

**UNPACKING ORGANIZATIONAL AMBIDEXTERITY:
DIMENSIONS, CONTINGENCIES, AND SYNERGISTIC EFFECTS**

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ABSTRACT

Significant ambiguity remains in the literature regarding the conceptualization of organizational ambidexterity. We unpack this construct into one with two dimensions we term *the Balance Dimension of Ambidexterity (BD)* and *the Combined Dimension of Ambidexterity (CD)*. BD corresponds to a firm's orientation to maintain a close relative balance between exploratory and exploitative activities, while CD corresponds to their combined magnitude. We reason that these dimensions are conceptually distinct, and rely on different causal mechanisms to enhance firm performance. We find that over and above their independent effects, concurrent high levels of BD and CD yield synergistic benefits. We also find that BD is more beneficial to resource constrained firms, while CD is more beneficial to firms having greater access to internal and / or external sources of resources. These results indicate that managers in resource constrained contexts may benefit from a focus on managing tradeoffs between exploration and exploitation demands, but for firms that have access to sufficient resources, the simultaneous pursuit of exploration and exploitation is both possible and desirable. (171 words)

Key Words: Organizational Ambidexterity, Exploration, Exploitation, Resource Scarcity.

The construct of organizational ambidexterity has attracted the growing attention of organizational theorists (for a recent review of the literature, see Raisch & Birkinshaw, 2008). The general agreement in this literature is that an ambidextrous firm is one that is capable of both exploiting existing competencies as well as exploring new opportunities, and also that achieving ambidexterity enables a firm to enhance its performance and competitiveness. However, beyond these points of consensus, there is some disagreement and considerable ambiguity regarding the nature of the ambidexterity construct.

When March (1991) first introduced the twin concepts of exploration and exploitation to the management literature, he argued that they should be viewed as two ends of a single continuum. In March's characterization, exploration and exploitation place inherently conflicting resource and organizational demands on the firm. In this view, tradeoffs between exploration and exploitation are seen as unavoidable and organizational ambidexterity largely involves the management of these tradeoffs in order to find the appropriate balance between the two. Others following in March's (1991) wake, similarly focus on the conflicting aspects of exploratory and exploitative orientations, their competition for scarce resources and the desirability of achieving an appropriate balance between the two (e.g. Auh & Menguc, 2005; Ghemawat & Costa, 1993; Sidhu, Commandeur, & Bolberda, 2007; Smith & Tushman, 2005).

Alternatively, some researchers have recently begun to characterize exploration and exploitation as independent activities, orthogonal to each other, such that firms can choose to engage in high levels of both activities at the same time (Gupta, Smith, & Shalley, 2006). In this view, ambidexterity has been emphasized to pertain to the capacity of a firm to pursue high levels of exploration and exploitation concurrently (e.g. Beckman, 2006; Jansen, Van Den Bosch, & Volberda, 2006; Lavie & Rosenkopf, 2006; Lubatkin, Simsek, Ling, & Veiga, 2006) rather than managing tradeoffs to find the most appropriate balance between the two.

Thus, while there is broad agreement that organizational ambidexterity somehow relates to the simultaneous pursuit of exploratory and exploitative activities, there exists a lack of conceptual clarity

regarding the extent to which ambidexterity concerns matching the magnitude of exploration and exploitation on a relative basis, or concerns the combined magnitude of both activities. This lack of consensus regarding the underlying construct, has led to a variety of different measures being used to operationalize the ambidexterity construct (e.g. He & Wong, 2004; Lubatkin *et al.*, 2006), a factor that makes it difficult to compare results across studies and amass a core set of findings on which to build. Moreover, this conceptual ambiguity has limited the usefulness of ambidexterity as a construct for scholars and practitioners. In particular, the varying interpretations of ambidexterity leave it unclear to what extent managers should be concerned with achieving a balance between exploration and exploitation or attempt to maximize both simultaneously.

In this paper, we seek to bring greater conceptual clarity to the treatment of ambidexterity, and in doing so, provide a more solid base for future theorizing and for the interpretation of findings and discernment of implications for managers. We begin by reviewing the literature on ambidexterity noting that what researchers have termed organizational ambidexterity is actually comprised of two distinct but related dimensions—one pertaining to the balance between exploration and exploitation which we term as the “Balance Dimension of Ambidexterity” (BD), and the other pertaining to their combined magnitude which we term the “Combined Dimension of Ambidexterity” (CD). Recently, some researchers have begun to view ambidexterity as a blend of these two aspects to varying extents (e.g. Gibson & Birkinshaw, 2004; He & Wong, 2004; Lubatkin *et al.*, 2006), but these works have not explicitly distinguished them at the conceptual level, nor have they examined their inter-relationship, or their distinct causal mechanisms and differing contingencies with respect to firm performance.

By explicitly distinguishing between these ambidexterity dimensions, we aim to provide greater precision to the conceptualization and operationalization of the construct, and to establish a basis on which to explore relationships and contingencies that have theoretical and practical importance. Our analyses highlight that both BD and CD are integral to the ambidexterity construct and we distinguish between them conceptually, operationally, and empirically. We reason that the relationship between ambidexterity and firm performance is more complex than previously understood because while its BD

and CD dimensions contribute to firm performance, they do so through very distinct processes. Further, we also reason that these distinct processes are both mutually supportive and differentially impacted by resource conditions. More specifically, we argue that while BD reduces the performance damaging effects of over-engagement in exploitation to the detriment of exploration or *vice versa*, CD enhances firm performance through the generation of a greater pool of complementary resources that may be leveraged across both. We also propose that over and above their unique independent effects, when integrated, concurrent high levels of BD and CD will yield synergistic performance benefits. We reason that such synergistic benefits arise because, in such cases, existing knowledge and resources can be more fully employed to absorb and be combined into new capabilities, and new knowledge and resources can also, to a fuller extent, strengthen and be integrated into the existing pool of competencies.

To further evaluate the distinctiveness of BD and CD as well as to assess the theoretical and practical utility of discriminating between the two, we theorize that the nature of the ambidexterity – firm performance link is contingent on the firm’s available resources—that is, the amount of resources that the firm possesses (as indicated by organization size) or can readily access from outside the firm (as indicated by environmental munificence). We hypothesize that BD is most beneficial to relatively resource constrained firms, while CD is most beneficial to firms with greater access to internal and / or external sources of resources. Additionally, our findings indicate that when firms have access to sufficient resources, tradeoffs between exploration and exploitation may not be binding constraints.

THEORY AND HYPOTHESES

According to March (1991), exploitation pertains to the refinement of existing competencies, whereas exploration involves searching for new knowledge and opportunities. Both activities are seen as critical to a firm’s sustainable competitive advantage. Owing to the linked nature of the exploration and exploitation constructs, researchers have started using ambidexterity as an integral concept to denote a firm’s dual orientation with respect to exploration and exploitation (e.g. Gibson & Birkinshaw, 2004; He & Wong, 2004; Lubatkin *et al.*, 2006; O’Reilly & Tushman, 2004; Tushman & O’Reilly, 1996).

In line with this characterization, there exists a broad consensus among definitions of ambidexterity that it somehow relates to the simultaneous pursuit of exploration and exploitation. For instance, Tushman and O'Reilly define an ambidextrous organization as one that is “able to implement both incremental (i.e. exploitative) and revolutionary (i.e. exploratory) changes” (1996: 8). He and Wong suggest they are “capable of operating simultaneously to explore and exploit” (2004: 483). Smith and Tushman describe them as organizations designed such that they “can both explore and exploit” (2005: 524). Lubatkin *et al.* define them as firms “capable of exploiting existing competencies as well as exploring new opportunities with equal dexterity” (2006: 2).

Beyond the broad consensus that ambidextrous organizations somehow engage in both exploration and exploitation, it is unclear from the above cited definitions the extent to which organizational ambidexterity involves a firm's effort to *increase* the combined magnitude of both exploratory and exploitative activities, or to *match* the magnitude of the two types of activities. These two understandings are very distinct. While the former focuses on the *absolute* magnitude of a firm's exploratory and exploitative activities, the latter considers their *relative* magnitude. He and Wong (2004) broke new ground by pointing out that these two differing interpretations of ambidexterity exist in the literature, but their focus was primarily on which measure to use to operationalize ambidexterity, rather than on the underlying conceptualization of ambidexterity.

In terms of theory development and management practice, such ambiguity in the treatment of the ambidexterity construct has material implications. This is illustrated in Table 1, which depicts the level of exploratory and exploitative activities of two firms. Firm A has a score of 10 on exploration and 5 on exploitation, while firm B has a score of 5 on both exploration and exploitation. Which of these firms is more ambidextrous? The answer to this question depends on how a researcher conceptualizes ambidexterity. If ambidexterity is conceptualized as the balancing of exploration and exploitation, Firm B is much more ambidextrous than Firm A. On the other hand, if ambidexterity is conceptualized as the combined magnitude of exploration and exploitation, the opposite conclusion is drawn and Firm A is seen to be significantly more ambidextrous than Firm B.

Insert Table 1 about here

Such differences in conceptualization can result in very different operationalizations of the ambidexterity construct. Corresponding to the “balance” view, ambidexterity can be operationalized as the absolute difference of exploration and exploitation (He & Wong, 2004), in which case Firm B would be considered as having greater ambidexterity. However, corresponding to the “combined” view, ambidexterity can be operationalized as the product (Gibson & Birkinshaw, 2004; He & Wong, 2004) or sum (Lubatkin *et al.*, 2006) of exploration and exploitation, and in either case Firm A would be characterized as having greater ambidexterity. Such a discrepancy in how ambidexterity is operationalized makes it difficult to compare results across studies and amass findings that can provide practical guidance to managers regarding whether they should strive for a balance between exploration and exploitation or seek to maximize both.

In fact, research on ambidexterity has acknowledged both aspects in examining this construct. For instance, He and Wong (2004) pointed out that both interpretations of ambidexterity exist in the literature, and consequently employed both a difference term and a product term to measure ambidexterity. Lubatkin *et al.* (2006) also considered more than one ambidexterity operationalization in their empirical tests in an attempt to reflect what we term the “balance” and “combined” views. Gibson and Birkinshaw (2004) focused on the multiplicative measure of ambidexterity in their principal regression tests, but their argumentation as well as their post-hoc analysis implies that the other view of ambidexterity is also considered. However, no previous study has *conceptually* distinguished between the balanced and combined aspects of ambidexterity or investigated their potentially distinct and interconnected effects on firm performance.

Thus, in recognizing the two differing ways to understand organizational ambidexterity that are established in the literature, we explicitly consider both in its conceptualization in order to capture a more complete picture of the construct. More particularly, we unpack the construct into one with two distinct dimensions, which we term as the Balance Dimension of Ambidexterity (BD) and the Combined

Dimension of Ambidexterity (CD) respectively. Distinguishing between these two dimensions at the conceptual level and examining their relationship allows us to provide greater clarity to the construct, and also provides the basis for hypothesizing about and evaluating their independent and joint effects on firm performance in varying organizational and environmental contexts.

The Balance Dimension of Ambidexterity (BD)

We reason that a higher level of BD, or a closer match in the relative magnitude of exploratory and exploitative activities, contributes to firm performance through more structured control of performance risk. Conversely, an imbalance between exploration and exploitation poses threats to firm performance through an increase in such risks (Levinthal & March, 1993; March, 1991). More specifically, when a firm's magnitude of exploitation well exceeds that of its exploration, the firm is likely to be subject to the risk of obsolescence. Firms susceptible to this type of risk may enjoy short-term success from exploiting existing products and markets, but this success may be ephemeral—unsustainable in the face of significant market and technological change (Tushman & Anderson, 1986). In this respect, existing competencies can quickly become outdated and lead to powerful path dependencies (Christensen & Overdorf, 2000) or core rigidities (Leonard-Barton, 1992) that impede the firm's learning and renewal.

Conversely, when a firm overemphasizes exploration to the exclusion of exploitation, it increases its risk of failing to appropriate returns from its costly search and experimentation activities. On this point, Teece (1986) cites company examples, such as EMI's experience with the CT scanner, and contends that investment in innovation without an attendant plan to develop the complimentary processes to exploit the fruits of such exploration is pointless. Other researchers have similarly stressed the need for efficient and reliable manufacturing, marketing, and financial capacities in order for a firm to capitalize on their investments in developing new products and markets (Utterback, 1994).

In summary, March (1991) and others following in his wake see exploration and exploitation as in opposition to each other insofar as they compete for resources and orient the organization in the pursuit of different goals. As a consequence, these researchers see a balance between exploration and exploitation as central to the notion of organizational ambidexterity. Building on this logic, we reason that the failure

to achieve a close balance between exploration and exploitation can leave a firm susceptible to either the risk of obsolescence or the risk of failure to appropriate. Conversely, striking a closer balance between the two types of activities enables a firm to avoid or better manage such performance-impairing risks.

H1a: BD is positively related to firm performance.

The Combined Dimension of Ambidexterity (CD)

Central to the conceptualization of CD is the idea that exploratory and exploitative processes are not necessarily in fundamental competition. In this respect, Gupta *et al.* (2006) point out that exploration and exploitation may take place in complementary domains (e.g. technologies and markets), which do not necessarily compete, for the same resources. Also in support of this view, Brown and Eisenhardt (1997) observe that firms may use sequential attention or rhythmic pacing to shift between exploration and exploitation. More recently, Burgelman and Grove (2007) report similar findings in their longitudinal study of Intel. Consistent with this research, we contend that exploratory and exploitative processes can in fact be supportive of one another and argue that each may help leverage the effects of the other for several related reasons we describe in the following paragraphs.

With respect to the positive effects of exploitation on exploration, we note that a high degree of exploitative effort can often improve a firm's effectiveness in exploring new knowledge and in developing resources that support new products and markets. We reason this to be the case because through repeated use of existing knowledge and resources, management can become better aware of where they reside within the firm, and have deeper understanding of the functionality of existing knowledge and resources. One result of such a deeper understanding is that the firm will become more capable of initiating various reconfigurations of existing knowledge and resources already under its control, capabilities associated with novel discoveries in products and markets (Fleming, 2001; Kogut & Zander, 1992). For instance, Burgelman (1994) describes how Intel's existing competencies and engineering knowledge related to its established memory chip business as well as its understanding of market trends enabled its managers to identify and seize an early and sustainable advantage in the microprocessor industry. Similarly, we also reason proficiency in a firm's exploitative processes will

better equip it to recognize and assimilate new external knowledge and resources. Such a capability can facilitate and promote exploration and has been identified by scholars in the absorptive capacity literature as being associated with organizational renewal and the development of commercially successful new products and technologies (Cohen & Levinthal, 1990; Zahra & George, 2002).

In an analogous manner, proficiency in a firm's exploratory processes can also enhance its ability to engage in successful exploitation. In this respect, successful exploration in one product or technological domain can enhance exploitative efforts in a complementary domain. For instance, Apple Computer's recent success with its iPod line of products has revitalized the entire Apple brand and has been a boon to its traditional hardware and software businesses. Further, successful exploration can also improve the economics of existing exploitative endeavors. This may occur because as a firm internalizes more outside knowledge and resources through exploration, its exploitation will take place in a larger pool of competencies, so that efficient routines and processes can be applied on a greater scale. In this respect, United Parcel Service's exploratory development of new business units offering existing and new clients a variety of novel supply chain and logistics services has improved the scale economies of its traditional core parcel delivery business.

In summary, we have proposed that because organizational knowledge and resources can often be effectively leveraged across both types of activities, exploratory and exploitative processes can often complement each other and lead to enhanced firm performance.

H1b: CD is positively related to firm performance.

The Simultaneous Pursuit of BD and CD

We expect that high CD will exert a more positive effect on firm performance when the firm also maintains a high level of BD. That is, we expect that, when combined, the two dimensions of ambidexterity will have a synergistic effect on firm performance. As noted above, the pursuit of CD is posited to enhance firm performance because it provides a greater potential to develop and leverage complementary knowledge and resources between exploratory and exploitative efforts, and thus provide a greater base for the firm to take advantage of its existing and new competencies. Extending this reasoning,

we propose that at a high level of BD (i.e. when exploration and exploitation are closely matched in magnitude), the leverage potential between these two types of activities will be more pronounced than when they are highly unbalanced.

That is, we reason that when a firm's level of exploitation is significantly lower than that of exploration (i.e. one situation of low BD), its absorptive capacity may be weak, a condition under which newly acquired knowledge and resources may not be sufficiently assimilated and processed through existing knowledge and resources (Zahra & George, 2002). Thus, they may not be efficiently utilized by complementary exploitative activities. The other situation of low BD is that a firm's exploratory capacity is significantly lower than its exploitative capacity. Under such conditions, less new knowledge and fewer novel resources will be brought to the firm through exploratory activities, which may limit the scale of the effect of exploitation. In either situation, the mutual leverage effect of exploration and exploitation is limited, and thus the positive performance enhancing effect of CD is also limited. Conversely, when a firm enjoys high BD (i.e. balanced exploration and exploitation), we reason that existing knowledge and resources can be used to a fuller extent, to acquire and generate new performance enhancing competencies, and at the same time, new knowledge and resources can, to a fuller extent, enhance and be integrated into the existing pool of competencies. As a consequence, we expect that the attainment of high levels of CD will be more performance enhancing when a firm's degree of BD is also high.

H1c: High levels of both BD and CD synergistically lead to better firm performance.

Organizational and Environmental Contingencies of Ambidexterity

In this section, we develop a series of hypotheses which posit that BD and CD are differentially moderated by organizational and environmental contingencies. In doing so, we further describe the distinctiveness of BD and CD and these hypotheses and their evaluation shed further light on the theoretical and practical usefulness of distinguishing between them. We examine two contingency variables—organization size and environmental munificence that both pertain to the amount of resources a firm possesses or may readily access (Penrose, 1959; Pfeffer & Salancik, 1978). These resources may also provide a buffer against risks (Thompson, 1967; Bourgeois, 1981) that may result from unbalanced

engagement in exploration and exploitation. Importantly, such resources have also been suggested by March (1991) to represent a constraint necessitating tradeoffs between exploration and exploitation.

Organization Size. We start our discussion of the effects of organization size with the straightforward observation that a firm's size is strongly indicative of the resources it possesses at its immediate disposal. In other words, larger firms will tend to have a larger pool of resources to draw upon than smaller firms (Chen & Hambrick, 1995; Penrose, 1959). A firm's stock of available resources, such as technology and financial capital, provides a buffer that mitigates the effects of risks and shocks that may adversely affect performance (Bourgeois, 1981; Thompson, 1967). In this respect, larger firms are more likely to possess deeper pools of slack resources (Bourgeois, 1981; Chen & Hambrick, 1995) and also to have resources dedicated to specialized departments that can help it respond to potentially damaging risks in a more timely and effective manner (Thompson, 1967).

As noted, an important potential benefit of BD is the mitigation of either the risk of obsolescence from over-committing to exploitation without a commensurate commitment to exploration, or the risk of the failure to appropriate due to over-committing to exploration without a corresponding level of exploitation. We reason that such risks will be relatively less threatening for larger firms, because their larger resource bases provide them with a better buffer to mitigate their potential adverse effects on firm performance. Conversely, we argue that the performance of smaller firms will be more susceptible to these risks because of their fewer resources to cushion these risks, for instance, with specialized departments to help their core departments deal with the risks effectively (Thompson, 1967). As such, while bigger and more resource-abundant firms may be able to withstand the risks associated with an unbalanced pursuit of exploration and exploitation, for smaller and resource-lean firms, achieving a high degree of BD to avoid potential risks is particularly critical.

H2a: Organization size moderates the relationship between BD and firm performance. High BD is more beneficial for smaller firms.

Resources play an important role in providing effective support to fuel a firm's activities and we reason that where possible, the simultaneous enhancement of exploration and exploitation (i.e. CD) will

be enormously taxing on available resources. Since exploration and exploitation represent very different organizational processes, they may each require different sets of supporting resources (March, 1991). For instance, because of the need for different processes, values, and culture, a firm may have to create and deploy units that are devoted to searching for new products and markets and separate them from those dedicated to appropriating returns from existing products and markets (Christensen, 1997; Tushman & O'Reilly, 1996). The exploitative units need to mobilize information and knowledge within the firm to improve the efficiency of existing organizational routines (Benner & Tushman, 2003; March, 1991), whereas the exploratory units need to get detached from the existing routines with more scanning of information and knowledge that resides outside the firm (McGrath, 1991).

Thus, success at pursuing CD will depend on the extent to which sufficient resources can be accessed and allocated to support a high level of engagement in both. As a consequence, we reason that when a firm possesses a larger stock of resources with which to fuel high levels of exploratory and exploitative efforts, those activities will be carried out more effectively, and the firm will be more likely to derive value from the pursuit of CD. In contrast, when a firm has a smaller stock of resources to deploy, it will be constrained in its attempt to provide sufficient resources to support both exploratory and exploitative activities. Under these conditions, one or both may be deprived of the resources necessary to maintain a high level of engagement. Thus, we predict that pursuing CD represents a less effective way to enhance firm performance when there is a smaller stock of resources available within the firm.

H2b: Organization size moderates the relationship between CD and firm performance. High CD is more beneficial to larger firms.

Environmental Munificence. Since organizations are open systems (Scott, 1992), they interact with their external environment and critically depend on it for the resources needed to operate its systems and fulfill its mission (Pfeffer & Salancik, 1978; Thompson, 1967). For instance, resources such as technological knowledge and industry information may be accessed through partnerships with external parties (Powell, Koput, & Smith-Doerr, 1996). In this respect, environments vary in terms of the types and amount of resources available to organizations (Hannan & Freeman, 1977). Organizational theorists

use the term “environmental munificence” to refer to the extent to which an environment supports the sustained growth of a firm (Dess & Beard, 1984). In a munificent (as opposed to scarce) environment, there are many growth opportunities to pursue and, importantly, the availability of abundant resources with which to pursue them (Dess & Beard, 1984). Thus, in munificent environments, it is easier and less costly for firms to obtain needed resources from outside the firm, including the financial capital and human resources that are needed to support complex activities (Dess & Beard, 1984; Keats & Hitt, 1988).

We propose that the degree of environmental munificence facing a firm has important implications regarding its pursuit of ambidexterity. With regard to BD, as noted earlier, firms may be highly susceptible to risks resulting from a lack of balance between exploration and exploitation unless it has sufficient buffering resources (Thompson, 1967). We reason that in more munificent environments, the failure to achieve a high level of BD will not necessarily exert a negative influence on firm performance, as under these conditions the firm may fairly easily acquire additional needed resources from external sources such as business partners and financial institutions (Lincoln, Gerlach, & Ahmadjian, 1996) to mitigate risks at the time they emerge. However, we argue, when the environment is scarce in available resources, balancing exploration and exploitation to avoid either the risk of obsolescence risk or the failure-to-appropriate becomes especially critical. Under such conditions, if the balance is lost and the risks occur, a firm will be less likely to be able to rely on environmental sources for resource support. Thus, we reason that BD matters more for firms in less munificent environments.

H3a: Environmental munificence moderates the relationship between BD and firm performance.

High BD is more beneficial for firms operating in less munificent environments.

Finally, we also posit that firms operating in munificent environments will benefit more from pursuing CD. As described above, the effective pursuit of CD requires substantial resource support for both exploratory and exploitative activities. We reason that in more munificent environments, the presence of relatively plentiful and accessible external resources can help the firm attenuate resource constraints (Dess & Beard, 1984; Pfeffer & Salancik, 1978), and under such conditions, firm management will find it easier to obtain the necessary resources to effectively pursue high levels of exploration and

exploitation concurrently. Conversely, in less munificent environments, we reason that firms will face greater difficulty in amassing the resources necessary to effectively carry out both.

H3b: Environmental munificence moderates the relationship between CD and firm performance.

High CD is more beneficial for firms operating in more munificent environments.

In summary, in highlighting the organization size and environmental munificence contingencies (hypotheses H2a/b and H3a/b) described above, we have argued that when a firm is more resource-constrained, BD is more critical to its performance. On the other hand, we have argued that under relatively resource-rich conditions, high CD is more critical and more likely to enhance firm performance.

Insert Figure 1 about here

METHODS

Sample and Data Collection

Like most ambidexterity studies to date (He & Wong, 2004; Lubatkin *et al.*, 2006; Smith & Tushman, 2005; Tushman & O'Reilly, 1996), we frame our ambidexterity hypotheses in terms of a firm's innovation orientation, that is, its orientation with regard to the introduction of new products/markets (i.e. exploration) and/or the improvement of existing products/markets (i.e. exploitation). To evaluate these hypotheses, we collected data through surveys in three high-tech parks in China in the middle of 2006. We selected technology firms from a transitional economy because they are confronted with a high degree of technological and institutional uncertainty in their task environments (Peng & Heath, 1996). In such contexts, the strategic choices made by these firms are expected to differ markedly, yielding substantial variability in the firms' degree of engagement in exploration and exploitation, and thus greater variance in their degree of ambidexterity. The sample firms are drawn from three high-tech parks located in three different economic zones—the Eastern coastal zone (Shandong), the Southern zone (Guangdong), and the Mid-West zone (Sichuan). We delivered questionnaires to a total of 200 randomly selected firms through park administrative offices. The firms in the sample are from a variety of high-tech industries, including biotech, computer software, automation, electronics, telecom, environmental technologies,

specialty chemicals, test measurement devices, advanced materials, semiconductors, and medical equipment (our categorization is consistent with Zahra, Ireland, & Hitt, 2001).

For each firm, separate questionnaires were delivered in sealed envelopes to their Chief Executive Officer (CEO) and Chief Technology Officer (CTO). We explained the purpose of the research in a cover letter, and requested their participation. We also provided envelopes for CEOs and CTOs to return completed surveys separately to the researchers. We made reminder phone calls to encourage participation. In some cases, when we heard from only one informant, we made an extra effort to follow up to get the response from the other one. The questionnaires were developed in English after interviews with a few Chinese CEOs. Most of the variables used in this study are measured using already established instruments. We used the conventional back-translation method to ensure the validity of the translation (Li & Atuahene-Gima, 2001). That is, we first asked an assistant who was competent in both English and Chinese to translate the questionnaire into Chinese. We then asked another assistant who was also competent in both languages to translate the Chinese version back into English. The researchers then compared the translated versions carefully and refined some wording in the Chinese version to avoid ambiguities and the potential for miscomprehension. Further improvements were made after pretests to ensure that the questions were clear, relevant, and interpreted as expected.

The final sample consists of 122 firms, from which we received completed and usable questionnaires from both the CEO and CTO. Thus, the response rate is $122/200=61\%$. Following Kanuk and Berenson, (1975), we assessed potential non-response bias by looking for differences between early and late respondents. To do so, we recorded the order of responses to the survey and found it to be non-significantly correlated with both firm age ($r=.223$, $p=.161$) and firm size ($r=.021$, $p=.723$), suggesting that concern regarding non-response bias is minimal (Combs & Ketchen, 1999; Hawes & Crittenden, 1984). We also found no significant differences in either firm age ($F=1.109$, $p=.377$) or firm size ($F=1.646$, $p=.125$) across industries. The 122 firms in the final sample average 118 employees in size, 1.5 million dollars in sales, and 6.2 years in age. In terms of geographic location, 74 of them are from the park located in East China, 25 from South China, and 23 from Mid-West China.

To mitigate the potential for common method bias, data for dependent and independent variables were collected from two different sources (i.e. the CEO and CTO). Using multiple respondents also enables us to assess the inter-rater reliability for certain variables. Along with the CEO, we selected the CTO as a second informant because our sample consists of high-tech firms that compete on technology and new products. Thus, we reason that CTOs will play a very important role in determining priorities and formulating strategies in these firms. In our sample, the average CEO is 40.4 years of age, with 4.5 years of tenure in the position, 7.0 years in the firm, and 11.6 years in the industry. The average CTO is 37.7 years of age, with 3.7 years of tenure in the position, 5.5 years in the firm, and 10.1 years in the industry. Thus, on average, both CEOs and CTOs have multi-year firm and industrial experience on which to base their answers to the questionnaires. As we do not have information on the CEOs and CTOs of non-responding firms or non-surveyed firms, we were not able to compare their age, firm tenure and industry experience to those responding to the survey.

Measures

Firm performance. As the majority of the China-based SMEs in our sample are private firms and not subject to the disclosure requirements of publicly traded companies, objective and reliable third-party data on their financial performance is unavailable. To measure firm performance, we adapted the scale of Gupta and Govindarajan (1986), and asked CEOs to rate, on a 1-7 Likert scale, their firm's performance over the last 12 months in terms of sales growth, profit growth, market share growth, operational efficiency, cash flow from market operations, and market reputation. We found this scale to have a Cronbach Alpha of .89. We selected the CEO's as the respondent because the CEO is likely to be the most knowledgeable informant about a firm's strategy and performance (McEvily & Zaheer, 1999) and because previous research has shown that CEO-reported firm performance significantly correlates with other, objective measures of firm performance (Dess & Robinson, 1984; Robinson & Pearce, 1988). As a further validity check, we collected the same measure of firm performance from CTOs, and found their ratings to be highly correlated with those of their CEOs ($r=.675$, $p<.001$).

Exploration and Exploitation. Organizational ambidexterity is an integrative construct of exploration and exploitation and therefore, our measures of BD and CD are based on underlying measures of exploration and exploitation. We use He and Wong's (2004) scale of exploration and exploitation, which proved to have high reliability and on which other studies have also built (e.g., Lubatkin *et al.*, 2006). To collect data for these measures, we asked CTOs to indicate, on a 1-7 Likert scale, the extent to which eight different statements were true regarding product development in their firm over the past 3 years (or since its founding if the firm was younger than 3 years old). Four of the statements pertain to the firm's exploration (i.e. introduction of new generations of products, extension of product range, opening up new markets, and entering new technological fields) and four pertain to exploitation (improvement of existing products, improvement of product flexibility, reduction of production cost, and enhancement of existing markets). The Cronbach Alpha for the exploration measure is .82 and is .79 for exploitation.

We employed confirmatory factor analysis (CFA) to examine the validity of the performance, exploration and exploitation scales. The fit indices showed that the measurement model fit the data reasonably well ($\chi^2=78.161$, $p<.05$; CFI=.979; NNFI=.967; RMSEA=.052; SRMR=.068) and all the items in these three constructs have highly significant standardized loadings. Based on these loadings, we found the composite reliability for firm performance (.89), exploration (.82) and exploitation (.76). Thus, these measures demonstrate good convergent validity and reliability (Fornell & Larker, 1981).

We further assess the discriminant validity of these constructs via a series of CFAs to test whether for each pair of constructs, a two-factor model fits the data better than a one-factor model (Bagozzi, Yi, & Phillips, 1991). The chi-square difference tests for all the related constructs in pairs demonstrated that, in each case, the chi-square in the constrained model (correlation fixed as 1) was significantly greater than the chi-square for the unconstrained model (correlation estimated freely). All the chi-square differences are significant, suggesting good discriminant validity (Anderson & Gerbing, 1988).¹

¹ Exploration vs. exploration (constrained model: $\chi^2=105.300$, d.f.=20; unconstrained model: $\chi^2=84.151$, d.f.=19), exploration vs. firm performance (constrained model: $\chi^2=108.993$, d.f.=35; unconstrained model: $\chi^2=94.083$, d.f.=34), exploitation vs. firm performance (constrained model: $\chi^2=98.229$, d.f.=35; unconstrained model: $\chi^2=87.038$, d.f.=34).

Balance Dimension of Ambidexterity (BD). As described above, BD relates to the balance, or relative magnitudes of exploration and exploitation. To operationalize BD, we follow He and Wong's (2004) treatment and use the absolute difference between exploration and exploitation. The absolute difference varies from 0 to 3.25. To facilitate interpretation, we reverse this measure by subtracting the difference score from 5 so that a higher value indicates greater BD.

Combined Dimension of Ambidexterity (CD). As defined earlier, CD concerns a firm's combined magnitude of exploration and exploitation. Reflecting our theoretical treatment of the CD, in which we propose that high levels of exploration and exploitation can complement and augment the performance enhancing effect of the other, we multiply exploration and exploitation to operationalize CD. This same measure has been used previously by He and Wong (2004), and Gibson and Birkinshaw (2004) used a similar operational approach. We mean centered the exploration and exploitation scales before obtaining their product in order to mitigate the potential for multicollinearity.

Organization size. We follow prior studies (Baum, Locke, & Smith, 2001; Chattopadhyay, Click, & Huber, 2001) and measure size as the firm's total number of full-time (or equivalent) employees. We correct for the fact that firm size is log-normally distributed by transforming it with the natural log.

Environmental munificence. Consistent with prior studies (Dess & Beard, 1984; Keats & Hitt, 1988), we measure environmental munificence as the average sales growth of firms in the same industry for the past three years. In this respect, industry sales growth reflects the availability of resources with which to pursue growth opportunities in the environment. The data were obtained from the park administrative offices where we sampled our firms, so munificence is calculated out of all the firms in these parks, including that of the focal firm.

In addition to the independent variables and moderators, we control for a variety of organizational and environmental factors in the estimated models. Like He and Wong (2004), we control for the potential independent effects of exploration and exploitation on firm performance in the final models estimated. We also control for *organization age* (years since inception) and a firm's sales *growth rate* in the last 3 years to account for the effect of the firm's historical performance. This variable is reported by

the CEO in the survey and verified by the records of park administrative offices. Since the Chinese economy is marked by uneven development across regions (Nee & Cao, 2005), we also control for the firm's *geographic location*. To do so, we employ two indicator variables to control for East China and South China locations and we use Mid-West China as the default category, as it is the most newly opened and least developed economic zone. Finally, we control for environmental instability, another important dimension characterizing organizational environments (Dess & Beard, 1984). This reflects the volatility or unpredictability of the environment. Following prior studies (e.g. Dess & Beard, 1984; Keats & Hitt, 1988), it is measured as the standard deviation of the sales growth of firms in the same industry during the past three years. Like environmental munificence, environmental instability is calculated from the sales growth rate of all firms in these three parks, including that of the focal firm.

ANALYSES AND RESULTS

Table 2 reports the descriptive statistics and correlations of all hypothesized and control variables. No inter-factor correlations are above the .65 threshold suggesting that our estimations are not likely to be biased by multicollinearity problems (Tabachnick & Fidell, 1996: 86). Of particular note, the correlation between BD and CD is found to be non-significant ($r=.091$, ns), which provides a strong preliminary indication that BD and CD represent two distinct dimensions of organizational ambidexterity.

Insert Table 2, 3 and Figure 2 about here

We employ OLS regression analysis to evaluate all hypotheses and the hierarchical moderated method to test the interaction hypotheses. All variance inflation factors (VIF) values are well below the recommended ceiling of 10 (Kleinbaum, Kupper, & Muller, 1988), further suggesting that the likelihood of multicollenarity problems is minimal. Table 3 reports these regression results.

Model 1 is the base model, with control and moderating variables included in the equation. We use He and Wong's (2004) approach and include both exploration and exploitation in all the estimates. Results from Model 1 indicate that exploration is positively related to performance ($b=.221$, $p<.01$), but that the effect of exploitation on performance is not significant ($b=-.028$, ns).

Also, following He and Wong (2004) which evaluates the effects of alternate ambidexterity variables in *separate* models, we first estimated models in which only one of the two ambidexterity dimensions is entered. Model 2a includes the main effect of BD only, and Model 2b examines the main effect of CD only. In these models, we find that both BD ($b=.306$, $p<.01$) and CD ($b=.233$, $p<.001$) are significant, which are results consistent with those reported by He and Wong (2004). Finally, we estimated Model 2c which includes the main effects of *both* our ambidexterity variables (i.e. BD and CD). These results indicate that CD has a positive effect on firm performance ($b=.182$, $p<.05$), however, though BD retains its positive sign, this effect is not significant ($b=.122$, ns). The results based on the most conservative model that includes all main effects (Model 2c) provide some support for H1b, but not for H1a.

Model 3 adds the BD * CD interaction term to Model 2c, and Model 4, in turn, includes all other hypothesized interaction terms. The results of entering interactions individually and that of entering them as a block are highly consistent, suggesting that the interactive relationships reported are robust across alternative model specifications. We note that the main effect of CD loses its significance in Model 4 when we include all the five interactions terms simultaneously, but the disappearance of the significance is not inconsistent with H1b. This is because in Model 2c, the coefficient for CD reflects its effect on firm performance across all levels of all the moderators. Thus it is a more parsimonious presentation of the CD's main effect, and is invariant to the variable's linear changes in scale (Bobko, 2001). In Model 4, however, the coefficient of CD in the presence of multiple interaction terms is hard to interpret, as it represents the slope of this variable when all the moderating variables are set as zero (Cohen, Cohen, West, & Aiken, 2003; Jaccard & Turrisi, 2003). That the effect of CD is subdued in such conditions actually suggests that there are significant interactive effects in which CD is involved.

Focusing on the model that includes a full set of interaction terms (Model 4), the interaction between BD and CD is, as predicted, positive and significant ($b=.505$, $p<.01$). Of particular note, R-square analysis suggests that over and above the main effects of BD and CD (Model 2c), the interactive effect of BD and CD explains an additional 5.2% of variance in firm performance (Model 3). Figure 2a

contains the plot of the interaction effect. Consistent with the reasoning of H1c which suggests that a greater balance of exploration and exploitation will lead to more opportunities to leverage knowledge and resources across activities, this plot indicates that the positive performance effect of a high level of CD is significantly enhanced by a high level of BD. Thus, there appears to be a synergistic effect on firm performance from achieving high levels of both BD and CD. However, the plot also shows that the performance is the lowest at a low level of BD *and* a high level of CD. Under such conditions, the firm not only fails to benefit from the leveraging between exploratory and exploitative activities, but is also subject to the high risks from an extreme imbalance of the two.

As argued in H2a and H2b, we find that organization size moderates the effects of BD and CD on firm performance. Our evaluation of H2a and the associated plot of the BD * size interaction (Figure 2b) indicates that while the benefits of BD extend to all firms, smaller firms benefit more ($b = -.197, p < .01$). Thus H2a is supported. In contrast, in line with the prediction of H2b, we find that organization size positively moderates the relationship between CD and firm performance, so that larger firms benefit from the performance enhancing effects of CD more than smaller firms ($b = .312, p < .001$). Further, the plot of the CD * size interaction (Figure 2c) indicates that while a high level of CD enhances the performance of larger firms, its performance effect is actually negative for very small firms. We calculated that the threshold where the effect of CD on firm performance becomes positive is an organization size of 87 employees and that the performance of smaller firms is actually negatively impacted by the pursuit of CD. This finding is consistent with the notion that the simultaneous pursuit of high levels of exploration and exploitation severely taxes a firm's resource base, and that among smaller firms, the available pool of resources is often insufficient to adequately support both activities at a high level.

H3a and H3b examine the effects of CD and BD under differing environmental conditions. H3a predicts that the positive effect of BD on firm performance will be more pronounced in contexts of less environmental munificence. As evidenced by the insignificant BD * environmental munificence interaction term ($b = .013, ns$), H3a is not supported. However, we do find evidence for H3b as the CD * environmental munificence interaction is positive and statistically significant ($b = .260, p < .01$). The plot of

this interaction (Figure 2d) indicates that firms operating in environments characterized by a greater degree of munificence benefit more from the pursuit of CD, but that the pursuit of a high level of CD has negative performance implications for firms operating in scarcer environments. Among our sample firms, we computed that the cut point above which firms begin to benefit from pursuing CD corresponds to an industry growth rate of 37.74% – a percentage that is very close to the average growth rate across all industries represented in this study (35.72%). These findings are consistent with our expectation that firms require access to abundant resources to effectively pursue CD.

In summary, we have found strong empirical support for five out of the seven hypotheses (i.e. H1b, H1c, H2a, H2b, H3b). Taken together, these results strongly indicate that BD and CD are two distinct dimensions of organizational ambidexterity that contribute to firm performance in different ways.

Robustness Tests

We believe that our findings are robust, and as noted above, we have taken various steps to ameliorate concerns over non-response bias, informant bias, common method bias, and measurement error. The possibility of reverse causation is almost always a concern in studies such as this which employ cross-sectional data. To assess the direction of causality between ambidexterity and performance, we followed the approach recommended by Landis and Dunlap (2000). We set firm performance as the independent variable, and the two dimensions of ambidexterity as dependent variables, and tested the interaction between firm performance and the organizational and environmental contingencies respectively. None of these reverse interaction terms are significant, which suggests that the possibility of reverse causality is of minimal concern (Landis & Dunlap, 2000).

Although we measure BD as a difference score and CD as a multiplicative term, we theorize both of them as distinct and integral concepts. As a way to alleviate concern about the potentially complex statistics involved, especially in examining their interaction, we have conducted additional tests to complement the regression analyses. We first split the sample based on the median of BD, and as suggested by H1a, the high-BD group has significantly higher mean performance than the low-BD group ($F=3.998, p<.05$). We then split the sample based on the median of CD, and the mean performance of the

high-CD group is significantly higher than that of the low-CD group ($F=3.883$, $p<.05$), which is consistent with H1b. As such, the sample can be divided into four groups based on the 2*2 design. We used ANCOVA (controlling for the two moderators in our theoretical model, i.e. organization size and environment munificence) and employed Tukey tests to conduct pair-wise comparisons of mean performance of these four groups. The results show that the high-BD-high-CD group performs significantly better than all the other three groups ($p<.05$ for all three comparisons). Overall, the post hoc results support H1c and the associated regression findings.

We also employed a similar median-split approach, 2*2 design, and related Tukey tests to do post hoc examinations of the other four interactions. Regarding the tests of BD*firm size, we found that the high-BD-small-firm group performs significantly better than the low-BD-small-firm group ($p<.01$). On the other hand, the performance of the high-BD-large-firm group is not significantly different from the low-BD-large-firm group in terms of performance. These results suggest that high BD enhances performance for smaller firms, but not for larger firms, supporting H2a and the associated regression findings. With regard to the test of CD*firm size, we found that firms in the high-CD-large-firm group perform significantly better than those in the low-CD-large-firm group ($p<.05$). Conversely, the performance of the high-CD-small-firm group is not significantly different than that of the low-CD-small-firm group. These findings indicate that while high CD significantly enhances performance for larger firms, it does not do so for smaller firms. This is consistent with H2b and the associated regression results. Concerning the test of BD*munificence, we found no significant performance difference between the high-BD-low-munificence group and the low-BD-low-munificence group. Nor did we find significant differences between the high-BD-high-munificence group and the low-BD-high-munificence group. Therefore, consistent with the regression result reported earlier, H3a is not supported. On the other hand, we found that firms in the high-CD-low-munificence group performed worse than those in the low-CD-low-munificence group ($p<.001$), a finding consistent with H3b and the associated regression results.

Collectively, these ANCOVA examinations and pair-wise comparisons are very consistent with the earlier regression findings, suggesting that those results are quite robust.

DISCUSSION

At the outset of the paper, we noted and described the ambiguity that remains in the literature regarding the conceptualization of the organizational ambidexterity construct. On one hand, ambidexterity can be understood as relating to a close balance of exploitation and exploration, which is consistent with the perspective introduced by March (1991) that exploration and exploitation compete for resources. On the other hand, ambidexterity can also be viewed as relating to the combined magnitude of the two, corresponding to the alternative view that exploration and exploitation are orthogonal activities. We have noted that this lack of clarity has led to differing operationalizations of the construct (He & Wong, 2004; Lubatkin *et al.*, 2006), which has made it difficult to compare results across studies and amass a core set of findings on which to build. Although some recent research on ambidexterity has, in varying ways, studied ambidexterity as a blend of both dimensions (Gibson & Birkinshaw, 2004; He & Wong, 2004; Lubatkin *et al.*, 2006), none have theorized on how these two dimensions entail different organizational processes and contingencies as well as how they may be mutually supportive. To address these concerns, and create a clearer basis for future theorizing and the discernment of practical implications, we have explicitly conceptualized it as a construct comprised of *two* distinct but related dimensions—Balance Dimension (BD) and Combined Dimension (CD)—corresponding to differing treatments of it in the literature.

We have reasoned that unpacking ambidexterity in this manner can shed new light on this important construct by providing a basis for teasing apart the various organizational processes through which various combinations of exploration and exploitation influence organizational performance. In this respect, we have hypothesized that a close balance of exploration and exploitation (i.e. BD) will enhance firm performance through the mitigation of risks stemming from the over-commitment to one or the other (H1a, 2a and 3a). At the same time, we have also reasoned that high combined levels of exploration and exploitation (i.e. High CD) enhance firm performance through different causal mechanisms – the development and leverage of complementary resources between exploratory and exploitative processes (H1b, 2b, and 3b). Moreover, we have also hypothesized a synergistic effect of high concurrent levels of

BD and CD that enhances firm performance through a third mechanism - by allowing existing knowledge and resources to be more fully employed to acquire new capabilities, and also by permitting new knowledge and resources to be more fully integrated into the existing pool of competencies (H1c).

Empirically, unpacking the ambidexterity construct into distinct dimensions has also proven beneficial as each dimension, through their main effects and / or interaction with the other (as well as organization size and environmental munificence variables), has explained previously-unaccounted-for variance in firm performance. That is, insofar as prior empirical research has included measures of one or the other ambidexterity dimension in their estimated models and have also not accounted for the interactive effect of these two dimensions, we reason that our operationalization approach holds the promise of explaining hitherto unexplained variance in research exploring the various antecedents and consequences of ambidexterity. In this respect, our study has focused on the effects of ambidexterity on financial performance among China-based SMEs operating in high technology sectors, but future research examining other outcomes such as internationalization and market impact, as well as studies exploring ambidexterity's effects on the performance of different populations of firms may also benefit by considering the independent and joint effects of BD and CD dimensions in their conceptual and empirical models. Our finding of independent and joint BD and CD effects also suggests that caution should be exercised in comparing the results of studies that utilize measures of different ambidexterity dimensions.

In concluding, we note that this study's findings relate to an ongoing controversy in the literature regarding the ability of firms to profitably pursue high levels of both exploitation and exploration. March sees a tradeoff, or a zero-sum game, between exploration and exploitation, as "organizations make explicit and implicit choices between the two" (1991: 71), and traditionally researchers have emphasized the contradiction between these processes (Floyd & Lane, 2000; Ghemawat & Costa, 1993). However, recently there is a growing camp in the literature that argues that exploration and exploitation processes are not necessarily in fundamental opposition and may actually be mutually enhancing (e.g. Gupta *et al.*, 2006) and this perspective is supported by some empirical evidence relating to technological innovation (Beckman, 2006; Katila & Ahuja, 2002) and organizational learning (Baum, Li, & Usher, 2000).

The results reported here shed light on this ongoing debate and they provide a strong indication that resource availability plays a pivotal role in determining whether there exists a binding tradeoff necessitating a concern with finding an appropriate balance of exploitation and exploration. In this respect, we find that firms, which are relatively resource constrained due to their small size or scarce operating environments benefit the most from achieving a close balance of exploration and exploitation (i.e. high BD). Conversely, as noted above, among relatively small firms, high CD (i.e. high exploitation *and* exploration) is associated with lower performance (Figure 2c). Together, these results suggest that for more resource constrained firms, the tradeoff view appears quite relevant and appropriate. At the same time, we also find that: a) in terms of performance, a close balance of exploitation and exploration is more important for smaller firms (Figure 2b) and, b) that the attainment of high CD is positively associated with performance among larger firms (Figure 2c) and those operating in more munificent environments (Figure 2d). Together, these findings indicate that tradeoffs between exploitation and exploration may be surmounted provided a firm has access to sufficient internal or externally located resources.

Such findings have clear practical implications for senior and middle-level management since prior research has left it unclear whether they should be more concerned with tradeoffs and seek to achieve a balance between exploration and exploitation, or alternatively attempt to achieve high levels of both simultaneously. Our findings indicate that the answer to this question is contingent upon the amount of internally controlled and externally accessible resources available to a firm. On this point, our results indicate that managers in resource constrained contexts may benefit from a focus on managing tradeoffs between exploration and exploitation demands, but for firms that have access to sufficient resources, the simultaneous pursuit of exploration and exploitation is both possible and desirable.

Limitations and Avenues for Future Research

This study is not without limitations, some of which suggest avenues for future research. One boundary condition for our study pertains to the generalizability of our findings beyond the population from which our sample firms are drawn. That the small-and-medium-sized enterprises (SMEs) studied here have emerged and are based in a transitional economy (China) is an important distinguishing

characteristic of our sample. Additionally, since the firms studied here operate in high-tech parks, they may be somewhat resource advantaged relative to similar firms located outside these zones. In this regard, we note that while our sample of China-based SME technology firms provides an excellent basis for the identification and examination of various processes linking ambidexterity and firm performance, these same characteristics suggest the need for future research to assess the generalizability of our findings. In particular, given that a key finding of this study is that a firm's ability to benefit from BD or CD is critically dependent on the internal or external resources available to it, studies examining the effects of these two dimensions among larger and more geographically diverse firms would be especially useful.

Second, we note that we have operationalized BD as the difference between levels of exploration and exploitation and that some prior research has indicated that the use of such a difference score to test the congruence of two component variables has significant limitations and suggested the use of polynomial regression (Edwards, 1994; Edwards & Parry, 1993). On the other hand, other researchers suggest that the problems noted by Edwards are empirically serious only when the component variables themselves are unreliable and are highly correlated, and that the use of a difference score should not be abandoned if the score represents a conceptually meaningful construct (Tisak & Smith, 1994). In our study, the difference score utilized does represent a strong conceptual construct (i.e. BD), and as noted in the Methods section, the component variables (exploration and exploitation) are both reliable and not highly correlated. Furthermore, while polynomial regression is more parsimonious in examining the main effects of congruence, to examine interactive effects such as the ones used to evaluate most of our hypotheses, it results in a number of cubical terms in one equation, making their interpretation very difficult. As a consequence, we have relied on linear regression estimates, an estimation approach that is also used by He and Wong (2004) for similar purposes, as well as by other recent studies that use difference scores to operationalize other conceptually meaningful constructs (e.g. Hogan, Barrett, & Hogan, 2007; Milton & Westphal, 2005).

Third, we also note that given the cross-sectional nature of this study, we have not been able to explore how a firm's exploratory and exploitative tendencies, or ambidextrous orientation, develop over

time. Like others employing cross-sectional data to study orientation constructs (e.g. Atuahene-Gima & Ko, 2001; Wiklund & Shepherd, 2003), we have relied on the assumption that a firm's orientation with respect to exploration and exploitation is quite stable over time. On this point, we note research indicating that significant path dependencies rooted in past resources deployments and established processes (e.g. Christensen, 1997; Leonard-Barton, 1992; Nelson & Winter, 1982) are endemic to most organizations, suggesting that a firm's exploratory-exploitative orientation will tend to be relatively stable over time. Nevertheless, it would be useful to evaluate the degree to which this is true. In this regard, we see a compelling need for longitudinal studies that can more precisely examine how what we term the balance and combined dimensions of ambidexterity evolve and/or co-evolve over time and the influence that such patterns have on organizational survival rates as well as short and long-term firm performance. A longitudinal study would also help draw stronger conclusions on the causality of the relationships between ambidexterity dimensions and performance.

Finally, like most other extant studies on ambidexterity (e.g. He & Wong, 2004; Lubatkin *et al.*, 2006; Smith & Tushman, 2005; Tushman & O'Reilly, 1996), we focus on its structural aspect, which, refers to how a firm organizes its investments and functions pertaining to exploratory and exploitative activities (Gibson & Birkinshaw, 2004). Gibson and Birkinshaw (2004) identify another type of ambidexterity, contextual ambidexterity, which pertains to the behavioral capacities of individuals to manage conflicting demands between the needs for alignment (supporting exploitation) and adaptability (supporting exploration). Gibson and Birkinshaw's findings indicate that these micro-level capacities complement structural ambidexterity, serving as a meta-capacity permeating all firm-level functions and activities. In this study we have unpacked distinct processes underlying the link between structural ambidexterity and firm performance, but we have not directly considered how the behavioral capacities associated with contextual ambidexterity may influence each of these distinct mechanisms. Future research examining the effects of such behavioral capacities on processes related to both the balance and combined dimensions of ambidexterity appears warranted and may shed additional light on the subtle and

complex processes through which organizations achieve and benefit from various combinations of exploration and exploitation.

CONCLUSION

In this paper, we build on and extend previous research on the conceptualization of organizational ambidexterity. In particular, we explicitly theorize about two distinct, but interrelated dimensions implied in the literature—the Balance Dimension (BD) and the Combined Dimension (CD). We describe the different underlying processes through which these two dimensions of ambidexterity contribute to firm performance, and highlight their synergistic effect with respect to performance. Our empirical tests on China based high-technology firms are strongly supportive of these theoretical arguments and also demonstrate that a firm's resource conditions differentially affect the performance consequences of these two dimensions. In doing so, this study brings greater conceptual clarity to the concept of organizational ambidexterity, and also makes the construct more useful and meaningful to practitioners.

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Table 1: Illustration of Different Conceptualizations of Organizational Ambidexterity

	Exploration Score	Exploitation Score	Assessment of Balance Dimension of Ambidexterity (BD)	Assessment of Combined Dimension of Ambidexterity (CD)
Firm A	10	5	Low	High
Firm B	5	5	High	Low

Table 2: Descriptive Statistics and Zero-order Correlations

	Mean	s.d.	1	2	3	4	5	6	7	8	9
1 Firm Performance	4.23	1.00									
2 Balance Di of Ambidex	3.20	.80	.156 [†]								
3 Combined Di of Ambidex	.47	1.33	.282**	.091							
4 Exploration	5.37	1.08	.311***	-.012	-.375***						
5 Exploitation	5.55	1.09	.132	-.006	-.315***	.470***					
6 Organization Size	4.30	1.11	.087	.251**	-.005	-.026	-.020				
7 Organization Age	6.19	4.41	-.041	.140	-.085	-.095	-.081	.598***			
8 Environ Munificence	35.72	12.56	.007	-.062	.240**	.157 [†]	.257**	-.083	-.044		
9 Environ Instability	49.92	21.45	.032	.027	.135	.056	.100	-.209*	-.151 [†]	.401***	
10 Org Past Growth Rate	35.45	38.38	-.026	-.194*	.125	-.006	.263**	-.124	-.282**	.152 [†]	-.028

[†] p<.1; * p<.05; **p<.01; ***p<.001

Table 3: Test of Hypotheses

DV: Firm Performance						
	1	2a	2b	2c	3	4
Constant	3.066(.742)***	2.026(.867)*	1.968(.705)**	1.794(.796)*	2.565(.802)**	2.856(.782)***
Location-East	-.626(.255)*	-.558(.254)*	-.528(.235)*	-.523(.240)*	-.442(.226)*	-.376(.216) [†]
Location-South	-.318(.287)	-.110(.310)	-.135(.275)	-.092(.296)	-.054(.279)	.102(.289)
Past Growth Rate	-.001(.004)	.001(.003)	.001(.004)	.001(.003)	.001(.003)	.002(.003)
Organization Age	.014(.027)	.021(.028)	.015(.027)	.017(.027)	.016(.028)	.051(.023)*
Organization Size	.173(.113)	.104(.108)	.132(.108)	.114(.105)	.113(.103)	.035(.086)
Environmental Instability	-.035(.366)	.090(.341)	.241(.357)	.231(.357)	.333(.353)	.408(.351)
Environmental Munificence	.001(.007)	.001(.007)	-.001(.007)	-.001(.007)	.003(.007)	-.001(.007)
Exploration	.221(.084)**	.244(.084)**	.325(.090)***	.311(.088)***	.129(.097)	.128(.095)
Exploitation	-.028(.106)	-.043(.105)	.003(.099)	-.010(.104)	-.083(.108)	-.128(.102)
Ambidexterity						
Balance Di of Ambidex (BD)		.306(.105)**		.122(.164)	.221(.157)	.226(.138)
Combined Di of Ambidex (CD)			.233(.055)***	.182(.093)*	.173(.086)*	.101(.080)
Interactions						
BD * CD					.430(.166)**	.505(.162)**
BD * Organization Size						-.197(.076)**
CD * Organization Size						.312(.083)***
BD * Environ Munificence						.013(.092)
CD * Environ Munificence						.260(.092)**
R ²	.150	.198	.217	.222	.274	.380
d.f.	9, 112	10, 111	10, 111	11, 110	12, 109	16, 105
F (R ²)	2.25*	2.64***	3.80***	3.40***	3.29***	4.17***

Unstandardized coefficients reported, with standard errors in parentheses

[†] p<.1; * p<.05; **p<.01; ***p<.001, two-tail test

Figure 1: Two Dimensions of Organizational Ambidexterity

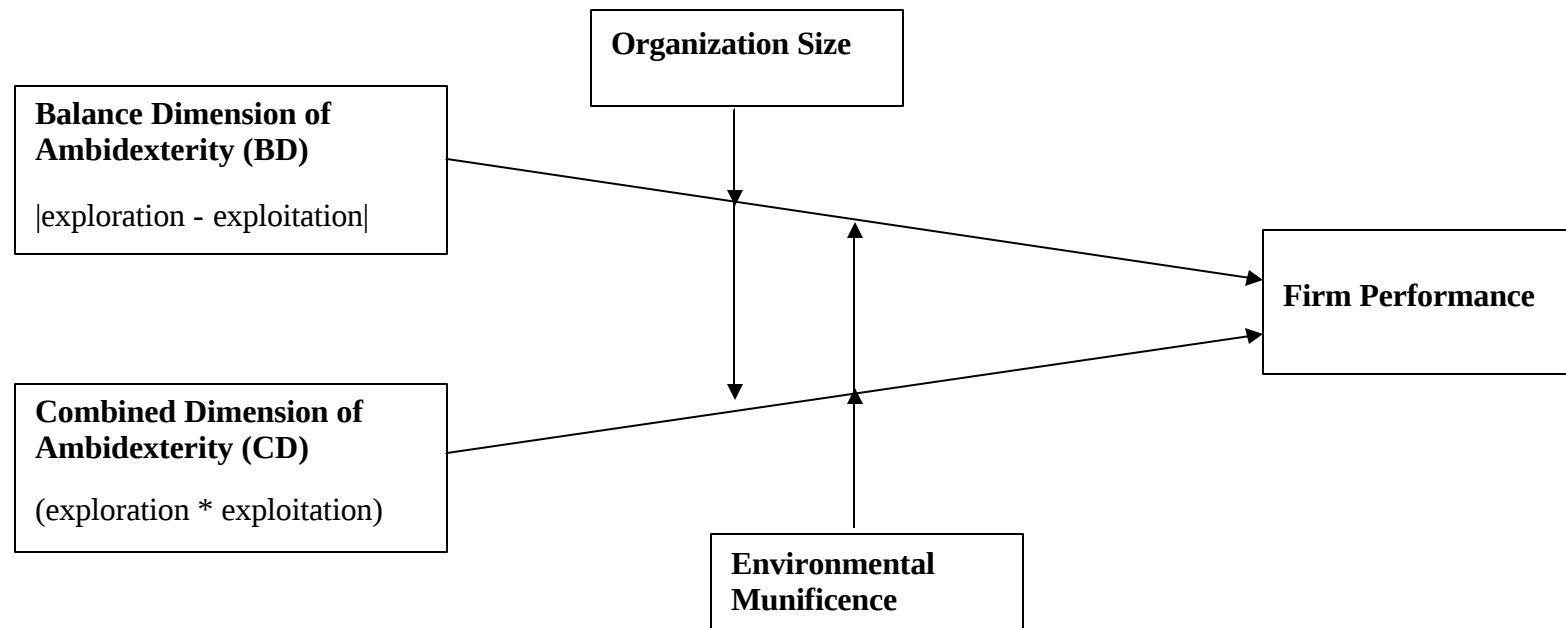
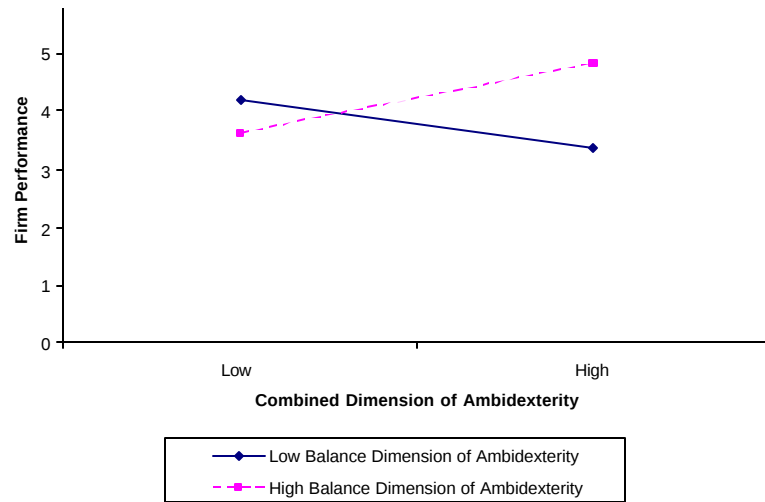
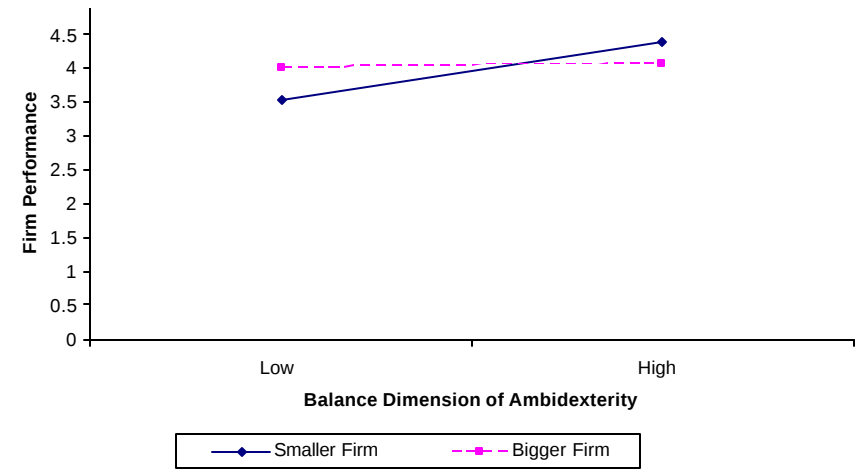


Figure 2: Interactions

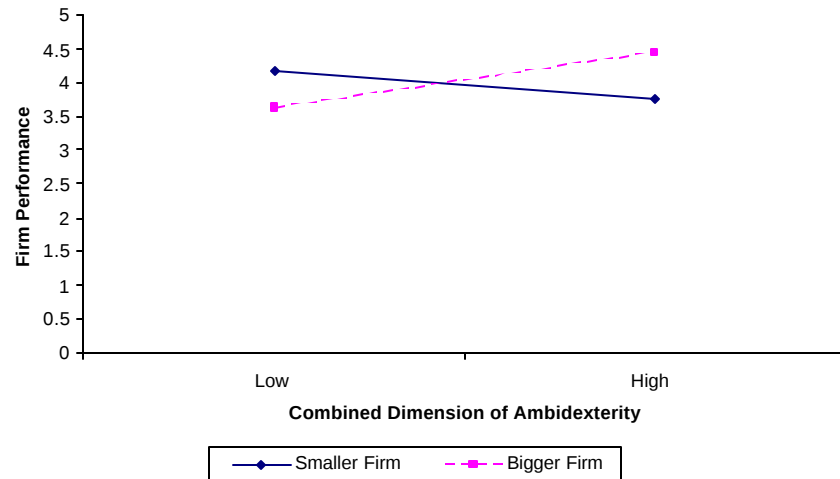
a. Interaction between Two Dimensions of Ambidexterity



b. Moderating Effect of Organization Size on Balance Dimension of Ambidexterity



c. Moderating Effect of Organization Size on Combined Dimension of Ambidexterity



d. Moderating Effect of Environmental Munificence on Combined Dimension of Ambidexterity

