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Where to From Here? EO-as-Experimentation, Failure, and Distribution of Outcomes

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This article examines two potential causal mechanisms underlying the observed entrepreneurial orientation (EO)–performance relationship. We find empirical support for the notion that EO might be a performance–variance-enhancing strategic orientation rather than a performance–mean-enhancing orientation. With such a conceptualization, performance variance (along with, or instead of, mean performance) and failure take center stage. To address the question of "where to from here," we discuss a number of research opportunities that we believe are going to make important contributions to the entrepreneurship and strategy literature.

A great deal is known about entrepreneurial orientation (EO) so we pose the question of "where to from here?" Are we at a point of saturation with little more to learn, or can future investigations of EO still make contributions to the strategy and/or entrepreneurship literature? We believe that EO scholars have reached the point at which it is time to open up a new chapter, a chapter that is likely to provide an interesting and informative story as we move forward through the pursuit of high-quality research opportunities. But what is this new chapter, and how will it lead to future contributions? We characterize the underlying approach of the majority of previous research as "EO-as-advantage"—defined as the notion that it pays to pursue an EO—and offer "EO-as-experimentation"—reflecting the notion that EO is associated with greater outcome variance, which enhances chances of both failure and success—as a different perspective that complements and extends extant research by generating many fruitful avenues for future research. In this study, we provide empirical evidence that supports an EO-as-experimentation perspective and use it to address the question of "where to from here?"

In so doing, we make two primary contributions. First, research has focused primarily on outcome variables that are consistent across the EO-as-advantage and the EO-as-experimentation perspectives, namely the performance of surviving firms. The vast majority of past studies find a positive relationship between EO and performance (e.g., Wiklund, 1999; Zahra, 1991; Zahra & Covin, 1995). This positive relationship appears to be even

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stronger in certain environments (e.g., Covin & Slevin, 1989; Zahra & Covin), for certain types of firms (e.g., Wiklund & Shepherd, 2003), and with certain configurations of internal and external conditions (Wiklund & Shepherd, 2005). By focusing on an outcome that distinguishes between the two perspectives—firm failure—we gain a deeper understanding of the mechanisms that are likely underlying the relationships reported in previous research. In a recent review of the EO–performance relationship (Rauch, Wiklund, Lumpkin, & Frese, 2009), none of the 51 studies reviewed took into account the possibility that EO may also be associated with failure. In unveiling these relationships, the research presented here is composed of an important step in more firmly grounding the EO construct theoretically. To date, no overarching theoretical framework has emerged for EO research (see Miller, 2011).

Causal mechanisms constitute the backbone of theories. Given that we discuss and show the empirical relevance of different causal mechanisms, the research presented here provides an impetus for further theory development. Our support for EO-as-experimentation, thus, provides a conceptualization of EO that is complementary to the dominating EO-as-advantage perspective. This reconceptualization opens up the opportunity for creating a new stream of valuable EO research; it begins a new chapter.

Second, we believe that future research on EO can make important contributions to the strategy and entrepreneurship literatures by using an EO-as-experimentation perspective to investigate the relationship between EO and failure and between EO and performance variance. Specifically, future research on EO can make important contributions by investigating more proximal outcomes (at the firm and/or project level) and the distribution of those outcomes, by investigating the role of EO on the relationship between the distribution and the mean of performance; by avoiding an anti-failure bias to investigate the role of EO in how firms manage failure to skew the distribution of outcomes' by investigating moderators in the relationship between EO and the distribution of outcomes, by using multilevel studies that investigate failures from the individual level of analysis and/or the individual level mediators and/or moderators of the failure–EO relationship; by choosing more homogenous samples that are suitable for answering EO research questions and choosing (creating) samples that include failures as well as successes (within or across firms); by experimenting with different methods, such as longitudinal methods that can capture dynamism (including time, causality, reciprocity) and experiments that can provide a more fine-grained investigation of the underlying mechanisms of the antecedents and/or consequences of EO; and by conducting multiple case studies that use EO to theoretically sample firms from which cases can be built or that use EO as the basis to compare and contrast firms to build theories of experimentation and exploration.

The article proceeds as follows. First, we explore the role of causal mechanisms in theorizing on the relationships between EO and performance and then focus on the likely causal mechanisms of this relationship under the EO-as-advantage and EO-as-experimentation perspectives. We highlight commonality and contrast between the different perspectives with hypotheses. Third, we detail the research method and report our findings. Fourth, we suggest a way forward for EO research. Finally, we offer some concluding comments.

Testing Competing Causal Mechanisms in EO Research

The Nature of Causal Mechanisms

A causal mechanism is the aspect of a theory that explains why a specific antecedent leads to a particular outcome (Anderson et al., 2006; Davis & Marquis, 2005; Hedstrom

& Swedberg, 1998). The support for a specific hypothesis or set of hypotheses does not provide unequivocal support for a particular theory because alternative causal mechanisms may generate identical hypotheses and provide equally valid explanations for the observed phenomenon. The difference between hypotheses and causal mechanisms is succinctly stated by Sutton and Staw (1995): "Hypotheses are concise statements about *what* is expected to occur, not *why* it is expected to occur" (p. 377). Therefore, causal mechanisms in EO research (as with most research) have remained assumed rather than tested. Given that causal mechanisms are unobservable, they cannot be tested directly. However, in examining the nature of the mechanisms underlying the EO–performance relationship, we build on Popper (1972, pp. 82–84), who proposed a test of causal mechanisms that involves comparing the results of competing hypotheses.[1] Popper suggested that if results are consistent with theory A but are inconsistent with theories B and C, we cannot claim that the causal mechanism of theory A is the true cause of Y, but it does suggest that A identifies a more likely cause of Y than theories B or C.

Theories' ability to explain and predict phenomena determines their relevance, and there are methodological standards for interpreting these results (Boyd, 1984). Using the term "strong inference," Platt (1964) proposed a "logical tree" for generating competing hypotheses for which researchers deliberately design studies such that observations are consistent with the predictions of one causal mechanism but are inconsistent with other competing mechanisms. Therefore, we need to identify one or more rival mechanisms that may generate the same hypothesis. *Additional* hypotheses can then be developed—namely, hypotheses that cannot simultaneously support all theories (Elster, 2007).[2]

Building on these insights, we set up a procedure for testing EO-as-advantage versus EO-as-experimentation. First, we establish that there is a relationship between the variables of interest so that one or more theories can be supported. In the context of the current study, this means establishing a relationship between EO and performance. Second, we must rule out the possibility that these results are driven by a spurious mechanism, such as sample selection (see Elster, 1998, pp. 62–63). Finally, we identify and test instances in which the causal mechanisms inherent in EO-as-advantage and EO-as-experimentation lead to different hypotheses of the relationships between the variables of interest. We address each of these steps in the subsections that follow.

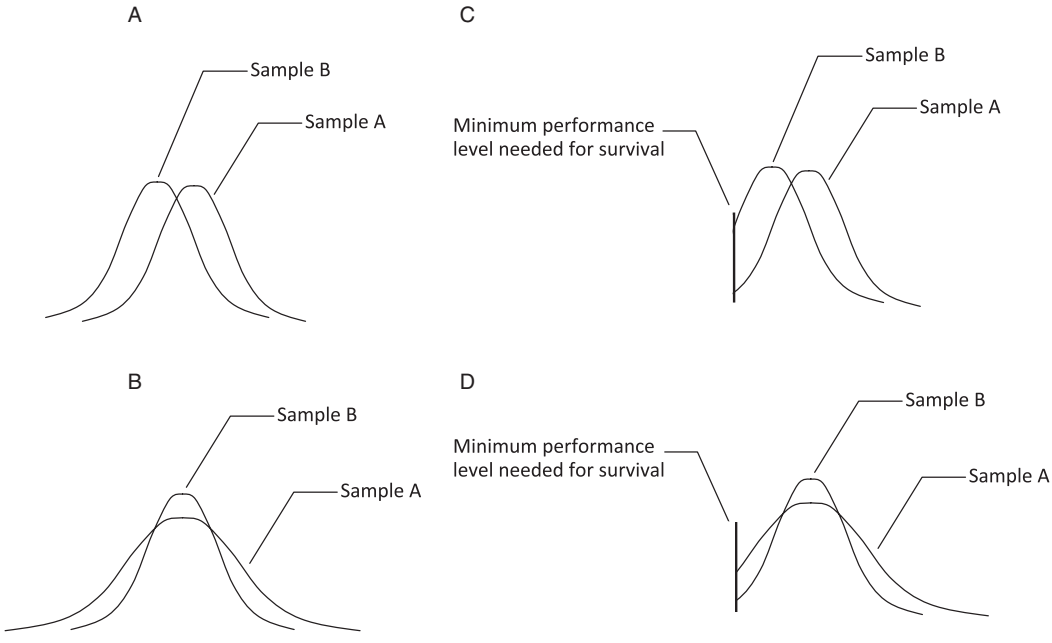
EO-as-Advantage Versus EO-as-Experiment Mechanisms

In any sample of firms, it can reasonably be assumed that performance will vary normally around a mean. Assume that there are two samples of firms—sample A and sample B—each with initially equal variance in the level of EO and the same performance means and distributions. The firms in sample A then introduce a strategy that is superior to the strategies pursued by the firms in sample B, and on average, the performance implications of this strategy are equal across all firms within sample A.[3] Graphically, this would give us two normal distributions with equal variance that are separated by the

1. Popper is probably best known for his ideas that theories can never be proven correct, only falsified (Popper, 1959). However, as noted by Platt (1964), "disproof is a hard doctrine" (p. 350). Agreeing with this assessment, in his later writings, Popper (1972) proposed that the weaker but relevant test of causal mechanisms involves comparing the results of competing hypotheses. Thus, we build on these ideas.
2. If two theories generate the exact same sets of hypotheses, they would, in fact, be one and the same theory.
3. Assuming that effects are homogeneous across the cases is consistent with theory and with standard statistical analysis.

Figure 1

(A) EO-as-Advantage; (B) EO-as-Experimentation; (C) EO-as-Advantage With Minimum Performance Needed for Survival; (D) EO-as-Experimentation With Minimum Performance Needed for Survival



average performance effect of the superior strategy as illustrated in Figure 1A. This illustrative example is consistent with the EO-as-advantage perspective.

Assume instead that the firms in sample A introduce a strategy that is associated with experimentation (e.g., they invest in and start experimenting with some new technology). Some of the firms will do this successfully, and others will not be successful. This strategy increases performance variance but has no effect on mean performance. We illustrate this example in Figure 1B. Sample A and sample B have the same mean, but sample A has a flatter and wider distribution of performance than sample B does. This illustrative example is consistent with the EO-as-experimentation perspective.

It is further reasonable to assume that a minimum level of performance is needed for survival such that firms performing below a particular minimum level will fail. This is illustrated by the vertical lines in Figures 1C and 1D, respectively. These minimum performance requirements serve to truncate the distributions at the minimum performance level needed for survival. Interestingly, the effect of introducing this minimum performance requirement has radically different effects depending on the perspective taken. In the case of EO-as-advantage, fewer firms in the high-performing sample (sample A) will fail. If we observe the two samples of firms after the new strategy has been introduced, the performance advantage attributable to their choice of a superior strategy will be attenuated. In the case of EO-as-experimentation, the effect will be the opposite. A larger share of firms in sample A will fail to meet the minimum performance needed for survival and will go out of business. When we observe the two samples after the introduction of the new strategy, it appears that the firms in sample A will, on average, achieve higher

performance. However, in reality, this effect is driven by an influence of the distribution of the outcome and not the mean. While our example of two samples is clearly simplified, it serves to illustrate the empirical consequences of two different perspectives of EO. Although the mechanisms themselves are unobservable, from an EO-as-advantage perspective, we expect EO to have a positive influence on survival as well as a positive influence on performance among surviving firms. In contrast, from an EO-as-experimentation perspective, we expect that EO will have a negative influence on survival but a positive influence on performance among surviving firms. We now turn to the theoretical underpinnings (mechanisms) for each of these perspectives and the formal hypothesis development.

Different Perspectives of EO and Their Performance Implications

EO-as-Advantage

Although the theoretical foundation of the relationship between EO and performance has rarely been explicated, it is clear that the majority of research on the topic implicitly assumes that EO somehow provides an advantage to firms. Arguments vary but share the essential idea that it pays to pursue an EO. At present, the dominating theory of competitive advantage is the resource-based view of the firm (RBV). Therefore, we use this theory to develop hypotheses for how EO influences relative performance and the likelihood of failure if its causal mechanisms are applicable to the relationship between EO and performance. The history, core ideas, and empirical findings of RBV have been thoroughly discussed elsewhere (e.g., Barney, 1991, 1995; Newbert, 2007), but a key notion of this theory is that firms controlling valuable and rare resources have the capacity to build a competitive advantage. If these resources are also inimitable and non-substitutable, this competitive advantage can be sustainable.

EO (and the strategies and behaviors that result) has been viewed as a resource, a capability, and an organizing context that allows firms to take advantage of their resource bases (Newbert, 2007). In their development of a strategic entrepreneurship framework, Ireland, Hitt, and Sirmon (2003) suggested that an orientation toward entrepreneurial activity leads organizations to structure their resource portfolios, bundle their resources, and leverage these bundles in ways to achieve a sustainable competitive advantage. Indeed, Wiklund and Shepherd (2003) argued and found empirical support for the notion that more EO allows firms to utilize their knowledge-based resources more fully, which improves the firms' relative performance. Similarly, Bhuian, Menguc, and Bell (2005) suggested that an entrepreneurial strategy is composed of an important dynamic capability that modifies and coordinates a firm's marketing knowledge.

From an EO-as-advantage perspective, available empirical evidence suggests that EO generates a competitive advantage (recognizing that this positive relationship between EO and performance is more positive under some [internal and external] circumstances than others) (see Rauch et al., 2009, for a review and meta-analysis). Thus, because performance outcomes are based on a sustainable competitive advantage, we would expect that firms that have greater EO would exhibit higher relative performance than firms with lesser EO. Similarly, if survival is a major aspect of performance (Baum & Silverman, 2004; Brush & Chaganti, 1999) and is negatively impacted by competitive rivalry and other competitive dynamics (Carroll & Delacroix, 1982; Romanelli, 1989), we expect that from an EO-as-advantage perspective, EO reduces competitive pressures, thereby enhancing survival chances. Thus:

Hypothesis 1: EO has a positive influence on relative firm performance among surviving firms.

Hypothesis 2: EO has a negative influence on firm failure.

EO-as-Experimentation and Its Performance Implications

A different view of performance outcomes arises from an EO-as-experimentation perspective. This perspective builds on the distinction between exploration and exploitation in organization learning theory (March, 1991). Firms choose between conducting exploratory activities that entail venturing into new activity areas and exploitative activities involving the honing of existing practices and competencies (Gupta, Smith, & Shalley, 2006; March). Because exploration is associated with activities that are distant from the firm's prior competencies and activities, these activities are riskier, and their outcomes are more uncertain. Thus, the variance in the range of outcomes is likely to be high. Some exploratory projects fail while others succeed, which generates performance variance. As noted by March, variance seeking is a double-edged sword: "The general principle that relative position is affected by variability, and increasingly so as the number of competitors increase, is true for any position. In competition to achieve relatively high positions, variability has a positive effect. In competition to avoid relatively low positions, variability has a negative effect" (p. 83). Therefore, if a minimum performance level is needed for firms to survive and this threshold is somewhere at the lower end of the performance distribution, in a random sample of firms, we expect higher failure rates *and* higher relative performance among surviving firms pursuing variance-seeking exploration strategies than among those pursuing more conservative strategies.

Although there is some ambiguity in the definitions of exploration and exploitation (Gupta et al., 2006), the literature does converge on the idea that there are distinct differences in the activities carried out through the two modes. Exploration is associated with experimenting, trialing, freely associating, and entering into new product markets, while exploitation is associated with refining, producing, reusing existing routines, and improving existing product markets (Baum, Li, & Usher, 2000; He & Wong, 2004; Holmqvist, 2004). EO appears to be more closely aligned with the activities of exploration than exploitation. Burgelman (1991) noted that corporate entrepreneurship is characterized by the generation of internal variance and learning in areas outside of existing strategies and visions. Indeed, the dimensions of EO—innovation, risk taking, and proactiveness (Covin & Slevin, 1989)—appear to be more consistent with the domain of experimentation and new product markets than with the refinement of existing routines and product markets (cf. Baum et al.). Thus:

Hypothesis 3: EO has a positive influence on relative firm performance among surviving firms.

Hypothesis 4: EO has a positive influence on firm failure.

Methods

Research Design and Sample

Data were collected by surveying a sample of small- and medium-sized Swedish businesses. The sample was stratified according to the following criteria: four industrial sectors based on International Standard Industrial Classification (ISIC) codes

(manufacturing, professional services, wholesale/retail, and other services); employment size class divided into two groups (10–49 and 50–249, which is equivalent to the European Union definitions of small- and medium-sized businesses, respectively); and corporate governance (independent firms and members of business groups). The sampling population contained 2,455 incorporated firms obtained from Statistics Sweden (the Bureau of Census). We collected data during two survey rounds, which were 3 years apart, using telephone and mail surveys targeting the chief executive officers (CEOs) of the small businesses.

During the initial survey round, we first contacted 2,454 firms by telephone and obtained 2,034 responses (82.9%). In order to ensure that we did not confuse failure with corporate restructuring in company groups, we started out by restricting the sample to include only independent firms. Company groups can choose to transfer profits among the companies in the group and close subsidiaries for reasons other than poor performance. Therefore, we asked each CEO if his or her company belonged to a group. In all, 1,213 firms (59.6%) reported that they were part of a company group and were therefore excluded from the sample, leaving 821 (40.4%) firms in the sample. Shortly after the initial telephone interview, the firms were mailed a survey, generating 466 complete responses after two reminders (a response rate of 56.7% from the refined sampling frame). This initial survey included measures for the independent and control variables (detailed later).

Three years later, the same CEOs were approached again to capture the firm's performance. We chose a 3-year lag for two primary reasons. First, a lag between independent and dependent variables helps safeguard against the potential for reverse causality. Second, it also takes time for strategic initiatives, such as those arising from EO, to have an impact on performance (Wiklund & Shepherd, 2003). This suggests that it is desirable to have a substantial lag between EO and outcome variables. Data collection during the second survey round also used a telephone interview followed by a mail questionnaire. In all, 239 firms provided complete responses to this questionnaire (51.2%). We provide further details about the 227 nonrespondents later where we discuss potential nonresponse bias.

Variables and Measures

Dependent Variable 1: Relative Performance. Ascribing to the view that performance is multidimensional (Cameron, 1978) and that relative performance is best tapped by comparing a firm with its direct competitors, we relied on the multidimensional scale developed in Wiklund and Shepherd (2003). In this scale, respondents are asked to compare the development of their own firm over the past 3 years relative to their two most important competitors for 10 different dimensions of performance: sales growth, revenue growth, growth in the number of employees, net profit margin, product/service innovation, process innovation, adoption of new technology, product/service quality, product/service variety, and customer satisfaction ($\alpha = .82$). We used 5-point scales ranging from "much lower" to "much higher" to capture this variable. Comparing a firm's performance with its main competitors appears to be particularly relevant from an EO-as-advantage perspective as competitive advantage essentially means outperforming main competitors.

The reliance on self-reported data from single informants has been the most common way of addressing performance in previous studies of EO and performance (Rauch et al., 2009). A drawback of this type of data collection is that it introduces the potential of common method bias. Therefore, in order to establish convergent validity, we correlated the performance index from the mail survey with another performance

measure collected during the telephone interview shortly beforehand, thus comparing the responses to two different measurement scales collected at two different points in time using mail and telephone surveys, respectively (this is an approach for establishing validity advocated by Robinson, Shaver, & Wrightsman, 1991). This second performance measure included four separate questions tapping net profits, sales development, cash flow, and value growth compared to competitors ($\alpha = .76$). The correlation between the two indices—performance measured by the mail survey and a different measure of performance from the telephone interview—was .53 ($p < .01$), suggesting that the correlation between the two underlying theoretical constructs, while correcting for measurement error, was .65 (Cohen & Cohen, 1983), indicating that common method bias was not a major problem.

Dependent Variable: Failure. Disappearance from the data set was not considered to be a sufficient criterion for classifying businesses as failures. Instead, we utilized Statistics Sweden's reporting on legal changes, which covers all incorporated companies in Sweden. By law, incorporated companies cannot simply dissolve and disappear. There are three potential exit routes for firms: liquidation, bankruptcy, and merger. In total, 28 firms were liquidated or went bankrupt and were therefore classified as failures. An additional 38 firms had disappeared as independent entities due to a merger. A merger may represent a failure or a success so we used Altman's (1968) Z-score model of financial distress to determine if the firm was in financial distress before merging with another firm. The Z-score model has frequently been used by academics in bankruptcy prediction models, by financial institutions in making their lending decisions, and by credit rating institutions in their expert systems (e.g., De Servigny & Renault, 2004). Therefore, this model represents a useful tool for determining if a firm is in financial distress at the time of a merger. A total of 10 out of the 38 merged firms were in financial distress at the time of the merger and were therefore classified as failures.[4]

Thus, out of the 466 firms originally surveyed, 239 firms survived the 3-year window of the study and provided complete responses, an additional 38 firms were failures, and 189 dropped out of the sample because they either merged with a firm and were not in financial distress (28) or they survived but failed to return usable responses (151). In our analyses, we took into account nonresponding firms and corrected our estimates in order to avoid bias.

EO. In their meta-analysis, Rauch et al. (2009) found that the most common measure of EO was developed by Covin and Slevin (1989) as it appeared in its original form or in slight variations thereof in over two thirds of the studies reviewed. We relied on the

4. Altman's Z-score model uses eight indicators of firms' size, leverage, liquidity, and performance as predictors of firms "in financial distress." Following Altman (1968) and the subsequent literature, we used the following variables, notations, and operationalizations: Z-score = A × 3.3 + B × .99 + C × .6 + D × 1.2 + E × 1.4. Where A = earnings before interest and taxes/total assets, B = net sales/total assets, C = market value of equity/total liabilities, D = working capital/total assets, and E = retained earnings/total assets. The following is the convention for interpreting the Z-score in the literature and in practice: "safe" for Z-scores above 3.0, "alertness" for Z-scores between 2.7 and 2.99, "good chances of the company going into distress" for Z-scores between 1.8 and 2.7, and "high probability of financial embarrassment" for Z-scores below 1.8. Thus, values below 3.0 signal some level of financial distress. Using the cutoff of 3.0 as signaling failing firms, 10 out of the 38 mergers were considered failures. In order to ensure robustness, we used different cutoff points for classifying mergers as failures. Only two firms were reclassified if we used a cutoff of 1.8, and the results of our hypothesis testing remained substantially the same for the different Z-scores used.

original version of the instrument, which is composed of nine items ($\alpha = .74$). The instrument taps three separate dimensions of EO: innovation, proactiveness, and risk taking.

Control Variables. All control variables were measured during the first survey round. We controlled for *Past Performance* by asking four separate questions during the first telephone interview, tapping each firm's net profits, sales development, cash flow, and value growth compared to its competitors ($\alpha = .76$). *Firm Size* was measured as the log of sales. The sample was stratified over three sectors: manufacturing, services, and retail and wholesale. Dummy variables were constructed for the two first sectors, leaving the largest sector (retail and wholesale) as the reference group, as suggested in the literature (Hair, Anderson, Tatham, & Black, 1998). In the selection equation, *Employment Size* (logged) was also included as a variable influencing the probability of failure (selection equation), but *Performance* (outcome equation) was not included in order to avoid potential collinearity problems (Puhani, 2000).

Analyses and Results

In Table 1, we present the descriptive statistics and correlations for the continuous variables. Our analysis strategy involves two main stages. The first stage tests for potential nonresponse bias. As mentioned earlier, our approach to examining a causal mechanism involves first ruling out the possibility that the empirical results were driven by a spurious mechanism, such as sample selection (see Elster, 1998, pp. 62–63). The second stage is the actual testing of the hypotheses. A complicating factor for our analysis is that there are two types of nonresponding firms: those that survived but chose not to respond and those that failed. Our two-stage strategy allows us to appropriately deal with both categories.

In first addressing potential nonresponse bias, we relied on Heckman's (1979) correction model using a two-step estimator (Berk, 1983). We first estimated a probit model for sample selection using response/nonresponse among surviving firms as the dependent variable, saving the probabilities of each case belonging to each of the categories (inverse Mills ratios). These results are displayed in the first column of Table 2. We then estimated

Table 1

Descriptive Statistics and Correlations

				Correlations				
	N	Mean	SD	1.	2.	3.	4.	5.
Performance	241	3.39	.43	1.00				
Entrepreneurial orientation	469	4.12	.86	.40	1.00			
Past performance	469	3.52	.67	.32	.28	1.00		
Firm size (log sales)	469	3.49	1.09	.03	.18	.13	1.00	
Employment size (log employment)	469	3.52	.94	.07	.05	.09	.77	1.00

Table 2

Testing for Nonresponse Bias

	Response		Relative performance without correction		Relative performance with correction	
	Coefficient (SE in parentheses)	z-statistic	Coefficient (SE in parentheses)	*t*-statistic	Coefficient (SE in parentheses)	*t*-statistic
Entrepreneurial orientation	.06 (.08)	.77	.19 (.04)***	5.27	.17 (.04)***	4.62
Past performance	.11 (.10)	1.18	.14 (.05)**	3.17	.11 (.05)*	1.98
Firm size	−.25 (.11)*	.01	−.02 (.02)	−.69	.02 (.03)	.57
Manufacturing	.21 (.15)	.17	−.05 (.06)	−.88	.10 (.06)	−1.65
Service	.06 (.16)	.73	.07 (.06)	1.15	.02 (.03)	.10
Employment size	.21 (.11)	1.89	—	—	—	—
Inverse Mills ratio	—	—	—	—	.61 (.40)	1.51
Constant	−.46 (44)	.29	2.16 (.20)***	10.89	2.73 (.44)***	6.15
N	428		239		239	
Pseudo R^2	.02		—		—	
R^2	—		.222***		.232***	
Chi^2	11.37		—		—	

* $p < .05$, ** $p < .01$, *** $p < .001$

and compared two performance equations: one without the correction for sample selection and the other correcting for sample selection by including the inverse Mills correction term. The comparison of these two equations allowed us to examine the magnitude of selection bias, if any is present. These results are displayed in the second and third columns of Table 2, respectively.

The selection equation reported in the first column is not statistically significant ($\chi^2 = 11.37$, $p > .10$), suggesting that the model was not able to significantly separate responding from nonresponding firms. The only variable that has a statistically significant impact is size ($\beta = -.25$, $p < .05$). The coefficient is negative, suggesting that smaller firms are more likely to respond. The second column reports the uncorrected performance equation, and the third column reports the equation corrected for nonresponse.[5] If we compare the two equations, we can see that although the results differ somewhat, they are quite similar with statistically significant effects for past performance (uncorrected for nonresponse $\beta = .14$, $p < .01$; corrected for nonresponse $\beta = .11$, $p < .05$) and EO (uncorrected for nonresponse $\beta = .19$, $p < .001$; corrected for nonresponse $\beta = .17$, $p < .001$). In summary, the nonsignificant selection equation, together with the similarity in the results when we corrected for sample selection and when we did not, suggests that nonresponse bias is not a major problem in our research or a driver of the results. As a consequence, we feel confident to proceed to testing the hypotheses in the second stage of the analysis.

First, in order to test the competing hypotheses 2 and 4, we estimated a probit equation with failure as the dependent variable. These results, reported in the first column of Table 3, show that the selection equation is statistically significant ($\chi^2 = 17.21$, $p < .01$). EO has a statistically significant positive influence on failure ($\beta = .32$, $p < .001$). This supports hypothesis 4, stating that firms with more EO are more likely to fail than those with less EO. At the same time, it rejects the competing hypothesis (hypothesis 2), stating that firms with more EO are less likely to fail than those with less EO. These results were also upheld when we simply compared the means of surviving and failed firms. A *t*-test showed that on average, failing firms scored 4.48 on the EO scale (the scale goes from 1 to 7), whereas surviving firms scored on average 4.11. This difference is statistically significant ($p < .05$). We also note a statistically significant negative influence of past performance. Firms that performed better in the past are also less likely to fail. Finally, the positive and statistically significant effect of the service sector coefficient suggests that firms in this industry are more likely to fail.

In order to test hypotheses 1 and 3, we then estimate the relative performance model. We tested two models: one adjusts for failure with the inverse Mills ratio and the other does not. These results are shown in the second and third columns of Table 3.[6] The results show that EO has a statistically significant positive effect on relative performance in both equations (uncorrected for nonresponse $\beta = .19$, $p < .001$; corrected for nonresponse $\beta = .27$, $p < .001$) and that the inverse Mills ratio is not statistically significant. Thus, there is a positive effect of EO on performance even when adjusting for failure. These results support hypothesis 1 and hypothesis 3, both of which stated that surviving firms with more EO will experience higher relative performance than those with less EO.

5. In order to take into account that standard errors may be heteroscedastic, we used a Huber–White sandwich estimator in these equations (StataCorp, 2001). As a result, F-statistics were not applicable.

6. In order to take into account that standard errors may be heteroscedastic, we used a Huber–White sandwich estimator in these equations. As a result, F-statistics were not applicable.

Table 3

The Effect of EO on Performance

	Failure		Relative performance without correction		Relative performance with correction	
	Coefficient (SE in parentheses)	z-statistic	Coefficient (SE in parentheses)	*t*-statistic	Coefficient (SE in parentheses)	*t*-statistic
Entrepreneurial orientation	.32 (.13)**	2.48	.19 (.04)***	5.27	.27 (.07)***	4.19
Past performance	−.27 (.16)*	−1.72	.14 (.05)**	3.17	.08 (.06)*	2.03
Firm size	.19 (.16)	1.23	−.02 (.02)	−.69	−.02 (.02)	−.99
Manufacturing	.32 (.26)	1.26	−.05 (.06)	.38	.02 (.08)	.25
Service	.74 (.26)***	2.89	.07 (.06)	1.15	.22 (.12)	1.87
Employment size	−.31 (.17)	−1.75	—	—	—	—
Inverse Mills ratio	—	—	—	—	−.31 (.20)	−1.50
Constant	−1.48 (.78)	−1.90	2.16 (.20)***	10.87	1.48 (.47)**	3.15
N	274		239		239	
Pseudo R^2	.073		—		—	
R^2	—		.222***		.232***	
Chi^2	17.25**		—		—	

* $p < .05$, ** $p < .01$, *** $p < .001$

Implications of Findings

This article builds on the logical tree for hypothesis testing suggested by Platt (1964) and on Elster's (2007) procedure for explanation in social sciences to examine the potential mechanisms underlying the relationship between EO and performance. To uncover these mechanisms, we followed a procedure composed of three steps: first, establishing that there is a relationship between the variables of interest, then ruling out that results are spurious, and finally, testing instances when the mechanisms lead to different predictions. Concerning the relationship between EO and performance, this approach turned out to be valuable and led to novel insights. It clearly has implications for future theory development in this domain. Two related questions were examined: how does EO influence relative firm performance, conditional on survival, and how does EO influence the likelihood of firm failure? Consistent with a large number of previous studies, we found that EO had a positive relationship with relative performance among surviving firms. We also found that these results were not likely to be spurious; that is, they did not appear to be driven by sample selection. In contrast to most EO studies, we investigated and found that EO also has a positive relationship with firm failure. Taken together, these findings support the notion that EO is more closely associated with the EO-as-experimentation perspective than with the EO-as-advantage perspective.

As with all studies, this work has limitations. EO is a fundamentally dynamic concept. We used a research design that allowed us to examine the future performance implications of EO, including the likelihood of failure. We did so using a measure of EO at one point in time. However, as we suggest later, there is more that can be done to investigate EO as a process and its important feedback effects. Furthermore, in this study, as with many previous studies (e.g., Wiklund & Shepherd, 2003), we relied on a single respondent (CEOs) for a firm. Multiple respondents could have improved our validity.

Where to From Here?

Our finding of a positive relationship between EO and failure is at odds with the implicit assumption of the vast majority of previous EO studies. As far as we are aware, previous studies have hypothesized and tested the performance of surviving firms without considering the potential impact of EO on performance variance. Given that so many (100+) studies have examined the relationship between EO and performance and that risk taking is closely associated with EO (risk taking is one of EO's dimensions), the absence of explicit investigations of performance variance may provide a misleading picture of the EO–performance relationship. Denrell (2003) noted that if a variable affects failure (particularly a variable including risk, such as EO), this could lead to spurious observations of performance implications: "It is less commonly observed that sampling on survivors also has another effect . . . Specifically, risky variables, even if unrelated to average performance will seem positively related to average performance" (p. 230).

Such research designs are not uncommon. Because of the lack of suitable data (Taylor & Greve, 2006), most research tends to overlook cases in which risky activities lead to failure (Gupta et al., 2006). In their review of the relationship between EO and performance, Rauch et al. (2009) observed that not one of the 50 plus studies included in their meta-analysis had taken into account the notion that an EO may also be associated with failure. We believe that our finding that EO seems to operate as a double-edged sword—it can enhance performance provided that a firm survives but also increase the probability of it failing—is novel and important. To date, scholars have been preoccupied with one of the

edges of the sword and have overlooked the other. More research into the survival consequences of EO is required before scholars can offer practical recommendations to managers. We believe that this "balanced examination of both edges of the sword" is quite different from the more general survivor and anti-failure biases noted in much of the literature. On the basis of the aforementioned reasoning, we propose the following:

Research Opportunity 1: *Future research on EO can make important contributions to the strategy and entrepreneurship literatures by using an experimentation perspective to investigate the relationship between EO and failure.*

Research Opportunity 2: *Future research on EO can make important contributions to the strategy and entrepreneurship literatures by using an experimentation perspective to investigate the relationship between EO and performance variance.*

EO and Mean and Distribution of Outcomes

Given the considerable literature that reflects an EO-as-advantage perspective, we propose that there are research opportunities associated with exploring the relationship between EO and variance in performance and also the relationship between variance in performance and mean performance. Does EO lead to greater variance in performance? We offered some preliminary evidence that suggests that the answer to this question could be yes, but there is substantially more work that can be performed in this area. In this study, we focused on variance across firms. Consistent with the EO-as-experimentation perspective, we found that firms with higher EO were more likely to fail. However, variance can also be considered within a firm in terms of the entrepreneurial projects it generates and pursues. The organization learning literature dealing with the implications of exploratory learning activities (March, 1991) could serve as a theoretical foundation for such research efforts. An advantage of examining performance variance within a firm is that such research could provide more fine-grained evidence of the causal mechanisms of the EO-as-experimentation perspective. On the basis of these mechanisms, we would anticipate that the higher the EO of the firm, the more entrepreneurial the projects the firm would pursue, but there would also be a wider distribution of outcomes with a larger share of failed projects and a larger share of highly successful projects.

Suitable dependent variables in this line of research could be different aspects of variance in outcomes. Outcome variance could be operationalized by, for example, the number of research and development projects that fail, the number of projects that perform moderately well, and the number of projects that are wildly successful (or use some continuous measure of project outcomes). Alternatively, an operationalization could benchmark the number of project failures (strikeouts) with the number of successes (home runs) and compare the ratio of strikeouts with home runs with others in an industry or with peers. Outcome variance could also be investigated in terms of variability in the "radicalness" of the entrepreneurial projects or the level of uncertainty surrounding them.

These measures are more proximal to the entrepreneurial actions generated by EO. The advantage of more proximal outcome variables is that they typically allow for a better understanding of the mechanisms bringing about a phenomenon and for potentially stronger empirical results because there is less unobserved heterogeneity in the investigated relationships. By refocusing scholarly attention from mean performance to the distribution of outcomes, our hope is that future theorizing on EO will lead to a range of "new" dependent variables—outcomes other than simply relative performance, including the distribution of performance outcomes. In addition, a substantial number of studies have examined how internal and external variables moderate the relationship between EO

and performance (e.g., Wiklund & Shepherd, 2003, 2005). This line of research could be fruitfully extended into the study of performance variance. For instance, do the variables that moderate the relationship between EO and mean performance also moderate the relationship between EO and variance in performance? In sum, the aforementioned suggests the following research opportunity:

> **Research Opportunity 3:** *Future research on EO can make important contributions to the strategy and entrepreneurship literatures by investigating more proximal outcomes (at the firm and/or project level) and the distribution of those outcomes.*

However, we are not suggesting that we should forget about mean performance altogether. There is more research to be done to explore the relationship between variance and mean performance than the simple tests offered here. Is the relationship between EO and mean firm performance mediated by variance? That is, does EO lead to a greater distribution of outcomes, and does a greater distribution of outcomes lead to higher mean performance? If there is strong competition for supremacy in an industry, higher short-term outcome variance is likely to be associated with a higher long-term mean (March, 1991). The empirical results of our study are consistent with such a relationship between performance variance and mean, but more research is needed. The question regarding the relationship with mean performance can also be reversed: what impact does an enhanced mean performance have on subsequent levels of EO and/or the distribution of outcomes? Thus, we suggest the following line of research:

> **Research Opportunity 4:** *Future research can make important contributions to the strategy and entrepreneurship literatures by investigating the role of EO on the relationship between the distribution and the mean of performance (and vice versa).*

EO and Managing the Distribution

A focus on the distribution of outcomes allows us to approach research questions related to EO from a new vantage point. One such vantage point relates to actively managing the outcome distribution itself. Ideally, entrepreneurial firms and entrepreneurial societies would like to skew the distribution of their outcomes such that there is a long tail at the highly successful end but only a short tail at the failing end. Applying real options reasoning, substantial contributions along these lines have already been made (McGrath, 1999). Indeed, McGrath (1999) proposed that a hallmark of an entrepreneurial firm and an entrepreneurial society is a greater distribution of outcomes. Greater variability *within a firm* means that more projects will fail and more projects will be highly profitable. Greater variability *within an economy* means more firms will fail and more firms will be highly profitable. It is the experimentation into the unknown that provides the tails of the distribution.

If firms are able to skew the distribution to the positive end or truncate it on the downside, they can afford more experimentation with less risk of the firm going bankrupt as a consequence of launched projects failing. Central to truncating the distribution on the downside is killing poorly performing projects early. This seems like an obvious strategy; however, this appears to be easier said than done. Recent research has explored the cognitive and emotional issues associated with project failure (Shepherd & Cardon, 2009), which means that projects and firms persist despite poor performance (DeTienne, Shepherd, & DeCastro, 2008; Gimeno et al., 1997; Shepherd, Wiklund, & Haynie, 2009). This increases the financial distribution of outcomes by elongating the "downside" tail. Therefore, greater distribution itself may not be the objective; rather, the objective may be

skewing the distribution so there are lower costs associated with experimentation while maintaining the upside potential.

Future research can investigate how EO is managed by norms, routines, and capabilities that "shape" the distribution curve. For example, does the relationship between EO and the shape of the distribution of outcomes depend on the generation and regulation of emotion over project failure, on attitudes toward failure, on the ability to learn from failure, on the speed at which projects are killed, on who is responsible for terminating projects, and so on. Alternatively, perhaps these variables represent antecedents to EO rather than moderators of the relationship between EO and the shape of the distribution of outcomes. For example, perhaps an EO's proactiveness comes from an organizational culture that does not fear failure but instead sees failure as a relatively ordinary event, or perhaps, the innovativeness of an EO comes from an organization's ability to learn from its failures. Also, risk taking may be enhanced by an organization's belief in its ability to regulate the negative emotions of its members should things go wrong. As we move from an emphasis on mean performance to the distribution of outcomes (or the shape of that distribution), we believe it requires scholars to overcome what McGrath (1999) refers to as our "anti-failure" bias. We believe that failure, its antecedents, and its consequences are important topics for future EO research. Thus, we suggest the following research:

> **Research Opportunity 5:** *Future research can make important contributions to the strategy and entrepreneurship literatures by avoiding an anti-failure bias to investigate the role of EO in how firms manage failure to skew the distribution of outcomes.*

It is likely that the extensive current literature on the moderators of the EO–performance relationship can potentially serve to identify how managers can shift the distribution of outcomes. Given that the research presented here has identified that the EO-as-advantage and EO-as-experimentation perspectives lead to similar empirical results regarding the relative performance of surviving firms, it might be that the moderators identified in previous research indeed influence the relationship EO has with both the mean and the distribution of outcomes in ways that have hitherto remained unexplored. For example, several scholars have noticed that aspects of the environment moderate the relationship between EO and performance. One reason for this influence might be that the payoffs of "home runs" relative to the losses of "strikeouts" differ across different environmental contexts. Such a proposition is quite different from the assumption that the *average* payoffs to entrepreneurial initiatives vary across contexts. Using an EO-as-experimentation perspective, we can raise and investigate several questions such as these, which are also highly relevant for managers. Thus, the following research is suggested:

> **Research Opportunity 6:** *Future research can make important contributions to the strategy and entrepreneurship literatures by investigating moderators in the relationship between EO and the distribution of outcomes.*

EO and Multilevel Research

EO scholars have debated about issues related to the level of analysis. EO is often captured on the basis of information from a single key informant (e.g., Wiklund & Shepherd, 2003) but is still considered a firm-level construct (cf. Rauch et al., 2009). However, we believe that there are considerable research opportunities crossing the individual and firm levels using multilevel research designs. Thematically, we advocate multilevel designs that are consistent with the research opportunities detailed earlier. For

example, how does a firm's EO influence an individual's intention (and behavior) to experiment with new technologies, new products, new markets, and/or new processes? What explains variance among organizational members in this relationship? Such explanations could include other individual-level variables (personal attitudes, values, goals, self efficacy, and so on) and/or firm-level variables (culture, climate, resource allocation, strategy, and external environment).

In addition to these multilevel questions about EO as an antecedent to individual-level experimentation, we believe there are interesting multilevel questions involving feedback loops. Recognizing that failure can occur as a result of experimenting into the unknown, it seems to us that an important stream of research will explore the implications of failure on EO-as-experimentation. Recent research has investigated individuals' negative emotional reactions to failure within firms (e.g., projects, Shepherd & Cardon, 2009) and the failure of the firm itself (Shepherd, 2003). How do individuals' negative emotional reactions to failure influence their firm's EO? On the one hand, perhaps organizational members' experience of negative emotions reduces their willingness to take further risks and/or makes them less proactive given the saliency of acting and being wrong. That is, members' negative emotional reactions to project failure may lower the firm's EO. On the other hand, perhaps experiencing negative emotions from project failure motivates and informs subsequent experimentation and therefore increases EO. Future research can explore the individual implications of failures within firms and how these may impact firms' EO.

We believe this highlights two broad opportunities. There is a need for greater theorizing on the mechanisms by which organizational members influence a firm's EO and the mechanisms by which the firm's EO influences the mindset of organizational members. We have suggested that learning and emotion might be mechanisms connecting the two levels. There is considerable research on the EO to performance relationship but little on the feedback effect. In particular, we have suggested that failure represents an important source of information, but we need more research to understand how and why it may influence a firm's EO. Thus, we propose the following:

> **Research Opportunity 7:** *Future research can make important contributions to the strategy and entrepreneurship literatures by (1) investigating the impact of failure on EO. Of particular importance (2) are multilevel studies that investigate failures from the individual-level of analysis (3) and/or individual-level mediators and/or moderators of the failure–EO relationship.*

EO and Methods

Our proposed path for EO research has implications for methods–samples and statistical techniques for theory-testing research and theoretical sampling for theory-building research. The most important aspect of a sample is that it is selected based on the research question. However, because broad samples are typically associated with considerable variance in unobserved variables, it is more difficult to isolate and examine the relationships of primary theoretical interest. We therefore recommend that future theory-testing research on EO focus on more homogenous samples that are consistent with the research opportunities that we proposed earlier. For example, if the purpose of a particular study is to explore the organizational culture and capabilities that enhance the relationship between EO and more positively skewed project performance distribution, then scholars could sample firms in new and emerging sectors in which experimentation is a valued strategy. Alternatively, scholars can explore the downside of EO by sampling firms in an

industry in which experimentation is believed to be a poor strategic orientation. Importantly, in order to avoid survivor bias, samples need to include failures—either failed projects within a firm or failed firms. Thus, we believe scholars should research the following area:

> **Research Opportunity 8:** *Future research can make important contributions to the strategy and entrepreneurship literatures by choosing more homogenous samples suitable for EO research questions and by choosing (creating) samples that include failures as well as successes (within or across firms).*

Given the nature of the EO construct, we anticipate that for the foreseeable future, research will rely heavily on the use of primary data and will collect the relevant information about EO and many other variables directly from firms. As we move from mean performance to "performance variance" outcomes (such as distribution and shape of distribution), we, nevertheless, recommend a greater reliance on methods other than the single survey (with or without lagged independent variables) that has characterized the majority of EO studies to date (including this one). The use of repeated measures allows researchers to examine the process aspects of EO, specifically nuanced examinations of relationships over time that are consistent with our overarching proposal that EO is associated with performance variance. For example, given that the EO-as-experimentation perspective emphasizes that EO leads to performance variance, it would be valuable to examine the relationship between EO and performance over time and any potential changes to the strength and/or direction of this relationship. There is some evidence that on average, the EO–performance relationship is sustainable (Wiklund, 1999), but more can be said about how (or when) this relationship varies between and within firms over time.

We expect that future EO research will also begin to use experiments, such as conjoint studies (for a review, see Lohrke, Holloway, & Woolley, 2009; Shepherd & Zacharakis, 1997). For example, conjoint analysis could be used to determine whether EO explains variance in CEOs' decision policies for exploiting potential opportunities. Perhaps this moderating role of EO on CEOs' opportunity–exploitation decision policies is influenced by internal and external environmental factors. We simply offer this example as an illustration of how experiments could be used in the future. The exact nature of the experiment obviously depends on the research question, theory, and hypotheses. Thus, we suggest another line of research:

> **Research Opportunity 9:** *Future EO research can make important contributions to the strategy and entrepreneurship literatures by experimenting with different methods such as longitudinal methods that can capture dynamism (including time, causality, and reciprocity) and experiments that can provide a more fine-grained investigation of the underlying mechanisms.*

We also believe that the EO-as-experimentation perspective opens up possibilities for theory-building research. A starting point for this study was that the mechanism underlying the performance implications of EO are still not understood well. There is a general movement in the literature toward explicating the mechanisms of phenomena. As stated by Davis and Marquis (2005), "The most productive theoretical work going forward will be in the cataloging and developing of organizational mechanisms" (p. 340). In-depth case studies are ideal for explicating such mechanisms. A fruitful research design would likely be to select some cases that score high on the EO scale and some that score low. By comparing within these groups and contrasting across them, research could gain in-depth documentation of the reasons for, and consequences

of, these differences in behavior as well as what kinds of entrepreneurial behaviors tend to cluster together. Another possibility is where the cases are homogeneous in EO but heterogeneous in experimentation; this research provides the basis for building a theory on the mechanisms that enable EO. Such theory-building efforts are necessary and likely to provide a rich contribution to the strategy and entrepreneurship literatures. Thus, we suggest one last type of research:

> **Research Opportunity 10:** *Future research can make important contributions to the strategy and entrepreneurship literatures through multiple case studies that use EO to theoretically sample firms from which to build cases or use EO as the basis to compare and contrast firms to build theories of experimentation and exploration.*

Conclusions

We propose and find empirical support for the EO-as-experimentation perspective as a complement to the commonly assumed but largely untested EO-as-advantage perspective. This empirically grounded conceptualization of EO opens up whole new avenues of research opportunities related to experimentation, performance variance, and failure. Given that we discuss and empirically test the causal mechanisms underlying the relationship between EO and performance, our research also provides a starting point for a stronger theoretical grounding of EO research. We feel that this provides an opportunity to start a new chapter to rejuvenate EO research.

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