

## RECONCEPTUALIZING ENTREPRENEURIAL ORIENTATION

BRIAN S. ANDERSON,<sup>1\*</sup> PATRICK M. KREISER,<sup>2</sup> DONALD F. KURATKO,<sup>3</sup> JEFFREY S. HORNSBY,<sup>4</sup> and YOSHIHIRO ESHIMA<sup>5</sup>

<sup>1</sup> Leeds School of Business, University of Colorado, Boulder, Colorado, U.S.A.

<sup>2</sup> College of Business, Iowa State University, Ames, Iowa, U.S.A.

<sup>3</sup> Kelley School of Business, Indiana University, Bloomington, Indiana, U.S.A.

<sup>4</sup> Henry W. Bloch School of Management, University of Missouri, Kansas City, Missouri, U.S.A.

<sup>5</sup> Faculty of Business Administration, Osaka University of Economics, Osaka, Japan

*Entrepreneurial orientation (EO)—a firm's strategic posture towards entrepreneurship—has become the predominant construct of interest in strategic entrepreneurship research. Despite the ever-increasing volume of nomological research on EO, there remain ongoing conversations regarding its ontology. Drawing from measurement theory, we outline an EO reconceptualization addressing the likely prevalence of Type II nomological error in the EO literature stemming from measurement model misspecification. Focusing on the question of whether EO is an attitudinal construct, a behavioral construct, or both, we propose a formative construction of EO viewing the exhibition of entrepreneurial behaviors and of managerial attitude towards risk as jointly necessary dimensions that collectively form the higher-order EO construct. We present an empirical illustration of our reconceptualization followed by a discussion of future research opportunities. Copyright © 2014 John Wiley & Sons, Ltd.*

### INTRODUCTION

What makes a firm entrepreneurial, and how do we distinguish entrepreneurial firms from those more conservatively managed? Miller's (1983) foundational paper provided much needed clarity regarding this fundamental issue to management scholars. After three decades of research building from Miller's (1983) insights, we delineate between entrepreneurial and conservative firms according to their entrepreneurial orientation (EO): the decision-making practices, managerial philosophies, and strategic behaviors that are

entrepreneurial in nature, with entrepreneurial referring to three components—innovativeness, proactiveness, and risk taking (Anderson, Covin, and Slevin, 2009). While scholars have noted that definitions and operationalizations of EO vary (Covin and Wales, 2012), a substantial body of EO research has shown that entrepreneurial firms generally outperform their more conservatively managed peers (Rauch *et al.*, 2009).

Despite the burgeoning scholarly interest in this area, a number of ontological questions persist in the EO literature. For example, there are ongoing conversations regarding the dimensionality of EO (Lumpkin and Dess, 1996); whether EO should be measured formatively or reflectively (Covin and Wales, 2012); whether EO is an attitudinal construct, a behavioral construct, or both (Covin and Lumpkin, 2011; Miller, 2011); whether the dimensions of EO must necessarily covary (Lumpkin and

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\*Correspondence to: Brian S. Anderson, 995 Regent Dr., Boulder, CO 80309, U.S.A. Email: brian.s.anderson@colorado.edu

Dess, 2001); and even whether the name “EO” is being appropriately used across studies (George and Marino, 2011). Active and constructive scholarly debate on the ontological assumptions of our theoretical constructs is healthy for scientific discourse (Bagozzi, Yi, and Phillips, 1991). However, when such arguments remain salient despite a proliferation of research on the EO phenomenon, it becomes apparent that fundamental questions surrounding what it means at the firm level to “be entrepreneurial” remain unsettled.

The current study applies a measurement theory perspective to identify how measurement model misspecification related to the question of whether to construe EO as an attitudinal construct, a behavioral construct, or both, contributes to nomological error—specifically Type II error (i.e., a false negative)—in the EO literature. Further, we suggest that certain ontological assumptions and measurement inconsistencies remaining unresolved under the dominant conceptualization of EO in the literature (i.e., Miller, 1983/Covin and Slevin, 1991) have limited the development of EO’s nomological network. We also maintain that efforts to resolve measurement issues related to EO without addressing these ontological issues (e.g., Covin and Wales, 2012; George, 2011; George and Marino, 2011), while offering valuable insights, have limited utility. That is, scholars may inadvertently continue to make nomological errors irrespective of adopting a particular *ex post* measurement remedy.

We therefore offer a reconceptualization of EO addressing Type II nomological error in the EO literature. Under our reconceptualization, we define EO in a manner consistent with Miller (1983) and Covin and Slevin (1991) as the joint exhibition of observed entrepreneurial behaviors and a managerial inclination at the strategic decision-making level favoring actions with uncertain outcomes. Under our reconceptualization, entrepreneurial behaviors and managerial attitude towards risk jointly and in totality comprise the conceptual domain of firm-level EO. We then pair a formative measurement model ontologically congruent with our reconceptualization that enables the refinement and expansion of EO’s nomological network. Specifically, our paper (1) demonstrates the need to revisit prior research questions, particularly regarding EO’s contributing factors, because of likely nomological error; and (2) illuminates new research questions and new research designs that meaningfully advance the EO conversation. We further offer

an empirical illustration of our reconceptualization to provide practical guidance to EO scholars, and conclude by discussing new research designs and opportunities for strategic entrepreneurship research leveraging our reconceptualization.

## EO, MEASUREMENT THEORY, AND NOMOLOGICAL CONCLUSIONS

### What is entrepreneurial orientation (EO)?

We may trace research on an entrepreneurial mode of strategic decision making to the works of Mintzberg (1973) and Khandwalla (1977), which argued that firm performance is largely predicated on gestalts comprised of strategic choices, organizational attributes (e.g., structure), and environmental exigencies. One such gestalt is entrepreneurial in nature, typified in part by proactive strategic moves and a willingness to take on projects with uncertain outcomes (Khandwalla, 1977). From this early work, Miller (1983) crystallized an entrepreneurial approach to strategy making by suggesting that entrepreneurial firms are those that pursue innovation, aggressively enter new markets, and accept a measure of strategic and financial risk in the pursuit of new opportunities. Notably, Miller (1983: 780) observed that an entrepreneurial firm should exhibit all three strategic components with some degree of simultaneity:

*In general, theorists would not call a firm entrepreneurial if it changed its technology or product-line ... simply by directly imitating competitors while refusing to take any risks. Some proactiveness would be essential as well. By the same token, risk-taking firms that are highly leveraged financially are not necessarily entrepreneurial. They must also engage in product-market or technological innovation.*

Building from Miller (1983) Covin and Slevin (1989, 1991) posited the existence of a continuum used to plot a firm’s strategic behavioral proclivities. The continuum ranges from more conservative to more entrepreneurial, with the entrepreneurial end of the spectrum evidenced by innovativeness, proactiveness, and risk taking. Covin and Slevin (1991: 8) further suggested that the observation of sustained entrepreneurial behaviors is a necessary condition for being entrepreneurial: “Organizations

with an entrepreneurial posture are those in which particular behavioral patterns are recurring.” Thus, under the Miller/Covin and Slevin conceptualization, a firm is entrepreneurial *because* it exhibits entrepreneurial behaviors, and there is an element of temporal consistency in this exhibition.

In the period following the Covin and Slevin (1991) conceptualization, scholars offered alternative perspectives on the conceptual domain of a firm-level strategic orientation towards entrepreneurship (e.g., Lumpkin and Dess, 1996; see Covin and Wales, 2012 for a discussion of the differences between the two conceptualizations). Nonetheless, as noted in two recent meta-analyses, the Miller/Covin and Slevin conceptualization is by far the dominant perspective of EO in the relevant literature (Rauch *et al.*, 2009; Rosenbusch, Rauch, and Bausch, 2013). We therefore ground our discussion in the Miller/Covin and Slevin view suggesting that entrepreneurial firms are those that exhibit innovativeness (the introduction of new products, processes, and business models), proactiveness (actively entering new product/market spaces and seeking market leadership positions), and risk taking (a willingness among strategic decision makers to contribute resources to projects with uncertain outcomes).

### Measurement theory

While numerous perspectives exist in the literature for the ontological grounding of theoretical constructs—realist, critical realist, constructivist, social constructivist, instrumentalist, and so forth (Bagozzi *et al.*, 1991; Borsboom, 2005)—there are essentially two ways with which to measure a latent construct: reflective measurement or formative measurement (Diamantopoulos, Riefler, and Roth, 2008). Prior research has amply covered the differences between these approaches (Jarvis, MacKenzie, and Podsakoff, 2003; MacKenzie, Podsakoff, and Jarvis, 2005), although we will explore some of those differences in depth in subsequent sections. However, the equations associated with both perspectives merit review, and we refer readers to online supporting information Appendix S1 for a more detailed discussion of measurement theory and construct development.

Reflective measurement, which is the most commonly employed perspective in the management literature (MacKenzie, Podsakoff, and Podsakoff,

2011), follows classical test theory wherein measures are a reflection—with error—of a latent construct. Under reflective measurement, variations in the latent construct induce variance in the indicators, as specified in the following equation:

$$x_i = \lambda_i \xi + \delta_i \quad (1)$$

In Equation 1,  $x$  is the  $i$ th indicator of the latent exogenous construct  $\xi$ , with  $\lambda$  representing the loading coefficient and  $\delta$  representing measurement error (Diamantopoulos *et al.*, 2008). While Equation 1 is generally associated with structural equation modeling techniques, the ontological assumptions of the equation are congruent with those made when researchers employ summated rating scales, which are created by taking the mean value among a set of indicators or by simply adding them together. As Spector (1992: 10) observed: “With a summated rating scale, each individual item is designed to be an observation of the intended trait. Each item represents an individual assessment of the true score. If the average (or sum) of individual items is calculated, the errors of measurement are assumed to average approximately zero, resulting in an estimate of the true score.” Furthermore, because the indicators are all observable manifestations of the same underlying latent phenomenon, we *a priori* expect the indicators to covary and to share the same antecedents (Borsboom, 2005).

In contrast, under a formative specification, the collective variance of a latent construct’s indicators define the total variance in the construct, represented by the following equation:

$$\eta = \sum_{(i=1)}^n \gamma_i x_i + \zeta \quad (2)$$

The sum of the indicators,  $x$ , collectively define the conceptual domain of the latent construct  $\eta$ , and changes in the indicators,  $\gamma$ , induce changes in  $\eta$ . Here, the disturbance term  $\zeta$  represents the amount of variance in the latent construct not accounted for by its indicators (MacKenzie *et al.*, 2005; note that  $\zeta$  is not an error term; see Diamantopoulos *et al.*, 2008).

### EO, measurement model misspecification, and nomological error

As noted by Miller (2011) and Covin and Lumpkin (2011), a highly salient yet largely unexplored

issue is whether EO is fundamentally a behavioral phenomenon or whether it represents some kind of attitudinal, philosophical, or dispositional characteristic among strategic decision makers. As Miller (2011) observed, the Miller/Covin and Slevin conceptualization—and the scale commonly used to measure it—includes behavioral and attitudinal components. For example, Covin, Green, and Slevin (2006: 57) offer the following definition of EO, broadly consistent with the Miller/Covin and Slevin conceptualization: “EO is a strategic construct whose conceptual domain includes certain firm-level outcomes and management-related preferences, beliefs, and behaviors as expressed among a firm’s top-level managers.”

There are two specific challenges when mixing attitudinal and behavioral components within a single latent construct. The first challenge, as noted by Koslowsky *et al.* (1997), is that attitude and behavior are mutually reinforcing; behavior is an outcome of attitude and the sustained engagement in a particular behavior reinforces the underlying attitude. The second challenge when mixing attitudinal and behavioral components is that, while it may be reasonable to assume that an attitude and a behavior share similar consequences, it is less clear that they share similar antecedents. This issue is particularly problematic in EO research. For example, does the *act* of new product introduction (captured by the innovativeness component) result from the same underlying cause(s) as a decision-making *proclivity* towards high-risk projects with the chance for high returns (the risk-taking component)?

Reflective measurement of the Miller/Covin and Slevin conceptualization defines EO as the intersection of, or shared variance between, the underlying components of innovativeness, proactiveness, and risk taking (Covin and Wales, 2012). Within this constraint, the assumption is that these components share the same antecedents (Covin and Lumpkin, 2011). Because, however, an attitude is a manifestation of underlying beliefs, perceptions, and cognitive schemas (Rosenberg and Hovland, 1960), it is conceptually unlikely that the same phenomena encouraging behavior also causally relate to attitude (Fishbein and Ajzen, 1975). The preceding is salient because, as George and Marino (2011) note, with only rare exception (e.g., Miller and Le Breton-Miller, 2011), scholars generally measure EO reflectively, and most often using a summated indicator approach with the Covin and Slevin (1989) EO scale or some derivative thereof.

Recall that under a reflective measurement model, the researcher makes the ontological assumption that changes in the underlying phenomenon of interest induce changes in all of its indicators simultaneously and of the same magnitude. This is because the indicators all share the same common cause; the indicators are interchangeable and perfectly covary, assuming the indicators are equally valid (Bollen, 1989). As George and Marino (2011) comment, however, there are theoretical arguments and supporting empirical evidence suggesting that the relationships among EO’s indicators, and between EO’s indicators and the higher-order EO, are not congruent with a reflective specification. The most significant evidence is research showing that innovativeness, proactiveness, and risk taking exhibit differing nomological relationships and do not perfectly covary (Lumpkin and Dess, 2001).

Thus, the question of attitude versus behavior manifests in manifold research design challenges for EO scholars. While Covin and Wales (2012) maintain that a reflective specification does not imply that each underlying component of EO must share *exactly* the same antecedents, measurement theory dictates that there must exist commonalities across the components such that a specified antecedent links causally to all three (MacKenzie *et al.*, 2011). It is this assumption, however, that induces Type II nomological error in the specification of EO’s contributing factors. EO scholars have likely overlooked—or have incorrectly rejected—research models where a given antecedent failed to “link up” with *all* of EO’s underlying components yet may be theoretically meaningful contributory factors to only one.

The broader implication for EO scholars is that a reflective specification of EO may be unnecessarily limiting and, of even greater concern, may have resulted in biased and/or incorrect nomological conclusions. Thus, continuing with a reflective specification that assumes EO’s dimensions share common antecedents may not be the most fruitful conceptualization to advance the EO conversation. As such, we submit that the reconceptualization of EO developed herein is both timely and valuable.

## RECONCEPTUALIZING EO

We define EO as a second-order, firm-level construct comprised of two lower-order dimensions: *entrepreneurial behaviors* (encompassing

innovativeness and proactiveness), and *managerial attitude towards risk* (risk taking). We define entrepreneurial behaviors as the firm-level pursuit of new products, processes, or business models (e.g., innovativeness) with the intended commercialization of those innovations in new product/market domains (e.g., proactiveness). We define managerial attitude towards risk as an inherent managerial inclination—existing at the level of the senior manager(s) tasked with developing and implementing firm-level strategy—favoring strategic actions that have uncertain outcomes (Miller, 1983). Under our reconceptualization, we reorder the three existing components of EO into two lower-order dimensions—risk taking as an attitudinal dimension, while innovativeness and proactiveness collapse to one behavioral dimension.

Under our reconceptualization, we posit that (1) EO is a multidimensional construct consisting of two noninterchangeable dimensions—entrepreneurial behaviors and managerial attitude towards risk; (2) there is positive covariance between these two dimensions; and (3) both dimensions are fundamentally necessary for EO to exist. For a firm to be entrepreneurial under our reconceptualization, observed entrepreneurial behaviors necessarily but do not sufficiently capture EO's conceptual domain; that is, a managerial proclivity towards pursuing projects with uncertain outcomes is an additional necessary condition. Further, under our reconceptualization, entrepreneurial behaviors and managerial attitude towards risk are conceptually and functionally distinct. As such, we suggest viewing EO through a formative specification. We further posit that, while the two dimensions positively covary and hence share some antecedents, there is an *a priori* expectation that the majority of factors that predict entrepreneurial behaviors and those that predict managerial attitude towards risk differ.

### Entrepreneurial behaviors

There are two primary reasons for collapsing the innovativeness and proactiveness components of EO into a single latent construct labeled entrepreneurial behaviors. The first reason is that there is little face validity in the *a priori* assumption of an attitudinal element of innovativeness and of proactiveness. This assertion stems from the observations of Miller (1983) and Covin and Slevin

(1991) that what gives meaning to innovation and to entering new markets are the specific *acts* of innovativeness and proactiveness. One cannot have innovation absent developing new products, processes, or business models; similarly, proactiveness does not exist without a firm actually entering a new market ahead of competitors and “acting in anticipation of future demand” (Lumpkin and Dess, 2001: 431). As such, entrepreneurial behaviors must be observable and derive their meaning only because a firm is behaving entrepreneurially.

One may then posit that the entrepreneurial behaviors dimension is itself formed by the lower-order components of innovativeness and proactiveness. We would suggest a different view and submit that, under the conceptual domain of entrepreneurial behaviors, innovativeness and proactiveness are inextricably confounded. This confounding leads to our second reason for collapsing innovativeness and proactiveness into a single dimension: while innovation is a necessary condition for entrepreneurship, it is not sufficient, nor is it meaningfully independent from proactiveness in this context (Rosenbusch, Brinckmann, Bausch, 2011). For example, as Schumpeter's classic works (1934, 1942) noted in their treatment of creative destruction, it is the combination of innovation (the creation of the new) with the process of commercialization (creating new markets and destroying old markets) that is the defining characteristic of entrepreneurship. The argument is that entrepreneurial firms do not simply create; entrepreneurial firms create with the intent of employing those creations to establish market leadership positions, to develop new markets, and to preempt competitors (Schumpeter, 1942). It is therefore conceptually inconsistent to create a theoretical distinction between the two: innovativeness and proactiveness are functionally equivalent reflections of the underlying entrepreneurial behaviors dimension.

### Managerial attitude towards risk

Drawing a conceptual distinction between managerial attitude towards risk and the exhibition of entrepreneurial behaviors, however, recognizes the inherent differences between managerial perceptions of risk and the behaviors pursued by managers that result from those perceptions (March and Shapira, 1987). Our argument that risk taking is attitudinal builds from the observation of March and

Shapira (1987: 1406) that “attitudes towards risk are usually pictured as stable properties of individuals, perhaps related to personality development or culture ...” In the context of Ajzen and Fishbein’s (1977) work on the attitude-behavior linkage, a stable individual property such as risk taking is distinct from the behavioral manifestations of that property (March and Shapira, 1987). To that end, Douglas and Shepherd (2002), for example, find that an individual’s attitude towards risk does not perfectly correlate with subsequent entrepreneurial action.

How managers think about risk, and the organizational actions taken that embody an element of risk, are therefore conceptually distinct. While the relevant literature thoroughly discusses the differences between attitude towards risk and risk-taking behaviors (Shapira, 1986; Wright *et al.*, 2007), the salient point in the context of EO is that the entrepreneurial behaviors undertaken by a firm are not a perfect correlate to the strategic decision maker’s attitude towards risk, as would be implied under a reflective measurement model. While the acts of innovation and new market entry inherently embody risk, the causal factors that encourage the exhibition of those specific strategic actions are a reflection of organization-level and/or environment-level phenomenon facilitating—or diminishing—their employment. Hence, it is necessary to treat entrepreneurial behaviors and managerial attitude towards risk as separate lower-order dimensions of the higher-order EO construct with differing antecedent relationships.

Notably, managerial attitude towards risk exists at the level of the senior-most decision maker tasked with firm-level strategic decisions. In practice, this individual is typically the CEO or managing director of the firm, or the senior executive in charge of a strategic business unit with independent profit-and-loss responsibility within a larger company (Covin and Lumpkin, 2011). The rationale underlying this level of analysis is that EO is a firm-level construct, and the behaviors exhibited under the EO rubric are most frequently associated with firm-level strategic choices (Covin and Slevin, 1991). Thus, managerial attitude towards risk exists at the level at which senior executives decide to pursue entrepreneurial behaviors as part of their firm’s strategy. It is noteworthy that the strategic management literature has long acknowledged that the attitudes, managerial philosophies, and

personal proclivities among senior managers reflect in firm-level strategic choices (Hambrick, 2007).

### Dimensional covariance

Our reconceptualization also recognizes two critical requirements fundamental to classifying entrepreneurial firms (i.e., Covin and Lumpkin, 2011). The first such requirement is that a firm must engage in entrepreneurial behaviors that involve the pursuit of new ideas, processes, and technologies, and that a firm must aggressively seek to commercialize those ideas by extending its boundaries to new product/market domains. The second requirement in classifying entrepreneurial firms is temporal stability—firms must engage in entrepreneurial behaviors with some reasonable consistency across time. We maintain that managerial attitude towards risk correlates with behavioral consistency. The proclivity of senior managers to pursue projects with uncertain outcomes is a fundamental covariate to the *sustained* pursuit of entrepreneurial behaviors. As such, we posit a mutualistic relationship between the dimensions. As an analogy, we find a similarly mutualistic relationship between risk-taking disposition and sustained entrepreneurial action in research on serial entrepreneurs (Haynie *et al.*, 2010). While at a different level of analysis, an assumption often made in serial entrepreneurship research is that prior entrepreneurial action reinforces the disposition to engage in future entrepreneurial action (Haynie *et al.*, 2010).

We note that a common assumption of formative measurement models is the lack of an *a priori* expectation of dimensional covariance (Howell, Breivik, and Wilcox, 2007). As Jarvis *et al.* (2003) and MacKenzie *et al.* (2011) observe, however, the requirement under formative measurement is not that the dimensions cannot covary but rather that they do not necessarily covary, as would be required under reflective measurement. The choice of dimensional covariance under a formative specification is thus a decision of the researcher and based on theoretical considerations. The preceding is an important distinction and represents a key strength of the formative approach suggested by our reconceptualization. By specifying *a priori* that we expect managerial attitude towards risk and entrepreneurial behaviors to covary—although not perfectly so—we allow for the possibility that the dimensions of EO *may* share certain antecedents,

but that there may also be other theoretically meaningful phenomena within EO's nomological network that relate to only one of the two dimensions. Unlike the predominant reflective perspective in the EO literature, under our approach a researcher need not accept a tradeoff between the granularity of exploring EO's antecedents while ignoring the broader contribution to the EO literature. Our reconceptualization thus expands the pool of antecedent relationships beyond that of the current Miller/Covin and Slevin conceptualization, while addressing nomological errors in the EO literature because of measurement model misspecification.

**A revised measurement model**

We propose a formative measurement model for our reconceptualization of EO as depicted in Figure 1. Formative measurement models inherently suffer from an identification problem—it is impossible to identify the construct-level disturbance term ( $\zeta$ ) absent additional steps taken by the researcher (Bollen and Lennox, 1991). The relevant literature suggests several remedies for identification, although space precludes us from discussing all such possibilities (see MacKenzie *et al.*, 2011, for a thorough discussion). We will mention one such identification method that not only allows a formatively measured construct to be estimated in both structural and confirmatory factor models, but also addresses the criticism of formative measurement offered by Howell *et al.* (2007) regarding interpretational confounding.<sup>1</sup>

As noted by MacKenzie *et al.* (2011), the preferred technique for dealing with formative model identification is to measure the focal latent construct with two additional reflective indicators intended to capture the entirety of the construct's theoretical domain (i.e., "global" effect measures of EO). The two additional indicators allow estimation of the disturbance term from content-valid measures of the latent construct that are theoretically congruent with, and included within, the construct's conceptual domain (Bollen, 2007). For example, a researcher could ask the respondent to rate the following statements regarding EO: "Overall, I

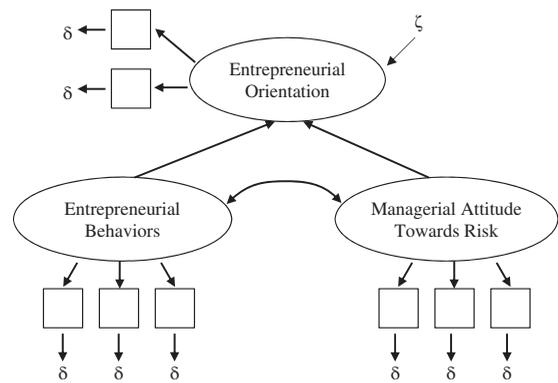


Figure 1. Reconceptualized EO measurement model

would consider my firm to be entrepreneurial," and "Generally speaking, my company is innovative, actively pursues new markets, and our managers are willing to take on risk." As MacKenzie *et al.* (2011) discuss, this procedure largely resolves the issue of interpretational confounding and facilitates the use of formatively measured constructs in a variety of structural and confirmatory factor models.

Under our reconceptualization, we therefore suggest the following measurement model for EO as shown in Figure 1 to include: (1) at least three reflective indicators for the two lower-order dimensions to facilitate identification (see Bollen, 1989), (2) the lower-order dimensions forming the higher-order EO construct, and (3) the inclusion of two additional global reflective indicators used for identification of the construct-level disturbance term. Notably, this measurement model is empirically equivalent to a MIMIC model (Multiple Indicators, Multiple Causes; see MacKenzie *et al.*, 2011). Conceptually, however, the interpretation is better understood as the latent variable EO defined by two lower-order dimensions, with two additional content-valid effect indicators facilitating identification (MacKenzie *et al.*, 2011). The strength of the preceding interpretation is ontological consistency between our conceptual model of EO and the measurement model used for its operationalization.

**AN EMPIRICAL ILLUSTRATION**

**Purpose**

Drawing from measurement theory, we based our EO reconceptualization on conceptual grounds,

<sup>1</sup> Interpretational confounding exists when there is a discrepancy between the nominal meaning of a construct (i.e., its theoretical meaning) and its empirical meaning as derived from its operationalization (see Jarvis *et al.*, 2003).

consistent with Covin and Lumpkin's (2011) observation that questions of EO's ontology are fundamentally theoretical in nature. Notably, in the EO literature, there are examples of deriving ontological conclusions from empirical analysis (e.g., Kreiser, Marino, and Weaver, 2002). We concur with Covin and Lumpkin's (2011) comment that, while such research offers valuable insights, it is inappropriate to derive ontological conclusions of a theoretical construct through data analysis. That said, we believe it worthwhile to offer an empirical illustration describing how EO scholars might use our reconceptualization in their research design. The purpose of this illustration is neither to empirically validate our reconceptualization nor to rigorously test an existing nomological relationship. Rather, we simply wish to illustrate the value of our reconceptualization using an empirical example.

### Sample and data collection

We collected data from the senior-most executive at 610 small to medium-sized South Korean businesses randomly selected from the membership rolls of the Korean Venture Business Association (KOVA). KOVA is a business trade organization located in Seoul, South Korea, that operates analogously to a chamber of commerce in the United States. We collected data in partnership with KOVA, with the number of respondents driven primarily by budgetary constraints. Specifically, our budget allowed for the collection of roughly 600 responses from KOVA's 11,248 members, for a response rate of  $\approx 5$  percent. We contacted member businesses by phone until we obtained the predetermined number of responses. *T*-test comparisons of firm age and firm size between the responding and nonresponding firms revealed no significant differences; neither did comparisons between early and late respondents. The survey was originally written in English, translated into Korean by a native Korean language speaker fluent in English, and then back-translated into English by a second native Korean speaker to verify that the translation process did not materially alter the meaning of the indicators (Brislin, 1980).

### Model specification

Our empirical illustration draws from the observation of Covin and Slevin (1991) that environmental exigencies, including environmental hostility,

causally influence EO. Environmental hostility refers to industry conditions characterized by "precarious industry settings, intense competition, harsh, overwhelming business climates, and the relative lack of exploitable opportunities" (Covin and Slevin, 1989: 75). Though other components of the firm's task environment are a source of causal influence, environmental hostility plays a fundamental role in understanding a firm's entrepreneurial strategic posture (Covin and Slevin, 1991). The logic for causal adjacency between hostility and EO is that in hostile environments, where resources are scarce and growth opportunities limited, firms achieve superior performance by following tried-and-true strategies that do not threaten the firm's survival (Miller and Friesen, 1983). This logic suggests a negative relationship between hostility and EO. Replicated in Figure 2, Rosenbusch *et al.* (2013) tested this relationship drawing from meta-analytic data and depicting EO mediating the relationship between hostility and firm performance, and found no direct relationship between hostility and EO (corrected  $r = -0.06$ ,  $p > 0.05$ ). Based on these findings, and the contradictory evidence in the broader EO literature, Rosenbusch *et al.* (2013) concluded that there is likely no meaningful causal connection between environmental hostility and EO.

When viewed through the lens of our reconceptualization, however, we posit that hostility is causally adjacent to EO, although it does so by influencing entrepreneurial behaviors, while likely exhibiting no significant influence on managerial attitude towards risk. We predicate our argument on the observation that hostile environments constrain strategic choice and favor the pursuit of more conservative strategies (Miller and Friesen, 1983). However, these environmental constraints act primarily to influence *behavior*; it is not likely that a firm's task environment will induce discernible changes to a senior manager's *attitude* towards risk, which is itself argued to be a more stable property of the senior manager (March and Shapira, 1987). Presenting a revised research model in Figure 3, we again suggest that EO mediates the relationship between hostility and performance. However, we decompose the mediation effect into hostility's relationship with EO's lower-order dimensions: EO mediates the relationship between environmental hostility and firm performance such that the effect of hostility on performance is transmitted through a negative relationship with entrepreneurial

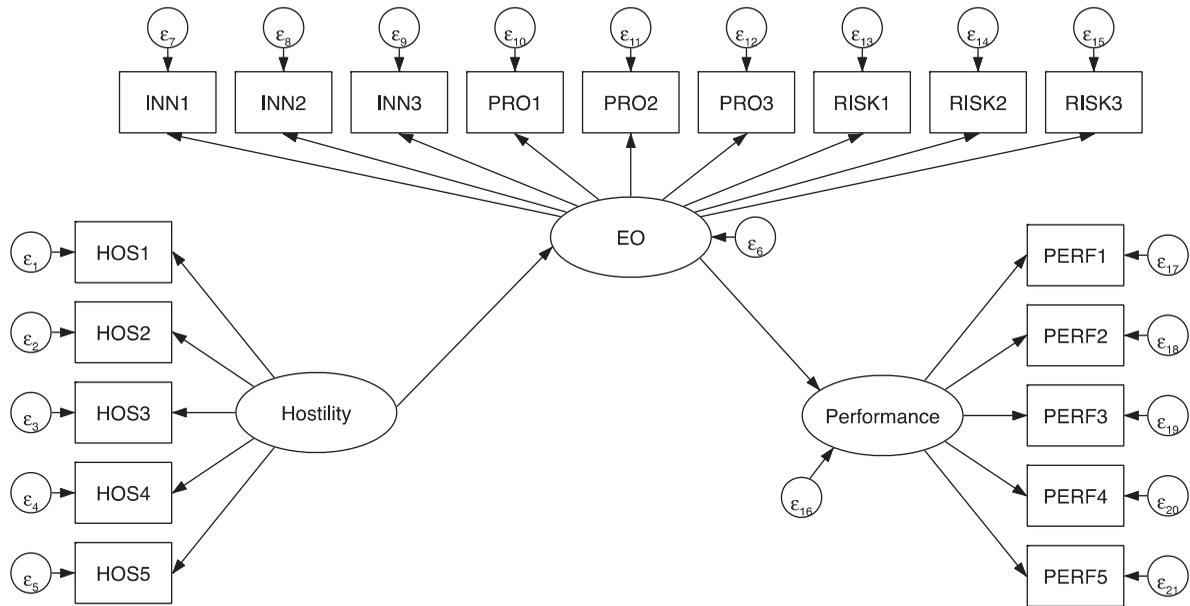


Figure 2. Structural model—EO (Miller/Covin and Slevin first-order reflective measurement model). While this figure depicts a first-order reflective measurement model, there is no material difference either conceptually or empirically between this model and a first-order reflective, second-order reflective measurement model wherein indicators of innovativeness, proactiveness, and risk-taking load on lower-order reflective dimensions of a reflectively construed first-order EO construct. See Bollen (1989)

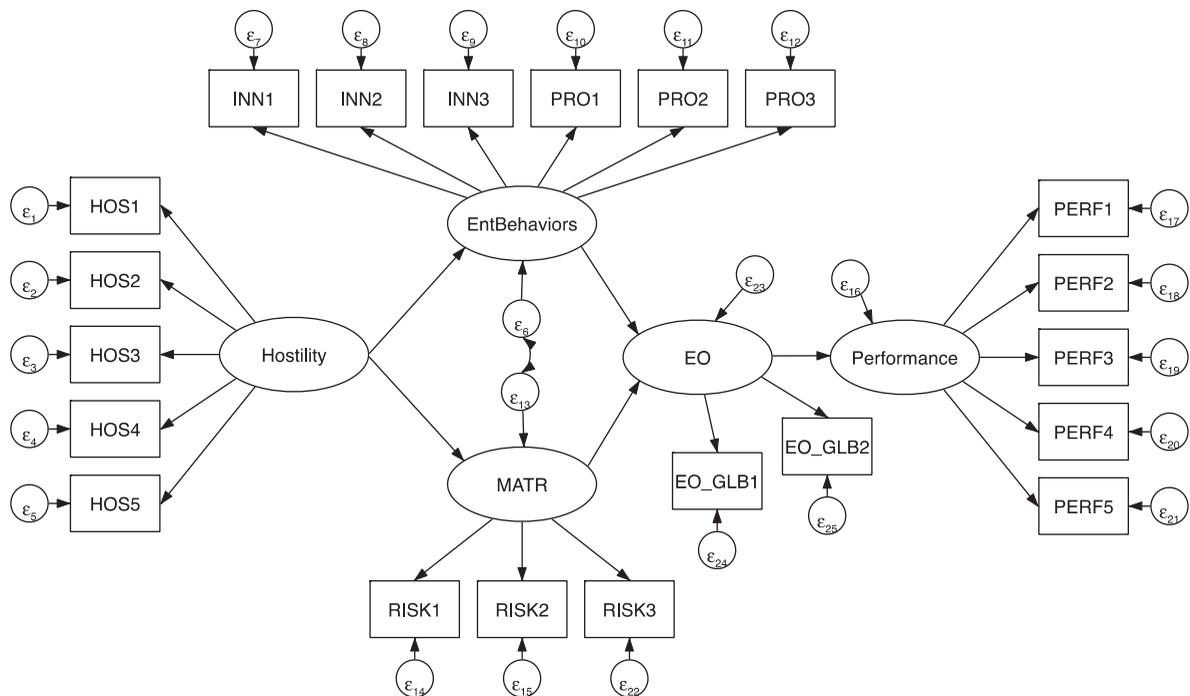


Figure 3. Structural model—reconceptualized EO (first-order reflective; second-order formative measurement model). EntBehaviors = entrepreneurial behaviors; MATR = managerial attitude towards risk

behaviors, while hostility does not exhibit a significant relationship with managerial attitude towards risk.

## Measures

Given that we ground our reconceptualization in the Miller/Covin and Slevin perspective, we measured EO using the widely employed Strategic Posture/EO scale developed by Covin and Slevin (1989). We chose the Covin and Slevin (1989) EO scale in part due to its popularity, but also to illustrate that, with small modifications, EO scholars may employ the scale in a manner consistent with our reconceptualization. There are nine indicators in the Covin and Slevin (1989) EO scale—three each for the components of innovativeness, proactiveness, and risk taking—and Runyan *et al.* (2011) found that the scale is robust in international research settings. Please see supporting information Appendix S2 for a description of all focal scales used in our empirical illustration.

We added two indicators to the Covin and Slevin (1989) scale to capture EO's global conceptual domain. As discussed previously, these indicators are necessary for identification purposes when specifying EO formatively. Respondents were asked on a seven-point Likert scale the extent to which they agreed with the following items, with the number 4 indicating a neutral position: (1) "*In general, my business unit ... 1—prefers to be cautious when considering new opportunities, to shy away from overly risky initiatives, and prefers to let rivals take the lead on innovation in our industry,*" to 7—"*is on the cutting edge when it comes to*

*exploiting entrepreneurial opportunities because of our demonstrated ability to embrace novel and risky initiatives;*" and (2) "*In general, I would consider my business unit to be ... 1—managed with a more conservative, risk-adverse managerial philosophy,*" to 7—"*managed with a more entrepreneurial, innovation-centric managerial philosophy.*" In so doing, our global indicators tapped into both behavioral and attitudinal elements of EO, making them each content-valid indicators of EO's conceptual domain as defined in our reconceptualization.

We measured environmental hostility using a five-item Likert scale commonly found in the EO literature (Covin and Slevin, 1989). We measured performance using five indicators of the senior manager's satisfaction with total sales, cash flow, return on equity, net income ratio, and the ability to fund growth from profits. Table 1 includes the summary statistics and correlation matrix for our focal constructs including EO as a unidimensional composite construct; entrepreneurial behaviors as a lower-order, reflectively measured construct; managerial attitude towards risk as a lower-order, reflectively measured construct; and two global indicators of EO. Note that we would expect strong covariance between the two global indicators because they are both content-valid measures capturing the totality of EO's conceptual domain. Additionally, we included the following controls: the log of firm revenue, the log of firm employees, the log of firm age, a dummy variable indicating whether or not the firm was in a high-technology industry, and environmental dynamism.

Table 1. Summary statistics and correlation matrix<sup>a</sup>

	Mean	s.d.	$\alpha$	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. EO	4.41	0.99	0.86											
2. Entrepreneurial behaviors	4.52	1.02	0.79	0.95										
3. MATR	4.19	1.19	0.85	0.85	0.65									
4. Performance	11.80	4.31	0.91	0.22	0.24	0.14								
5. Hostility	4.02	0.96	0.67	-0.08	-0.09	-0.04	-0.12							
6. EO Global 1	4.45	1.60	—	0.61	0.55	0.57	0.13	-0.05						
7. EO Global 2	4.40	1.42	—	0.58	0.50	0.58	0.12	-0.08	0.50					
8. Age	9.70	7.25	—	-0.06	-0.03	-0.09	0.10	0.06	-0.12	-0.15				
9. Employees	2.80	1.15	—	0.09	0.10	0.05	0.26	-0.01	-0.05	-0.06	0.42			
10. Turnover	7.72	1.84	—	0.08	0.09	0.04	0.30	0.05	-0.05	-0.07	0.44	0.79		
11. High tech industries	0.47	0.50	—	-0.02	-0.02	-0.02	-0.05	0.03	-0.04	0.04	-0.05	0.03	-0.01	
12. Dynamism	4.24	0.95	0.69	0.17	0.21	0.07	0.26	-0.05	0.10	0.10	0.03	0.14	0.17	-0.10

*N* = 610

<sup>a</sup>Correlations greater than  $\pm 0.08$  are significant at  $p < 0.05$ . Age, employees, and turnover log transformed. EO = entrepreneurial orientation, measured as a first-order reflective construct; MATR = managerial attitude towards risk.

## Analysis

We began our analysis by estimating a confirmatory factor model (CFA) of our focal variables. We estimated all models using the structural equation modeling module of Stata 12.1 (Stata Corporation, 2012). For the initial CFA, we modeled EO following Covin and Slevin (1989) as a unidimensional composite construct wherein all nine indicators loaded on the latent EO construct. All indicators related positively and significantly to their intended constructs ( $p < 0.001$ ), and we observed no significant cross-loadings. The overall model, however, exhibited relatively poor fit ( $\chi^2 = 660.148$ ,  $p < 0.001$ ; RMSEA = 0.075; CFI = 0.891; TLI = 0.875; SRMR = 0.064). Examination of the modification indices suggested freeing the covariance between the error terms of INN2 and INN3, between PRO1 and PRO2, between INN1 and PRO1, between RISK2 and RISK3, and between PERF1 (Performance) and PERF3. These minor steps are reasonable approaches to improve model fit and are appropriate given that the measures are all indicators of the same latent construct (Bollen, 1989). The revised CFA exhibited significantly improved fit ( $\chi^2 = 357.951$ ,  $p < 0.001$ ;  $\chi^2_{\text{DIFF}} = 302.197$ ,  $p < 0.001$ ; RMSEA = 0.049; CFI = 0.954; TLI = 0.946; SRMR = 0.058).

We then replicated the Rosenbusch *et al.* (2013) study by estimating a structural model with environmental hostility as a predictor of EO, and EO predicting firm performance, shown in Figure 2. We again followed the Miller/Covin and Slevin conceptualization and measured EO as a unidimensional composite construct wherein all nine EO indicators loaded on the first-order factor. This model demonstrated acceptable fit ( $\chi^2 = 364.008$ ,  $p < 0.001$ ; RMSEA = 0.050; CFI = 0.953; TLI = 0.945; SRMR = 0.061). However, the standardized path coefficient between environmental hostility and EO was nonsignificant ( $\beta = -0.087$ ,  $p > 0.1$ ), although we did find a positive and significant relationship between EO and performance ( $\beta = 0.207$ ,  $p < 0.001$ ). Thus, our initial results largely mirrored those as reported in Rosenbusch *et al.* (2013).

We then turned to our reconceptualization. We began with a CFA of performance, hostility, and EO following our proposed reconceptualization as outlined in Figure 1. In this model, the three innovativeness indicators and the three proactiveness indicators load on the entrepreneurial behaviors construct, and the three risk-taking

indicators load on the managerial attitude towards risk construct. In turn, entrepreneurial behaviors and managerial attitude towards risk relate causally to the higher-order EO construct, and we identified the construct-level disturbance term with our two global reflective indicators. Maintaining the error covariance modifications suggested in our initial analysis, the resulting CFA fit the data well ( $\chi^2 = 404.579$ ,  $p < 0.001$ ; RMSEA = 0.046; CFI = 0.957; TLI = 0.949; SRMR = 0.051).

It is important to note here that the evaluation of construct validity for formatively measured constructs differs demonstrably from that for reflectively measured constructs. For example, the concept of internal consistency reliability (i.e., Cronbach's alpha) among formative indicators does not apply because of the presumption that the lower-order dimensions are conceptually independent (MacKenzie *et al.*, 2011). However, we may evaluate the reliability of the two lower-order reflectively measured dimensions separately. In this instance, the estimated reliability of the entrepreneurial behaviors construct and the managerial attitude towards risk construct are  $\alpha = 0.79$  and  $\alpha = 0.85$ , respectively. We further examined the validity of our measurement model by evaluating the standardized path coefficients between the two lower-order dimensions and the higher-order EO construct. Both parameter estimates were positive and significant ( $\beta_{\text{ENT BEHAVIORS}} = 0.445$ ,  $p < 0.001$ ;  $\beta_{\text{MATR}} = 0.505$ ,  $p < 0.001$ ). The standardized loadings of the two global reflective indicators of EO were also positive and significant ( $\lambda_{\text{EO GLOBAL 1}} = 0.708$ ,  $p < 0.001$ ;  $\lambda_{\text{EO GLOBAL 2}} = 0.701$ ,  $p < 0.001$ ). Further, EO's combined indicators accounted for 84.2 percent of EO's total variance ( $\sigma^2_{\text{EO}} = 0.918^2$ ), indicating that the specified measures were responsible for the majority of the variance in the higher-order EO construct (Diamantopoulos *et al.*, 2008). Collectively, these results corroborate our specified measurement model.

We then estimated our structural model using the reconceptualized EO variable, as depicted in Figure 3 (error term covariance modifications excluded for parsimony). In this model, we estimated paths from hostility to entrepreneurial behaviors and from hostility to managerial attitude towards risk, which in turn are lower-order predictors of the higher-order EO construct, with the

Table 2. Model estimation results<sup>a</sup>

Structural parameter	Model 1: <i>EO</i> <sub>Unidimensional</sub>		Model 2: <i>EO</i> <sub>Reconceptualization</sub>	
	$\beta$	s.e.	$\beta$	s.e.
Hostility → EO	-0.087	0.054		
EO → Performance	0.208***	0.043		
Hostility → Entrepreneurial behaviors			-0.150**	0.058
Hostility → MATR			-0.060	0.054
Entrepreneurial behaviors → EO			0.549***	0.132
MATR → EO			0.416***	0.128
EO → Performance			0.213***	0.044
$\sigma^2$ Entrepreneurial behaviors			0.022	
$\sigma^2$ MATR			0.004	
$\sigma^2$ EO	0.007		0.868	
$\sigma^2$ Performance	0.043		0.045	
$\chi^2$	364.008***		421.964***	
RMSEA	0.050		0.047	
CFI	0.953		0.954	
TLI	0.945		0.946	
SRMR	0.061		0.057	

$N = 610$

<sup>a</sup> Standardized coefficients;  $\sigma^2$  = amount of explained variance, or equivalently, the  $R^2$ ; EO = entrepreneurial orientation; MATR = managerial attitude towards risk.

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$

construct-level disturbance term identified by the two global reflective indicators. As before, we also estimated the relationship between EO and performance. This model demonstrated acceptable fit ( $\chi^2 = 421.964$ ,  $p < 0.001$ ; RMSEA = 0.047; CFI = 0.954; TLI = 0.946; SRMR = 0.057). Consistent with our expectations, we observed a negative and significant relationship between hostility and entrepreneurial behaviors ( $\beta = -0.150$ ,  $p < 0.01$ ). Further, the path between hostility and managerial attitude towards risk was nonsignificant ( $\beta = -0.060$ ,  $p > 0.1$ ). We also found a positive relationship between EO and performance ( $\beta = 0.213$ ,  $p < 0.001$ ). As a robustness test, we re-estimated our model with our control variables. This analysis revealed no material changes in the sign or significance of the estimated focal coefficients. Lastly, it is worthwhile to note that our model fit indices changed little between the models as shown in Figures 2 and 3. This is consistent with the observation of Jarvis *et al.* (2003) that model fit indices are rarely influenced by measurement model misspecification and cannot be relied upon when evaluating the influence of misspecification. We summarize the primary results from both structural models in Table 2.

## Summary

Our empirical illustration highlights the problem of nomological error in the EO literature due to measurement model misspecification. In our structural model using a first-order, unidimensional conceptualization of EO, we found no significant relationship between hostility and EO. Adopting our reconceptualization, however, we identified a significant negative relationship between hostility and EO, with hostility transmitting that effect through a firm's entrepreneurial behaviors, but not through managerial attitude towards risk. Hence, measurement model misspecification resulted in a Type II error in the case of the unidimensional model, as would be expected (MacKenzie *et al.*, 2005). The finding of a Type II error carries significant ramifications for EO research, although admittedly such impact is not directly quantifiable. Given the bias towards publishing significant findings (i.e., non-null relationships) in the management literature (Pfeffer, 2007), we can only speculate as to the number of "true" antecedent relationships incorrectly rejected by EO scholars during the early stage of data analysis because of misspecification. Our belief is that such occurrence is likely high, particularly given the significant quantity differential between research on

EO's consequences and on its antecedents (Rauch *et al.*, 2009).

Our empirical illustration does have certain limitations. For example, the analyses used cross-sectional data and subjective performance indicators. However, the primary purpose of our empirical example was not to focus on the nuances of the hostility-EO relationship—although our findings may prompt further study in this regard—but rather to illustrate how our reconceptualization alleviates nomological error in EO research. Ultimately, our illustration underscores why congruence between the theoretical meaning of a construct and the approach used to measure it is vital for drawing nomological conclusions (Bagozzi, Yi, and Phillips, 1991).

## DISCUSSION AND CONCLUSION

As Miller (2011) recently noted, while the Miller/Covin and Slevin EO conceptualization has served the field well, the time has come to revisit the core ontological assumptions underpinning the conceptual domain of firm-level EO. In the spirit of Miller's (2011) observation, our reconceptualization shows that we can recast EO in a manner that remains largely consistent with its original formulations while addressing the ontological and measurement inconsistencies hampering knowledge creation in the field. We suggest that our proposed reconceptualization offers a number of important advantages to EO scholars.

### Revisiting existing nomological relationships

Our empirical illustration identified a Type II error—a failure to reject a false null hypothesis—resulting from measurement model misspecification. One implication from this finding is that there is a distinct possibility that such misspecification is the reason for the preponderance of null findings in hostility-EO research (Rosenbusch *et al.*, 2013). However, the implication of nomological error from measurement model misspecification extends beyond the hostility-EO relationship. Unfortunately, absent empirically replicating past EO-antecedent research, we cannot conclusively determine the extent of such error in the literature, although simulation-based research on measurement model misspecification suggests that nomological error rates may be worryingly

high (George, 2011; Jarvis *et al.*, 2003; MacKenzie *et al.*, 2005).

Confounding the preceding problem is that scholars may be tempted to jettison insignificant relationships during the early stages of data analysis in favor of reporting supported hypotheses (Pfeffer, 2007). As such, EO scholars may have inadvertently ignored theoretically meaningful contributing factors by erroneously believing those factors to be inconsequential or insignificant. Importantly, simply suggesting that measuring EO formatively versus reflectively does not fully address the ontological challenges discussed at the beginning of the current paper. Addressing these challenges requires reexamining EO's ontological assumptions to recognize that a firm's strategic posture arises through the observation of the firm's behaviors, and that how managers view risk is a necessary covariate with those behaviors. Our reconceptualization accomplishes these requirements, and suggests that viewing existing antecedent relationships through a new lens may fundamentally alter how scholars examine and interpret EO's contributing factors.

To illustrate, consider two prior studies incorporating antecedent relationships to EO and employing the common unidimensional conceptualization of EO. While both studies draw conclusions consistent with the unidimensional conceptualization of EO, we wish to illustrate how the results of these studies may have changed under our reconceptualization and when employing a formative measurement model. In their study of governance factors and entrepreneurial orientation among non-profit organizations, Coombes *et al.* (2011) argued that board activism—activism referring to the vigor with which a board embraces its governance and oversight duties—positively relates to EO, and “translates into intentional efforts to bring about change via new approaches,” (Coombes *et al.* 2011: 837). Hence, activist boards are more likely to encourage entrepreneurial activities. Building from the preceding logic, we might speculate that an activist board's desire to bring about change may result in a positive relationship between activism and the lower-order dimension of entrepreneurial behaviors. However, we could envision a negative relationship between board activism and managerial attitude towards risk, building on Gomez-Mejia and Wiseman's (1997) observation that activist boards may diminish a CEO's attitudinal proclivity to commit resources to projects with uncertain outcomes.

Board activism may thus differentially relate to EO's two lower-order dimensions, although this is an empirical question.

Consider further a more complicated causal model offered by De Clerq, Dimov, and Thongpapanl (2013), wherein knowledge sharing within a firm positively relates to EO, routine formalization relates negatively to EO, and routine formalization moderates the relationship between knowledge sharing and EO. Specifically, De Clerq *et al.* (2013) hypothesized that the positive relationship between knowledge sharing and EO is greater when formalization is low (i.e., formalization negatively moderates the knowledge sharing-EO path). However, our reconceptualization suggests a more complex moderation model. For example, we might argue that routine formalization strengthens the knowledge sharing-entrepreneurial behaviors relationship, because formalization focuses managerial attention on higher-value opportunities (Ocasio, 1997). Conversely, because of formalization's tendency to diminish managerial risk-taking, we might posit a differential moderating relationship of formalization on the knowledge sharing-managerial attitude towards risk relationship. We could further speculate that the main effect is actually contingent on formalization—there is little *a priori* reason to suspect that knowledge sharing influences managerial attitude towards risk *except* in the presence of routine formalization. Again, our point with these examples is not to suggest that the preceding studies are normatively wrong. Rather, by viewing these relationships through the lens of our reconceptualization, scholars may recognize the acuteness of the attitudinal/behavioral distinction and the advantage of a formative specification using our reconceptualization.

### Causal inference, new indicators, and new designs

While revisiting past nomological relationships in the EO literature has merit, we submit that the most significant contribution of our reconceptualization is to move the EO conversation forward in exciting and promising new directions.

#### *Drawing causal inference*

There is a distinct disadvantage in adopting the existing unidimensional conceptualization of EO when designing studies to draw causal inferences

between EO and antecedent phenomenon. Because strategy and entrepreneurship scholars generally cannot randomly assign behaviors to a population of companies (an experiment), researchers must deal with the endogeneity present in a research model using other techniques to evaluate causal adjacency (Antonakis *et al.*, 2010). While endogeneity may arise from reverse causality, there are myriad causes inducing a correlation between the error term in a regression equation and the focal predictor variables (we refer interested readers to Antonakis *et al.*'s, 2010, exemplary discussion of endogeneity and its sources). However, we do wish to highlight one source of endogeneity—omitted variable bias—and discuss why this is particularly problematic for EO antecedent research using the existing unidimensional conceptualization.

Consider a standard regression equation accounting for omitted variables:

$$EO = \alpha + X_t\beta_t + X_u\beta_u + \epsilon \quad (3)$$

In Equation 3,  $X_t$  represents an observed predictor variable expected to causally influence the criterion,  $EO$ .  $X_u$  represents a vector of variables that also causally influences EO, but we do not directly observe these variables. In a randomized experiment, conditions are ideally created to eliminate or to effectively marginalize  $X_u$  such that what remains is a consistent and unbiased estimate of the effect of  $X_t$  on EO (i.e.,  $X_u\beta_u = 0$ ). Such conditions rarely present themselves in EO research, and without addressing  $X_u$ , scholars draw inappropriate conclusions regarding EO's causal factors because of bias in the estimate of  $X_t$  (Antonakis *et al.*, 2010). Unfortunately, the most common technique to deal with omitted variable bias—the use of instrumental variables—presents its own challenges for scholars using the unidimensional conceptualization of EO.

Consider that for an instrument ( $z$ ) to be valid, it must (1) significantly covary with the assumed endogenous variable ( $x$ ) (e.g.,  $COV(z,x) \neq 0$ ); and (2) be strictly exogenous (i.e.,  $COV(z,\epsilon) = 0$ ) (Wooldridge, 2010). For scholars adopting the unidimensional operationalization of EO, this means finding an instrument strongly correlated with all three lower-order dimensions of the same direction and of the same magnitude, but not correlated with the equation disturbance term. Given the acknowledged difficulties in finding valid instruments (Semadeni, Withers, and Certo, 2014), it is, we suggest, very difficult to meet such a standard.

Under our reconceptualization, the researcher must identify more total instruments because of the decomposition of EO into its two lower-order dimensions (at least two per endogenous variable; see Wooldridge, 2010). However, we maintain that, by distinguishing between the behavioral and attitudinal components of EO, identifying such instruments is easier because we clearly delineate the conceptual domain of each dimension. As such, our reconceptualization is more robust to research designs seeking to draw causal inference (Bagozzi *et al.*, 1991).

#### *New indicators*

There is a growing call in the EO literature to create new operationalizations and measures of EO (George and Marino, 2011; Miller, 2011). We agree with past conclusions that the Covin and Slevin (1989) psychometric scale has been exceedingly valuable to EO scholars (Covin and Wales, 2012). However, as Covin and Lumpkin (2011) observed, the popularity of the Covin and Slevin (1989) scale may also have been unintentionally limiting, as its widespread adoption likely discouraged the development of alternate measures of EO. While our empirical illustration suggests that scholars may use the Covin and Slevin (1989) scale in a manner consistent with our reconceptualization, we also add to the call for new EO indicators. Indeed, there is legitimate concern that retrospective summated scales may be inadequate in capturing the conceptual domain of EO, and particularly in assessing managerial attitude towards risk.<sup>2</sup> Under the rubric of our reconceptualization, we submit that EO scholars could embrace new indicators that offer exciting new possibilities.

For example, one area of interest is functional magnetic resonance imaging (fMRI) techniques used to measure the respondent's brain activity when evaluating risky or uncertain strategic decisions (Powell, 2011). One caveat to the preceding is that EO is fundamentally a firm-level construct and that managerial attitude towards risk resides at the level of the senior manager ultimately responsible for strategic decision making, and access to these individuals, particularly in larger firms, is admittedly difficult. Nonetheless, we maintain that research designs employing such an indicator of

managerial attitude towards risk, combined with survey and secondary data for the entrepreneurial behaviors construct (e.g., patents, R&D expenditures, new product introductions), creates a powerful indicator set under our reconceptualization. Such indicators also address a number of concerns regarding the validity of single-respondent survey data that currently dominates EO research (Miller, 2011), and may further lend themselves well to experimental and quasi-experimental designs.

#### *Alternative research designs and estimators*

Consider that, in our empirical illustration, we assumed EO as latent, and estimated following Equation 2 with a disturbance term,  $\zeta$ , representing the amount of variance in the latent construct not accounted for by its indicators. An alternate method to model a formative construct is to assume  $\zeta = 0$ , represented by the following equation:

$$\eta = \sum_{(i=1)}^n \gamma_i x_i \quad (4)$$

Here, we again define  $\eta$  by the weighted total variance of its indicators. However, because we also posit that the indicators are error free,  $\eta$  effectively becomes an observed variable (Bollen, 2007). We refer to this type of specification as a summative, or composite, index (Diamantopoulos and Winklhofer, 2001).

A weakness of Equation 4 is the loss of the disturbance term (the amount of variance in  $\eta$  not accounted for by its indicators), rendering coefficient estimates of variables inconsistent, even with optimum weighting of the indicators (Bollen and Lennox, 1991). Equation 4, however, does have certain advantages. The first advantage is that the resulting value of  $\eta$  does not suffer from the identification problem mentioned previously necessitating additional reflective indicators. The second advantage of Equation 4, if  $\gamma$  is set equal to one or if using weights derived from principal components analysis, is that a researcher may use the resulting value of  $\eta$  in a wide range of estimators including regression, nonlinear models, dynamic models, and so forth (Bollen, 2007) as both an antecedent variable and as a criterion. Such a specification may enable researchers to adopt new indicators and new research designs that push the EO conversation forward, assuming that such measurement limitations are duly noted.

<sup>2</sup> We thank an anonymous reviewer for this insight.

While admittedly not as preferred as the latent variable structural equation modeling approach, we further propose that a related structural equation estimator—seemingly unrelated regression—offers promise for EO scholars, particularly regarding contributory factors to EO's lower-order dimensions (Wooldridge, 2010). Depicted in Equations 5 and 6, a researcher simultaneously estimates a model where different variables, represented as  $X$  and  $Z$ , predict entrepreneurial behaviors and managerial attitude towards risk.<sup>3</sup> The researcher also allows the error terms, represented as  $\epsilon_1$  and  $\epsilon_2$ , respectively, to covary (e.g.,  $\text{COV}[\epsilon_1, \epsilon_2] \neq 0$ ). The explicit error covariance reflects the theoretical development of our reconceptualization as a mutualistic relationship between the two lower-order EO dimensions.

$$\text{Entrepreneurial Behaviors} = \alpha_1 + \beta_1 X + \epsilon_1 \quad (5)$$

$$\text{Managerial Attitude towards Risk} = \alpha_2 + \beta_2 Z + \epsilon_2 \quad (6)$$

A weakness of the preceding approach is that a researcher is unable to link the two lower-order dimensions to the higher-order EO construct, limiting the theoretical utility of the research model (MacKenzie et al., 2011). However, this approach does have three important strengths. The first strength of this approach is to accommodate a wide variety of indicators. While survey data could be used, secondary financial ratios and categorical, count, and dichotomous measures—which can be difficult to employ using covariance-based structural equation modeling—could be used to construct the two lower-order EO dimensions. The second strength of this approach is to better accommodate longitudinal data where econometric methods are often more robust to data of this type (Wooldridge, 2010). Additionally, with the inclusion of valid instruments, a researcher could easily convert a seemingly unrelated regression model to a three-stage least squares model, which allows the researcher to account for potential endogeneity within the system and thus helps facilitate causal inference (Antonakis et al., 2010).

An additional strength of Equations 5 and 6, and one we believe encourages several promising

research opportunities, is the ability to estimate models with contextual effects influencing the relationship between a given antecedent and EO's lower-order dimensions. Such a specification may prove fruitful for EO scholars because both direct and contextual factors likely differentially influence the two lower-order dimensions. For example, Wales, Patel, and Lumpkin (2013) posit that CEO narcissism may increase a strategic decision maker's risk-taking proclivities, although a firm's compensation structure (March and Shapira, 1987), for example, might moderate this relationship. It is certainly possible to estimate such contextual effects using structural equation modeling. However, given the significant interest in boundary condition research in the EO literature (Covin and Lumpkin, 2011), additional analytical techniques such as those proposed in Equations 5 and 6 open a number of new research streams for EO scholars.

To illustrate further, consider the nomological relationship between EO and various manifestations of organizational learning and knowledge management (e.g., Anderson et al., 2009; Kreiser, 2011). A frequently mentioned perspective in the EO conversation is the reciprocally causal relationship between EO and learning/knowledge exploitation; namely, that the enactment of entrepreneurial strategies generates knowledge that becomes the basis for further entrepreneurial initiatives (Anderson et al., 2009). The theoretical mechanisms behind such knowledge generation and exploitation remain underexplored, but, as Kreiser (2011) suggests, the types of knowledge generated by entrepreneurial strategies and the types of knowledge necessary to facilitate new market entry are likely to be distinct. Under our reconceptualization, scholars may be able to peer further into this black box by identifying knowledge typologies that facilitate entrepreneurial behaviors, the learning and psychological processes influencing managerial attitude toward risk, and the differing contextual factors influencing both relationships in a single research model using a variety of indicators and adopting recursive and nonrecursive designs.

## CONCLUSION

While EO scholars generated significant insights over the past three decades, much work remains to expand our knowledge of entrepreneurial strategies and the causes and consequences of what it

<sup>3</sup> Note that  $X$  and  $Z$  could also be modeled as predicting both entrepreneurial behaviors and managerial attitude towards risk in a multivariate seemingly unrelated regression (Wooldridge, 2010).

means to “be entrepreneurial” at the firm level. This paper provides specific recommendations to facilitate the resolution of nomological error in the EO literature that may be limiting EO’s contribution to the strategic management and entrepreneurship field. By reconceptualizing EO in a manner congruent with its well-defined theoretical domain while simultaneously addressing relevant conceptual and measurement issues, we hope to propel EO research along an exciting new trajectory.

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## SUPPORTING INFORMATION

### Additional supporting information may be found in the online version of this article:

Appendix S1. A brief discussion of measurement theory and construct development.

Appendix S2. Measures used in empirical illustration.