Strategic Management Journal
Strat. Mgmt. J., **32**: 254–279 (2011)
Published online EarlyView in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/smj.882
Received 9 May 2008; *Final revision received 19 July 2010*

CLARIFYING THE CONDITIONS AND LIMITS OF THE CONTRIBUTIONS OF ORDINARY AND DYNAMIC CAPABILITIES TO RELATIVE FIRM PERFORMANCE

PAUL L. DRNEVICH[1] and ALDAS P. KRIAUCIUNAS[2]*
[1] *Culverhouse College of Commerce, University of Alabama, Tuscaloosa, Alabama, U.S.A.*
[2] *Krannert Graduate School of Management, Purdue University, West Lafayette, Indiana, U.S.A.*

Strategy scholars have argued that capabilities can influence firm performance through a variety of means and mechanisms. However, the role of capabilities and their proposed contributions have been narrowly theorized and insufficiently tested. We contribute to resolving these issues by considering the conditions under which ordinary and dynamic capabilities contribute to higher relative firm performance. We do so by examining the positive and negative contributions of capabilities to relative firm performance as well as the effects of environmental dynamism and the degree of capability heterogeneity. We utilize measures of relative firm performance at both the process and firm level within a sample of Chilean firms, which due to a dynamic environment allows for a clearer link between the environment and the use of capabilities. We find that environmental dynamism negatively affects the contribution of ordinary capabilities and positively affects the contribution of dynamic capabilities to relative firm performance. Further, heterogeneity strengthens the contribution of dynamic capabilities to relative firm performance, but is less important for ordinary capabilities. Interestingly, we find support for the direct effects of capabilities to be stronger with a process-level performance measure, whereas the influences of environmental dynamism and heterogeneity are stronger with a firm-level measure.

INTRODUCTION

Management scholars generally accept that organizational capabilities can be a major source of firm performance (Wernerfelt, 1984; Barney, 1991, 2001; Peteraf, 1993), and previous research has made great strides to develop and refine the conceptualizations and definitions of various types of capabilities (generic, organizational, ordinary, dynamic, heterogeneous, and homogeneous). An important outcome from this prior work is that these types of capabilities may operate quite differently on the resource base of the firm and thus may hold differing implications for competitive advantage and firm performance (Leiblein and Madsen, 2009; Hoopes and Madsen, 2008). However, despite the development of the concept and the argued importance of capabilities to competitive advantage and firm performance in past research, many theoretical and empirical issues remain a source of debate (Hoopes, Madsen, and Walker, 2003; Armstrong and Shimizu, 2007; Newbert, 2007, 2008) and scholars have not theorized alternative relationships. First, given the general agreement on the positive contributions of capabilities, scholars have not considered the drawbacks of ordinary and dynamic capabilities for firm performance and lack sufficient empirical testing of the

Keywords: capabilities; heterogeneity; firm performance; environmental dynamism
*Correspondence to: Aldas P. Kriauciunas, Krannert Graduate School of Management, Purdue University, 403 W. State Street, West Lafayette, IN 47907, U.S.A. E-mail: akriauci@purdue.edu

contributions of dynamic capabilities. Second, past research has underexamined alternative relationships between environmental dynamism and the contribution of capabilities to firm performance. These relationships also remain relatively untested. Finally, the field has neither clearly argued nor tested the importance of heterogeneity on the contribution of capabilities to firm performance. Thus, scholars may be missing an opportunity to consider the conditions under which heterogeneity is and is not important. Underlying these issues, the appropriate level of analysis at which to measure the contributions of capabilities to performance also remains under debate (Ray, Barney, and Muhanna, 2004; Armstrong and Shimizu, 2007).

We address these gaps in the literature by examining a central research question: under what conditions do ordinary and dynamic capabilities contribute to firm performance? We theorize and examine this central question through three hypotheses. As a foundational issue, we first examine the direct relationships and theorize how ordinary and dynamic capabilities may improve, as well as hinder, firm performance. Second, we consider the influence of the environment to determine whether the degree of environmental dynamism constrains or enhances the performance contribution of ordinary and dynamic capabilities. Finally, we theorize and examine whether heterogeneity of capabilities is necessary to ensure that both ordinary and dynamic capabilities contribute to firm performance. Together, these three parts of our central question help us to understand the contributions of ordinary and dynamic capabilities to firm performance, as well as understand the conditions that may enhance, or the limits that may negate, these contributions. Further, we also analyze performance at two levels, the process level and the firm level, to reflect the theorized contributions of capabilities to the firm's competitive advantage (Porter, 1980; Rumelt, 1982; Barney, 1991; Amit and Schoemaker, 1993) and to determine if the contributions of capabilities are observable at all levels of the firm. The logic behind this approach is that process-level measures may best capture the contribution of the capability, whereas firm-level measures capture both the contribution and the cost of managing the capability.

In this study, we define ordinary capabilities as those capabilities through which a firm 'makes its living' in the short term (Winter, 2003). Ordinary capabilities are distinct from generic capabilities in that the latter refers to a view of capabilities by their functional area classification (i.e., secondary or support activities in a firm's value chain [Porter, 1985]). Correspondingly, we define dynamic capabilities as those capabilities used to extend, modify, change, and/or create ordinary capabilities (Collis, 1994; Dosi, Nelson, and Winter, 2000; Winter, 2003; Hoopes and Madsen, 2008). We define environmental dynamism as a change in the competitive environment that affects how firms compete with each other and how they respond to customer needs and developments in the industry (Porter, 1980; Miller and Friesen, 1983; Wang and Ang, 2004). We define a heterogeneous capability as one that is unique, customized, idiosyncratic, and/or specific to a firm (Amit and Schoemaker, 1993; Teece, Pisano, and Shuen, 1997), and a homogeneous capability as one that is common to the industry, nonidiosyncratic/not specific to the firm, and relatively undifferentiated from those of a firm's competitors. Finally, we consider process-level and firm-level performance as 'relative' to the firm's industry (Ordanini and Rubera, 2008) and therefore use the term *relative firm performance* in this study.

To examine our central question and to test our three hypotheses, we consider information technology (IT)-based ordinary and dynamic capabilities in a sample of Chilean firms. We utilize the context of IT-based capabilities because firms may use technology to either enhance existing, or enable new capabilities within the firm, which makes them an ideal context for cleanly studying ordinary and dynamic capabilities. We utilize the setting of Chile because its dynamic environment allows for a clearer link between environmental dynamism and the use of ordinary and dynamic capabilities. Our analysis indicates that both ordinary and dynamic capabilities contribute positively to relative firm performance. Further, we find that the contribution of dynamic capabilities is higher in more dynamic environments, but the contribution of ordinary capabilities is lower. We also find that the degree of heterogeneity has minimal influence on the contribution of ordinary capabilities, but positively affects the contribution of dynamic capabilities to relative firm performance. Finally, we observe that the empirical support for, and significance of, these observations varies depending on whether we measure relative firm performance at the process or firm level. Specifically, the direct effects of capabilities are stronger at the

DOI: 10.1002/smj

process level, whereas the influences of environmental dynamism and heterogeneity are stronger at the firm level.

In this paper, we provide four contributions to understanding the conditions under which ordinary and dynamic capabilities contribute to higher relative firm performance. First, rather than accepting the existing premise that capabilities contribute positively to firm performance, we explore both the possible positive and negative effects of ordinary and dynamic capabilities to relative firm performance. Second, we clarify theoretically the positive and negative influence of environmental dynamism on the contributions of ordinary and dynamic capabilities to relative firm performance. Our finding that dynamic capabilities offer a greater performance contribution when employed in conducive settings (dynamic environments), but are less effective than ordinary capabilities in more stable environments, provides the first empirical evidence of the boundary conditions for the role of dynamic capabilities under different levels of environmental dynamism. Third, by explicitly considering the importance of heterogeneity for the contribution of capabilities to relative firm performance and providing the first empirical test of the importance of heterogeneity, we show that the presumed necessity or superiority of heterogeneous capabilities (Wernerfelt, 1984; Barney, 1991, 2001; Peteraf, 1993; Teece *et al*., 1997) over homogeneous capabilities (Eisenhardt and Martin, 2000; Winter, 2003) is not universal. Fourth, by measuring the impact of capabilities on relative performance at both the process and firm level, we contribute to resolving the debate regarding the appropriate level of analysis at which to measure performance (Ray *et al*., 2004; Armstrong and Shimizu, 2007). We do so through our finding that the performance contribution of capabilities may be primarily at the process level, but the effects of environmental dynamism or heterogeneity may be more evident at the firm level.

In the next section, we consider the conditions under which ordinary and dynamic capabilities contribute to higher relative firm performance. We review and extend existing theory to develop a model and hypotheses for the direct contributions of ordinary and dynamic capabilities, and the implications of environmental dynamism for, and the role of heterogeneity in, the contributions of capabilities to relative firm performance. We present the conceptual model for our hypotheses in Figure 1. We then develop measures and analytical models to test our hypotheses on a sample of primary data collected from Chilean firms and present our results. We conclude with a discussion of our observations, limitations, contributions, and implications for future research.

THEORY AND HYPOTHESES DEVELOPMENT

The contribution of ordinary and dynamic capabilities to relative firm performance

To evaluate the conditions under which ordinary and dynamic capabilities contribute to relative firm performance, we first consider both the positive and negative effects of these capabilities to determine if we can expect that both types of capabilities contribute to improved relative firm performance. We argue that managing capabilities incurs an expense (Helfat *et al*., 2007), and that the use of capabilities can increase revenue and/or reduce costs (Barua *et al*., 2004; Wang and Ang, 2004), which may or may not offset the increased expense. Our review of prior research indicates that ordinary capabilities contribute to

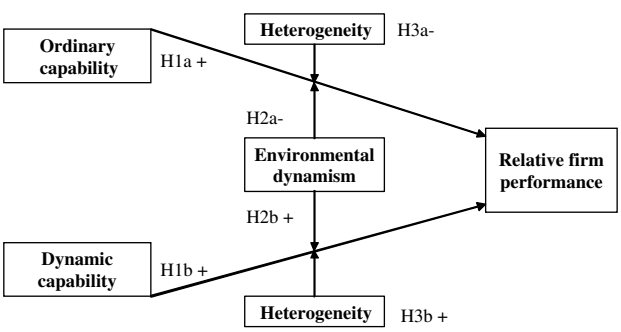

Figure 1. Model of capabilities, dynamism, heterogeneity, and relative firm performance

DOI: 10.1002/smj

performance by increasing revenue (e.g., Brush and Artz, 1999; Peng and York, 2001), as well as by reducing the costs associated with providing services (e.g., Brush and Artz, 1999; Kaleka, 2002). These actions can positively affect firm performance (Williamson, 1991). Reviews of the literature examining these issues in the IT context also indicate that ordinary capabilities can improve the quality of a firm's existing processes and products (Barua *et al*., 2004; Lai *et al*., 2008; Piccoli and Ives, 2005; Zhu and Kraemer, 2002) resulting in increased revenue. Improved process and product quality can directly (or indirectly) positively affect firm performance (Porter, 1980; 1985; Williamson, 1991; Barney 1991; Makadok, 2010). While our hypotheses do not discern between different performance measures, our empirical analysis will consider relative performance at both the process level (focusing on capability output) and at the firm level (focusing on profitability).

Although the definition of ordinary capabilities is agnostic regarding the influence on resulting performance, our review of the capabilities literature indicates that no previous empirical research has hypothesized a negative relationship between ordinary capabilities and firm performance.[1] As such, we consider the conditions under which the use of ordinary capabilities may result in decreased relative firm performance. A major reason would be that a firm is incurring a cost (financial or managerial) with the capability without a corresponding return. First, this situation may occur if a firm concentrates on using a capability that provides a return, even though using a more effective capability would provide an even greater return (Tallon, 2008). In this situation, performance may still increase, but (relative to the competition) performance could decrease. Such a situation could also occur if the efficiencies provided through ordinary capabilities no longer reflect the needed strategic direction of the firm, but remain due to embedded path dependencies. Second, a firm may employ a capability that is disconnected entirely from its profit mechanism(s) (Makadok, 2001, 2010). In this case, the firm will not achieve any return from the capability to cover its costs of usage. Finally, a firm may use a capability that has a negative effect on performance. For example, such a situation could arise surrounding a capability that previously contributed to the firm's operations, but the prior approach to creating value is no longer salient to customers (Leonard-Barton, 1992) or interferes with the use of more productive capabilities.[2]

Although ordinary capabilities can contribute both positively and negatively to firm performance, we believe the net effect will be positive. The reason for this is that firms, as a matter of normal business prudence, intentionally manage and actively attempt to limit their downside risks. We observe support for this argument in previous research that shows strategic decisions involve multiple criteria, trade-offs, and uncertainty as components of the decision analysis (Van de Ven, 1986; Keeney and Raiffa, 1993). For example, in making major strategic decisions, managers often employ utility or value analysis processes in which the decision makers assign utility values and consequences to the decision (Keeney and Raiffa, 1993). Such practices, if implemented effectively, help identify and limit the downside (i.e., loss of utility or value) from strategic decisions (Miller and Reuer, 1996; Miller and Leiblein, 1996; Ruefli, Collins, and Lacugna, 1999). Further, firms also hire, incentivize, and monitor managerial performance in an attempt to affect such outcomes. As a result, firms are likely to abandon or replace capabilities should performance fall below a certain threshold. Given that firms will not limit the upside benefits of ordinary capabilities, but do limit the downside, the net contribution of ordinary capabilities to firm performance should be positive.

Given our arguments that ordinary capabilities will contribute to a firm's performance, we consider this relationship relative to the competition. If a firm uses ordinary capabilities more than its competitors do, then its relative performance should be

[1] Our review of the capabilities literature encompassed 31 papers. Of these, 21 were identified by Newbert (2007) and 10 others were identified using Newbert's methodology of considering empirical papers having ordinary or dynamic capabilities as the independent variable and performance as the dependent variable. These additional papers were published subsequent to Newbert (2007). Of these 31 papers, the 24 papers focusing on ordinary capabilities tested 380 relationships.

[2] Some scholars may question what would happen if the contribution of the capabilities were negative (i.e., would the firm stop performing that capability or get rid of it?). In such cases, where the contribution of ordinary capabilities is negative, we feel continued use of that capability may continue for several reasons. First, the underperforming capability may be better than its complete absence, so a new ordinary capability would be needed to replace the old one. Second, the ordinary capability may be needed to allow another capability to provide a positive contribution. We thank an anonymous reviewer for this suggestion.

DOI: 10.1002/smj

higher. The reason for this, as explained above, is that ordinary capabilities allow the firm to enhance existing processes, products, and services. Therefore, we propose the following relationship:

Hypothesis 1a: The greater the use of ordinary capabilities, the greater the relative performance of the firm.

Next, we consider the contribution that dynamic capabilities can have to relative firm performance. Firms use dynamic capabilities to recognize and respond to opportunities and threats by extending, modifying, changing, and/or creating a firm's ordinary capabilities to accomplish first-order change (Collis, 1994; Dosi *et al*., 2000; Winter, 2003; Hoopes and Madsen, 2008). This view is also consistent with the conclusions of Eisenhardt and Martin (2000: 1118), who argued that one could conceptualize dynamic capabilities as tools firms may employ to manipulate existing resource configurations in order to create new resource configurations. The contributions of dynamic capabilities can occur in several ways. First, dynamic capabilities can positively affect firm performance by allowing the firm to identify and respond to opportunities through developing new processes, products, and services (Chmielewski and Paladino, 2007; Makadok, 2001, 2010; Zou, Fang, and Zhao, 2003), which has the potential to increase revenue. Second, dynamic capabilities can improve the speed, effectiveness, and efficiency with which a firm operates and responds to changes in its environment (Hitt *et al*., 2001; Chmielewski and Paladino, 2007; Tallon, 2008). This improved response speed, effectiveness, and efficiency with respect to dealing with environmental changes can positively affect firm performance by allowing the firm to take advantage of revenue enhancing opportunities and adjust its operations to reduce costs. Third, dynamic capabilities offer previously unavailable sets of decision options for the firm, and thus provide the potential for greater performance contributions (Eisenhardt and Martin, 2000; Zhu, 2004) such as increased revenues or profits. Therefore, dynamic capabilities can improve upon the contribution of ordinary capabilities by extending existing resource configurations in ways that result in entirely new sets of decision options (Eisenhardt and Martin, 2000).

Similar to the case of ordinary capabilities, the definition of dynamic capabilities is agnostic regarding its influence on performance. However, our review of the capabilities literature indicates no previous empirical research has hypothesized or found a direct negative relationship between dynamic capabilities and firm performance.[3] There are, however, several reasons why dynamic capabilities can decrease firm performance. Specifically, the downside risk (or negative impact) from dynamic capabilities resides in the fact that they require extensive management and are more complex to use. The resulting difficulties and associated costs may not have a commensurate increase in performance since dynamic capabilities have a high chance of failure, may lead to unnecessary change, and change the firm extensively. We know that the greater the change a firm attempts to implement, the greater the risk of failure (Cyert and March, 1963; Leonard-Barton, 1992). Further, infrequent use and lack of adequate monitoring of dynamic capabilities will cause them to lose their effectiveness over time, thus reducing the increased revenue potential they provide (Helfat *et al*., 2007). Other drawbacks of dynamic capabilities include mismanaging capabilities and/or not fully integrating them into the firm to realize their benefits (Tallon, 2008). The drop in dynamic capability effectiveness or not effectively managing them will result in the firm being less able to identify and respond to opportunities and threats (Helfat *et al*., 2007).

However, we believe that firms, as a matter of normal business practice, actively manage and, therefore, attempt to limit their downside risks just as they do with ordinary capabilities. Internal processes help to identify and limit the downside (i.e., loss of utility or value) from strategic decisions (Keeney and Raiffa, 1993; Miller and Reuer, 1996; Miller and Leiblein, 1996; Ruefli *et al*., 1999). As a result, firms are likely to abandon or replace dynamic capabilities should performance fall below a certain threshold.

Given our arguments that dynamic capabilities can contribute to a firm's performance, we consider this relationship relative to the competition. If a firm uses dynamic capabilities more than its competitors, then its relative performance should be higher. The reason for this, as explained earlier, is that dynamic capabilities enable the firm to change

[3] Our review of the capabilities literature identified seven empirical dynamic capabilities papers, which tested 51 hypotheses.

DOI: 10.1002/smj

its processes, products, and services. Therefore, we propose the following relationship:

Hypothesis 1b: The greater the use of dynamic capabilities, the greater the relative performance of the firm.

The effects of environmental dynamism on ordinary and dynamic capabilities

We build from Hypothesis 1 to consider how the degree of environmental dynamism affects the contribution of ordinary and dynamic capabilities to relative firm performance. Environmental dynamism reflects the 'amount and unpredictability of change in customer tastes, production or service technologies, and the modes of competition in the firm's principal industries' (Miller and Friesen, 1983: 233). Although the definitions for ordinary and dynamic capabilities discussed previously do not explicitly invoke the degree of environmental dynamism, the accepted view is that dynamic capabilities are more important in a dynamic environment than in a non-dynamic environment since they contribute to change in the firm (Chmielewski and Paladino, 2007; Helfat *et al*., 2007). However, there has been no explicit consideration of how environmental dynamism will influence the contribution of ordinary capabilities to how a firm 'earns its living' (Winter, 2003). The absence of such consideration suggests that the effectiveness of ordinary capabilities will not increase in dynamic environments. Prior work on capabilities (in general) and the environment indicates that firm performance will decline as the firm's environment becomes more dynamic (Wang and Ang, 2004). This situation occurs if the capabilities are not flexible and/or aligned with the changing environment (Eisenhardt, 1989; Simerly and Li, 2000; Garg, Walters, and Priem, 2003), and if firms cannot use dynamic capabilities to adjust to these types of changing environments (Teece *et al*., 1997; Eisenhardt and Martin, 2000). Recently, Chmielewski and Paladino (2007) and Tallon (2008) have examined the link between environmental features (e.g., market turbulence, competitive intensity, environmental dynamism) and capabilities in general, but with mixed results. No study to date has explicitly modeled and tested the moderating effect of environmental dynamism on either ordinary or dynamic capabilities.

Increased dynamism in a firm's environment may cause changes in suppliers, buyers, the overall competitive environment, and the nature of competition—all of which may raise challenges for the firm (Miller and Friesen, 1983; Chmielewski and Paladino, 2007; Tallon, 2008). As argued previously, firms use ordinary capabilities to ensure a continuity of current operations. Therefore, in unstable environments, ordinary capabilities may be ill suited if the firm needs to be able to adjust to changes and cannot rely only on the continuity of past operations (e.g., Leonard-Barton, 1992). This line of argument suggests that increased environmental dynamism will weaken the contribution of ordinary capabilities to relative firm performance.

So far, our reasoning implicitly assumes that increased dynamism in the environment requires a firm to change. It is worth considering, however, whether increased dynamism will result in a firm's ordinary capabilities becoming an even more, rather than less, important contributor to relative firm performance. This point evolves from the observation that a firm's environment is multidimensional (Miller and Friesen, 1983; Wang and Ang, 2004). For example, Miller and Friesen (1983) argue that hostile environments increase the need to conserve resources and pursue economical strategies. As a result, when faced with a more dynamic environment, the firm must consider if it simply needs 'more of the same' or 'more of something different.' The accepted argument that ordinary capabilities will have a negative contribution toward firm performance assumes that the environmental changes require a firm to undertake something different. However, in consolidating/declining industries, efficiencies will become the core basis of competition (Porter, 1980). In such situations, the ordinary capabilities that contribute to improving current activities will be more important in contributing to firm performance.

To determine whether a firm's ordinary capabilities will have a positive or negative influence on firm performance under increased environmental dynamism, we consider in which type of environment a firm will spend most of its time. In considering the industry life cycle, an industry is more likely to be in the start -up, growth, or maturity phases than in the consolidation/decline phase (Porter, 1980). Second, there are more firms in the start-up, growth, or maturity phases than there are in the consolidation/decline phases of an industry

DOI: 10.1002/smj

(Klepper and Graddy, 1990).[4] Taken together, this line of reasoning indicates that any given firm is more likely to experience high dynamism that weakens the contribution of ordinary capabilities than the dynamism that will strengthen their contribution. Therefore, we propose the following relationship:

Hypothesis 2a: The higher the degree of environmental dynamism, the lower the contribution of ordinary capabilities to relative firm performance.

In contrast, we expect the positive contribution of dynamic capabilities to relative firm performance to increase in environments that are more dynamic. This is because dynamic capabilities can extend, modify, change, and create ordinary capabilities (in response to environmental dynamism) and thus play a fundamental role in changing other routines and in ensuring that the firm can change its overall operations and have new sets of decision options (Eisenhardt and Martin, 2000; Winter, 2003). Therefore, firms operating in dynamic environments can gain greater benefits from using dynamic capabilities than in stable environments since such capabilities enable the firm to adjust to the environment (Eisenhardt, 1989; Helfat *et al*., 2007).

However, the contribution of dynamic capabilities to relative firm performance may decrease rather than increase as environmental dynamism increases. First, as we argued in Hypothesis 2a, the influence of environmental dynamism depends on the type of dynamism the firm is facing. If the dynamism does not require change but rather requires increased efficiency, then the firm will not need to increase its dynamic capabilities usage and therefore their contributions to firm performance will decrease (Miller and Friesen, 1983; Helfat *et al*., 2007). Helfat and Peteraf (2003), in discussing capability lifecycles, refer to this as 'retrenchment' of a capability. Second, as environmental dynamism increases, it becomes harder to manage dynamic capabilities and ensure that there is a fit with the environment (Tallon, 2008). Third, an increase in environmental dynamism may still be at too low of a level for dynamic capabilities to be needed, thus resulting in no increase in the contribution of dynamic capabilities to firm performance (Helfat *et al*., 2007). Fourth, under conditions of extremely high environmental dynamism (i.e., high-velocity environments), dynamic capabilities may no longer be able to serve their purpose and thus will not contribute to increased firm performance (Helfat *et al*., 2007).

In reviewing the arguments for and against the increase in the contribution of dynamic capabilities to relative firm performance as environmental dynamism increases, we argue that there is a positive net impact. Regarding the first two points above, firms develop managerial hiring and development processes to help ensure that managers can recognize and respond to at least some of the more commonly expected opportunities and threats presented by dynamic environments (i.e., a firm's owners do not select managers at random, but actively select, develop, incentivize and monitor such agents [Jensen and Meckling, 1976]). These processes should allow a firm to manage and use capabilities appropriately. Regarding the latter two points concerning the end-points of environmental dynamism, we believe it likely that much of the time, the dynamism in a firm's environment is not at the low or high extremes (Eisenhardt, 1989). Thus, in most circumstances, we expect a firm will be operating with a manageable level of environmental dynamism allowing it to use its dynamic capabilities effectively. Therefore, we propose the following relationship:

Hypothesis 2b: The higher the degree of environmental dynamism, the higher the contribution of dynamic capabilities to relative firm performance.

The contribution of heterogeneous capabilities to relative firm performance

In the last pair of hypotheses, which considers the conditions under which capabilities contribute to relative firm performance, we evaluate the contribution of heterogeneous capabilities. The heterogeneity of a capability is a characteristic that indicates how different a capability is from capabilities in other firms. In our view, a capability can vary from being homogeneous to heterogeneous along a continuum. The field has neither fully considered nor tested the importance of heterogeneity on the contribution of capabilities to relative firm performance (Newbert, 2007). Thus,

[4] See Porter (1980: 156–188) for more explanation of industry evolution.

there is a need to examine whether heterogeneity of capabilities is necessary for both ordinary and dynamic capabilities to contribute to higher relative firm performance. After discussing the broader advantages and disadvantages of heterogeneity and homogeneity, we develop the argument that a greater degree of heterogeneity will have a negative impact for ordinary capabilities, but a positive impact for dynamic capabilities. Our argument centers on the idea that heterogeneity has associated disadvantages and the expected benefits that heterogeneity provides may not always cover these disadvantages.

The importance of heterogeneity relies on the argument that heterogeneous capabilities can serve as sources of sustained competitive advantage (Wernerfelt, 1984; Barney, 1991, 2001; Peteraf, 1993; Teece *et al*., 1997). A major basis for such competitive advantage relies on a firm possessing capabilities that create value for its customers, that the firm is able to capture some of this value, and that the firm's competitors are unable to obtain, imitate, or substitute for the capability (Barney, 1991; Teece *et al*., 1997).

In contrast, the underlying argument regarding the advantages of homogeneous capabilities is that one can observe 'commonalities' in capabilities across successful firms (Eisenhardt and Martin, 2000). Therefore, the value contributed to a firm's performance is more attributable to the capability itself, rather than the heterogeneity of the capability (Sakakibara, 1997; Eisenhardt and Martin, 2000; Winter, 2003).[5] The existence of homogeneous characteristics of capabilities across firms would indicate that such capabilities are not idiosyncratic to the firm. Homogeneous capabilities may also represent a firm's use of industry 'best practices,' which are superior to the practices of an individual firm's heterogeneous capabilities and therefore may provide firms using the best practices with competitive advantages (Greve, 2009; Matusik, 2002). This superiority lies in part in the fact that homogeneous capabilities can provide greater efficiencies since they involve common practices and they are easier to manage since there is an exogenous body of knowledge regarding that practice. As such, only some capabilities may be worth protecting from imitation.

The contribution of heterogeneous ordinary capabilities to relative firm performance

Prior work (Wernerfelt, 1984; Barney, 1991) primarily indicates that we should expect heterogeneous ordinary capabilities to have a positive contribution to relative firm performance. This positive contribution occurs because a major part of competitive advantage relies on a firm having something that other firms do not have, such as unique, firm-specific capabilities (Barney, 1991; Teece *et al*., 1997; Schroeder, Bates, and Junttila, 2002). However, potential performance disadvantages of heterogeneous ordinary capabilities revolve around making the capability firm specific (Miller, 2003). A heterogeneous ordinary capability is more difficult to manage and will have few alternative uses within the firm. Further, the heterogeneous ordinary capability may even be inappropriate for a firm. For example, the heterogeneous ordinary capability may provide superior governance capabilities or economy of scale advantages when economy of scope advantages are required, making heterogeneity irrelevant to its contribution.

In considering homogeneous ordinary capabilities, scholars have argued for a positive contribution to performance since such capabilities improve transactional efficiency (Williamson, 1975) and the firm's capacity to economize (i.e., improve existing capabilities and allow it to operate more efficiently) (Williamson, 1991). This contribution is due to the benefits of economizing across the firm's day-to-day activities (e.g., through use of best practices from market-sourced capabilities, which can lower operating costs). Homogeneous ordinary capabilities, by their very nature, are more standardized than heterogeneous ordinary capabilities, typically follow industry best practices, and are easier for firms to manage and support (e.g., supplier-provided off-the-shelf capabilities, outsourced services). They can also offer firms access to more current technological innovations, avoid competency traps, and may provide speed, support, and scale advantages that more customized heterogeneous ordinary capabilities cannot (Williamson, 1991; Carr, 2004; Melville, Kraemer, and Gurbaxani, 2004; Greve, 2009).

[5] Institutional pressures and the resulting isomorphism (DiMaggio and Powell, 1983) may be an alternative reason to observe homogeneous capabilities. If firms are using capabilities for reasons other than efficiency, institutional support or other benefits accruing from the legitimacy associated with the capabilities must compensate, or else the impact on performance can be negative. We appreciate an anonymous reviewer bringing this to our attention.

DOI: 10.1002/smj

However, homogeneous ordinary capabilities can also create disadvantages. Since a firm can acquire these capabilities from the market, they are equally available to a firm's competitors. Therefore, a firm may not continue to improve such capabilities if competitors benefit from the improvements. For example, if a firm is sourcing a capability from a service provider, the buying firm is unlikely to collaborate with the service provider to improve the capability beyond its current level, as such effort and knowledge would also benefit other clients of the service provider that could include the buyer's competitors (Mesquita, Anand, and Brush, 2008). Further, while the service provider may improve the capabilities they offer to maintain industry best practices, the capabilities will remain homogenous so as not to limit the service provider's current or potential client base. Thus, the capabilities available to firms from the service provider reflect the general needs of a large customer base, rather than the specific needs of each individual firm.

Although heterogeneous ordinary capabilities may be beneficial to the firm, past work and recent calls for research indicate that many advantages may be less sustainable and that organizations increasingly compete using temporary advantages (D'Aveni, Dagnino, and Smith, 2008). This observation, coupled with the associated difficulty in managing heterogeneous capabilities, makes homogeneous ordinary capabilities more appropriate for the firm. Such capabilities reflect industry best practices making them generally superior to most heterogeneous ordinary capabilities, as well as easier for a firm to use and manage. Thus, we expect that as the heterogeneity of an ordinary capability increases, a firm's performance relative to its industry group should decrease:

> *Hypothesis 3a: The higher the degree of heterogeneity of an ordinary capability, the lower the contribution of the ordinary capability to relative firm performance.*

The contribution of heterogeneous dynamic capabilities to relative firm performance

The accepted position in the literature is that dynamic capabilities can have a positive contribution to performance and that heterogeneity is a major basis for this contribution (Teece *et al*., 1997). While successful heterogeneous dynamic capabilities can be idiosyncratic in their details, the scale of 'idiosyncratic firm effects' (e.g., heterogeneity) of dynamic capabilities may be overstated in the literature (Eisenhardt and Martin, 2000: 1109–1110). Further, Eisenhardt and Martin (2000: 1108) argue that despite idiosyncrasies, dynamic capabilities still exhibit 'common features that are associated with effective processes across firms.' Therefore, while dynamic capabilities may be somewhat rare (e.g., not possessed equally across all firms), their rarity-based (e.g., heterogeneous) advantages are likely not sustainable, since they may be imitable and vulnerable to substitution due to having key features in common. Such common features allow firms to more easily deploy and manage their dynamic capabilities. Thus, increasing the heterogeneity of dynamic capabilities makes them more difficult to manage relative to homogeneous dynamic capabilities, indicating substantial potential drawbacks to heterogeneous dynamic capabilities. As such, the arguments regarding the benefits of homogeneous dynamic capabilities could parallel those made for homogeneous ordinary capabilities.[6]

Although heterogeneity in a dynamic capability makes that capability harder to use and manage, this added effort could benefit a firm given dynamic capabilities' higher contribution potential, uniqueness, and imitation costs (Teece *et al*., 1997). Thus, a firm would want its dynamic capabilities to be different from those of its competitors. Dynamic capabilities should be more unique to the firm than ordinary capabilities given their influence on a firm's ability to undertake change (Teece *et al*., 1997; Eisenhardt and Martin, 2000; Winter, 2003). The ability to change and adapt that dynamic capabilities provide can allow the firm to have a higher probability of survival and a higher level of firm performance through increased revenue and profits (Helfat *et al*., 2007). This ability to change is also a core part of a firm's competitive advantage (Leonard-Barton, 1992; Greenwood and Hinings, 1993). In particular, as defined earlier, dynamic capabilities allow a firm to modify, extend, change, or create ordinary capabilities. If

[6] One can also argue that as long as the dynamic capabilities allow the firm to adjust to changes in its environment, the degree of heterogeneity is not an important characteristic of the capability. Although this could be true for survival or competitive parity, we do not believe it would hold for higher relative firm performance. We appreciate an anonymous reviewer pointing out this difference.

DOI: 10.1002/smj

two firms modify, extend, or change their ordinary capabilities in the same way, then it is more difficult to achieve a higher level of relative firm performance. Dynamic capabilities can also create new ordinary capabilities, which can lead to new output opportunities, innovations, and increased revenue. As such, heterogeneity of a dynamic capability indicates that a firm has processes for extending, modifying, and/or changing its capabilities that are relatively unique. Following this logic, a firm should differentiate itself from its competitors through its dynamic capabilities because it is more likely to see the added effort of managing the dynamic capabilities offset by the superior performance benefits they provide. Thus, we expect that greater heterogeneity of dynamic capabilities should increase a firm's performance relative to its industry group:

> *Hypothesis 3b: The higher the degree of heterogeneity of a dynamic capability, the higher the contribution of the dynamic capability to relative firm performance.*

In sum, our hypotheses are built around the core question of under what conditions do ordinary and dynamic capabilities contribute to relative firm performance? After predicting that both capabilities can improve relative firm performance, we argue that environmental dynamism and degree of heterogeneity limit the contributions of ordinary capabilities but positively affect the contributions of dynamic capabilities.

METHODS

To test our hypotheses, we collected data from a sample of firms operating in the South American country of Chile. We targeted Chile for several reasons. First, Chile has been a leading contender for joining the North American Free Trade Agreement (NAFTA), which would open their markets to international competition from firms in the United States, Canada, and Mexico. Thus, Chile has a more dynamic environment than most developed economies, which allows for a clearer link between the environment and the use of ordinary and dynamic capabilities. Further, Chile is a more developed country than most other emerging economies. It has a sound governance system, which allows us to expect a visible relationship between capabilities and performance. In addition, being an open economy, Chile has fewer restrictions on technology acquisition and use, which allowed us to focus on IT-based capabilities. We also believe that the potential for NAFTA membership at the time of our study (2001–2003) encouraged firms to change many of their major business processes to prepare for the opportunities and threats created by NAFTA. These factors make Chile a strong target for collecting the rich primary data necessary to test our hypotheses.

We used a Spanish language survey instrument to collect data from multiple managerial decision makers at both the process and firm levels from the companies in our sample. Prior work used a similar version of this survey to collect data from firms in Central and Eastern Europe, demonstrating some validity and applicability of the instrument in similar contexts. This survey consisted of a 'pen and paper' instrument, which we had translated and back translated to identify any language or terminology problems. We resolved issues identified through the two translations and administered the survey to 700 firms in Chile.

The survey had three primary sections. The first section gathered firm-level information on size, industry, and performance for the five-year period of 1999 to 2003. The second section requested information on changes in four of the organization's major process-level areas (product and service quality assurance, human resources system, technological base, and marketing program) over the three-year period of 2001 to 2003. Through fieldwork and prior research (Pearce, 1991; May, Stewart, and Sweo, 2000), we identified these four areas as encompassing the primary activities relevant to small, medium, and large firms. The third section of the survey gathered information regarding the firm's IT usage and its impact on organizational process changes and performance from 2001 to 2003. Although there was only one survey per firm, the modular design of the survey allowed for specialists to complete the section most appropriate to their skills. As a result, one to five specialists completed each survey, with an average of 2.4 specialists per survey. This approach, consistent with similar prior research (Kriauciunas and Kale, 2006), ensures a cross-section of qualified respondents and limits threats to validity posed by single-respondent/common-method bias (Lyles and Baird, 1994; Zander and Kogut, 1995; Capron, Dussauge, and Mitchell, 1998).

DOI: 10.1002/smj

We utilized a local partner university to handle survey distribution, collection, and follow-up. The local partner contacted 1,500 firms from a list of organizations that had participated in various programs at the university. Of that number, 700 indicated that they would participate in the survey. After the first mailing, the partner made follow-up calls to firms to encourage participation and 300 replied that they would complete the survey. Following the end of the survey period (December 2004), we received complete and usable responses on 192 unique business process changes at 48 individual firms, representing almost a seven percent response rate. This level is not uncommon for emerging markets (Hoskisson *et al*., 2000). Testing for nonresponse bias based on firm size indicated that the sample underrepresented small and medium sized firms. As a result, the sample may have some possible skewing toward large firms, making the results potentially less generalizable to small and medium sized firms. In the case of missing data (1.5% or less for all survey-based constructs), we used mean replacement before calculating the variable (Roth, 1994; Roth, Switzer, and Switzer, 1999).

MEASURES

We present an overview of our constructs with their specific item measures and respective survey questions in Table 1. We describe these variables and their measures in more detail in the remainder of this section.

Dependent variables

Reviews of the prior literature indicate that we can better understand the importance of capabilities using two levels of performance (Ray *et al*., 2004; Armstrong and Shimizu, 2007). We chose to measure our dependent variable at two levels not only to address the call for additional research comparing performance measures, but because each measure has its own set of strengths and weaknesses. The first measure we chose is at the process level; the role of capabilities is to either support current activities (ordinary capabilities) or new activities (dynamic capabilities), therefore we can and should measure performance as close to the output of the capability as possible. The process-level measure focuses on the benefits to the firm without any explicit measure of costs and it assumes that one can capture the relationship between capabilities and their output. Finally, this measure is likely to be more insular from events external to the firm. Our second measure is at the firm level. This measure captures both the benefits and costs of using capabilities and reflects the core reason why firms operate—to be profitable. This measure assumes, however, that benefits and costs at the capability level will be measurable at the firm level. It will also be closer linked to external events and provide a more objective measure of performance across firms.

Past work (e.g., Barua, Kriebel, and Mukhopadhyay, 1995; Bharadwaj, 2000; Melville *et al*., 2004) indicates that the performance contribution of capabilities may be primarily at the process level, but the performance effects of environmental dynamism or characteristics such as heterogeneity may be at the firm level. In addition, only a few prior studies (Hult and Ketchen, 2001; Kaleka, 2002; Barua *et al*., 2004) have used multilevel dependent variables. Recent reviews of the extant literature conclude a need for multiple levels of performance measures (Armstrong and Shimizu, 2007).[7] Helfat *et al*. (2007) also indicate that it may be more difficult to capture empirically the contribution of capabilities using measures of firm performance, hence a need for a process-level measure as well. Finally, we define these process-level and firm-level performance measures, as 'relative' to the firm's industry (Ordanini and Rubera, 2008).

Relative firm performance—process level

We derive our *process-level dependent variable* (relative firm performance—process level [*RFPP*]) from the survey by asking respondents how 'the use of IT and its related organizational changes in the last three years has impacted' a set of items (productivity, business process performance, and quality of products or services). To select these items, we relied on fieldwork and prior research (Pearce, 1991; May *et al*., 2000; Filatotchev, Buck, and Zhukov, 2000). We measured responses to the items on a seven-point Likert

[7] Our own review of empirical capabilities research indicates support for 62 percent of the 256 hypotheses using a lower level of performance measure, whereas there was support for 74 percent of the 175 hypotheses using a firm-level measure of performance. This difference was significant at $p<0.001$.

DOI: 10.1002/smj

Table 1. Study variables, descriptions, and measures

Dependent variables	Variable description	Measures
Relative firm performance at the process level (RFPP)	Performance impact of IT use relative to industry group average	Organizational performance: the use of IT and its related organizational changes in the last three years has impacted: • Productivity • Business process performance • Quality of products or services
Relative firm performance at the firm level (RFPF)	Profitability relative to industry group average	How would you rate the profitability of your firm in 2003?
Independent variables	**Variable description**	**Measures**
Ordinary capability (OC)	Measure of ordinary capabilities	Use of IT : think on the general use of IT in your firm in the last three years: • Enhance existing product or service • Enhance existing business process
Dynamic capability (DC)	Measure of dynamic capabilities	• Develop new product or service • Implement new business process • Create new customer relationships • Change way of doing business
Ordinary capability heterogeneity (OC_HET)	Measure of heterogeneous ordinary capabilities	$OC\_HET = (EC_{ia}/OC_i)/(ECind_a/OC_{ind})$
Dynamic capability heterogeneity (DC_HET)	Measure of heterogeneous dynamic capabilities	$DC\_HET = (EC_{ia}/DC_i)/(ECind_a/DC_{ind})$
Control variables	**Variable description**	**Measures**
Firm size (SIZE)	Firm size	Natural log of revenue for 2003
Industry (MFG, SVC, or OTH)	Firm's industry group (manufacturing, service, or other)	Percent of revenue firm receives from industry group
Environmental dynamism (ED)	Measure of dynamism of firm's industry	Expected change in firm's competitive environment over the next five years
Extent of change (EC)	Degree of change in business process	Extent of change in business process during the last three years
Business group (BG)	Membership in group	Dummy variable: No = 0; Yes = 1

DOI: 10.1002/smj

scale in which a low score (1) represents a significant decrease, a moderate score (4) represents no impact, and a high score (7) represents a significant increase in performance across the items. Reliability analysis indicates that the three items have a Cronbach alpha of 0.897, which conforms to the accepted level of at least 0.70 (Nunnally, 1978). After calculating the arithmetic average of the three items, we took the firm measure for process-level performance and divided it by the industry average for that firm (manufacturing, service, or other) from within the sample. This process provided a measure relative to the industry (Ordanini and Rubera, 2008).

Relative firm performance—firm level

We derived our *firm-level dependent variable* (relative firm performance—firm level [*RFPF*]) from the survey by asking respondents to indicate their firm's profits as a percentage of sales for 2003. Respondents could indicate one of five different profitability/sales ranges (<0%, 0%, 0 to 5%, 5 to 15%, and >15%). We requested ranges rather than actual numbers as fieldwork indicated managers did not want to provide specific numbers, but would be willing to indicate ranges. We subsequently coded the responses using the mid-point of each range (−5%, 0%, 2.5%, 10%, and 20%). Since we did not have a particular mid-point for the minimum and maximum ranges of <0% and >15%, we set the corresponding midpoints at −5 percent and 20 percent. Prior to standardizing the measure, the raw responses for firm-level performance ranged from −5 percent to +20 percent, with a mean of 8.59 percent, a mode of 2.5 percent, and a standard deviation of 7.69 percent. As with the firm-level performance measure, we took the measure for firm-level performance and divided it by the firm's dominant industry group (manufacturing, service, or other) average for this measure to calculate a measure of relative firm performance (Ordanini and Rubera, 2008).

Independent variables

In this study, we use four primary independent variables: *ordinary capability, dynamic capability, environmental dynamism,* and *degree of heterogeneity of the capability*. In measuring capabilities, we considered IT-based capabilities, given that IT is one of the largest areas of expenditures for firms. In our measure, it is not the existence of the physical technology that constitutes the capability, but the routines surrounding the use of IT in a particular firm. We therefore selected survey items designed to measure the respondent's perception of how the firm used IT to either enhance its current or enable new capabilities between 2001 and 2003, consistent with the definitions of ordinary and dynamic capabilities (Collis, 1994; Dosi *et al*., 2000; Winter, 2003). Our starting points for the measures were the definitions of ordinary and dynamic capabilities from prior theory (Collis, 1994; Dosi *et al*., 2000; Winter, 2003). For ordinary capabilities, which focus on how the firm earns a living now, theory derived items for this measure included: enhance existing products or services; enhance existing business processes; enhance existing customer relationships; and enhance existing ways of doing business. Similarly, for dynamic capabilities, which focus on how the firm will compete in the future, theory derived items for this measure included: develop new products or services; implement new business processes; create new customer relationships; and change way of doing business. We then utilized exploratory and confirmatory factor analysis (where applicable) to guide our alignment of the survey items to measure these constructs. Further, our independent variables either cover the same period as the dependent variable (for the process-level measure) or precede the dependent variable (for the firm-level measure).

Ordinary capability

Following our factor analysis for the variable *ordinary capability* (OC) (Hypotheses 1a, 2a, and 3a), we dropped items with low loadings or high cross-loadings leaving two items. We asked respondents if IT had enhanced (1) *existing* products or services and (2) *existing* business processes between 2001 and 2003. We used these items since existing capabilities reflect ordinary capabilities, which is consistent with the definition of ordinary capabilities (Collis, 1994; Dosi *et al*., 2000; Winter, 2003). We measured responses to these items on a seven-point Likert scale, in which a low score (1) represents that the firm never uses IT in this manner, and a high score (7) represents that the firm frequently uses IT in this manner. Reliability analysis indicated that the two items have a Cronbach alpha of 0.897 for ordinary capability,

DOI: 10.1002/smj

which conforms to the accepted level of at least 0.70 (Nunnally, 1978). We calculated our measure of ordinary capability as an arithmetic average of the two respective items.

Dynamic capability

We measured the variable *dynamic capability* (DC) (Hypotheses 1b, 2b, and 3b) using four items from the survey designed to measure the respondent's perception of how the firm used IT to enable new capabilities between 2001 and 2003. We derived the items based on past research by focusing on how a capability helps the firm create value through enabling new capabilities (Collis, 1994; Dosi *et al*., 2000; Winter, 2003). These items are: to develop *new* products or services; to implement *new* business processes; to create *new* customer relationships; and to *change* ways of doing business. We measured responses to these items on a seven-point Likert scale in which a low score (1) represents that the firm never uses IT in this manner, and a high score (7) represents that the firm frequently uses IT in this manner. Reliability analysis indicated that the items for these measures have a Cronbach alpha of 0.893. This conforms to the accepted level of at least 0.70 (Nunnally, 1978). We calculated our measure of dynamic capability as an arithmetic average of the four respective items.

Environmental dynamism

We calculated *environmental dynamism* (ED) (Hypotheses 2a and 2b) in the firm's environment from a survey question asking the respondents to evaluate how the firm expected its competitive environment to change over the next five years (Miller and Friesen, 1983). The competitive environment includes how firms compete with each other and how they respond to customer needs and developments in the industry (Porter, 1980; Miller and Friesen, 1983; Wang and Ang, 2004). Response options to the question included: (1) less competitive; (2) similar level of competitiveness; or (3) more competitive. To calculate the measure for environmental dynamism, we compared the firm's response to the 'expected change in environment' question with its industry group's average response for this item. Our measure for environmental dynamism therefore represents the ratio of the firm to its industry group average, which serves to measure whether the firm expects its operating environment to be more (or less) dynamic. We base this measure on the argument that a firm's expectations of the future are based on its experience (correctly or incorrectly) (Bettis and Prahalad, 1995).

Extent of change

We use *extent of change* (EC) (Hypotheses 3a and 3b) as an interim measure to calculate heterogeneity. We also include it in the regressions as a separate control variable. We measured extent of change by asking the respondents about the extent of change in each of the four business processes (product and service quality assurance, human resources system, technological base, and marketing program) during the prior three years. We measured responses to this item on a seven-point Likert scale in which a low score (1) represents no change, a medium score (4) represents a moderate change, and a high score (7) represents a significant change in the business process.

Heterogeneity of capability

We use *heterogeneity of ordinary capability* (OC_HET) for Hypothesis 3a and *heterogeneity of dynamic capability* (DC_HET) for Hypothesis 3b. To calculate these measures, we build from the idea that we can observe heterogeneity through greater levels of capability efficiency (i.e., greater output than expected for a given level of input) (Collis, 1994; Dutta, Narasimhan, and Rajiv, 2005). Therefore, the greater the efficiency of the capability, the greater we would expect the heterogeneity of the capability to be relative to capabilities in other firms. To capture this heterogeneity, we measured the efficiency of the output of the capability (i.e., how the output of a capability used in the firm differs relative to the average output from the capability's usage in its industry group). To measure this usage, we took the extent of change measure described earlier, of each of four business processes (product and service quality assurance, human resources system, technological base, and marketing program) of the firm and divided that number by the level of capability usage (either ordinary capability or dynamic capability as described earlier) in the firm.

This approach allowed us to determine how much change the firm was able to achieve in each

DOI: 10.1002/smj

of the four process areas, given their usage of the ordinary or dynamic capability. We then compared this ratio to the industry group average for each of the four process areas of the firm. A large ratio indicates that a firm is able to achieve more change than its industry group, given the level of capability usage. A small ratio indicates that the firm achieved less change than its industry group, given the level of capability usage. This ratio of how much change a firm achieved per level of usage of a capability lets us determine the degree of heterogeneity in the capability. The formulas used for the calculations are as follows:

$$OC\_HET = (EC_{ia}/OC_i)/ECind_a/OC_{ind}$$

$$DC\_HET = (EC_{ia}/DC_i)/ECind_a/DC_{ind}$$

(Where i = firm; a = process; ind_a = industry average for the process; ind = industry average for that firm for that IT-based capability)

Control variables

We used five control variables in this study: firm size, industry, environmental dynamism, extent of change, and business group. We measured *firm size* (termed 'Size') as the natural log of the firm's revenue (in millions of Chilean pesos) for 2003, the last year of the study. We controlled for size since larger firms could have access to more or better capabilities than smaller firms, while smaller firms may have more flexibility and the ability to develop dynamic capabilities more quickly. We measured *industry* by asking the respondents to complete a table allocating a percentage of their firm's revenues to certain major industries, such that they total 100 percent. We assigned a dummy variable to each firm based on their dominant industry: processing and manufacturing (MFG), which included 15 firms; sales and service (SVC), which included 21 firms; and 'other' (OTH), which included 12 firms in such industries as utilities, chemicals, energy, and transportation (Khanna and Rivkin, 2001; Kriauciunas and Kale, 2006). We used the measures for the manufacturing (MFG) and other (OTH) industries as control variables in our study, with respect to the excluded industry, sales and service (SVC). As described earlier, we developed the measure for environmental dynamism to calculate the interaction between ordinary and dynamic capabilities with the degree of environmental dynamism for use in Hypotheses 2a and 2b. We also include environmental dynamism in our models as a separate measure for control purposes, as environmental dynamism may influence firm performance. Extent of change is a variable used to calculate capability heterogeneity for Hypotheses 3a and 3b. It is also included as a control variable since the extent of change can influence firm performance. We developed a dummy variable measure for *business group* (BG) to indicate whether the firm belongs to such a group since business group membership may influence performance in emerging economies (Khanna and Rivkin, 2001).

Analytical procedures

The analysis procedures consisted first of confirmatory factor analysis (to confirm the reliability of measurement items where prior theory was available to guide the selection of measurement items for the construct) and exploratory factor analysis using varimax rotation (where prior theory was not available and/or to explore item loadings on distinct factors and to check cross loadings). Following reliability testing of our measures, we employed regression with clustering by firm on a standardized dataset. We also undertook additional supplemental analysis to test for various other validity, reliability, and robustness issues (presented later in our sensitivity analysis section). Our sample contained multilevel data consisting of measures and performance in 48 firms, with measures of heterogeneity calculated from changes in four areas of firm operations (product and service quality assurance, human resources system, technological base, and marketing program) in each firm. This process yielded 192 observations—four from each firm. Since ordinary least squares regression assumes independent observations, our model testing employed regression with clustering by firm (PROC GENMOD) on a standardized dataset, using SAS version 9.1. In this approach, we used a 'class' statement and a 'repeated' statement in the regression to indicate that the 192 observations in our sample data clustered into 48 firms, and that the process observations may correlate within the firms but would be independent across the firms.

Table 2 provides the correlation matrix and descriptive statistics for the dependent, independent, and control variables of interest in this study.

DOI: 10.1002/smj

Table 2. Summary statistics and correlation matrix

Variable	N	Mean	Std Dev	RFPP	RFPF	OC	DC	OC_HET	DC_HET	SIZE	MFG	SVC	OTH	ED	EC
RFPP	48	1.00	0.12	1.00											
RFPF	48	1.00	0.92	−0.09835	1.00										
OC	48	6.00	0.97	0.41184**	0.17636*	1.00									
DC	48	5.09	1.37	0.46009**	−0.00702	0.40958**	1.00								
OC_HET	192	1.00	0.30	−0.0494	−0.09533	−0.52348**	−0.08803	1.00							
DC_HET	192	1.00	0.49	−0.26540**	0.13146^	−0.17588*	−0.66794**	0.43647**	1.00						
SIZE	48	12.74	3.49	0.23802**	−0.03088	0.11809	0.01355	−0.01489	0.00805	1.00					
MFG	48	0.38	0.49	0.0013	−0.00059	−0.22347*	−0.24694**	0.00145	−0.00118	−0.02316	1.00				
SVC	48	0.44	0.50	−0.00358	0.0004	0.08723	0.11953^	−0.00124	0.00077	−0.00096	−0.68313**	1.00			
OTH	48	0.19	0.39	0.00295	0.00022	0.16631*	0.15436*	−0.00022	0.0005	0.02994	−0.37210**	−0.42366**	1.00		
ED	48	1.00	0.17	−0.04979	−0.24737**	−0.11789	−0.07107	0.01071	0.0565	0.07706	−0.00384	0.00438	−0.00079	1.00	
EC	48	5.09	1.21	0.26072**	0.02482	0.11689	0.20149*	0.73173**	0.32645**	0.05619	0.06855	−0.07369	0.00864	−0.09142	1.00
BG	48	0.54	0.50	0.08465	0.38751**	0.02171	0.11311	0.17409*	−0.02579	0.00954	0.10796	−0.03161	−0.09373	−0.11826	0.26014**

** significant at $p \leq 0.01$ * significant at $p \leq 0.05$ ^ significant at $p \leq 0.10$

Since our measures of heterogeneous capabilities (ordinary capability heterogeneity and dynamic capability heterogeneity) incorporate the extent of change in each business process, we have 192 observations. The other variables are measured at the firm level and have only one observation per firm (N=48).

RESULTS AND ANALYSIS

We present the results of the tests of our hypotheses in Tables 3 and 4. Table 3 contains the results using process-level relative performance, while Table 4 contains the results of the same models using firm-level relative performance.

Results with relative firm performance at the process level

In Model 1, we test the relationship between process-level performance and our control variables for firm size, industry group (manufacturing and other, with respect to the excluded category service), environmental dynamism, extent of change, and business group. The results of this model show that the coefficients for firm size and extent of change are significant. This significance is consistent through most of the remaining models.

In Model 2, we test Hypotheses 1a and 1b to examine the contribution of ordinary and dynamic capabilities to process-level performance. The coefficient for ordinary capabilities is positive and significant. Further, the coefficient for dynamic capabilities is positive and significant. Thus, we *observe support for Hypotheses 1a and 1b*; both ordinary and dynamic capabilities have a positive association with process-level performance.

In Models 3, 4, and 5 we test Hypotheses 2a and 2b regarding the effects of environmental dynamism on the contribution of ordinary and dynamic capabilities to process-level performance. In these models, the coefficients for the interactions of ordinary and dynamic capabilities with environmental dynamism are not significant. Therefore, we *fail to observe support for Hypotheses 2a and 2b* using process-level performance as the dependent variable.

In Models 6, 7, and 8 we test Hypotheses 3a and 3b regarding the moderating influence of heterogeneity on the contribution of ordinary and

Table 3. Results of model testing for relative firm performance at the process level (RFPP)

Model	1	2	3	4	5	6	7	8	9
Hypothesis	Controls	H1a,b	H2a	H2b	H2a,b	H3a	H3b	H3a,b	Full
Variable	RFPP	RFPP	RFPP	RFPP	RFPP	RFPP	RFPP	RFPP	RFPP
Ordinary capability (OC)		0.26**	0.27**	0.26**	0.26**	0.55**	0.27**	0.60**	0.59**
Dynamic capability (DC)		0.36**	0.36**	0.38**	0.38**	0.38**	0.28*	0.27*	0.28**
Ordinary capability & dynamism (OC_ED)			−0.03		0.01				0.05
Dynamic capability & dynamism (DC_ED)				−0.04	−0.04				−0.07
Ordinary capability heterogeneity (OC_HET)						0.44		0.50	0.52^
Dynamic capability heterogeneity (DC_HET)							−0.09	−0.13	−0.15
Firm size (SIZE)	0.23**	0.20**	0.20**	0.20**	0.20**	0.19**	0.20**	0.19**	0.20**
Manufacturing industry (MFG)	−0.02	0.12^	0.13^	0.13^	0.13^	0.21*	0.10	0.20*	0.20*
Other industry (OTH)	−0.01	−0.06	−0.06	−0.05	−0.05	−0.07	−0.06	−0.07	−0.06
Environmental dynamism (ED)	−0.04	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01
Extent of change (EC)	0.24**	0.14*	0.15*	0.15*	0.15*	−0.22	0.19*	−0.20	−0.21
Business group (BG)	0.02	−0.02	−0.03	−0.03	−0.03	−0.02	−0.02	−.03	−0.02
Model Fit									
Df	185	183	182	182	181	182	182	181	179
X2	168	123	123	122	122	121	122	120	120
Value/DF	0.91	0.67	0.67	0.67	0.68	0.66	0.67	0.66	0.67
Log likelihood	−260	−230	−229	−229	−229	−228	−229	−227	−227

** significant at p ≤0.01 * significant at p ≤0.05 ^ significant at p≤0.10
The interaction variable OC_ED was calculated after centering the scores for the main variables.

Table 4. Results of model testing for relative firm performance at the firm level (RFPF)

Model	10	11	12	13	14	15	16	17	18
Hypothesis	Controls	H1a,b	H2a	H2b	H2a,b	H3a	H3b	H3a,b	Full
Variable	RFPF	RFPF	RFPF	RFPF	RFPF	RFPF	RFPF	RFPF	RFPF
Ordinary capability (OC)		0.21**	0.23	0.23**	0.34**	0.21	0.18*	0.02	0.09
Dynamic capability (DC)		−0.14^	−0.14^	−0.20**	−0.29**	−0.14^	0.25*	0.26*	0.19^
Ordinary capability & dynamism (OC_ED)			−0.06		−0.38**				−0.47**
Dynamic capability & dynamism (DC_ED)				0.21**	0.47**				0.57**
Ordinary capability heterogeneity (OC_HET)						−0.01		−0.23	−0.36
Dynamic capability heterogeneity (DC_HET)							0.46**	0.48**	0.62**
Firm size (SIZE)	−0.01	−0.04	−0.05	−0.05	−0.11^	−0.04	−0.03	−0.02	−0.11^
Manufacturing industry (MFG)	−0.03	−0.02	−0.01	−0.07	−0.05	−0.02	0.08	0.04	0.01
Other industry (OTH)	0.03	0.02	0.03	−0.03	−0.04	0.02	0.00	0.01	−0.05
Environmental dynamism (ED)	−0.21**	−0.19**	−0.18**	−0.23**	−0.20**	−0.19**	−0.21**	−0.21**	0.23**
Extent of change (EC)	−0.09	−0.09	−0.08	−0.10	−0.08	−0.08	−0.33**	−0.15	−0.10
Business Group (BG)	0.39**	0.40**	0.39**	0.44**	0.37**	0.40**	0.42**	0.42**	0.38**
Model Fit									
Df	185	183	182	182	181	182	182	181	179
X2	152	145	144	139	129	145	134	134	110
Value/DF	0.82	0.79	0.79	0.76	0.71	0.80	0.74	0.74	0.62
Log likelihood	−250	−246	−245	−242	−234	−246	−238	−238	−220

** significant at p ≤0.01 * significant at p ≤0.05 ^ significant at p≤0.10
The interaction variable OC_ED was calculated after centering the scores for the main variables.

dynamic capabilities to process-level performance. In Models 6 and 7, the coefficients for ordinary capability heterogeneity and dynamic capability heterogeneity are not significant. In Model 8, the coefficient for ordinary capability heterogeneity is significant, but opposite of our hypothesized direction. Therefore, we *fail to observe support for Hypotheses 3a and 3b* using process-level performance as the dependent variable. We include a full model (Model 9) where all the effects are similar as in the previous models.

Results with relative firm performance at the firm level

We present the results of our analysis with firm-level performance as the dependent variable in Table 4.

In Model 10, we test the relationship between firm-level performance and our control variables for firm size, industry group (manufacturing and other, with respect to the excluded category service), environmental dynamism, extent of change, and business group. The results of this model show that the coefficients for environmental dynamism and business group are significant in the model, and that this level of significance is consistent through most of the remaining models. These results contrast with those in the models using firm-level performance (in Table 3), in which environmental dynamism and business group were not significant, but extent of change was significant.

In Model 11, we test Hypotheses 1a and 1b to examine the contribution of ordinary and dynamic capabilities to firm-level performance. We find the contribution of ordinary capabilities to firm-level performance is positive and significant. Therefore, we *observe support for Hypothesis 1a;* ordinary capabilities have a positive association with relative firm performance at the firm level. We also find the contribution of dynamic capabilities to firm-level performance is negative and marginally significant ($p \leq 0.10$), opposite of our prediction. Therefore, we *fail to observe support for Hypothesis 1b* using firm-level performance as the dependent variable.

In Models 12, 13, and 14 we test Hypotheses 2a and 2b regarding the effects of environmental dynamism on the contribution of ordinary and dynamic capabilities to firm-level performance. In Model 12, the coefficient for the interaction of ordinary capability with environmental dynamism is negative, but insignificant. However, once we control for the effect of the interaction of dynamic capability with environmental dynamism in Model 14, the coefficient for the interaction of ordinary capability with environmental dynamism is significant and negative as predicted. Therefore, we *observe support for Hypothesis 2a;* the moderating effect of environmental dynamism is such that ordinary capabilities have a negative association with relative firm performance at the firm level. In Models 13 and 14, the coefficient for interaction of dynamic capability with environmental dynamism is positive and significant. Therefore, we also *observe support for Hypothesis 2b;* the moderating effect of environmental dynamism is such that dynamic capabilities have a positive association with firm-level performance.

In Models 15, 16 and 17, we test Hypotheses 3a and 3b regarding the moderating influence of heterogeneity on the contribution of ordinary and dynamic capabilities to firm-level performance. In Models 15 and 17, the coefficients for ordinary capability heterogeneity are not significant. Therefore, we *fail to observe support for Hypothesis 3a* using firm-level performance as the dependent variable. In Models 16 and 17, the coefficients for dynamic capability heterogeneity are both positive and significant as predicted. Therefore, we *observe support for Hypothesis 3b;* the effect of heterogeneity is such that dynamic capabilities have a positive association with firm-level performance. We include a full model (Model 18) where all the interaction effects are similar as in the previous models.

Collectively, our results indicate at least partial support (varying based upon the level of the dependent variable) for all hypotheses with the exception of Hypothesis 3a. We discuss these results and their implications in the next section.

DISCUSSION AND IMPLICATIONS

In this study, we theorized and examined a central research question: under what conditions do ordinary and dynamic capabilities contribute to relative firm performance? We developed three hypotheses to explore the direct effects of capabilities on relative firm performance and the implications of environmental dynamism and heterogeneity. In this section, we review the results by hypothesis and discuss the dependent variables jointly, rather

DOI: 10.1002/smj

than separately as we did in the previous section. By discussing the dependent variables together, we can compare the implications of dependent variable choice for measuring the contribution of capabilities to relative firm performance.

In our first set of hypotheses, we theorized the basic direct relationships to determine if ordinary and dynamic capabilities always contribute to increased relative firm performance. In testing Hypothesis 1a, we observed support for the argument that ordinary capabilities would have a positive contribution to relative firm performance at the process level and at the firm level. These findings suggest that ordinary capabilities have a net positive contribution to process-level performance through factors that improve business process performance and the quality of products and services. Further, these findings also suggest that ordinary capabilities contribute positively to firm-level profitability through factors that contribute to cost reductions and revenue enhancements. Given that this hypothesis was the only one supported at both levels of relative firm performance, it speaks to the importance and contribution of ordinary capabilities to different levels of the firm. These results also appear to support our reasoning that firms have mechanisms in place to limit the negative impact of ordinary capabilities on firm performance.

In testing Hypothesis 1b, we observed support for the argument that dynamic capabilities will have a positive contribution to relative firm performance at the process level, but not at the firm level. These findings suggest that dynamic capabilities change a firm's processes, products and services, and customer relations resulting in a positive contribution to process-level performance. The changes, though, did not measurably contribute to firm-level profitability. Interestingly, the results are opposite of what we predicted for the firm-level performance measure, indicating that dynamic capabilities appear to negatively affect relative firm-level performance. There are several possible reasons for this finding. First, performance gains may not offset the additional difficulty of managing dynamic capabilities, as well as the subsequent adjustments resulting from using the dynamic capability within the time period of our study. Second, given that it is difficult to manage dynamic capabilities and to measure their influence, it may be harder than we hypothesized for managers to limit the negative influence of dynamic capabilities at the firm level. This difficulty arises from the less frequent use of dynamic capabilities, difficulty in managing them, and the delay in seeing the expected results from using them. Third, it may be that firms were using dynamic capabilities to compensate for previously poor performance or were using past success to fund IT investments.[8] We consider this possibility in our sensitivity analysis section.

In our second set of hypotheses to determine whether the degree of environmental dynamism affects the contribution of ordinary and dynamic capabilities, we had predicted a negative moderating relationship for ordinary capabilities in Hypothesis 2a and a positive moderating relationship for dynamic capabilities in Hypothesis 2b. We failed to observe support for either hypothesis using our process-level dependent variable, but did observe support for both using our firm-level measure. These results suggest that the effects of the environment are observable at the firm level, but not the process level. This contrast may be because the influence of environmental dynamism may not work its way down to the process level. These results also support our argument that a firm experiencing increased environmental dynamism is less likely to be in a consolidation/decline phase of the industry, which would have favored ordinary capabilities.

In our third set of hypotheses, we theorized the implications of heterogeneity for the contributions of capabilities to relative firm performance through Hypotheses 3a and 3b. In testing Hypothesis 3a, we failed to observe support for the predicted negative effect of heterogeneity on the contribution of ordinary capabilities to performance at either the process or firm level. In fact, for one performance measure, we found an opposite relationship. Heterogeneity did strengthen the contribution of ordinary capabilities when measured at the process level, indicating that for some firms protecting ordinary capabilities can be beneficial. This may indicate that not all best practices diffuse across an industry, thus using heterogeneous ordinary capabilities may provide more advantages than we argued previously. For the firm-level measure, given the nature of how ordinary capabilities

[8] We thank an anonymous reviewer for this suggestion and for leading us to examine this and several other possible alternative explanations. This additional analysis is available upon request.

DOI: 10.1002/smj

operate (i.e., enhancing existing processes, products, services), it appears that the predicted difficulty of managing more heterogeneous ordinary capabilities, that we argued, were marginal. It may also be that best practices in this area have not become available to all firms in an industry. As such, heterogeneity neither significantly lessened the direct effects of the ordinary capabilities, nor did they provide a consistent positive influence. These results suggest that scholars should consider the influence of resource-based view arguments regarding heterogeneity as well as the contribution of the capability itself to improved performance to gain a better understanding of the role of ordinary capabilities in competitive advantage.

In testing Hypothesis 3b, we observed support for the prediction that the level of heterogeneity enhances the positive effect of dynamic capabilities on relative firm performance at the firm level, but not at the process level. Underlying this hypothesis is the argument that given the nature of how dynamic capabilities operate (i.e., enabling changes in processes, products, and services), the advantages of heterogeneity for a dynamic capability will outweigh the added difficulties of managing them. Observing support only at the firm level of analysis suggests that the effects of heterogeneity sharpen the distinctions of relative performance with competitors. Specifically, heterogeneity of the dynamic capability increases management costs as well as protects the capability from imitation. This combined influence may be more apparent at the firm level, given that our profit-based measure integrates costs and revenues. Further, this observation indicates that the contribution to relative firm performance from a heterogeneous dynamic capability may simply not always be as measurable at the process level. These observations indicate support for dynamic capabilities perspectives that rely on arguments of heterogeneity to explain the dynamic capability-competitive advantage relationship (i.e., Teece *et al*., 1997; Helfat *et al*., 2007). Thus, we conclude that while dynamic capabilities also contribute to relative firm performance, heterogeneity also appears to enhance the contribution of dynamic capabilities to relative performance at the level of the firm. Therefore, given that firms use dynamic capabilities to enact first-order change, firms that can do this faster and/or more effectively and differently from their industry group, should realize greater relative performance.

Several control variables also provide insights. Environmental dynamism was not significant at the process level, but was significant and generally negative at the firm level, suggesting that although the environment may influence both costs and revenues (and thus profits at the firm level), the firm's processes are relatively sheltered from the environment. For extent of change, we found a positive and significant relationship with the process-level measure, but a negative (though generally not significant) relationship with the firm-level measure (profitability). We believe this difference relates to the process-level measure capturing the relationship that larger change can lead to greater output contributions at the process level. However, the firm-level measure captures both benefits and costs from the change, which may lead to an offsetting result for the time period in our study. The business group measure was not significant at the process level, but was positive and significant at the firm level indicating that business group membership may not benefit a firm's performance regarding its processes, but is associated with higher firm profitability. This observation may be due to business group membership helping a firm resolve institutional issues or increase market power.

The comparison of the results for the two dependent variables highlights the need to consider capabilities at multiple levels of analysis. In our study, we generally found significant results for direct capability relationships at both the process and firm level of analysis, though not always in the direction predicted. In addition, the results using the firm-level measure of performance had higher significance than the results using the process-level measure of performance. This distinction reflects the general level of significance identified in our review of the empirical capabilities literature. These contrasting results also offer empirical support for the conclusions of Armstrong and Shimizu (2007) regarding the need to consider multiple levels of analysis. For environmental dynamism and degree of heterogeneity, their reflection of external factors (the environment and capability heterogeneity relative to competitors) means that we are more likely to observe their influence at the firm level rather than the process level.

These results have important managerial implications as well. First, firms can benefit by using both ordinary and dynamic capabilities. However,

DOI: 10.1002/smj

managers should be aware that the benefits that accrue from these capabilities might not be apparent at all levels of the firm. Second, the effect of capability uniqueness may vary based on both the environment in which the capability is deployed and the uniqueness of the capability. Specifically, firms may achieve higher relative performance by increasing ordinary capability usage in stable environments and increasing dynamic capability usage in dynamic environments. Further, firms may achieve higher relative performance by making their dynamic capabilities different from their competitors' dynamic capabilities. They should carefully consider differentiating ordinary capabilities and investigate whether best practices associated with the ordinary capability are generally available. For example, managers may wish to use supplier-provided off-the-shelf technologies to support ordinary capabilities when they reflect industry best practices and/or consider outsourcing some ordinary capabilities, while investing in the custom development of technologies for dynamic capabilities.

LIMITATIONS AND SENSITIVITY ANALYSIS

We believe this paper makes some valuable contributions toward understanding the importance of ordinary and dynamic capabilities. Like all research, this study is also subject to some limitations. First, although our measures provide insight for understanding some of the complex factors surrounding capabilities, future research may wish to develop more direct measures of heterogeneous capabilities as well as additional multilevel measures of firm performance. A second potential limitation is our development of dependent and independent variables using the same survey. This approach has the potential to introduce common method variance (Podsakoff *et al*., 2003), and is a potential issue for research designs utilizing survey-based measures. However, we believe that using two different levels of dependent variables with different types of measurement data, and having multiple respondents per survey reduces the potential impact of this issue, while also providing insight into how the capabilities may affect the firm in different ways. Third, a larger, more robust U.S., European, and/or multi-country sample may provide added explanatory power and yield additional insights to the issues we test, as well as expand the generalizability of our results. Such approaches could also address potential issues of context specificity and external validity of a single country study such as this one. Fourth, future research may wish to examine the contribution of capabilities as a function of industry and market maturity, given that the contribution of dynamic capabilities may decrease in mature markets or in those with fewer players. Finally, it would be interesting to have additional time periods in which to consider environmental dynamism. Our paper considers a five-year time period, but comparing different time periods (e.g. two-year, five-year, 10-year) could further inform the field regarding the link between capabilities and the environment. In addition to considering different time periods, future work should use measures of environmental dynamism that explicitly require the use of new capabilities, such as changing customer characteristics, degree of consolidation, or number of new product offerings.

We also conducted sensitivity analysis for our independent and dependent variables. Since size is sometimes difficult to measure using revenue in emerging economies (Hoskisson *et al*., 2000), we also ran our analysis with size measured by the natural log of the number of employees as opposed to our measure of size as natural log of sales revenues (Kriauciunas and Kale, 2006). No significant differences resulted in our analysis from this change in measures. Since the construct of heterogeneity is difficult to measure, we also calculated heterogeneity of ordinary and dynamic capabilities as the absolute value of the difference from the industry average. Here we also observed no significant differences resulting from this change in measures. We also considered our relative firm performance dependent variables, and heterogeneity and environmental dynamism independent variables as distance measures rather than ratio measures and found no major differences.

Further, we explored whether the contributions of ordinary or dynamic capabilities experience diminishing returns. We first explored this possibility for heterogeneous ordinary capabilities by adding a squared term to our models. The squared term for ordinary capability heterogeneity was not significant for either of our dependent variables indicating no curvilinear relationship. We then

DOI: 10.1002/smj

added a squared term for heterogeneous dynamic capabilities to our models. While the squared term was not significant at the process level, it was significant at the firm level. This finding indicates that the contribution of heterogeneous dynamic capabilities to relative firm performance, though positive, may diminish as the degree of heterogeneity increases.

Finally, we were concerned regarding reverse causality in our models. In particular, there is the risk that firms that are more successful invest more in their IT-based capabilities, which then allows them to use those capabilities more and lead to further increased firm performance. Alternatively, firms may use capabilities to overcome previously poor performance. To consider this possibility, we used an estimated change in profit for three time periods (1999–2000, 2000–2001, and 1999–2001). These time periods preceded the period of IT-capability usage. The results (not reported for brevity, but available upon request) indicated that previous improvements in performance resulted in lower use of ordinary capabilities and did not consistently influence the use of dynamic capabilities. Thus, we are confident that reverse causality is not driving our results.

CONCLUSIONS AND CONTRIBUTIONS

By considering the conditions under which ordinary and dynamic capabilities contribute to improved relative firm performance, we make several contributions to the strategy literature. First, we examined the positive and negative effects of ordinary and dynamic capabilities to provide a more complete understanding of their contributions to firm performance. Our support for the positive contribution of ordinary capabilities at both levels of analysis indicates that ordinary capabilities appear to provide the foundation for a firm's operations. However, the positive and negative contributions of dynamic capabilities indicate they have a more complex influence on firm performance. Second, we provided contrasting arguments regarding the influence of the environment on the contribution of ordinary and dynamic capabilities to relative firm performance. We found that dynamic capabilities do not automatically improve firm performance, but offer a greater contribution when employed in appropriate settings (dynamic environments) indicating some boundary conditions or limitations for dynamic capabilities. Third, we integrated core arguments regarding the importance of heterogeneity to address an underexamined area fundamental to capabilities research (Armstrong and Shimizu, 2007; Newbert, 2007). Our finding that the importance of heterogeneity depends on the type of capability under consideration helps us to resolve some of the persistent conflicting arguments in the strategy literature regarding the presumed necessity or superiority of heterogeneous capabilities (Barney, 1991; Teece *et al*., 1997) over homogeneous capabilities (Eisenhardt and Martin, 2000; Winter, 2003). Fourth, by measuring the contribution of capabilities at both the process and firm levels, we contribute to resolving the debate that a possible reason for limited empirical support and conflicting conclusions in previous studies may be the level of analysis used (Armstrong and Shimizu, 2007), and thus suggest that future research should use multilevel dependent variables.

In conclusion, our findings suggest that the 'more capabilities are better' and/or 'heterogeneous capabilities are better' arguments are incomplete as there are conditions and limits regarding when and where capabilities contribute to relative firm performance. As such, we are now closer to understanding the fundamental ways in which capabilities can contribute to competitive advantage, and look forward to the field advancing analysis of this important topic.

ACKNOWLEDGEMENTS

We thank Editor Will Mitchell and two anonymous reviewers from *SMJ* for assisting us in developing this manuscript for publication. We also thank Craig Armstrong, Thomas Brush, Enrique Canessa, Jungpil Hahn, Grazina Kriauciuniene, Michael Leiblein, Tammy Madsen, Kent Miller, Scott Newbert, Anne Parmigiani, Steven Postrel, Miguel Rivera-Santos, Anthony Scime, Mark Shanley, and Govert Vroom for their advice, input, and comments on previous versions of this manuscript. We also appreciate the support and cooperation of the Labor and Global Exchange Program at the Institute of Labor and Industrial Relations at the University of Michigan and Adolfo Ibanez University.

REFERENCES

Amit R, Schoemaker PJH. 1993. Strategic assets and organizational rent. *Strategic Management Journal* **14**(1): 33–46.

Armstrong C, Shimizu K. 2007. A review of approaches to empirical research on the resource-based view of the firm. *Journal of Management* **33**(6): 959–986.

Barney J. 1991. Firm resources and sustained competitive advantage. *Journal of Management* **17**(1): 99–120.

Barney J. 2001. Is the resource-based view a useful perspective for strategic management research? Yes. *Academy of Management Review* **26**(1): 40–56.

Barua A, Konana P, Whinston AB, Yin F. 2004. An empirical investigation of net-enabled business value. *MIS Quarterly* **28**(4): 585–620.

Barua A, Kriebel C, Mukhopadhyay T. 1995. Information technologies and business value: an analytic and empirical investigation. *Information Systems Research* **6**(1): 3–23.

Bettis RA, Prahalad CK. 1995. The dominant logic: retrospective and extension. *Strategic Management Journal* **16**(1): 5–14.

Bharadwaj A. 2000. A resource-based perspective on information technology capability and firm performance: an empirical investigation. *MIS Quarterly* **24**(1): 169–196.

Brush TH, Artz KW. 1999. Toward a contingent resource-based theory: the impact of information asymmetry on the value of capabilities in veterinary medicine. *Strategic Management Journal* **20**(3): 223–250.

Capron L, Dussauge P, Mitchell W. 1998. Resource redeployment following horizontal acquisitions in Europe and North America, 1988–1992. *Strategic Management Journal* **19**(7): 631–661.

Carr N. 2004. *Does IT Matter? Information Technology and the Corrosion of Competitive Advantage.* Harvard Business School Press: Boston, MA.

Chmielewski DA, Paladino A. 2007. Driving a resource orientation: reviewing the role of resource and capability characteristics. *Management Decision* **45**(3): 462–483.

Collis DJ. 1994. How valuable are organizational capabilities? *Strategic Management Journal*, Winter Special Issue **15**: 143–152.

Cyert RM, March JG. 1963. *A Behavioral Theory of the Firm*. Prentice-Hall: Englewood Cliffs, NJ.

D'Aveni RA, Dagnino GB, Smith KG. 2008. The age of temporary advantage? Call for papers for special issue of *Strategic Management Journal* strategicmanagement.net/pdfs/SMJCall200805.pdf (8, May 2008).

DiMaggio PJ, Powell WW. 1983. The iron cage revisited: institutional isomorphism and collective rationality in organizational fields. *American Sociological Review* **48**(2): 147–160.

Dosi G, Nelson R, Winter S. 2000. Introduction: the nature and dynamics of organizational capabilities. In *Nature and Dynamics of Organizational Capabilities*, Dosi G, Nelson R, Winter SG (eds). Oxford University Press: New York; 1–21.

Dutta S, Narasimhan O, Rajiv S. 2005. Conceptualizing and measuring capabilities: methodology and empirical application. *Strategic Management Journal* **26**(3): 277–285.

Eisenhardt K. 1989. Making fast strategic decisions in high velocity environments. *Academy of Management Journal* **32**(3): 543–576.

Eisenhardt KM, Martin JAM. 2000. Dynamic capabilities: what are they? *Strategic Management Journal*, October–November Special Issue **21**: 1105–1121.

Filatotchev I, Buck T, Zhukov V. 2000. Downsizing in privatized firms in Russia, Ukraine, and Belarus. *Academy of Management Journal* **43**(3): 286–304.

Garg VK, Walters BA, Priem RI. 2003. Chief executive scanning emphases, environmental dynamism, and manufacturing firm performance. *Strategic Management Journal* **24**(8): 725–744.

Greenwood R, Hinings CR. 1993. Understanding strategic change: the contribution of archetypes. *Academy of Management Journal* **36**(5): 1052–1081.

Greve HR. 2009. Bigger and safer: the diffusion of competitive advantage. *Strategic Management Journal* **30**(1): 1–23.

Helfat CE, Finkelstein S, Mitchell W, Peteraf MA, Singh H, Teece DJ, Winter SG. 2007. Dynamic Capabilities. Blackwell: Malden, MA.

Helfat CE, Peteraf MA. 2003. The dynamic resource-based view: capability lifecycles. *Strategic Management Journal*, October Special Issue **24**: 997–1010.

Hitt M, Bierman L, Shimizu K, Kockhar R. 2001. Direct and moderating effects of human capital on strategy and performance in professional service firms: a resource-based perspective. *Academy of Management Journal* **44**(1): 13–28.

Hoopes D, Madsen T. 2008. A capability-based view of competitive heterogeneity. *Industrial and Corporate Change* **17**(3): 393–427.

Hoopes DG, Madsen TL, Walker G. 2003. Why is there a resource-based view? Toward a theory of competitive heterogeneity. *Strategic Management Journal*, October Special Issue **24**: 889–902.

Hoskisson RE, Eden L, Ming Lau C, Wright M. 2000. Strategy in emerging economies. *Academy of Management Journal* **43**(3): 249–267.

Hult GTM, Ketchen DJ Jr. 2001. Does market orientation matter? A test of the relationship between positional advantage and performance. *Strategic Management Journal* **22**(9): 899–906.

Jensen MC, Meckling WH. 1976. Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* **3**(4): 305–360.

Kaleka A. 2002. Resources and capabilities driving competitive advantage in export markets: guidelines for industrial exporters. *Industrial Marketing Management* **31**(3): 273–283.

Keeney RL, Raiffa H. 1993. *Decisions with Multiple Objectives: Preferences and Value Tradeoffs*. Cambridge University Press: Cambridge, UK.

Khanna T, Rivkin JW. 2001. Estimating the performance effects of business groups in emerging markets. *Strategic Management Journal* **22**(1): 45–74.

Klepper S, Graddy E. 1990. The evolution of new industries and the determinants of market structure. *RAND Journal of Economics* **21**(1): 27–44.

Kriauciunas A, Kale P. 2006. The impact of socialist imprinting and search on resource change: a study of firms in Lithuania. *Strategic Management Journal* **27**(7): 659–679.

Lai F, Li D, Qiang Q, Zhao X. 2008. The information technology capability of third party logistics providers: a resource-based view and empirical test from China. *Journal of Supply Chain Management* **9**(1): 21–36.

Leiblein MJ, Madsen TL. 2009. Unbundling competitive heterogeneity: incentive structures and capability influences on technological innovation. *Strategic Management Journal* **30**(7): 711–735.

Leonard-Barton D. 1992. Core capabilities and core rigidities: a paradox in managing new product development. *Strategic Management Journal*, Summer Special Issue **13**: 111–125.

Lyles M, Baird I. 1994. Performance of international joint ventures in two Eastern European countries: the case of Hungary and Poland. *Management International Review* **34**(4): 313–329.

Makadok R. 2001. Toward a synthesis of the resource-based and dynamic-capability views of rent creation. *Strategic Management Journal* **22**(5): 387–401.

Makadok R. 2010. The interaction effect of rivalry restraint and competitive advantage on profit: why the whole is less than the sum of the parts. *Management Science* **56**(2): 356–372.

Matusik SF. 2002. An empirical investigation of firm public and private knowledge. *Strategic Management Journal* **23**(5): 457–467.

May R, Stewart W Jr, Sweo R. 2000. Environmental scanning behavior in a transitional economy: evidence from Russia. *Academy of Management Journal* **43**(2): 403–427.

Melville N, Kraemer K, Gurbaxani V. 2004. Review: information technology and organizational performance: an integrative model of IT business value. *MIS Quarterly* **28**(2): 283–322.

Mesquita LF, Anand J, Brush TH. 2008. Comparing the resource-based and relational views: knowledge transfer and spillover in vertical alliances. *Strategic Management Journal* **29**(9): 913–941.

Miller D. 2003. An asymmetry-based view of advantage: towards an attainable sustainability. *Strategic Management Journal*, October Special Issue **24**: 961–976.

Miller D, Friesen PH. 1983. Strategy-making and environment: the third link. *Strategic Management Journal* **4**(3): 221–235.

Miller KD, Leiblein MJ. 1996. Corporate risk-return relations: returns variability versus downside risk. *Academy of Management Journal* **39**(1): 91–122.

Miller KD, Reuer JJ. 1996. Measuring organizational downside risk. *Strategic Management Journal* **17**(9): 671–691.

Newbert SL. 2007. Empirical research on the resource-based view of the firm: an assessment and suggestions for future research. *Strategic Management Journal* **28**(2): 121–146.

Newbert SL. 2008. Value, rareness, competitive advantage, and performance: a conceptual-level empirical investigation of the resource-based view of the firm. *Strategic Management Journal* **29**(7): 745–768.

Nunnally J. 1978. *Psychometric Theory* (2nd edn). McGraw-Hill: New York.

Ordanini A, Rubera G. 2008. Strategic capabilities and Internet resources in procurement: a resource-based view of B-to-B buying process. *International Journal of Operations & Production Management* **28**(1): 27–52.

Pearce J. 1991. From socialism to capitalism: the effects of Hungarian human resources practices. *Academy of Management Executive* **5**(4): 75–88.

Peng MW, York AS. 2001. Behind intermediary performance in export trade: transactions, agents, and resources. *Journal of International Business Studies* **32**(2): 327–346.

Peteraf MA. 1993. The cornerstones of competitive advantage: a resource-based view. *Strategic Management Journal* **14**(3): 179–191.

Piccoli G, Ives B. 2005. IT-dependent strategic initiatives and sustained competitive advantage: a review and synthesis of the literature. *MIS Quarterly* **29**(4): 747–776.

Podsakoff P, MacKenzie S, Lee J-Y, Podsakoff N. 2003. Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology* **88**: 879–903.

Porter M. 1980. *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. Free Press: New York.

Porter M. 1985. *Competitive Advantage: Creating and Sustaining Superior Performance*. Free Press: New York.

Ray G, Barney JB, Muhanna WA. 2004. Capabilities, business processes, and competitive advantage: choosing the dependent variable in empirical tests of the resource-based view. *Strategic Management Journal* **25**(1): 23–37.

Roth P. 1994. Missing data: a conceptual review for applied psychologists. *Personnel Psychology* **47**: 537–560.

Roth P, Switzer FS III, Switzer DM. 1999. Missing data in multiple item scales: a Monte Carlo analysis of missing data techniques. *Organizational Research Methods* **2**(3): 211–232.

Ruefli TW, Collins JM, Lacugna JR. 1999. Risk measures in strategic management research: auld lang syne? *Strategic Management Journal* **20**(2): 167–194.

Rumelt R. 1982. Diversification strategy and profitability. *Strategic Management Journal* **3**(4): 359–369.

Sakakibara M. 1997. Heterogeneity of firm capabilities and cooperative research and development: an empirical examination of motives. *Strategic Management Journal*, Summer Special Issue **18**: 143–164.

Schroeder RG, Bates KA, Junttila MA. 2002. A resource-based view of manufacturing strategy and the relationship to manufacturing performance. *Strategic Management Journal* **23**(2): 105–117.

Simerly RL, Li M. 2000. Environmental dynamism, capital structure and performance: a theoretical integration

and an empirical test. *Strategic Management Journal* **21**(1): 31–49.

Tallon PP. 2008. Inside the adaptive enterprise: an information technology capabilities perspective on business process agility. *Information Technology and Management* **9**(1): 21–36.

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

Van de Ven AH. 1986. Central problems in the management of innovation. *Management Science* **32**(5): 590–607.

Wang CK, Ang BL. 2004. Determinants of venture performance in Singapore. *Journal of Small Business Management* **42**(4): 347–363.

Wernerfelt B. 1984. A resource-based view of the firm. *Strategic Management Journal* **5**(2): 171–180.

Williamson O. 1975. *Markets and Hierarchies: Analysis and Antitrust Implications*. Free Press: New York.

Williamson O. 1991. Strategizing, economizing, and economic organization. *Strategic Management Journal*, Winter Special Issue **12**: 75–94.

Winter SG. 2003. Understanding dynamic capabilities. *Strategic Management Journal*, Winter Special Issue **24**(10): 991–995.

Zander U, Kogut B. 1995. Knowledge and the speed of the transfer and imitation of organizational capabilities: an empirical test. *Organization Science* **6**(1): 76–92.

Zhu K. 2004. The complementarity of information technology infrastructure and e-commerce capability: a resource-based assessment of their business value. *Journal of Management Information Systems* **21**(1): 167–202.

Zhu K, Kraemer K. 2002. E-commerce metrics for net-enhanced organizations: assessing the value of e-commerce to firm performance in the manufacturing sector. *Information Systems Research* **13**(3): 275–295.

Zou S, Fang E, Zhao S. 2003. The effect of export marketing capabilities on export performance: an investigation of Chinese exporters. *Journal of International Marketing* **11**(4): 32–55.