7.139)	(5.915)		
external star × *perf_corp above hist_corp* $_{(t-1)}$			-8.776	-3.866
			(5.387)	(6.235)
perf_corp below hist_corp × *perf_unit below asp_internal* × *external star* $_{(t-1)}$	-17.551*			
	(8.651)			
perf_corp below hist_corp × *perf_unit above asp_internal* × *external star* $_{(t-1)}$		16.573**		
		(5.781)		
perf_corp above hist_corp × *perf_unit below asp_internal* × *external star* $_{(t-1)}$			10.564*	
			(5.364)	
perf_corp above hist_corp × *perf_unit above asp_internal* × *external star* $_{(t-1)}$				-3.424
				(2.151)
Observations	1105	1105	1105	1105

All control variables in Table 2.2 are included but not reported here.

Robust standard errors in parentheses; $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed)

Table 2.3b. Results of Conditional Fixed-effects Poisson Regression (Social)

DV = *num_acqu_unit*	Model 1	Model 2	Model 3	Model 4
perf_unit below asp_internal $_{(t-1)}$	-0.822^{+}	-0.024	-0.644	-0.040
	(0.462)	(0.306)	(0.452)	(0.299)
perf_unit above asp_internal $_{(t-1)}$	0.225	-0.094	0.232	-0.311
	(0.224)	(0.285)	(0.220)	(0.318)
perf_corp below social_corp $_{(t-1)}$	-10.494	3.969	-1.228	-0.785
	(9.305)	(6.243)	(3.445)	(3.287)
perf_corp above social_corp $_{(t-1)}$	4.135*	4.251*	9.500*	6.145
	(1.679)	(1.663)	(4.666)	(4.031)
external star $_{(t-1)}$	-0.270	-0.802	0.365	-0.625
	(0.452)	(0.512)	(0.648)	(0.629)
perf_corp below social_corp × *perf_unit below asp_internal* $_{(t-1)}$	10.357*			
	(4.741)			
perf_corp below social_corp × *perf_unit above asp_internal* $_{(t-1)}$		-13.032*		
		(6.089)		
perf_corp above social_corp × *perf_unit below asp_internal* $_{(t-1)}$			-4.064	
			(3.998)	
perf_corp above social_corp × *perf_unit above asp_internal* $_{(t-1)}$				0.838
				(2.149)
external star × *perf_unit below asp_internal* $_{(t-1)}$	1.036*		0.271	
	(0.405)		(0.444)	
external star × *perf_unit above asp_internal* $_{(t-1)}$		0.600^{+}		0.850*
		(0.339)		(0.337)
external star × *perf_corp below social_corp* $_{(t-1)}$	12.070	-4.175		
	(7.374)	(5.567)		
external star × *perf_corp above social_corp* $_{(t-1)}$			-7.656	-1.270
			(5.933)	(5.068)
perf_corp below social_corp × *perf_unit below asp_internal* × *external star* $_{(t-1)}$	-20.904*			
	(8.355)			
perf_corp below social_corp × *perf_unit above asp_internal* × *external star* $_{(t-1)}$		12.431*		
		(6.287)		
perf_corp above social_corp × *perf_unit below asp_internal* × *external star* $_{(t-1)}$			10.155^{+}	
			(5.300)	
perf_corp above social_corp × *perf_unit above asp_internal* × *external star* $_{(t-1)}$				-2.330
				(2.435)
Observations	1105	1105	1105	1105

All control variables in Table 2.2 are included but not reported here.

Robust standard errors in parentheses; $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed).

Table 2.4. An illustration of the interpretation of three-way interaction in Table 2.3a (Model 1)

case	*perf_corp below hist_corp*	*perf_unit below asp_internal*	*external star*	Predicted # of acquisition (fixed effects = 0)	p value
1	0.09	0	1	1.07	0.000
2	0.09	0	0	0.72	0.001
3	0.09	6	1	0.01	0.699
4	0.09	6	0	0.83	0.600
5	0	0	1	1.06	0.000
6	0	0	0	1.07	0.000
7	0	6	1	3.47	0.357
8	0	6	0	0.27	0.679

ESSAY 3: WHEN DOES THE PRE-ENTRY EXPERIENCE OF NEW VENTURES IMPROVE NEW VENTURE PERFORMANCE? A META-ANALYTICAL INVESTIGATION OF CRITICAL MODERATORS

ABSTRACT

While pre-entry experience is widely regarded as a critical asset that positively impacts new venture performance, empirical support is mixed. To address this inconsistency, we meta-analyze the empirical findings in 130 papers that examine the performance implications of pre-entry experience. We draw theoretically on the organizational learning literature to argue that the relationship between pre-entry experience and new venture performance will be contingent on the characteristics (i.e., levels and types) of pre-entry experience, the environmental context of the new venture, and the interaction between the two. In particular, we examine the effects of two levels of pre-entry experience (firm and founder), four types of founder-level pre-entry experience (entrepreneurial, managerial, industry, and functional experience), and whether the context of the new venture is low- versus high-technology. In the raw sample, the correlation between pre-entry experience and performance is only 0.06, with 0.01 for firm-level pre-entry experience and 0.07 for founder-level pre-entry experience. Once we account for the moderating effects, however, we find that, for example, firm-level pre-entry experience deployed in high-technology context has a 0.19 correlation with new venture performance, and founder-level entrepreneurial experience deployed in a low-technology context has a 0.25 correlation with new venture performance (statistically significant). These findings provide compelling new evidence for the importance of pre-entry experience and advance our understanding of the boundary conditions on the relationship between pre-entry experience and new venture performance.

INTRODUCTION

The pre-entry experience of a new venture refers to the "experience in related industries gained before entry into a focal industry" (Qian, Agarwal, & Hoetker, 2012: 1332). It is frequently heralded as an important asset that aides new venture performance by providing valuable knowledge and skills (Agarwal, Echambadi, Franco, & Sarkar, 2004; Balasubramanian, 2011; Chen, Williams, & Agarwal, 2012; Dencker, Gruber, & Shah, 2009; Tzabbar & Margolis, 2017). Although this argument is compelling, the empirical evidence is inconclusive. While many studies have shown a positive relationship between pre-entry experience and new venture performance (e.g., Agarwal et al., 2004; Balasubramanian, 2011; Dencker & Gruber, 2015), others have reported a negative relationship (e.g., Chen, 2013; Florin, Lubatkin, & Schulze, 2003; Shrader & Siegel, 2007), or no relationship at all (e.g., Lee, Lee, & Pennings, 2001; Stuart & Abetti, 1990). As a result, Delmar and Shane (2006: 216) conclude that "this pattern of empirical results makes it difficult to accept the hypothesis that founding team experience enhances new venture performance" and Ganco and Agarwal (2009: 229) conclude that "there is conflicting empirical evidence regarding the main effect of pre-entry experience on performance."

Our goal in this paper is to address this "serious shortcoming for the field of entrepreneurship" (Dencker & Gruber, 2015: 1035). We do not seek to develop a "new grand theory" of pre-entry experience. Rather, we seek a clear understanding of what the data in the current literature show about the relationship between pre-entry experience and new venture performance, and identify and test theoretically relevant boundary conditions to the relationship in a manner that will facilitate progress in this important body of entrepreneurship research.

As we see it, the inconclusive findings in the literature result from a set of empirical and theoretical challenges. First, existing estimation of the relationship between pre-entry experience and new venture performance is quite noisy. Most empirical studies of pre-entry experience are restricted to rather small

samples. In our census of studies in the literature, the small sample issue is particularly salient for studies focusing on founders' pre-entry experience, which has a median sample size of only 188. The sample size problem is compounded by the broad range of operationalizations of the pre-entry experience construct. Given these issues, it is not surprising that existing results based on a single study with a relatively small sample size may come to widely varying and even contradictory conclusions. To get a better understanding of the effect size of the relationship between pre-entry experience and new venture performance, we conduct a theoretically motivated meta-analysis that aggregates across a large number of studies and accounts for measurement and sampling errors, thereby facilitating a more accurate estimate of the effect size of the relationship.

The second challenge is that the pre-entry experience construct is quite heterogeneous, both in levels and types. In terms of levels, pre-entry experience of a new venture includes both *firm-level* and *founder-level experience* (Chen, Williams, & Agarwal, 2012; Qian, Agarwal, and Hoetker, 2012). Firm-level pre-entry experience is the background of a new venture (Klepper, 2004; Klepper & Simons, 2000), such as whether a new venture is a diversifying entrant or an independent start-up (e.g., Agarwal et al., 2004; Balasubramanian, 2011; Bayus & Agarwal, 2007). Founder-level pre-entry experience is the prior experience of the founding entrepreneurs in certain business activities or managerial roles before a new venture is established (Dencker, Gruber, & Shah, 2009; Dencker & Gruber, 2015). Relatively few efforts have been devoted to distinguishing the relationships of the two levels of pre-entry experience with new venture performance. Furthermore, founder-level pre-entry experience may be of four types: entrepreneurial, managerial, industry, and functional experience. While each of the four types of pre-entry experience has been frequently discussed in the existing literature, their comparative implications for new venture performance have not been systematically studied (Dencker & Gruber, 2015). To fill the gap, we examine the moderating effect of the founder-level (vs. firm-level) pre-entry experience, as well as the types of experience, on the relationship between pre-entry experience and new venture performance in an effort to see if doing so helps address the inconsistent empirical findings in the literature.

The third challenge is that the contexts in which the relationship between pre-entry experience and new venture performance is examined are quite heterogeneous. To assess the effect of the environmental context, we draw on the organizational learning literature to argue that the relationship between pre-entry experience and new venture performance is moderated not only by the new venture's environmental context, but also by its interactions with the different levels (firm versus founder) and types of pre-entry experience. The organizational learning literature has long focused on the moderating effect of the characteristics of experience (e.g., Argote, McEvily, & Reagans, 2003; Argote & Ophir, 2002) and the environmental context (e.g., Posen & Levinthal, 2012; Romme, Zollo, & Berends, 2010; Zollo & Winter, 2002) on the relationship between general experience and learning outcomes (typically outside of entrepreneurial settings). Recent developments in this literature point to the centrality of how the environmental context interacts with the characteristics of experience in influencing learning outcomes, as "experience interacts with the context to create knowledge" (Argote & Miron-Spektor, 2011: 1124). To address this challenge, we build on the organizational learning literature to argue that the environmental context and the levels and types of pre-entry experience will jointly influence new venture performance.

We conduct a meta-analysis of the empirical findings in 130 papers that investigate the association between pre-entry experience and new venture performance. Meta-analysis is a useful technique to derive the effect size of a relationship and examine the theory-guided moderating effects that are difficult to test in isolated empirical studies (Crook, Ketchen, Combs, & Todd, 2008; King, Dalton, Daily, & Covin, 2004). By meta-analyzing the findings in our sample, we derive the effect size of the main relationship between pre-entry experience and new venture performance and estimate the moderating effect of the characteristics (levels and types) of pre-entry experience. We also test the moderating effects of an important environmental factor, *low- versus high-technology industries,* and its interaction with the characteristics of pre-entry experience.

The meta-analytic results based on the raw sample show a positive and significant correlation between pre-entry experience on new venture performance of 0.06, with a correlation of 0.01 for firm-level pre-entry

experience and 0.07 for founder-level pre-entry experience. However, the estimated magnitude of the effect of pre-entry experience is sufficiently small that it could easily be insignificant (or reversed) in any single small sample study. Our moderating analysis shows that the relationship between pre-entry experience and new venture performance is much larger once we account for the moderating effects of the interactions between the environmental context and the levels and types of pre-entry experience. In particular, firm-level pre-entry experience deployed in a high-technology context has a correlation with new venture performance as high as 0.19, much higher than the firm-level experience deployed in a low-technology context (-0.00). Similarly, founder-level entrepreneurial experience deployed in a low-technology context has a 0.25 correlation with new venture performance, much higher than entrepreneurial experience deployed in high-technology context (0.15). Thus, by aggregating across many studies, and modeling how the environmental context of the new venture and the levels and types of pre-entry experience independently and jointly impact the magnitude and directionality of the pre-entry experience-new venture performance relationship, our study provides a theory-driven explanation which helps reconcile the equivocal findings in prior work.

The rest of this paper is organized as follows. In the next section, we review the literature on the relationship between pre-entry experience and new venture performance. We then discuss the potential moderating effects of the levels and types of pre-entry experience, the environmental context, and their interactions. Following that, we introduce the meta-analysis methods and present the meta-analytic results. Finally, we discuss the theoretical and managerial implications of our findings and highlight directions for future research.

THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

Review of the Pre-Entry Experience-New Venture Performance Relationship

Pre-entry experience, the experience or knowledge of a new venture that is gained before the new venture is established (Qian et al., 2012), is generally regarded as an important asset for new ventures. Pre-entry experience can provide new ventures with a variety of knowledge, which may be useful in identifying new opportunities (Gruber, MacMillan, & Thompson, 2008), obtaining external financing (Hsu, 2007), building social relationships (Dencker & Gruber, 2015; Gimeno et al., 1997), and managing ongoing activities (Dencker & Gruber, 2015). The variety of knowledge can enhance new ventures' problem-solving competencies and enable new ventures to deliver products or services with lower cost and/or higher quality (Eisenhardt & Schoonhoven, 1990; Shrader & Siegel, 2007). As such, pre-entry experience is argued to have a positive relationship with new venture performance.

Empirically, as shown in panel A of Table 3.1, which includes an overview of results from a subset of representative studies, many studies have reported a positive relationship between pre-entry experience and new venture performance. For instance, Agarwal et al. (2004) find that, in the disk drive industry, spin-outs that have more pre-entry experience have higher survival chances than *de novo* entrants. Haber and Reichel (2007), using data on small tourism ventures in Israel, find a significant and positive relationship between entrepreneurial experience and new venture performance. Similarly, by surveying the Chinese entrepreneurs in small and medium sized firms in Singapore, Lee and Tsang (2001) find a positive relationship between pre-entry experience and venture growth. Thus, the extant literature is largely premised on the following (baseline) hypothesis:

Hypothesis 0. Pre-entry experience is positively related to new venture performance.

While the theoretical argument that pre-entry experience relates positively to new venture performance is compelling, a number of studies have failed to find support for this prediction (see Panel B of Table 3.1). For instance, Florin et al. (2003) find that entrepreneurial and industry experience negatively relates to the return on sales, Chen (2013) finds that entrepreneurial experience negatively relates to the early performance of new ventures, Shrader and Siegel (2007) find that industry experience has a negative relationship with new ventures' profit and sales growth, and Tornikoski and Newbert (2007) find a non-significant relationship between industry experience and various new venture outcomes. The inconsistent findings suggest that the relationship between pre-entry experience and new venture performance is not unconditional.

[Insert Table 3.1 about here]

To address the mixed findings on the relationship between pre-entry experience and new venture performance, extant studies have examined the boundary conditions of the relationship. Building on the detailed archive data of the new entrants into certain industries, or the survey data of the entrepreneurs, the extant studies have identified various moderators at both firm and environmental levels. For example, at the firm level, Bayus and Agarwal (2007) find that entry timing matters for the relationship between pre-entry experience and firm survival. At the environmental level, the existing literature has identified the moderating effects of, for example, technology regime shift (Chen, Williams, & Agarwal, 2012), industry life cycle (Agarwal & Bayus, 2002), and contextual similarities (Eesley & Roberts, 2012; Toft-Kehler, Wennberg, & Kim, 2014; Zheng, Devaughn, & Zellmer-Bruhn, 2016).[14]

These studies enhance our understanding of the contingency nature of the relationship between pre-entry experience and new venture performance. However, they are subject to several limitations, and are unable

[14] Studies examining entrepreneurial human capital have identified other moderators including developed (vs. less developed) countries and national uncertainty avoidance culture (Mayer-Haug et al., 2013; Unger et al., 2011).

to fully address the mixed empirical results. Most of the extent studies do not distinguish firm-level pre-entry experience from founder-level pre-entry experience (Qian et al., 2012). Nor do they show consistent findings on the relative relationships of different types of pre-entry experience with new venture performance (Dencker & Gruber, 2015). Thus, we have limited understanding about, for example, whether the performance implication of founder-level pre-entry experience is similar to that of firm-level pre-entry experience, or which type of pre-entry experience (e.g., entrepreneurial, industry) has a greater relationship with new venture performance. Moreover, we do not fully understand how different environmental contexts impact estimates of the contribution of pre-entry experience to performance. For example, even studies examining the role of high-tech context come to widely varying conclusions about its impact on the merits of pre-entry experience.[15] While studies in different industry contexts may increase generalizability, they confound our diagnosis of the causes of the inconsistent findings. These issues are compounded by the fact that sample sizes tend to be small. The median sample size (the number of new entrant firms) for studies focusing on founder-level pre-entry experience is 188, while the sample size is 392 for studies focusing on firm-level pre-entry experience. These sample sizes may be too small to get consistent estimates of the relationship between pre-entry experience and new venture performance given this heterogeneity in construct definitions. We seek to make further progress, not only via a meta-analysis that can aggregate across many small sample studies, but also by theorizing how different levels and types of pre-entry experience relate to new venture performance.

Moderating Effects of Different Levels and Different Types of Pre-entry Experience

Pre-entry experience is a comprehensive construct. By definition, any experience that is gained in related industries before the new venture is established and transferred to the new venture can be called pre-entry

[15] While Kato & Honjo (2015) find that the relationship between pre-entry experience and new venture performance is higher in high-technology than in low-technology context, Unger et al. (2011) find a non-significant moderating effect of high-technology context.

experience. Thus, based on the different pre-entry activities that the founders or parent firms of a new venture have experienced, scholars may operationalize pre-entry experience by different levels (individual vs. firm-level) and different types (e.g., entrepreneurial experience, managerial experience). If different levels or types of pre-entry experience relate heterogeneously to new venture performance, it is not surprising to observe different or even contradictory findings on the pre-entry experience-new venture performance relationship. Thus, it is important to understand the roles that different levels and types of pre-entry experience play in the relationship between pre-entry experience and new venture performance.

Firm-level versus founder-level pre-entry experience: We first analyze different levels of pre-entry experience. According to Chen, Williams, & Agarwal (2012) and Qian, Agarwal, & Hoetker (2012), pre-entry experience can be distinguished as firm-level and founder-level experience. Strictly speaking, an individual's experience is different from a firm's experience. However, because founders can transfer their individual experience to new ventures with a paucity of experience, their pre-entry experience can act as a quasi-experience of the new venture.

Firm-level pre-entry experience has been traditionally investigated in the industry evolution literature (Bayus & Agarwal, 2007; Helfat & Lieberman, 2002). Studies in this literature typically define pre-entry experience by the background or type of new ventures (e.g., Klepper, 2004). They identify two main types of new ventures: (1) new ventures established either by the incumbent firms in other industries (i.e., diversifying entrants) or by founders that inherit the experience/knowledge endowments from the incumbent firms in the same industry (i.e., spin-outs); (2) independent start-ups lacking such experience endowments. Assuming that the former type of new ventures generally have more pre-entry experience than the latter type, many studies have examined how the two types of new ventures differ in survival and economic performance (e.g., Agarwal et al., 2004; Balasubramanian, 2011; Bayus & Agarwal, 2007; Klepper & Simons, 2000).

In contrast, founder-level pre-entry experience is traditionally investigated in the entrepreneurship literature, particularly the entrepreneurial human capital literature (Dencker et al., 2009; Gimeno et al., 1997). Studies in this literature define pre-entry experience by the amount of the founders' prior experience. These studies measure the founder's pre-entry experience by, for example, the number of years that a founder has worked in related industries, or the number of new ventures with which the founders have been involved prior to entry. They then examine the association between the founder's pre-entry experience and new venture performance (e.g., Chen, Kor, Mahoney, & Tan, 2017; Dencker, Gruber, & Shah, 2009; Dencker & Gruber, 2015; Gimeno, Folta, Cooper, & Woo, 1997).

Though the existing literature has examined the performance implications of both firm-level and founder-level pre-entry experience, few studies have discussed the relative effects of the two levels of pre-entry experience. To fill the gap, we argue that firm-level pre-entry experience may relate differently to new venture performance from founder-level pre-entry experience. Although both firm-level and founder-level pre-entry experience can provide important knowledge and skills to new ventures, Qian et al. (2012) argue that firm-level pre-entry experience includes integrative firm-level capabilities such as the routines and procedures that are not captured by founder-level pre-entry experience. Similarly, Chen et al. (2012) argue that firm-level pre-entry experience include integrative knowledge and transformation experience, which provides both strategic and structural flexibility to deal with the impediments to growth. Though founders can indirectly transfer some routines from their former employers to the new venture, the extent of such transfer may be smaller than that from entrants directly endowed by parent firms. Thus, firm-level pre-entry experience may have a higher correlation with new venture performance than founder-level pre-entry experience. Accordingly, we propose:

> *Hypothesis 1: firm-level pre-entry experience has a higher correlation with new venture performance than founder-level pre-entry experience.*

Types of pre-entry experience. Pre-entry experience differs not only in levels, but also in types. Compared to firm-level pre-entry experience, there are more types of founder-level pre-entry experience discussed in the existing literature. For instance, while firm-level pre-entry experience is generally operationalized as a dichotomous variable (Qian et al., 2012), founder-level pre-entry experience has been operationalized as various experience such as entrepreneurial, managerial, industry, technical, finance experience (e.g., Gruber et al., 2012). As such, we focus on different types of founder-level pre-entry experience. In particular, we define the types of founder-level pre-entry experience by the different activities through which experience is gained. Entrepreneurs may gain experience via involvement in establishing new ventures, taking managerial roles, working in related industries, or working in functional roles (e.g., R&D, marketing).

Accordingly, we identify four main types of founder-level pre-entry experience, i.e., entrepreneurial, managerial, industry, and functional experience. The four types of pre-entry experience may have different relationships with organizational outcomes. Gruber et al. (2012), for instance, divide founder-level pre-entry experience into entrepreneurial, managerial, and functional (marketing and technological) experience. They find that these different types of pre-entry experience differently impact opportunity identification. Regarding the performance implications of the founder-level pre-entry experience, many studies empirically control for the effects of various types of founder-level pre-entry experience (e.g., Batjargal, 2007; Santarelli & Tran, 2013; Stuart & Abetti, 1990; Weterings & Koster, 2007). However, the theory development on the relative effects of different types of pre-entry experience is often omitted, "an omission that touches on debates in the literature regarding which type of knowledge is most effective in entrepreneurial endeavors" (Dencker & Gruber, 2015: 1040). Consequently, we lack theory on the relative effects of the different types of pre-entry experience. As such, our theoretical analysis for this section is mainly *exploratory*.

Theoretically, the existing literature has focused on two particular conceptual differences between the different types of founder-level pre-entry experience. First, it has been argued that pre-entry experience can

be distinguished based on whether it embodies specialized expert knowledge or generalized knowledge of how to organize specialized knowledge (Alvarez & Busenitz, 2001; Kirzner, 1979). For instance, in distinguishing entrepreneurial, managerial, and functional experience (i.e., marketing and technological), Gruber et al. (2012) argue that both entrepreneurial and managerial experience reflect more generalized knowledge, whereas functional experience is more specialized. While generalized knowledge is beneficial for new ventures to identify opportunities and generate economic returns (Gruber et al., 2012), specialized knowledge helps new ventures develop products or services more efficiently (Matusik & Fitza, 2012). Thus, it is theoretically unclear whether or not generalized knowledge has a stronger relationship with new venture performance than specialized knowledge. In a recent study, Dencker and Gruber (2015) suggest that the relative effects of generalized and specialized knowledge may depend on the riskiness of the tasks. Consistent with the generalized-specialized knowledge notion, they suggest that managerial experience is more generalized than industry experience because industry experience makes founders more likely to be "entrenched in their industry-specific paradigms" (p1040). As such, they argue that managerial experience is better suited than industry experience in addressing riskier tasks because generalized managerial experience enables founders to identify a greater range of actions and makes them less likely to be cognitively overwhelmed by the various task demands.

Second, different types of pre-entry experience may also be distinguished based on their fungibility, i.e., whether certain pre-entry experience can be applied "more broadly in many environmental settings" or are "specific to particular settings" (Helfat & Lieberman, 2002: 733). Helfat and Lieberman (2002) argue that industry experience (e.g., knowledge on industry conditions and buyer/supplier relationships) and functional experience (e.g., marketing knowledge) are less fungible than managerial experience (e.g., knowledge about managing multiple businesses). Although it is argued that fungible resources are beneficial to new venture performance (Sapienza, Autio, George, & Zahra, 2006), the existing literature has also shown that less fungible knowledge endowments can improve new venture performance as long as the context of the new venture is close to the context in which the knowledge endowment is accumulated

(Eesley & Roberts, 2012; Toft-Kehler et al., 2014). Thus, it is theoretically unclear whether less-fungible pre-entry experience (e.g., industry and functional experience) outperforms more-fungible pre-entry experience (e.g., managerial experience).

Empirically, extant studies have reported inconsistent findings on the relative effects of different types of pre-entry experience. For instance, Stuart and Abetti (1990) find that entrepreneurial experience, rather than managerial, industry, and functional experience, is positively related to new venture performance. Weterings and Koster (2007) find that entrepreneurial experience improves the innovative performance of a new venture, but industry and managerial experience has no significant relationship with innovative performance. However, Santarelli and Tran (2013) find that industry experience, rather than entrepreneurial experience, improves the profitability of new ventures. Dencker and Gruber (2015) find that, while managerial experience improves new venture revenue, industry experience has no significant relationship with revenue.

In sum, although we propose that different types of pre-entry experience may moderate the relationship between pre-entry experience and new venture performance, we have no *a priori* theoretical reason to believe that one particular type of pre-entry experience will have a more or less positive relationship with new venture performance than any other type of pre-entry experience. As such, we do not offer directional hypotheses for the moderating effects of the different types of pre-entry experience. Instead, we propose a non-directional hypothesis that predicts heterogeneity in effect sizes:

> *Hypothesis 2. The effect of founder-level pre-entry experience on new venture performance is different across different types of pre-entry experience.*

Moderating Effects of the Interactions between Environmental Context and the Levels and Types of Pre-entry Experience

We rely theoretically on the organizational learning literature to argue that the relationship between pre-entry experience and new venture performance is influenced by the environmental context and its interaction with the characteristics (levels and types) of pre-entry experience. Recent developments in the organizational learning literature have recognized that the environmental context of the firm influences the relationship between experience and organizational outcomes (Argote, 2012). In particular, Argote and Miron-Spektor (2011) develop a theoretical framework to analyze how the environmental context impacts the process of learning from experience. In this framework, the environmental context (e.g., industry, institutions) in which a firm is embedded is highlighted as an important factor influencing the process of learning from experience. Similarly, Posen and Levinthal (2012) argue that the performance implications of organizational learning depend on the level of environmental dynamism. Romme et al. (2010) show that knowledge and routines may have different effects on dynamic capabilities as the level of environmental dynamism changes. Thus, drawing on the theoretical basis of the organizational learning literature, we argue that the relationship between pre-entry experience and new venture performance will be moderated by the environmental context of the new venture.

While the set of potentially relevant environmental factors is large, we are constrained, methodologically, by our meta-analytic approach. As a method to quantitatively integrate existing findings (Eden, 2002), meta-analysis relies on the information available in prior studies. We cannot examine the effects of the variables whose information cannot be consistently derived from prior research. Consequently, we focus on one dimension of environmental context, i.e., whether the industries of the new ventures are *high-technology*. In the following section, we discuss theoretically the moderating effect of the environmental context, and its interactions with the levels and types of pre-entry experience.

High-technology industry context. The environmental context can influence the relationship between pre-entry experience and new venture performance by influencing the value of pre-entry experience, which may be eroded in a fast-changing environment. We argue that the relationship between pre-entry experience and new venture performance is weaker in high-technology industries than in low-technology industries. Compared to low-technology industries, high-technology industries are more innovative and dynamic (Kato & Honjo, 2015; Thornhill, 2006; Unger et al., 2011), as the pace of technological change is much faster (Weiss & Heide, 1993). Indeed, as Bourgeois and Eisenhardt (1988) have indicated, technological substitution in terms of product standards and features occurs quite frequently in high-technology industries. The high-paced rate of change makes pre-entry experience on products, technologies, and markets more likely to become obsolete (Bahrami & Evans, 1995; Von Hippel, 1986), and its value for a new venture may be eroded (Batjargal, 2007; Bayus & Agarwal, 2007). Applying obsolete pre-entry experience to solve current problems may even harm new venture performance. Holbrook, Cohen, Hounshell, and Klepper (2000), for example, document that pre-entry experience enhances the competitive advantage of new ventures when serious technological changes are absent; however, pre-entry experience is less useful when environmental changes render experience obsolete. Thus, pre-entry experience may have a weaker relationship with new venture performance in high-technology industries. Accordingly, we propose:

> *Hypothesis 3. The relationship between pre-entry experience and new venture performance is lower in high-technology industries than in low-technology industries.*

Interaction between experience levels and environmental context. In addition to influencing the relationship between pre-entry experience and new venture performance directly, the organizational learning literature suggests that the environmental context may interact with the characteristics of pre-entry experience in influencing the relationship. Argote and Miron-Spektor (2011), for instance, argue that different types of experience are not equally valuable in promoting organizational learning in different contextual conditions. Following the organizational learning literature, we argue that relationship between

pre-entry experience and new venture performance is moderated by the interaction of high-technology industries and the levels and types of pre-entry experience. We discuss the interaction with levels of pre-entry experience below, and then turn to the interaction with types of pre-entry experience.

Firm-level pre-entry experience should have a larger impact on new venture performance in high-technology industries than founder-level pre-entry experience. In high-technology industries, the pace of change is fast, and both firm- and founder-level pre-entry experience is subject to obsolescence. However, the detrimental effect of experience obsoleteness may be less severe for firm-level pre-entry experience than for founder-level pre-entry experience. Firm-level pre-entry experience includes integrative knowledge and transformational experience that may not be included in founder-level pre-entry experience (Qian et al., 2012). Such additional integrative knowledge and transformation experience enables new ventures to closely scan market and technology information and reorganize the new venture to incorporate such information to the pre-entry experience of the firm (Chen et al., 2012). This way, new ventures can enrich or modify their pre-entry experience to adapt to the changing environment. In contrast, the adaptation process of founder-level pre-entry experience is slower due to the lack of the integrative knowledge and transformational experience. As such, we argue:

> *Hypothesis 4: The negative moderating effect of high-technology industries on the relationship between pre-entry experience and new venture performance is weaker for firm-level than for founder-level pre-entry experience.*

Interaction between experience type and environmental context. In addition to the levels of pre-entry experience, environmental context also interacts with the different types of pre-entry experience to moderate the relationship between pre-entry experience and new venture performance. In particular, we propose that the environmental context may interact with the four types of founder-level pre-entry experience in influencing the pre-entry experience-new venture performance relationship. In other words,

the moderating effect of high-technology industries on the relationship between one type of pre-entry experience and new venture performance may be different from the moderating effect of high-technology industries on the relationship between another type of pre-entry experience and new venture performance. However, since extant theory suggests no dominant a priori prediction for directionality between different types of pre-entry experience and new venture performance (see Hypothesis 2), we provide a non-directional heterogeneity-based hypothesis:

> *Hypothesis 5. The moderating effect of high-technology industries on the relationship between pre-entry experience and new venture performance is different across different types of pre-entry experience.*

METHOD

Literature Search

We searched for *published* and *unpublished* studies related to pre-entry experience and new venture performance through December 2016 to construct the universe of the potential papers related to pre-entry experience, in three steps. First, we searched the title and the abstract of the articles in various databases, such as *ABI Inform, Business Source Complete, EconLit, Google Scholar, JSTOR, ScienceDirect*, and *SSRN*. We used the combinations of pre-entry experience (e.g., spin-outs, spin-offs, diversifying entrants, *de novo* entrants, *de alio* entrants, entrepreneurial experience, managerial experience, industry experience, functional experience), performance (e.g., profit, sales growth, business success), and new venture related terms (e.g., new venture, startup, entrepreneurial) as keywords.[16]

Second, we manually searched twelve leading journals in the fields of management, strategy, and entrepreneurship to identify relevant studies. These journals include: *Academy of Management Journal, Administrative Science Quarterly, Organization Science, Strategic Management Journal, Journal of Management, Journal of Management Studies, Journal of Business Venturing, Strategic Entrepreneurship Journal, Research Policy, Entrepreneurship Theory and Practice, Small Business Economics, and Journal of Small Business Management.*

Third, we checked the references and citations of all included papers and the recent review papers related to pre-entry experience (e.g., Agarwal & Braguinsky, 2015; Klepper, 2009; Klotz et al., 2014; Mannor et

[16] Business closure related variables, such as failure, survival, and exit, are not used as a performance measure in this study because many of the studies using closure variables did not distinguish failed and successful closure, making the results difficult to interpret.

al., 2017; Mayer-Haug et al., 2013; Unger et al., 2011). Studies missing in the first two steps were added. In total, the literature search process yields 1459 studies.

Inclusion Criteria

We then searched within this supersample of 1459 studies to identify those that are specifically related to the relationship between pre-entry experience and new venture performance. To be included in the meta-analysis, the identified studies need to meet each of the following five criteria. First, the research settings of the included studies should concern new venture performance. Second, the selected studies should be related to the firm-level or founder-level pre-entry experience. Studies investigating only, for example, the experience of individual employees were excluded. Third, the included studies must be quantitative. Conceptual studies, case studies, and review papers were excluded. Fourth, the included studies must provide the minimum information required by meta-analysis, i.e., the sample size and correlation between pre-entry experience and new venture performance. Twenty studies that did not provide adequate information (e.g., correlation matrices were missing) were excluded. We contacted the authors of the papers which did not report the effect size information. Among the 22 authors we contacted, we received the correlation matrix of seven papers, which were included in our analysis. Finally, we checked the independence of the samples by checking whether the included studies used the same sample and the same relationship to ensure that correlations were not double counted. Applying the five criteria resulted in a final sample of 130 papers.

Effect Sizes and Variables

In meta-analytic studies, the dependent variable is typically the correlation between two constructs of interest, in our case, pre-entry experience and new venture performance. In the discussion below, we follow convention by referring to this as the "effect size." We then proceed to discuss the variables that moderate the effect size. Following standard practice (Lipsey & Wilson, 2001), one of the authors and a graduate

assistant developed a coding protocol by jointly coding all variables in 15 randomly selected studies to record the theoretical and methodological features of the studies. We then independently coded the rest of the studies. The mean interrater reliability between one of the authors and the graduate assistant was 0.96 and all discrepancies were subsequently resolved by discussion.

Effect size. Following convention in meta-analysis, the bivariate correlations between pre-entry experience and new venture performance were used as the effect size of the relationship. Pre-entry experience is measured as, for example, the number of years of experience in an industry, the number of, or tenure in, prior new ventures, and the number of, or tenure in, prior managerial positions. New venture performance is measured as, for example, revenue, profit, sales growth, and employee growth. Consequently, each study reports at least one, and possibly multiple, effect sizes reflecting correlations between different measures of pre-entry experience and new venture performance.

To obtain effect size information, we coded the sample size and the bivariate correlation for each study in the sample. Most of the studies in the sample rely on objective measures of pre-entry experience. A small number of studies used survey based subjective measures of pre-entry experience. If such a study reports the reliabilities of the independent and/or dependent variables, we adjusted the correlations following standard practice (Hunter & Schmidt, 2004).

Levels of pre-entry experience. Following Qian et al. (2012), we identified two levels of pre-entry experience i.e., firm-level and founder-level. We created one dummy variable, *founder_level* (= 1 if the pre-entry experience is measured by the founders' or founding teams' pre-entry experience; = 0 if the pre-entry experience is measured based on the distinction between independent start-ups vs. diversifying entrants or spinouts).

Type of founder-level pre-entry experience. In line with the existing literature (e.g., Dencker & Gruber, 2015; Gruber et al., 2012), we distinguished four types of founder-level pre-entry experience, i.e., entrepreneurial, industry, managerial, and functional experience. In the meta-analysis, we included four dummies for each type of pre-entry experience: *entrepreneurial_exp* (= 1 if the pre-entry experience is entrepreneurial or startup experience; = 0 otherwise), *industry_exp* (= 1 if the pre-entry experience is industry experience; = 0 otherwise), *managerial_exp* (= 1 if the pre-entry experience is managerial experience; = 0 otherwise), *and functional_exp* (= 1 if the pre-entry experience is in the functional areas such as marketing, R&D, technology, and finance; = 0 otherwise). If a study includes multiple pre-entry experience types, we include all of them in our meta-regression analysis.

High-technology industries. To decide whether a sample involved high-technology ventures or not, we relied on both the description of the empirical setting of the papers and a list of high-technology industries published by the Bureau of Labor Statistics (BLS) (Hecker, 2005). Specifically, we first created a variable related to research design, *single_industry* (= 1 if all firms in a study are in the same industry; =0 otherwise). If *single_industry* equals one and the industry is in the BLS's list, *high_tech* is coded as one (e.g., Bayus & Agarwal, 2007; Eisenhardt & Schoonhoven, 1990). If *single_industry* equals zero, i.e., a study includes multiple industries, *high_tech* is coded as one if (1) all of the industries are reported and in the BLS's list, or (2) the industry information is not reported but the paper claimed that its empirical setting is high-technology (e.g., Stam & Elfring, 2008). The excluded category (*single_industry* = 0, *high_tech* = 0) is the case that a study included multiple industries, but either all industries are low-technology, or it is impossible to judge whether these industries are all high-technology.

Control variables. Methodological factors may be important sources of the heterogeneous findings across studies. Thus, we need to control for the influence of the methodological factors to examine the moderating effects of theoretical factors. Specifically, we included four groups of methodology related control variables. First, we controlled for the different measures of new venture performance. We distinguished between new

venture performance measured by *sales* (revenues, incomes), *profit*, or *growth* (e.g., sales growth, profit growth, asset growth, and employment growth).

Second, we controlled for the measures of pre-entry experience. If it is measured by the number of years, *exp_by_year* was coded as one and zero otherwise.

Third, we controlled for the factors related to research design. *Ceteris paribus*, studies including both surviving and failed ventures tend to have lower selection bias than those including only surviving ventures (Chrisman, McMullan, & Hall, 2005). Thus, we controlled for *failed_ventures_included*, which was coded as one when a study included failed ventures in its sample and zero otherwise. We controlled for whether a study is based on survey or archive data (*survey* = 1 if it is survey research; = 0 otherwise), and whether it is longitudinal or cross-sectional (*longitudinal* = 1 if it is longitudinal; = 0 otherwise). We also controlled for whether the firms in a study are from a single industry (if so, *single_industry* = 1), and whether the firms are from a developed country (if so, *developed_econ* = 1; = 0 otherwise).

Finally, we controlled for whether a study is published (if so, *published* =1; = 0 otherwise), and whether it is published in a top journal (if so, *top_journal* = 1; = 0 otherwise).[17] We also included a series of publication year dummies to control for the unobservable time effects.

Analytical Process

Following prior literature, our analysis proceeds in two stages. In the first stage, we investigate the overall relationship between pre-entry experience and new venture performance by conducting an *aggregation analysis*. We follow the classical method outlined by Hunter and Schmidt (2004) to calculate the aggregate

[17] The top journals in this study include: Academy of Management Journal (AMJ), Administrative Science Quarterly (ASQ), Management Science (MS), Organization Science (OS), and Strategic Management Journal (SMJ).

correlations. If a study reports more than one effect size, such as multiple correlations between multiple types of pre-entry experience and multiple types of new venture performance, we follow the Hunter and Schmidt's (2004: 435) method in calculating the linear composite correlations between the composite of pre-entry experience variables and the composite of performance variables.

In the second stage, we investigate the moderating effects of the independent variables by using *meta-regression* analysis (e.g., Stanley & Jarrell, 2005).[18] Note that in meta-regression analysis the dependent variable is the effect size (i.e., correlation), rather than the focal variable. As recommended by Bijmolt and Pieters (2001), we use hierarchical modeling to account for the multilevel data structure because new ventures are nested within studies, which in turn are nested within countries (Raudenbush & Bryk, 2002; Snijders & Bosker, 2011).[19] Moreover, because studies with larger sample sizes generally have lower sampling error and thus more stable estimates, standard practice is to more highly weight these studies in the analysis (Huffcutt, 2002; Hunter & Schmidt, 2004). Thus, we included the ratio of sample size to the total sample size as the sampling weight in meta-regression analysis. Because the distribution of the effect sizes (i.e., correlations) are not necessarily normal, we followed prior literature (Hedges & Olkin, 1985) and applied Fisher's z transformation to correct for skewness in the distribution of the correlations. We used the transformed effect size as the dependent variable in the meta-regression analysis.

[18] Another method to examine moderating effects in meta-analysis is subgroup analysis (Hunter & Schmidt, 2004). Subgroup analysis examines one moderator at one time, leaving the influence of other variables uncontrolled (Geyskens et al., 2009). Thus, meta-regression analysis, which controls the influence of various variables, is typically. The subgroup analysis is available upon request. Our results are robust to this alternative method.

[19] Unlike aggregation analysis in the first stage, meta-regression analysis does not require us to aggregate the multiple effect sizes in the same study as one effect size. Thus, the samples sizes in meta-regression analysis is larger.

RESULTS

Aggregation Analysis Results for the Baseline Hypothesis

Table 3.2 presents the results of the overall relationship between pre-entry experience and new venture performance. *N* is the aggregate number of observations in the underlying studies, and *K* is the number of studies. The effect size, $\bar{r}$, is the sample size weighted correlation and ρ is the sample size weighted and measurement error corrected correlation. Since $\bar{r}$ is almost identical to ρ in all instances, we discuss the former. The correlations ($\bar{r}$) between pre-entry experience and new venture performance is 0.06 (95% C.I. = 0.01/0.11), suggesting that as pre-entry experience increases by 1 SD, new venture performance on average increases by 0.06 SD. This result provides support for the baseline hypothesis H0 that pre-entry experience is positively related to new venture performance. That said, the average effect size is fairly small, and thus, it is not surprising that we observe different or even contradictory findings across studies.

In addition, the results in Table 3.2 suggest that the relationship between pre-entry experience and new venture performance is heterogeneous across different levels and types of pre-entry experience. In particular, the correlation ($\bar{r}$) between firm-level pre-entry experience and new venture performance is only 0.01, much smaller than the correlation between founder-level pre-entry experience and new venture performance, which is 0.07.[20] Regarding the four types of founder-level pre-entry experience, we find that new venture performance is significantly and positively related to entrepreneurial, managerial, and functional experience ($\bar{r}$ = 0.11, 0.08, and 0.15 respectively). While new venture performance is positively related to industry experience ($\bar{r}$ = 0.08), the 95% C.I. of $\bar{r}$ marginally includes zero. These results suggest a larger

[20] The number of studies for firm-level pre-entry experience looks smaller than that for founder-level pre-entry experience (9 vs. 125) because a majority of firm-level pre-entry experience studies focus on survival related measures rather than the economic performance related measures. Since we focus only on economic performance, a large portion of studies on firm-level pre-entry experience is excluded from our analysis.

heterogeneity in the effect sizes of the relationship between pre-entry experience and new venture performance.

We next examined the extent of heterogeneity in effect sizes across studies. The existence of heterogeneity may be driven by artifacts (e.g., sampling and measurement error) or by theoretical moderating variables. Following standard practice (Geyskens, Krishnan, Steenkamp, & Cunha, 2009; Hunter & Schmidt, 2004), we used two methods to assess heterogeneity. First, we used a chi-square (χ^2) test to assess the extent to which the variance of effect size is beyond sampling error variance (Hunter & Schmidt, 2004). Significant values of χ^2 indicate the existence of within-group heterogeneity (Vanneste, Puranam, & Kretschmer, 2014). Results in Table 3.2 show that the χ^2 values are significant for all relationships except the firm-level pre-entry experience-new venture performance relationship. Second, we calculated the percentage of the variance explained by artifacts, i.e., the sampling and measurement errors. Results in Table 3.2 indicate that statistical artifacts explain less than 50% of the observed variance of the raw correlations of all relationships.

From the above heterogeneity analysis, we conclude that there exist theoretical moderating variables that may explain the heterogeneous findings on the relationship between pre-entry experience and new venture performance. In particular, as a rule of thumb, when the percentage of variance explained by artifacts is less than 75%, theoretical moderators exist (Hunter & Schmidt, 2004). Given that the variation explained by artifacts is well below 50% in our sample, in the next section, we undertake moderating analysis to answer the rest of our research questions.

[Insert Table 3.2 about here]

Moderating Analysis Results for the Main Hypotheses

In this section, we present the meta-regression results of the moderating effects of the characteristics (levels and types) of pre-entry experience and the environmental context. We first present results on the correlations between all variables used in the meta-regression estimation. We then show the direct effects of the founder-level pre-entry experience (vs. the firm-level), the four types of founder-level pre-entry experience, and the environmental context. Finally, we show the effects of the interactions between the environmental context and the levels and types of pre-entry experience.

Summary statistics of variables in the meta-regression estimation are shown in Tables 3.3a and 3.3b. The Fisher's z transformed effect size, *r*, is labeled *zr* in the two tables. Most correlations are relatively low with two exceptions: the correlations between *failed_ventures_included* and *founder_level* (-0.53), and the correlation between *failed_ventures_included* and *longitudinal* (0.53). These relatively high correlations suggest that studies focusing on founder-level pre-entry experience tend to not include failed ventures in their sample, whereas this tendency is less severe in studies using longitudinal data. When we do not include *failed_ventures_included, or longitudinal,* or both as control variables in our estimation, the core results remain unchanged. Thus, multicollinearity does not appear to be a major concern.

[Insert Tables 3.3a and 3.3b about here]

Table 3.4 shows the results of the moderating effects of the characteristics of pre-entry experience and the environmental context. We start with Model 0, which presents the results on the effect size — the correlation between pre-entry experience and new venture performance, after controlling for the nested data structure. The constant, which represent the main effect, is significant and positive (β_0 = 0.04, p<0.001).

This value is similar to the main effect in Table 3.2 (0.06), providing further evidence for the baseline hypothesis.[21]

Model 1 shows the results of the control variables, plus the main effect of pre-entry experience. Once controls are included, the main effect of pre-entry experience becomes non-significant. Regarding the controls for the nature of the measure of new venture performance, we found that the coefficient on *sales* is significant and positive, whereas the coefficients on *profit, sales growth*, and *profit growth* are all marginally negative. The result suggests that studies tend to have higher effect sizes when they use sales to measure new venture performance. Thus, the choice of performance measures may have a substantial impact on the estimated pre-entry experience-new venture performance relationship. With respect to the measures of pre-entry experience, the coefficient on *exp_by_year* ($\beta = 0.04$, $p<0.01$) is significantly positive. This result suggests that studies measuring pre-entry experience by the number of years may report a higher correlation between pre-entry experience and new venture performance. With respect to the control variables related to research design and publication status, we find a significant and negative coefficient on *failed_ventures_included* ($\beta = -0.10$, $p<0.001$). This indicates that studies including failed ventures tend to report lower effect sizes. Thus, the studies that exclude failed ventures may overestimate the relationship between pre-entry experience and new venture performance.

We now turn to the results of the effects of our theoretical moderators. Model 2 shows the results of the moderating effects of the founder-level vs. firm-level pre-entry experience. In this model, firm-level pre-entry experience is treated as the reference group. Thus, the constant, -0.01, reflects a non-significant relationship between firm-level pre-entry experience and new venture performance after a series of variables are controlled. The coefficient on *founder_level*, which represents the difference between the effect sizes of the two levels of pre-entry experience, is significant and positive ($\beta = 0.08$, $p<0.001$),

[21] The value 0.04 reported in Table 3.4 (Model 0) is smaller than 0.06 reported in Table 3.2 because the sample weighting in meta-regression analysis is slightly different due to the hierarchical model structure.

suggesting that founder-level pre-entry experience has a much higher correlation with new venture performance (i.e., 0.07, $p>0.10$) than firm-level pre-entry experience (i.e., -0.01, $p>0.10$). This is opposite to Hypothesis 1, which argues for a greater relationship between firm-level experience and new venture performance.

Model 3 of Table 3.4 shows the results of the moderating effects of the four types of founder-level pre-entry experience and provides evidence in support of Hypothesis 2. Recall that the coefficients reflect the correlation between pre-entry experience and new venture performance. In this model, the coefficient on *founder_level* represents the difference between firm-level and founder-level pre-entry experience in terms of their relationships with new venture performance after the four types of founder-level pre-entry experience are controlled. The average correlation between founder-level pre-entry experience and new venture performance is the sum of the constant and the coefficient on *founder_level*, 0.24, which is jointly significant ($p<0.001$).

The coefficient on *entrepreneurial experience* reflects the difference between entrepreneurial and other types of founder-level pre-entry experience in their relationships with new venture performance. The estimated correlation between entrepreneurial experience and new venture performance can be calculated as the sum of the constant, the coefficient on *founder_level*, and the coefficient on *entrepreneurial experience*, 0.24, which is jointly significant ($p<0.001$). Likewise, we can calculate the estimated correlations between managerial, industry, and functional experience and new venture performance: 0.22 ($p<0.01$), 0.11 ($p>0.10$), and 0.18 ($p<0.05$) respectively.

We then examine whether these correlations are different from one another using a chi-square test. We find that the correlation of entrepreneurial experience is greater than managerial experience ($\chi^2 = 27.91$, $p<0.001$). The correlation of managerial experience is significantly greater than the correlations of both industry ($\chi^2 = 9.52$, $p<0.01$) and functional experience ($\chi^2 = 10.25$, $p<0.01$). The correlation of functional

experience with performance is greater than that of industry experience ($\chi^2 = 4.54$, $p<0.05$). Thus, it seems that entrepreneurial experience has the largest relationship with new venture performance, and managerial, functional, and industry experience follows. In sum, the results show that different types of pre-entry experience may have different relationships with new venture performance. Thus, Hypothesis 2 is supported.

In Model 4, the coefficient on high-technology industries is not significant. This result suggests that, after a series of control variables, high-technology industries may not have a direct influence on the pre-entry experience-new venture performance relationship, though we will show soon that it indirectly influences the relationship via interacting with the characteristics of pre-entry experience. Thus, Hypothesis 3, which predicts a negative moderating effect of high-technology industries, is not supported.

[Insert Table 3.4 about here]

The results in Model 5 of Table 3.4 show the influence of the interaction between high-technology industries and the levels of pre-entry experience. After adding the interaction to Model 4, the coefficient on *high-technology industries*, which is non-significant in Model 4, is significantly positive ($\beta = 0.14$, $p<0.01$), and the coefficient on the interaction is significantly negative ($\beta = -0.17$, $p<0.001$). This result suggests that the moderating effect of high-technology industries on the pre-entry experience-new venture performance relationship is significantly positive for firm-level pre-entry experience, but the moderating effect is much weaker for founder-level pre-entry experience. Thus, Hypothesis 4, which argues for a greater relationship between firm-level pre-entry experience and new venture performance in high-technology industries, is supported.

To examine the moderating effects of the interactions between high-technology industries and the four types of pre-entry experience, we add their interactions to Model 5, and the results are shown in Model 6. Among the four interactions, only the coefficient on the interaction between functional experience and high-

technology industries is significant. When examining the differences between the coefficients on the four interactions, we find that the difference between entrepreneurial and functional experience (χ^2 = 14.11, p<0.001), managerial and industry experience (χ^2 = 10.91, p<0.01), and managerial and functional experience (χ^2 = 6.39, p<0.05) are significantly different from each other. Thus, the moderating effect of high-technology industries varies across different types of founder-level pre-entry experience, and Hypothesis 5 is supported.

To better understand the interactions between high-technology industries and the characteristics of pre-entry experience, we calculated the correlations between the different levels and types of pre-entry experience and new venture performance in both high- and low- technology industries based on the results of Model 6. The results are shown in Table 3.5. The calculation of the correlations of, for example, functional experience, is as follows: We summed the constant (-0.00), the coefficient on *founder_level* (0.25), the coefficient on *functional experience* (-0.11) to get the correlation between functional experience and new venture performance in low-technology industries (i.e., 0.13). We then added the coefficient on *high_tech* (0.19), the coefficient on *founder_level*× *high_tech* (-0.24), and the coefficient on *functional exp.*× *high_tech* (0.10) to the correlation in the low-technology industries to get the correlation in the high-technology industries (i.e., 0.18).

[Insert Table 3.5 about here]

The results in Table 3.5 suggest that firm-level pre-entry experience has a higher correlation with new venture performance in high-technology (i.e., 0.19, p<0.01) than in low-technology industries (i.e., -0.00, p>0.10) based on a chi-square test. For founder level pre-entry experience, the results are more complicated. Similar to firm-level pre-entry experience, founder-level functional experience has a higher correlation with new venture performance in high-technology (i.e., 0.18, p<0.05) than in low-technology industries (i.e., 0.13, p<0.10). In contrast, founder-level entrepreneurial experience has a higher correlation with new

venture performance in low-technology context (i.e., 0.25, $p<0.01$) than in high-technology context (i.e., 0.15, $p<0.05$). Though managerial experience also has a higher correlation with new venture performance in low-technology context, the difference of correlations in high- and low-technology context is only marginally significant. We did not find a significant difference between high- and low-technology context in terms of the correlation of industry experience with new venture performance. These results show that the relationship between pre-entry experience and new venture performance is substantially influenced by the interactions of the characteristics of pre-entry experience and the environmental context of the new venture. These results provide further evidence in support of Hypotheses 4 and 5.

Robustness: Endogeneity and Non-publication Bias

Meta-analytic studies are subject to two substantial empirical biases, the first concerning endogeneity, and the second concerning nonpublication. In a meta-analytic study, we cannot fix these issues because our analysis must, by definition, employ the data and analysis of existing studies, but we can seek to assess the extent of the bias.

Endogeneity is a major concern in entrepreneurship and other literatures. To assess the endogeneity concern, we followed Frank (2000) in calculating the impact threshold for a confounding variable (known as the ITCV). The square root of ITCV indicates the minimum correlation between a confounding variable (*cv*) and an independent variable *x* or a dependent variable *y* that makes the significant impact of *x* on *y* non-significant. Thus, the higher the square root of ITCV, the less severe the endogeneity bias of the relationship between *x* and *y*. Results in Table 3.6 show that the square roots of ITCV range from 0.26 to 0.36 for the four types of founder-level pre-entry experience, but only 0.13 for firm-level pre-entry experience. Since correlations equal to or greater than 0.30 are medium effect sizes (Cohen, 1992), it seems that the

relationships between founder-level pre-entry experience and new venture performance are less plagued by endogeneity bias than firm-level pre-entry experience.

[Insert Table 3.6 about here]

Another main concern in meta-analysis studies is nonpublication bias. It refers to the extent to which the studies included in the meta-analysis are a biased sample of all existing published and unpublished studies (Hunter & Schmidt, 2004; Rosenthal, 1979). We employed two methods to assess the extent of nonpublication bias (Geyskens et al., 2009). First, we assessed the bias by calculating the "fail-safe N," the number of extra studies with null results that "bring the significance level for a set of studies down to the "just significant' level" (Hunter & Schmidt, 2004, p.499). The higher fail-safe N, the less severe the nonpublication bias. The results in Table 3.6 show that fail-safe N are high for the relationships between founder-level pre-entry experience and new venture performance (ranging from 201 to 632), but small for the relationship between firm-level pre-entry experience and new venture performance (i.e., 17).

Second, we used the "trim and fill" method to assess non-publication bias (Duval & Tweedie, 2000; Geyskens et al., 2009). Based on the assumption that studies are symmetrically distributed around the true mean of the effect sizes, this method calculates the number of the missing effect sizes. The greater the ratio of the missing effect sizes relative to the number of the effect sizes included in our meta-analysis, the more severe the nonpublication bias. Results in Table 3.6 suggest that the ratio is relatively small for founder-level pre-entry experience, but higher for firm-level pre-entry experience.

In sum, the results based on both methods suggest that the relationships between founder-level pre-entry experience and new venture performance have higher fail-safe N and lower missing ratio than the relationships between firm-level pre-entry experience and new venture performance. Thus, we are confident

that nonpublication bias is not serious for founder-level pre-entry experience, but less confident about the results for firm-level pre-entry experience.

DISCUSSION

Although pre-entry experience is generally viewed as a valuable asset that relates positively to new venture performance, empirical findings on the relationship are mixed (Delmar and Shane, 2006; Ganco and Agarwal, 2009; Dencker and Gruber, 2015). To address this gap, we draw on the organizational learning literature to develop and test a contingency perspective on the presumed relationship between pre-entry experience and new venture performance. Meta-analytic results based on a sample of 130 papers show that pre-entry experience is positively associated with new venture performance. The average effect size is a correlation of 0.06, with the correlation reaching as high as 0.25 for founder-level entrepreneurial experience deployed in a low-technology context. Thus, our results show strong evidence of the positive relationship between pre-entry experience and new venture performance. However, the relationship is quite nuanced in both magnitude and directionality, with results substantially influenced by the levels (firm v. founder) and types of pre-entry experience, and their interactions with the environmental context. Our findings extend the existing pre-entry experience literature in several ways as discussed below.

Theoretical Contributions

First, this study contributes to the pre-entry experience literature by integrating firm-level and founder-level pre-entry experience and highlighting the relative effect size of the two levels of experience. While both firm-level and founder-level pre-entry experience are under the same umbrella as pre-entry experience, they are traditionally examined in different streams of research. Firm-level pre-entry experience is mainly discussed in the industry evolution literature (e.g., Agarwal et al., 2004; Klepper, & Simons, 2000), whereas founder-level pre-entry experience is mainly discussed in the entrepreneurship and entrepreneurial human capital literatures (e.g., Dencker et al., 2009; Dencker & Gruber, 2015). Although both literatures highlight the importance of pre-entry experience, they rarely speak to each other (Qian et al., 2012). By decomposing pre-entry experience into the firm-level and founder-level, this study represents one of the first efforts to

integrate the two literatures to better understand the relationship between pre-entry experience and new venture performance. More importantly, we find that the effect size of the relationship between pre-entry experience and new venture performance is smaller for firm-level than for founder-level pre-entry experience. Though our moderating analysis results partially show how the relative effects change in different contexts, we invite future research to examine the relative effects of the two levels of pre-entry experience and identify additional boundary conditions.

Second, this study enriches our understanding of the relative relationships between different types of founder-level pre-entry experience and new venture performance. As pointed out by Dencker and Gruber (2015), the lack of work on the effect size ranking of different types of pre-entry experience is a critical limitation that may constrain our understanding of which type of pre-entry knowledge is more effective in entrepreneurial endeavors. Although many studies empirically control for the effects of various types of pre-entry experience (e.g., Batjargal, 2007; Santarelli & Tran, 2013; Stuart & Abetti, 1990; Weterings & Koster, 2007), few studies have developed a theory to understand why different types of pre-entry experience may have different implications for new venture performance. Our results contribute to this literature by showing that entrepreneurial experience has the largest relationship with new venture performance, followed by (in rank order) managerial, functional, and industry experience. These results provide support for Gruber et al.'s (2012) assertion that pre-entry experience may be of two sorts: specialized expert knowledge such as industry and functional experience and generalized knowledge such as entrepreneurial and managerial experience. Generalized knowledge is theorized to allow entrepreneurs to more "fully recognize the value inherent to their knowledge or how to deploy the knowledge to generate economic returns" (Gruber et al., 2012: 1431). Dencker and Gruber (2015) test this claim, in part, finding that managerial experience has greater effect on new venture performance than does industry experience. Our results extend this finding across two types of specialized and generalized experience. Nevertheless, more theoretical development is needed to understand the relative effects of the different types of experience.

Third, this study contributes to the pre-entry experience literature by highlighting the importance of the interaction between the environmental context and the characteristics (i.e., levels and types) of pre-entry experience. In addressing the mixed findings on the relationship between pre-entry experience and new venture performance, the existing literature has examined the moderating effect of the environmental context and some types of pre-entry experience in isolation. However, the effect of the interaction between the characteristics of pre-entry experience and the environmental context, which is suggested by the organizational learning literature (e.g., Argote & Miron-Spektor, 2011), has rarely been examined. We find a substantial effect of the interactions between the two types of moderators. For instance, we find that firm-level pre-entry experience has a larger relationship with new venture performance in high- than in low-technology industries. Founder-level functional experience deployed in high-technology industries has a larger relationship with new venture performance than when it is deployed in low-technology industries, entrepreneurial and managerial experience have larger relationships with new venture performance in low-technology industries. These findings suggest that environmental context is crucial, but only for certain levels or types of pre-entry experience.

Managerial Implications

This study has implications for both entrepreneurs and venture capitalists. The positive relationship between pre-entry experience and new venture performance depends on both the characteristics (i.e., levels and types) of pre-entry experience and the environmental context. Thus, venture capitalists who often rely on the pre-entry experience of the founders or the parent firms to judge the quality of new ventures (e.g., Mannor et al., 2017; Zacharakis & Meyer, 2000) should be aware of the contingency nature of any such positive relationships. For example, they may wish to weight founders' entrepreneurial and managerial experience more heavily than industry and functional experience because, as our results indicate, the former have a larger relationship with new venture performance. Entrepreneurs need to pay attention to the match between the characteristics of their experience and the environmental context. For instance, our results show that, while using functional experience in a high-technology context may increase new venture performance,

this effect is weaker when deployed in a low-technology context. Awareness of these nuanced patterns may help entrepreneurs make choices going forward.

Limitations and Future Research

This study is subject to several limitations, which point to important directions for future research. First and foremost, as a meta-analysis, the quality of our findings is fundamentally determined by the quality of the underlying studies. This is true for factors such as construct conceptualization, construct measurement, and sample representativeness. It is also true for causality. For reasons related to the challenges of data collection in the context of entrepreneurship, few studies are able to strongly show causality and the effect size used in meta-analytic studies is a bivariate correlation. Consequently, our meta-analysis must be considered as correlational rather than causal.

Second, we assume that the relationship between pre-entry experience and new venture performance is linear. Only a few studies have investigated the possibility of nonlinear relationships between pre-entry experience and new venture performance (e.g., Delmar & Shane, 2006; Toft-Kehler et al., 2014). Meta-analysis is limited in its ability to deal with a potentially nonlinear relationship, not only because few of the underlying studies examine nonlinear relationships, but also because they may not report the squared term in the correlation table. It is possible that the inconsistent findings on the relationship between pre-entry experience and new venture performance reflect, in part, the nonlinear nature of the relationship. Future research might combine both the contingency perspective and the nonlinear possibility to deepen our understanding of the relationship between pre-entry experience and new venture performance.

Third, our selection of moderators is constrained by our meta-analysis approach. In addition to levels and types, there are other ways to characterize pre-entry experience (e.g., failure vs. success experience). Similarly, the environmental context includes more dimensions than low- versus high-technology industries.

Thus, we focus only on a small set of potential moderators. Future research could extend our study by examining more boundary conditions of the relationship between pre-entry experience and new venture performance.

Finally, although we tried our best to collect both published and unpublished papers, it is inevitable that some relevant studies have not been identified.

Conclusion

This study contributes to the strategy and entrepreneurship literatures by using meta-analysis to examine the relationship between pre-entry experience and new venture performance. Our meta-analytic results show support for the positive relationship between pre-entry experience and new venture performance. More importantly, we find that the positive relationship is moderated by the levels and types of pre-entry experience and their interactions with the environmental context, and thus, we highlight boundary conditions under which pre-entry experience improves new venture performance. The relationship between pre-entry experience and new venture performance is multifaceted, and we hope that this meta-analysis spurs further research that delves deeper in understanding this important relationship.

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Table 3.1. Representative Studies on the Pre-Entry Experience-New Venture Performance Relationship

Study	Journal	Country	Industry	Endowment type	Performance	Findings
Panel A. Findings supporting a positive relationship						
Agarwal et al., 2004	AMJ	U.S.	Disk drive	Technology and market experience	Survival, sales, growth	Technology know-how increases survival; marketing know-how has no significant impact on survival.
Baum, Bird, & Singh, 2011	PP	U.S.	Printing & graphics	Startup and industry experience	Employment and sales growth	Both startup and industry experience are positively related to growth.
Box, Watts, & Hisrich, 1994	JBV	U.S.	Manufacturing	Startup and industry experience	Employment growth	Both startup and industry experience are positively related to growth.
Capelleras, Greene, Kantis, & Rabetino, 2010	JSBM	South America	N.A.	Startup and industry experience	Employment growth	Startup experience is positively related to venture growth; industry experience has no significant impact on growth.
Chaganti & Schneer, 1994	JBV	U.S.	Manufacturing and service	Industry experience	ROA and sales	Industry experience is positively related to ROA, but has no significant impact on sales.
Chandler & Lyon, 2009	ETP	U.S.	Manufacturing, service, and else	Industry experience	Sales growth	Industry experience is positively related to sales growth.
Chrisman et al., 2005	JBV	U.S.	Manufacturing, service, and else	Prior experience	Sales and employment	Prior experience is positively related to both sales and employment.
Dencker & Gruber, 2015	SMJ	Germany	Manufacturing, service, and else	Startup, industry, and managerial experience	Revenue	Industry experience has positive, managerial experience has marginal, and self-employment experience has no significant relation with revenue.
Eesley & Roberts, 2012	SEJ	U.S. and others	Manufacturing, service, and else	Startup experience	Revenue	Startup experience positively impacts revenue.
Eisenhardt, & Schoonhoven, 1990	ASQ	U.S.	Semiconductor	Industry experience	Sales growth	Industry experience positively impacts sales growth.
Haber & Reichel, 2007	JBV	Israel	Tourism	Startup experience	Revenue, profit, and growth	Startup experience positively impacts revenue, but has no significant impact on profit and growth.
Hmieleski & Baron, 2008	SEJ	U.S.	N.A.	Startup experience	Revenue and employment growth	Startup experience has no significant impact on growth.
Hmieleski & Baron, 2008	AMJ	U.S.	N.A.	Startup experience	Revenue and employment growth	Startup experience is positively related to both revenue and employment growth.

Honig, 1998	JBV	Jamaica	High- and low-technology	Industry experience	Profit	Industry experience positively impacts monthly profit.
Honig & Karlsson, 2004	JoM	Sweden	Manufacturing, service, and else	Startup and managerial experience	Profit	Startup experience positively impacts profit, but not on survival; managerial experience has no significant impact on neither survival nor profit.
Kor, 2003	OS	U.S.	High-technology	Managerial experience	Sales growth	Managerial experience positively impacts sales growth.
Lee, Lee, & Pennings, 2001	SMJ	Korea	High-technology	Industry experience	Sales growth	Industry experience has no significant impact on sales growth.
Lee & Tsang, 2001	JMS	China	Manufacturing and service	Managerial and industry experience	Growth in sales and profit	Experience positively impacts new venture growth.
Lerner, Brush, & Hisrich, 1997	JBV	Israel	Manufacturing, service, and else	Industry experience	Revenue	The impact of industry experience on revenue is not significant.
Lyles, Saxton, & Watson, 2004	JoM	Hungary	Manufacturing, service, and else	Industry experience	Firm performance	Industry experience positively impacts venture survival.
McGee, Dowling, & Megginson, 1995	SMJ	U.S.	High-technology	Functional experience	Sales growth	The effect of marketing and production experience is positive; the effect of tech experience is not significant.
Patzelt et al., 2008	BJM	Germany	Biotechnology	Industry experience	Employee growth	Biotech industry experience has no significant impact but pharma industry experience has positive impact.
Robb & Watson, 2012	JBV	U.S.	Manufacturing, service, and else	Industry experience	Firm closure	Industry experience significantly reduces firm closure rate.
Song, Song, & Di Benedetto, 2011.	JOM	U.S.	Manufacturing	Startup, industry, and functional experience	First product performance	All experience variables positively impact first product performance.
Soriano & Castrogiovanni, 2012	SBE	Europe	Manufacturing	Industry experience	Revenue per individual	Industry experience positively impacts productivity.
Stam & Elfring, 2008	AMJ	Dutch	Open source software	Startup, industry, and managerial experience	New venture performance	The experience has no significant impact on new venture performance.
Stam & Wennberg, 2009	SBE	Dutch	High- and low-technology	Startup, industry, and managerial experience	Employment growth	Industry and managerial experience have positive impact; the effect of startup experience is not significant.
Stuart & Abetti, 1990	JBV	U.S.	High-technology	Startup, managerial,	Subjective performance	Only startup experience is positively related to subjective performance.

				functional, and industry experience		
Toft-Kehler, Wennberg, & Kim, 2014	JBV	Sweden	Manufacturing, service, and else	Startup and managerial experience	Venture performance	Startup experience has inverted-U shaped relationship with performance; managerial experience positively impacts performance.
Vissa & Chacar, 2009	SMJ	India	Software	Startup and functional experience	Revenue growth	Startup experience has no significant relation, but functional experience has no significant relation with revenue growth.
Wasserman, 2016	SMJ	U.S.	Technology and life-sciences	Startup experience	Company valuation	Startup experience positively impacts company valuation.
Wennberg, Wiklund, & Wright, 2011	RP	Sweden	Manufacturing, service, and else	Startup, industry, and managerial experience	Employee and sales growth	Startup and industry experience positively impact all performance variables; the effects of managerial experience is not significant.
Zheng, 2012	JBV	China	N.A.	Startup and industry experience	New venture growth	Startup experience has no significant impact on growth; industry experience significantly impacts growth.
Zheng et al., 2015	SMJ	U.S.	Banking	Industry experience	ROA	Industry experience positively impacts ROA.
Panel B. Findings rejecting a positive relationship						
Chen, 2013	JEMS	U.S.	Manufacturing, service,and else	Startup experience	1st year's earning of new business	Startup experience negatively impacts 1st year's earning of new business.
Eggers & Song, 2015	AMJ	China	Food, service, and else	Startup experience	Growth	Startup experience has no significant impact on growth.
Florin, Lubatkin, & Schulze, 2003	AMJ	U.S.	Various	Human resources (start-up & industry experience)	Sale growth and ROS	Human resources have no signifcant impact on sales groth, but negatively impact ROS
Gimeno et al., 1997	ASQ	U.S.	Manufacturing, service, and else	Startup and managerial experience	Economic performance	Neither startup nor managerial experience significantly impacts economic performance.
Jo & Lee, 1996.	Technov.	Korea	Manufacturing	Startup, industry, managerial, and functional experience	Profit and growth	Startup and managerial experience are negatively related to profit; industry experience is positively related to but

						functional experience is not significantly related to profit and growth.
Ndofor & Priem, 2011	JoM	U.S.	Manufacturing and service	Startup and managerial experience	Profit and Startup return	The impact of startup experience on profit and return is not significant; the effect of managerial experience on profit is negative but on return is not significant.
Pena, 2004	SBE	Spain	N.A.	Startup and managerial experience	Employment, sales, and profit growth	Startup experience negatively impacts employment and sales growth; managerial experience positively impacts employment and sales growth but not profit growth.
Santarelli & Tran, 2013	SBE	Vietnam	N.A.	Startup and industry experience	Profit	Self-employment has negative impact on profit; industry experience has positive impact on profit.
Sullivan & Marvel, 2011	JMS	U.S.	High-technology	Startup experience	First-year sales	Startup experience has no significant impact on first-year sales.
Scholten et al., 2015	Technov.	Netherlands	Biotechnology, ICT and consulting	Startup and research experience	Early employee growth	Neither startup nor research experience has significant impact on early employee growth.
Shrader & Siegel, 2007	ETP	U.S.	High-technology	Industry, startup, functional experience	Profit and sales growth	Industry experience negatively impacts profit and sales growth; startup experience has no significant impact.
Tornikoski & Newbert, 2007	JBV	U.S.	N.A.	Startup, industry, and managerial experience	Made a sale	Startup experience negatively impacts sales performance; industry and managerial experience has no significant impact.
Wiklund & Shepherd, 2003	JMS	Sweden	Manufacturing, service, and else	Experience (startup and managerial)	Employment and sales growth	Experience has no significant impact on growth.
Zhang et al., 2013	SEJ	China	Manufacturing and else	Startup experience	Profit	Startup experience has no significant impact on profit.
Zhao, Libaers, & Song, 2015	JPIM	China	N.A.	Startup experience	Product performance	Startup experience has no significant impact on product performance.
Zimmerman, 2008	ETP	U.S.	Software	Startup experience	IPO value	Startup experience has no significant impact on IPO value.

Note: AMJ = Academy of Management Journal; PP = Personal Psychology; JBV = Journal of Business Venturing; ASR = American Sociological Review; JSBM = Journal of Small Business Management; ETP = Entrepreneurship Theory and Practice; MS = Management Science; OS = Organization Science; SMJ = Strategic Management Journal; SEJ = Strategic Entrepreneurship Journal; ASQ = Administrative Science Quarterly; RP = Research Policy; JoM = Journal of Management; JMS = Journal of Management Studies; BJM = British Journal of Management; JOM = Journal of Operations Management; SBE = Small Business Economics; JEMS = Journal of Economics & Management Strategy; JTT = Journal of Technology Transfer; JPIM = Journal of Product Innovation Management; Technov = Technovation.

Table 3.2. Meta-Analytic Results of the Pre-Entry Experience-New Venture Performance Relationship

	N	K	$\bar{r}$	ρ	σ_r^2	% variance due to artifacts	χ^2 statistics	95% C.I.
Pre-entry experience	191,158	134	0.06	0.06	0.005	15.68	792.35***	0.01/0.11
Levels of pre-entry experience								
Firm level	50,786	9	0.01	0.01	0.000	45.61	10.92	-0.02/0.03
Founder level	140,372	125	0.07	0.07	0.005	17.30	618.05***	0.02/0.13
Types of founder level pre-entry experience								
Entrepreneurial experience	99,929	64	0.11	0.11	0.005	13.42	444.50***	0.06/0.15
Managerial experience	85,567	30	0.08	0.08	0.001	28.76	73.63***	0.04/0.11
Industry experience	23,928	50	0.08	0.08	0.008	24.93	152.07***	-0.01/0.17
Functional experience	6,176	31	0.15	0.15	0.018	27.17	82.53***	0.02/0.29

Note. N = total sample size (number of new ventures); K = total number of studies/correlations; $\bar{r}$ = sample-size-weighted mean observed correlation; ρ = sample-weighted-measurement-corrected mean true score correlation; σ_r^2 = sample-size-weighted observed variance of correlations; % variance due to artifacts = the percentage of observed variance of raw correlation explained by artifacts (e.g., sampling and measurement error); χ^2 = statistics test of homogeneity of correlations; 95% C.I. = 95% confidence interval of $\bar{r}$.

***p<0.001

Table 3.3a. Basic Statistics of the Variables in the Meta-Regression Estimation (k = 460)

	Mean	SD	Min	Max
zr [a]	0.07	0.16	-0.37	0.85
founder_level	0.96	0.20	0	1
entrepreneurial experience	0.35	0.48	0	1
managerial experience	0.17	0.37	0	1
industry experience	0.20	0.40	0	1
functional experience	0.19	0.39	0	1
high_tech	0.30	0.46	0	1
sales	0.23	0.42	0	1
profit	0.25	0.43	0	1
sales growth	0.16	0.37	0	1
asset growth	0.02	0.13	0	1
profit growth	0.04	0.20	0	1
employment growth	0.13	0.33	0	1
exp_by_year	0.42	0.49	0	1
failed_ventures_included	0.14	0.35	0	1
survey	0.76	0.43	0	1
longitudinal	0.26	0.44	0	1
single_industry	0.32	0.47	0	1
developed_economy	0.84	0.36	0	1
published	0.93	0.26	0	1
top_journal	0.14	0.34	0	1

[a.] Fisher's z transformed correlation.

Table 3.3b. Correlations of the Variables in the Meta-Regression Estimation (k = 460)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) zr [a]	1.00													
(2) *founder_level*	0.06	1.00												
(3) *entrepreneurial experience*	-0.07	0.16	1.00											
(4) *managerial experience*	-0.03	0.10	-0.33	1.00										
(5) *industry experience*	0.06	0.11	-0.37	-0.23	1.00									
(6) *functional experience*	0.07	0.02	-0.35	-0.22	-0.24	1.00								
(7) *high_tech*	0.01	-0.17	-0.18	-0.10	0.06	0.23	1.00							
(8) *sales*	0.13	-0.16	-0.01	-0.10	-0.10	0.18	0.23	1.00						
(9) *profit*	-0.01	0.12	-0.01	0.00	0.04	0.01	-0.26	-0.32	1.00					
(10) *sales growth*	-0.05	-0.05	-0.12	0.00	0.05	0.07	0.19	-0.24	-0.24	1.00				
(11) *asset growth*	-0.01	-0.05	0.01	-0.02	0.02	-0.02	-0.09	-0.07	-0.08	-0.06	1.00			
(12) *profit growth*	-0.10	0.05	0.11	0.10	-0.08	-0.10	-0.14	-0.12	-0.12	-0.09	-0.03	1.00		
(13) *employment growth*	-0.04	0.08	0.08	0.09	-0.01	-0.12	-0.10	-0.21	-0.22	-0.17	-0.05	-0.08	1.00	
(14) *exp_by_year*	0.07	0.18	-0.25	0.17	0.15	-0.03	-0.10	-0.22	0.09	0.08	-0.08	0.10	0.09	1.00
(15) *failed_ventures_included*	-0.05	-0.53	-0.08	-0.06	0.00	-0.11	0.12	0.08	-0.08	0.01	-0.01	-0.09	-0.08	-0.08
(16) *survey*	0.14	0.38	0.21	0.12	-0.06	-0.17	-0.35	0.05	0.08	-0.25	-0.04	0.12	0.12	0.04
(17) *longitudinal*	0.04	-0.36	-0.19	-0.08	0.02	0.14	0.27	0.07	-0.03	0.07	-0.04	-0.13	-0.12	0.01
(18) *single_industry*	0.02	-0.27	0.08	0.03	-0.16	-0.01	0.19	0.25	-0.05	-0.13	-0.06	0.20	0.01	-0.12
(19) *developed_economy*	0.06	-0.09	-0.02	-0.06	-0.02	0.10	0.23	0.20	-0.01	0.01	-0.17	-0.05	-0.14	-0.01
(20) *published*	0.05	0.31	0.12	-0.06	0.04	-0.06	-0.10	-0.06	0.10	-0.09	0.04	0.06	0.03	-0.07
(21) *top_journal*	-0.03	-0.13	-0.12	-0.09	0.03	0.05	0.14	0.08	-0.08	0.16	0.00	-0.08	-0.11	-0.03

	(15)	*(16)*	*(17)*	*(18)*	*(19)*	*(20)*	*(21)*
(16) *survey*	-0.31	1.00					
(17) *longitudinal*	0.53	-0.24	1.00				
(18) *single_industry*	0.04	0.00	0.12	1.00			
(19) *developed_economy*	0.11	-0.24	0.21	0.27	1.00		
(20) *published*	-0.10	0.14	-0.13	0.03	-0.07	1.00	
(21) *top_journal*	0.29	-0.27	0.11	0.00	0.08	0.11	1.00

[a.] Fisher's z transformed correlation. The correlation coefficients whose absolute values are greater than 0.09 are significant at 0.05 level.

Table 3.4. Meta-Regression Results based on Hierarchical Linear Model

DV= Fisher's z transformed corr.	Model 0	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant (main effect)	0.04***	0.04	-0.01	0.10	0.11	0.06	-0.00
	(0.00)	(0.05)	(0.05)	(0.07)	(0.07)	(0.07)	(0.07)
Levels of pre-entry experience							
founder_level			0.08***	0.14***	0.16***	0.20***	0.25***
			(0.02)	(0.03)	(0.05)	(0.04)	(0.05)
Types of founder level pre-entry experience							
entrepreneurial experience				0.00	0.00	-0.00	0.01
				(0.02)	(0.02)	(0.02)	(0.05)
managerial experience				-0.02	-0.03	-0.03	-0.02
				(0.02)	(0.02)	(0.02)	(0.04)
industry experience				-0.12***	-0.13***	-0.13***	-0.15***
				(0.02)	(0.02)	(0.02)	(0.04)
functional experience				-0.06***	-0.06***	-0.07***	-0.11**
				(0.02)	(0.02)	(0.01)	(0.04)
Environmental context							
high-technology industries					-0.02	0.14**	0.19**
					(0.02)	(0.05)	(0.06)
Interaction between environment context and levels of pre-entry experience							
founder_level × high_tech						-0.17***	-0.24**
						(0.05)	(0.08)
Interactions between environmental context and types of founder level pre-entry experience							
entrepreneurial exp. × high_tech							-0.05
							(0.06)
managerial exp. × high_tech							-0.03
							(0.07)
industry exp. × high_tech							0.10
							(0.07)
functional exp. × high_tech							0.10*
							(0.05)
Control variables							
sales		0.10***	0.07***	0.09***	0.09***	0.07***	0.07***
		(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
profit		-0.02+	-0.04***	-0.03+	-0.03*	-0.05**	-0.04*
		(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)
sales growth		-0.02+	-0.06***	-0.05***	-0.05***	-0.07***	-0.07***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
asset growth		0.02	0.04	0.06+	0.05	0.09*	0.09*
		(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)
profit growth		-0.05+	-0.08*	-0.08**	-0.08**	-0.09***	-0.08**
		(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
employment growth		-0.03	-0.07**	-0.06*	-0.06*	-0.08***	-0.07***
		(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
exp_by_year		0.04**	0.03**	0.05**	0.05**	0.05*	0.03
		(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)
failed_ventures_included		-0.10***	-0.08***	-0.13***	-0.13***	-0.12***	-0.14***

		(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)
survey		0.01	0.02	-0.03*	-0.03*	-0.03*	-0.03*
		(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
longitudinal		0.04*	0.03+	0.05*	0.05*	0.04*	0.04*
		(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
single_industry		-0.02	0.01	0.01	0.02	-0.01	-0.02
		(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
developed_economy		0.02	0.00	-0.01	-0.01	-0.01	-0.01
		(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
published		0.11**	0.06	0.06	0.05	0.09+	0.09+
		(0.03)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)
top_journal		-0.01	0.02*	0.05**	0.05**	0.06***	0.07**
		(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
publication year dummies		<Yes>	<Yes>	<Yes>	<Yes>	<Yes>	<Yes>
Observations	460	460	460	460	460	460	460
# of study (# of country)	135	135	135	135	135	135	135
	(27)	(27)	(27)	(27)	(27)	(27)	(27)
Var (residual)	0.008	0.006	0.006	0.005	0.004	0.004	0.004

Standard errors in parentheses; + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Variance components at both study and country levels are less than 0.0001.

Table 3.5. Estimated Correlations between Pre-entry Experience and New Venture Performance

Pre-entry experience	Environmental context		Difference between high- and low-tech industries
	High-technology industries	Low-technology industries	
Firm level	0.19**	-0.00	0.19**
Founder level			
Entrepreneurial experience	0.15*	0.25**	-0.10*
Managerial experience	0.14+	0.22**	-0.08+
Industry experience	0.14+	0.09	0.05
Functional experience	0.18*	0.13+	0.05*

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.6. Endogeneity and Nonpublication Bias Assessment

Pre-entry experience	ITCV	Fail-Safe N	The ratio of missing studies (%)
Firm level pre-entry experience	0.13	17	18.18
Founder level pre-entry experience			
Entrepreneurial experience	0.32	632	0
Managerial experience	0.27	201	0
Industry experience	0.26	368	16.67
Functional experience	0.36	446	0

ITCV= the impact threshold for a confounding variable, an indicator of endogeneity bias.
Fail-safe N= measure of nonpublication bias.