Entrepreneurial Orientation and Organizational Performance: Exploring Moderated Curvilinear Relationships

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Keywords: Entrepreneurial orientation, firm performance, environmental dynamism, curvilinear relationships

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ABSTRACT

Empirical investigations of the EO–firm performance relationship have typically focused on small and medium-sized ventures and have relied on survey data. Will the shape of the relationship curve hold for firms that moved past the ‘ventures’ phase? Our study investigates a sample of 11,843 small, medium, and large publicly listed firms drawn from the COMPUSTAT database. We confirm the existence of a U-shaped EO-performance relationship, and our analysis offers new evidence on the role of EO in SMEs versus large firms. Contrary to conventional wisdom, our sample of SMEs displayed lower levels of EO than large firms, and large firms were found to be five times more likely to have high rather than low levels of EO. Additionally, environmental dynamism was found to influence the U-shaped relationship. We offer a deeper understanding and new insights on the moderating role of environmental dynamism. For example, the U-shaped EO-performance curves for high and low environmental dynamism were found to intersect, contradicting prior arguments that different levels of environmental dynamism will deliver differing EO-performance relationships. Finally, this study offers evidence of the interpretive advantages of using financial proxies to reflect study variables, compared to traditional approaches like surveys.

Keywords
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INTRODUCTION

Scholars define EO as the risk-taking propensity of a firm’s top management, which can be observed in the high-level routines that guide organizational processes (Anderson et al., 2015; Covin & Slevin, 1989). Over the past four decades, entrepreneurship and strategy researchers have highlighted the critical role of entrepreneurial orientation (EO) in delivering firm performance. Prior studies generally support a positive and linear relationship between EO and firm performance (Rauch et al., 2009; Soares & Perin, 2020). However, there are reasons to question the linear relationship. A few scholars have proposed curvilinear relationships between EO and performance. A few treatments proposed an inverted U-shaped relationship between EO and performance (e.g., Su, Xie, & Li, 2011; Tang et al., 2008), other treatments proposed a U-shaped relationship between individual EO dimension and performance (e.g., Dai et al., 2014; Kreiser et al., 2013), and one single-industry study suggested a J-shaped relationship in the context of small and medium enterprises (SMEs) (Kohtamaki et al., 2019). In addition, scholars have noted that EO is an organizational phenomenon found in every firm - small, medium, or large (Wiklund & Shepherd, 2005). What would the EO-performance curve look like if the sample included a large number of small, medium, and large firms? The jury is still out on the true nature of the EO-performance relationship that can be generalizable to firms of all sizes.

Scholars have noted that EO is especially critical for SMEs since they need robust capabilities to sense, seize, and materialize opportunities to grow and succeed (Teece, 2007,
Thus, the expectation was that SMEs would demonstrate higher levels of EO than large firms. However, few empirical studies have focused on firms of all three sizes, making such arguments difficult to test. What would the EO-performance curve look like if the sample included firms of all sizes? Would the distribution of small, medium, and large firms along the EO-performance curve reflect the theoretical trend predicted by researchers? For example, would SMEs be more likely to be found at the higher end of the EO spectrum than large firms? Would this hold true under different environmental conditions?

To address these gaps in the EO-performance literature, we conceptualize EO as a dynamic managerial capability (D’Souza & Fan, 2022) and seek answers to three research questions. First, what does the shape of the curve representing the EO-performance relationship look like if small, medium, and large firms are included in the sample? Further, do prior assumptions about the relationship between firm size and EO hold across small, medium, and large firms? Second, how can we extend the current understanding of the relationship between firm size, EO, and firm performance? Third, scholars believe that the task environment significantly moderates the EO-performance relationship (Anderson et al., 2022). We seek new insights into how the environment moderates the EO-performance relationship across small, medium, or large firms.

Unlike most EO-related investigations where data were collected from SMEs using survey techniques, this study uses secondary data from COMPUSTAT. Using a dataset of 94,548 observations from 11,843 publicly listed firms from 2000 to 2021, this study confirms the existence of a U-shaped relationship between EO and firm performance for a large and diverse sample of publicly held firms. This context has been sparsely researched. Our empirical methods
complement and extend existing approaches to EO-performance research found in the literature. While survey techniques allow researchers to collect primary data from SMEs, sample sizes are often limited. Using secondary data from COMPUSTAT enables us to investigate a large sample of SMEs and large firms across all industries in North America, making our results more generalizable. Further, survey techniques operationalize EO and performance as subjective perceptions that can be challenging to interpret. Our study uses financial indicators as proxies for EO and performance, which enable us to use objective measures of the study variables. In addition, financial indicators directly reflect managerial actions, making them less prone to respondents' attitudinal or dispositional limitations when survey techniques or content analysis approaches are used.

This study offers several theoretical, methodological, and practitioner implications. First, this study contributes to the stream of research on EO and firm performance that conceptualizes EO as a resource-consuming dynamic capability (D'Souza & Fan, 2022). Second, the use of data from publicly held firms suggests that the influence of EO is significant not only in entrepreneurial firms highlighted in prior research but also in mature firms of all sizes, making the findings more generalizable (Gentry, Dibrell, & Kim 2016; Titus & Anderson, 2018). Third, this study has implications for the methodological approach to EO-performance research. Operationalizing EO with secondary data rules out the subjective nature of surveys (Covin & Wales, 2019; Miller, 2011). Finally, this study offers contributions to practitioners. Evidence of the pervasive influence of EO on firm performance across publicly held firms in this study suggests that managers would benefit from the application of the U-shaped relationship proposed
in this study as they work to design and leverage the EO of their firms to enhance performance relative to that of their competitors (Kindermann et al., 2022).

LITERATURE REVIEW

Entrepreneurial Orientation and its Measures

Entrepreneurial orientation has its roots in the early work of Mintzberg (1973), where the job of an entrepreneur was deemed to include innovation, dealing with uncertainty, and generating new and unique resource combinations. A few years later, Miller (1983) defined entrepreneurship as the pioneering, innovative, and risk-taking activities firms undertake to renew themselves. Building on these insights, scholars posit that a firm's entrepreneurial orientation (EO) could be measured by its top manager's disposition and entrepreneurial routines. Covin & Slevin (1989) conceptualizes a three-dimensional reflective scale to measure EO - The innovativeness, proactiveness, and risk-taking dimensions. Later, scholars developed other ways to operationalize EO. Lumpkin and Dess (1996) proposed a five-item formative conceptualization of EO. Anderson et al. (2015) offered a two-factor formative EO construct where one factor captures a firm's innovative and proactive behaviors, and another measures its executive's psychological propensity towards risks. Additionally, scholars have created subsets of EO constructs like international EO (Covin & Miller, 2014), team EO (Covin et al., 2020), nonprofit organizational EO (Al-Tabbaa et al., 2022), CEO EO (Liu & Xi, 2022), and global EO (Lumpkin & Pidduck, 2021).

Different EO conceptualizations suggest different approaches to EO measurement. Specifically, there have been subjective and objective operationalizations of the EO construct.
For example, scholars who adopted reflective measures of EO have used surveys to collect subjective data from key informants (e.g., Calabro et al., 2021; Covin & Slevin, 1989). Scholars also have used computer-aided text analysis (CATA) to measure EO (Engelen, Neumann, & Schwens, 2015; Gruhn et al., 2017; Lumpkin & Dess, 1996; McKenny et al., 2018). To overcome common method bias and subjective bias inherent in such operationalizations, Miller (2011) suggested that scholars use secondary financial data as a proxy measure for EO. This has been adopted in subsequent research (e.g., Miller & Le Breton-Miller, 2011; Kreiser et al., 2020). In this study, we adopt Kreiser et al.’s (2020) operationalization of the EO construct based on financial data.

**Entrepreneurial Orientation and Firm Performance**

Scholars have adopted a resource-based view (Barney, 1991) to conceptualize a positive and linear relationship between EO and firm performance (Rauch et al., 2009). That is, they view EO as a driver of the firm’s unique resource configuration and logically derive a positive relationship between EO and firm performance. A critical link in this argument is the process by which EO influences the resource configuration of the firm to deliver firm performance ultimately. To examine how EO enables the transformation of firm resources and the costs incurred during the EO-driven resource transformation process, we turn to the capability-based view, expressly, the dynamic capability lens.

The capability-based view describes a firm as processes and routines that work to generate value for the customer. Most firms need two types of capabilities to compete in the market, i.e., the ordinary or operational capabilities (the 'how to earn a living now' capabilities, Winter, 2003, p. 992) and dynamic capability - the ability to refine and renew ordinary
capabilities (Teece, Pisano, & Shuen, 1997). Since EO is conceptualized as a driver of a firm's innovative, proactive, and risk-taking actions to shape commercial activities, scholars have argued that EO represents a dynamic capability of the firm (Lumpkin & Pidduck, 2021; D’Souza & Fan, 2022). Further, like any other dynamic capability, EO consumes scarce firm resources during its creation and implementation (Wilkund & Shepherd, 2011). Therefore, positive returns on EO-related investments are not guaranteed (Kindermann et al., 2022). As Porter (1985) notes, a firm, whether a new venture or a mature organization, could get ‘stuck in the middle’ due to expenditures intended to alter its position in a dynamic and competitive landscape. Thus, the assumption of a uniform positive relationship between EO and performance may not be accurate in all instances. This led to the first two of our research questions on the shape of the EO-performance curve and the influence of firm size on this relationship.

**Moderator of the EO – Firm Performance Relationship**

Scholars have investigated several moderating variables that could influence the EO-performance relationship since moderators essentially impose boundary conditions (Baron & Kenny, 1986). EO-performance moderators have been grouped as internal or external moderators (Wales, Gupta, & Mousa, 2013). Not surprisingly, one of the external moderators - the task environment - is the one most frequently examined because it impacts management’s perception of uncertainty, organizational structure, and firm performance (Covin & Slevin, 1991; Lawrence & Lorsch, 1967; Tung, 1979). Scholars note that the task environment (henceforth, we will use the term ‘environment’ to represent the ‘task environment’) is a multi-dimensional construct and has been operationalized on three dimensions: munificence, complexity, and dynamism (Dess & Beard, 1984; Tung, 1979). Munificence represents the environment’s capacity to accommodate
the scope of competition, complexity represents issues like heterogeneity and industry concentration, and dynamism reflects the environment's rate of change or turbulence (Boyd, 1990; Duncan, 1972). While most studies examine the environment as a critical antecedent of corporate strategies (Rosenbusch, Rauch, & Bausch, 2013), scholars have also examined the moderating role of the individual environmental dimensions on the EO-performance relationship. Using a sample of 161 small manufacturers, Covin & Slevin (1989) found that small firms that adopt higher EO perform better in a hostile environment. Conversely, small firms that adopt lower EO levels perform better in a benign environment. Wiklund and Shephard’s (2005) study focused on the moderating effect of another dimension of the environment, i.e., dynamism. They suggest a positive and linear relationship between EO and performance and that higher levels of environmental dynamism reduced the slope of the relationship. We seek to discover new insights into how the dynamism component of the environment moderates the EO-performance relationship across a large sample of small, medium, or large firms.

**HYPOTHESES DEVELOPMENT**

**Entrepreneurial Orientation and Firm Performance**

Prior investigations of the EO-performance relationship had posited a positive and linear relationship between the two constructs. Two meta-analyses confirmed this general view of a linear relationship between EO and firm performance. Rauch et al. (2009) analyzed 53 samples from 51 studies and identified a moderately large effect size between EO and firm performance ($r = 0.242$). Separately, Soares & Pena (2020) confirmed a 0.24 mean correlation when they analyzed 137 effect sizes from 78 studies. Scholars have used different lenses to posit a positive
linear relationship between EO and firm performance (Rodriguez-Serrano & Martin-Armario, 2019; Zou et al., 2018) and have argued that the relationship between EO and firm performance is more complex and that a simple positive linear relationship between EO and firm performance could be challenged both conceptually and empirically. The wide dispersion of effect sizes identified in the EO-performance relationship (Soares & Pena, 2020) suggests that the EO-performance relationship is complex and warrants further investigation.

Surprisingly, only a limited number of studies have challenged the linear assumption or have empirically tested a curvilinear relationship between EO and firm performance. Among those that have done so, an inverted U-shaped relationship between EO and firm performance has been suggested by Tang et al. (2008) and Su, Xie, & Li (2011). Scholars have posited that the EO-performance relationship could be U-shaped (e.g., Dai et al., 2014; Kohtamaki, Heimnon, & Parida, 2019; Kreiser et al., 2013).

Since every EO dimension requires some resource commitment, scholars have used cost-benefit analysis to support the possibility of a curvilinear relationship between EO and firm performance. The general argument is as follows: When EO is low, a firm can allocate most of its resources to build operational efficiencies, thereby maintaining high performance. The firm is later forced to increase its EO level to align with the changing environment. Since the transformation of organizational routines operationalized by the increase in EO will necessitate drawdowns and reallocation of the limited organizational resources, the firm’s performance could falter since the expected benefits resulting from the resulting new opportunities have not yet materialized. Eventually, the firm will attain a high performance when adjusted routines match the new environmental requirements. Based on these arguments, we posit that EO has a
curvilinear, U-shaped relationship with firm performance. In other words, firm performance is high when the level of EO is low, and its performance bottoms out when the level of EO is moderate. It eventually increases when the EO level rises further.

_Hypothesis 1: The EO-performance relationship is U-shaped._

The Moderating Effects of the Environment on the EO-Performance Relationship

Most studies on the EO-performance relationship include the environment as a control variable (Anderson et al., 2022), and there have been treatments that have positioned the environment as an antecedent of EO (Rosenbusch, Rauch, & Bausch, 2013). However, there are limited investigations of the moderating influence of the environment on the EO-performance relationship, e.g., Tajeddini & Mueller (2018). Given the nascency of the EO-performance literature, that is understandable. However, the increased variance in the findings of extant literature suggests that investigations on the potential moderators in the EO-performance relationship, especially the environmental moderators, to explain these variances are called for (Rauch et al., 2009).

Dess & Beard (1984) characterized the environment as a three-dimensional construct. Munificence represents the extent to which the environment offers resources and capacity for firms to grow. Complexity represents dispersion and heterogeneity in the environment. Dynamism represents the turbulence and instability of the environment. When environmental munificence is high, firms need more motivation to explore and innovate and tend to focus more on how best to exploit their existing resources. When environmental complexity and dynamism are high, firms are motivated to explore, innovate, and seek new opportunities to outperform in these complex and uncertain markets (Atuahena-Gima, Li, & De Luca, 2006). Taken together,
scholars have posited that the moderating effect of the environment on the EO-performance relationship hinges on how the firm aligns its EO levels with the external environment (Lawrence & Lorsch, 1967).

In this study, our focus is on the moderating effect of one of the three environmental dimensions, i.e., dynamism, since scholars have examined the moderating effects of the two other environmental moderators, i.e., munificence and complexity (Martins & Rialp, 2011; Pearce, Fritz, & Davis, 2010). We acknowledge these scholarly works and control for environmental munificence and complexity in our model. Prior research offers guidelines for how this moderating effect could manifest itself (Moreno & Casillas, 2008; Tajeddini & Mueller, 2019). Wiklund and Shepherd (2005) found that higher levels of environmental dynamism work to decrease the slope of the EO-performance relationship, i.e., it mitigates or weakens the influence of EO on performance. In the context of a U-shaped EO-performance relationship, this would imply that higher levels of environmental dynamism would be expected to flatten the U-shaped curve hypothesized earlier. Therefore, we offer the following hypothesis:

_Hypothesis 2: Environmental dynamism moderates the U-shaped EO-performance relationship such that when environmental dynamism is low, the relationship is reflected in a deeper U-shaped curve, and when environmental dynamism is high, the relationship is reflected in a flatter U-shaped curve._

METHOD

Sample

Scholars have used COMPUSTAT data not only for strategy and finance research but also for entrepreneurship studies (For example, see Gentry et al., 2016; Keil et al., 2017; Kresier
et al., 2020; Miller, Le Breton-Miller, 2012; Titus & Anderson, 2018). We leveraged COMPUSTAT datasets to construct a panel dataset at the ‘firm-year’ level to test our hypotheses. The initial sample for our study included all firms in the COMPUSTAT North American Fundamentals Annual database. This dataset includes all publicly traded firms listed on the US stock markets, including the New York Stock Exchange, NASDAQ, and NYSE Amex. The sample window was 22 years (2000 to 2021). Firms in the financial services, insurance, banking, and public services sectors were excluded because of the widely varied reporting standards used by these firms (McGahan & Porter, 1997). Firms that report missing annual sales were removed from the sample since financial ratios will be used to operationalize individual items of EO and annual sales are used as denominators in calculating some ratios. After removing observations with missing data on other key financials, the final sample includes about 94,548 observations from 11,843 firms.

**Dependent Variable**

Firm performance was measured as return on assets (ROA) – net income divided by total assets, which a commonly used accounting-based measure of firm financial performance (Combs et al., 2005). In robustness checks, we used return on sales (ROS) as the dependent variable to cross-check and confirm our findings.

**Independent Variable**

We followed scholarly recommendations and measured EO using archival financial indicators. Miller & Le Breton-Miller (2011) first introduced financial ratio indicators to measure the three dimensions of EO. Specifically, they use the ratio of research & development expenses to total sales to measure the innovativeness dimension. Second, they use the ratio of
annual earnings reinvested within the company to gauge the proactiveness dimension. Finally, they apply the unsystematic risk to estimate the risk-taking dimension, where the unsystematic risk is defined as the risk of a price change in firm market value due to firm-specific circumstances. Recently, Kreiser, Anderson, Kuratko, & Marino (2020) employed Anderson et al.’s (2015) two-factor formative construct to conceptualize EO and adapted Miller & Le Breton-Miller’s (2011) EO operationalizations with a slight modification in their study. They measure the risk-taking dimension with a proxy of the debt-to-equity ratio. Our study adopts Anderson et al. ‘s (2015) two-factor formative construct to conceptualize EO and uses the EO measure suggested by Kreiser et al. (2020). In sum, the innovativeness dimension of EO is measured as R&D intensity (a firm’s annual R&D expenses divided by its total sales), and the proactiveness dimension of EO is measured as the retention ratio (net income less dividends, divided by net income). Like Kreiser et al.’s (2020) work, we excluded from our EO measure the indicator for risk-taking. In alignment with prior literature, we argue that a firm’s innovativeness and proactiveness best represent its engagement in entrepreneurial behaviors, whereas risk-taking is a stable dispositional trait (Anderson et al., 2015; Anderson et al., 2019). Nevertheless, we controlled for the debt-to-equity ratio since it reflects a behavioral manifestation of manager risk-taking.

Moderating Variable

Environmental dynamism reflects the volatility and unpredictability of change within an industry (Dess & Beard, 1984). Industry sales volatility is usually adopted to measure dynamism (Keats & Hitt, 1988). Adopting Keats and Hitt’s (1988) approach, we regressed the natural logarithm of total industry sales, with years serving as the independent variable. The antilog of
the standard error of the year regression coefficient was then used as a proxy for the volatility of industry sales.

**Control Variable**

We included several firm-level control variables in our estimation model. We controlled for recoverable slack as the mean of three indicators: the ratio of accounts receivable to sales; the ratio of selling, general, and administrative expenses to sales; and the ratio of inventory to sales. (Miller and Leiblien, 1996). Recoverable slack was shown to be an important antecedent to a firm's level of EO (Kreiser et al., 2020). We controlled for available slack, measured as cash and marketable securities less current liabilities, divided by total revenue (Bourgeois & Singh, 1983). Available slack represents liquid assets available to a firm, which may confound its EO measures. We controlled for a firm's debt-to-equity ratio. The debt-to-equity ratio is a proxy for a firm's ability to obtain capital to fund operations. It also proxies managerial risk-taking because a high debt-to-equity ratio represents top managers' willingness to take on substantive financial risk. We controlled for other firm performance indicators, including sales growth rate, and earnings per share. Including other performance metrics accounts for the broad nature of performance among publicly traded firms and parcels out performance variations that may confound the EO-performance relationship. We controlled for firm size using the number of employees and total assets. Firm age was also controlled. Because the founding years of many firms were missing, we used years-since-IPO as a proxy for firm age. Finally, we controlled for environmental munificence and complexity to better isolate the effects of environmental dynamism in the analysis (Anglin et al., 2018; Pearce, Fritz, & Davis, 2010). Munificence reflects the abundance or scarcity of resources to sustain growth within an industry (Dess &
Beard, 1984). Following Keats and Hitt's (1988) method, this study used the industry growth rate as a proxy for munificence. Environmental complexity reflects the degree of concentration of an industry, which was measured as Herfindahl’s index of all firms’ market share in an industry in a year.

**ANALYSIS**

**Hypotheses Testing**

For the primary analysis, we use a firm-level fixed-effect model. The fixed-effects model can effectively address endogeneity concerns in multilevel data. Estimation can be biased in multilevel data if a non-trivial correlation exists between level 1 variables and the entity level disturbance term (Antonakis et al., 2010). In our study, although we included several variables that may covary with EO, other unobserved firm-level variables may correlate with EO. Thus, using a firm fixed-effects model can alleviate such concerns. Year fixed effects were included by using year dummies. Industry fixed effects were also included since we used firm fixed effects, and the firms are nested within industries. We did not apply variable transformations to the data except winsorizing all variables at the 5th and 95th percentiles to exclude extreme values. Table 1 presents the summary statistics and correlations of all variables. The VIF scores of all variables range from 1.04 to 1.89, suggesting minimal concerns of multicollinearity.

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**Insert Table 1 about here**

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Hypothesis testing results are presented in Table 2. Column (1) of Table 2 includes only control variables, Column (2) includes the linear main effects of EO, Column (3) includes the
curvilinear effects of EO, Column (4) includes the curvilinear effects and the main effects of dynamism, and Column (5) includes the moderation effects of dynamism. All models included firm fixed-effects and year fixed-effects.

Hypothesis 1 proposes a U-shape relationship between EO and firm performance. Column (3) in Table 2 indicates that the squared term of EO is positive and significant (b = 0.743, p < 0.001), indicating the existence of a U-shape effect of EO. To further validate the effect of the U-shape effect of EO, we conducted an additional test by following Haans et al.'s (2016) suggestion. Three conditions must be met to confirm a U-shaped relationship. First, the regression coefficient of the squared term must be significant and have the expected sign (i.e., negative for an inverted U-shape and positive for a U-shape). Second, the slope of the U-shaped curve must be sufficiently steep at both ends of the sample data range (negative at the lower end and positive at the upper end). Third, the inflection point of the U-shape curve must be well within the sample data range. Following the specific test steps of Lind and Mehlum (2010), our results met all three necessary conditions of a U-shape relationship. The slope at the lower end is -.22 (p < 0.001), and the slope at the upper end is 1.26 (p < 0.001). The turning point of the U-shape curve is 0.14, which is within the 95% Fieller interval for the turning point: [0.131; 0.162]. Thus, the results support the U-shape relationship between the EO and firm performance. We plotted the main U-shape effect in Figure 1.
Hypothesis 2 proposes that environmental dynamism moderates the U-shape relationship. Column (5) in Table 2 indicates that the interaction term between EO squared and dynamism is negative and significant (b = -18.573, p < 0.01), indicating the existence of a moderation effect. We conducted an additional test by following Haans et al.'s (2016) suggestion to confirm the direction of moderation. The result indicates that as dynamism increases, the U-shape effect of EO flattens (weakens), and its turning point shift to the left. We plotted the moderation effect in Figure 2.

Supplementary Analysis

We conducted several supplementary analyses for robustness checks. First, we tested the robustness of our results by using alternative firm performance metrics. We used ROS (return on sales, i.e., profitability ratio) as the dependent variable and replicated all models. The results confirm the main U-shape effect of EO and the moderating effect of environmental dynamism on ROS. The full results are presented in the following tables. The main-effect plot and the interaction plot are graphed in Figure 3 and Figure 4.

Insert Figure 1 about here

Insert Figure 2 about here

Insert Table 3 about here
Finally, to address the potential bias due to omitted variables, which is a primary source of endogeneity, we analyzed the impact threshold of a confounding variable (ITCV) (Busenbark et al., 2022). The results indicate that the impact of an omitted variable would have to be higher than 0.027 to invalidate the causal inference of EO. In our data, adjusted earnings per share (0.211) and recoverable slack (0.042) have higher impacts than the threshold, and all other covariates have a lower impact than the threshold. Thus, it is unlikely that there exists such an omitted variable that would bias the causal inference.

**DISCUSSION**

Using survey data from a sample of SMEs, Wiklund & Shepherd (2005) posit a positive and linear EO-performance relationship in SMEs. Further, the slope of the linear relationship was found to decrease when environmental dynamism increased, implying that EO’s influence on firm performance weakens when environmental dynamism increased. Unlike their investigation, our study suggests a U-shaped curve for the EO-performance relationship across a large sample (11,843) of SMEs and large firms. The U-shaped curve becomes considerably flatter when environmental dynamism is high, representing EO’s weakened influence in high-
dynamism environments as Wiklund and Shepherd had predicted. Equally interesting is the fact that the inflection point of the U-shaped EO-performance curve shifts to the left and up when environmental dynamism is high. We will discuss the implications of this shift later.

To further investigate the research implications of the U-shaped curve in Figure 1 and answer the three research questions, we drill down into other characteristics of firms in our sample. In Table 4, we use the firms’ positions on the U-shaped curve and size to assemble firm-level data. Specifically, we split the firms based on their positions on the right and the left of the inflection point on the curve in Figure 1. We use Gartner’s sales-anchored definition (www.gartner.com) of firm size to classify firms as small, medium, and large. Here our investigation focused on sales, total assets, and firm-size categories. In Table 5, we group firms based on their performance (positive or negative). In other words, firms with positive ROA were placed in one group, and firms with negative ROA were placed in another group. Here our investigation focuses on differences in the mix of SMEs and large firms, the age of SMEs and large firms, average firm size, average EO, average ROA, and average ROS. We will discuss our findings in the next section.

Findings
This study offers new and unique insights into the interrelationship among EO, firm size, ROA, and environmental dynamism. Specifically, it extends the EO-performance stream of research by providing answers to three research questions.

Research Question 1

Using a large dataset, we empirically confirm the shape of the EO – ROA relationship (Figure 1) and offer new insights into the distribution of firm size along the curve (Table 4). Table 4 offers new insights on the relationship between EO and firm size. First, contrary to the commonly accepted scholarly view that SMEs need high levels of EO to survive and outperform (Rauch et al., 2009), 34% of the 11,843 SMEs in our sample displayed low EO levels. In general, firms with EOs below the inflection point (EOs <= 0.156) displayed average sales revenue of just $539 million. Firms with EOs above the inflection point (EOs> 0.156) displayed average sales revenue three times higher at $2,484 million, supporting the preponderance of higher EO levels in large firms. Further, since the ROAs of firms on the left of the inflection point were generally lower than those on the right (see Figure 1), it could be inferred that SMEs with lower EO levels are expected to suffer from low ROAs. One potential explanation for this finding might be the need for additional slack to develop and implement EO. When SMEs start to reposition themselves, especially in a low dynamic environment, the resource-consumption demands imposed by EO will lead to a drop in ROA until the demand for resources levels out and the newly installed routines satisfy organizational needs to match the new environment.

Second, the data in Table 4 suggests that the number of large firms (1,932 firms) on the right side of the infection point is almost five times those on the left of the infection point (407 firms). If large firms are bound by bureaucracy and inertia, as suggested by organizational
theorists, why do they predominantly display above-average EOs? Could it be because large firms have higher levels of slack to pursue innovation, proactive organizational strategy, and take more risks? Could there be other explanations for this paradox? Our findings call for further research on this phenomenon.

Third, when we compute the total number of firms (of all sizes) on each side of the inflection point, we find that approximately one-third of these firms (4,023 firms) on the left side of the inflection point seem to be pursuing low EO levels. In comparison, two-thirds of the firms (7,820 firms) pursue high EO levels (see Table 4). However, irrespective of the level of EO, most of these firms (except a few on the extreme right of Figure 1) seem to be shackled with negative ROA. Why has this occurred? Would adding additional constructs (e.g., strategy, absorptive capacity, ambidexterity) help provide answers to this phenomenon? Again, this calls for further theoretical development and empirical testing to offer new insights into the underlying organizational processes associated with this phenomenon.

Research Question 2

Research question 2 addresses the relationship between EO, firm size, and ROA. Table 5 offers an answer to this important question, given that long-term profit maximization is the enduring intent of any business. We use ROA as our metric to investigate the distribution of firms in our sample. As noted in Table 5, we find that firms with ROAs below zero tend to be smaller firms with an average of 1,968 employees, while firms with ROAs above zero are larger firms with more than five times the number of employees (10,336). Larger firms in the sample are more profitable compared with smaller firms. Second, the average EO of firms with negative ROA is 0.188, which is around 50% of firms with positive ROA (EO = 0.370). This confirms the
positive relationship between EO and firm performance. Third, we fail to find a significant age difference between firms with negative ROA and those with positive ROA. We should note that COMPUSTAT does not include the founding year of the firm. Hence, we could only use ‘years since IPO’ as a proxy for firm age.

Research Question 3

Figure 2 offers two insights into the moderation effects of environmental dynamism on the relationship between EO and ROA. First, the inflection point for the high dynamism EO-performance curve occurs at a higher ROA and a lower EO level than that for the low dynamism curve, suggesting that firms operating in environments that exhibit higher dynamism are better off increasing their EO quickly because not only does the inflection point occur earlier on the EO scale, but the ROA from such efforts is also better (albeit by just a bit) than firms operating in environments with low levels of dynamism. Second, the curve for high environmental dynamism is flatter but exhibits an inflection point at a higher ROA than for low environmental dynamism. This results in the high and low dynamism curves intersecting at a point in the EO-ROA space (see Figure 2). The phenomenon implies that high environmental dynamism and low environmental dynamism have the same effect on the EO-performance relationship at the point of intersection. However, this contradicts prior scholarly arguments (e.g., Wiklund and Shepherd, 2005) that higher environmental dynamism levels will weaken the EO-performance relationship. What were the extraneous conditions, processes, or configurations that resulted in the point of intersection in the EO-ROA space in Figure 2? We call for more research to investigate this paradox and generate new explanations for the occurrence.
CONTRIBUTIONS

One contribution of our study is a refinement of the current understanding of the EO-performance relationship. It suggests that the U-shaped relationship in the context of SMEs may also exist across a broader spectrum of small, medium, and large publicly held firms. This finding is a timely response to recent calls for investigations on the curvilinear relationship between EO and performance relationship (Hai et al., 2022; Kohtamaki, Heimonen, & Parida, 2019; Rauch et al., 2009; Wales, 2016). Additionally, the use of publicly held firms in our study offers an expanded domain of future scholarly works. For example, EO has been conceptualized as a source of ‘trial-and-error’ experimental overtures of the firm that drain valuable resources and lead the firm into uncharted territory where it could get ‘stuck in the middle’ and performance might suffer (Porter, 1985; Wiklund & Shepherd, 2011). Scholars are encouraged to explore the psychological path of top management teams as they adjust EO levels for future growth (Fan & D'Souza, 2021; Hambrick, 1987; Li & Jones, 2019; Piaskowska et al., 2022).

Further, scholars are encouraged to use different theoretical lenses, such as behavioral and strategic management, to uncover nuanced characteristics of the curvilinear relationship between EO and firm performance. Such endeavors could unlock new research streams that leverage managerial phenomena like bounded rationality and opportunistic behavior (Cyert & March, 1963; Fiegenbaum, et al., 1996).

A second contribution lies in a more nuanced interpretation of the moderating role of environmental dynamism on the relationship between EO and firm performance. Contrary to most studies where dynamism is included as either a control variable or antecedent, this study finds that using dynamism as a moderator in the model provides an improved explanation of the
EO-performance relationship under conditions of high and low environmental dynamism. Our findings suggest that EO needs to be significantly high (greater than 0.6 on a 0.0 – 0.7 scale) to deliver positive ROA for the firm, irrespective of the level of environmental dynamism (see Figure 1). Further, many firms with EOs below the 0.6 level can, perhaps, never expect to realize positive ROA. This gloomy outlook warrants further research into what can be done to enhance the impact of EO on firm performance. Recently scholars, e.g., Hughes et al. (2018) and D’Souza & Fan (2022), have suggested that research on the mediators and moderators of the relationship between EO and firm performance is warranted. Our findings support such approaches to understand the EO-performance relationship better. Scholars might also consider leveraging the ambidexterity lens to juxtapose EO-related explorative activities against routine exploitative activities as the firm jostles to establish a strong and sustainable competitive position relative to its competitors (D’Souza, Sigdyal, & Struckell, 2017; Kraus et al., 2022; O’Reilly & Tushman, 2004). Additionally, scholars are encouraged to use multiple lenses to articulate the role of the environment in the EO firm performance relationship. One possible lens could be institutional theory (Meyer & Rowan, 1977; Scott, 1995). Recently, Wales et al. (2021) explored the country-level institutional boundary conditions and how they interact with the EO-performance relationship.

A third contribution is a departure from traditional measurement approaches (surveys or content analyses) to operationalizing the study variables. While the survey approach allows researchers to collect primary data from SMEs, measuring EO psychometrically produces a subjective perspective. Thus, the results from survey-based data can be challenging to interpret and generalize. Our study uses financial metrics as proxies for EO and performance, which
enable us to employ objective measures of the study variables. The use of financial metrics as proxies for EO dimensions is grounded in the literature (Miller & Le Breton-Miller, 2011). Since publicly held firms hold legal responsibilities for financial reports, this study affords a high level of confidence in the robustness and accuracy of the data collected. Further, using financial proxies enables interpretations that could have immediate relevance to practice. We can easily interpret the magnitude of the effects of EO on ratios such as ROA and ROS, which is much more intuitive for executives to understand in comparison to subjective performance measures such as those derived using, say, Likert scales. Finally, content analysis of annual reports or other company filings provides a perspective on how a firm communicates its intentions (McKenny et al., 2018). Thus, the content analysis approach can only capture the attitudinal or dispositional perspective of EO. In contrast, financial indicators directly reflect the actual resource allocation actions of firms, and they are well suited to capture the behavioral perspective of EO.

**Limitations**

While it is encouraging to confirm the U-shaped relationship between EO and firm performance with a sample of publicly listed firms of all sizes, we would like to alert the reader to potential limitations of the study. The first limitation is the prospect of common method bias. This problem is especially prevalent in studies when the data is subjective (e.g., collected using a Likert scale). We agree that it would be ideal to use separate datasets to operationalize the dependent and independent variables. However, using hard data in our study (and in other similar studies, e.g., Kreiser et al., 2020) makes this less of a problem. A second potential limitation resides in our sample. Although we use a large sample of 11,843 small, medium, and
large from the COMPUSTAT database, our study excludes privately held firms. Therefore, the reader needs to exert caution when applying the findings of our study to privately held firms. A third limitation of the study might be our selection of Anderson et al.’s (2015) conceptualization of EO. Our study accepted the arguments made by Kresier et al. (2020) and only operationalized the behavior components of EO. Future research is encouraged to use content analysis to operationalize the attitude component of EO when investigating the EO-performance relationship.

CONCLUSION

This study explores the EO-performance relationship using a large sample of small, medium, and large firms. The moderating role of environmental dynamism is also explored. We confirm the existence of a U-shaped EO-performance relationship and offer several interesting findings that offer off-ramps for future research on the relationship between EO and firm performance. Contrary to conventional wisdom, our sample of SMEs displayed lower levels of EO than large firms. Further, large firms were five times more likely to display high levels of EO than low levels of EO. Additionally, environmental dynamism was found to influence the U-shaped relationship in exciting ways. We discussed these findings in the context of current thinking on the EO-performance relationship, highlighting the paradoxes raised by the findings and offering theoretical and methodological recommendations for future research. Finally, this study offers evidence of the interpretive advantages of using financial proxies to reflect study variables, compared to traditional approaches like surveys. We hope our investigation spurs
additional research that delivers an even better understanding of the EO-performance relationship.
Table 1 - Correlation Matrix

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N = 94548

* p < 0.05, ** p < 0.01, *** p < 0.001
### Table 2 - Fixed Effects Models Predicting ROA with Entrepreneurial Orientation

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- Standard errors in parentheses. Standard errors are clustered at the firm level.
- + p < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001
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<td>Munificence</td>
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<td>(0.031)</td>
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<tr>
<td>EO # EO</td>
<td>2.025***</td>
<td>2.023***</td>
<td>2.335***</td>
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<td>49.357*</td>
<td>24.181</td>
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<td>0.914***</td>
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<td>Yes</td>
<td>Yes</td>
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<td>80.295***</td>
<td>78.033***</td>
<td>75.734***</td>
<td>71.953***</td>
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<td>R-squared</td>
<td>0.279</td>
<td>0.278</td>
<td>0.277</td>
<td>0.277</td>
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</table>

Standard errors in parentheses. Standard errors are clustered at the firm level.

*p < 0.10, *p < 0.05, **p < 0.01, ***p < 0.001
Table 4: Firm size and EO

<table>
<thead>
<tr>
<th></th>
<th>All firms positioned left of the inflection point of the EO-performance curve (EO &lt;= 0.156)</th>
<th>All firms positioned right of the inflection point of the EO-performance curve (EO &gt; 0.156)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Count of Sample Firms</td>
<td>4023</td>
<td>7820</td>
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<tr>
<td>Average Sales</td>
<td>639.25 million</td>
<td>2484.18 million</td>
</tr>
<tr>
<td>Average Total Assets</td>
<td>812.96 million</td>
<td>1807.30 million</td>
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</tbody>
</table>

Size Categories

- Small Firms (less than 50 million in Sales) | 1894 | 2222 |
- Medium Firms (50 million – 1 billion in Sales) | 1722 | 3666 |
- Large Firms (Over 1 billion in Sales)       | 407  | 1932 |

Note: The inflection point is when EO = 0.145. The cut-offs for small, medium and large businesses are based on Gartner’s definition (https://www.gartner.com/en/information-technology/glossary/smbs-small-and-midsize-businesses)
Table 5: ROA, firm size, and EO

| Below Zero ROA | • N of Firms: 7166  
|                | • SME: 5450  
|                | • Large: 1716  
|                | • Average age  
|                | • SME: 2.58  
|                | • Large: 2.58  
|                | • Average size: 1968 employees  
|                | • Average EO: 0.188  
|                | • Average ROA: -0.35  
|                | • Average ROS: -1.56  
| Above Zero ROA | • N of Firms: 4677  
|                | • SME: 1834  
|                | • Large: 2843  
|                | • Average age  
|                | • SME: 2.50  
|                | • Large: 3.25  
|                | • Average size: 10336 employees  
|                | • Average EO: 0.370  
|                | • Average ROA: 0.06  
|                | • Average ROS: 0.05  

Figure 1 – Main Curvilinear Effects of EO on ROA

Figure 2 - Moderation Effects of Dynamism on the Relationship between EO and ROA
Figure 3 – Main Curvilinear Effects of EO on ROS

![Graph showing the main curvilinear effects of EO on ROS.]

Figure 4 - Moderation Effects of Dynamism on the Relationship between EO and ROS

![Graph showing the moderation effects of dynamism on the relationship between EO and ROS.]

Legend:
- **Right Dynamism**
- **High Dynamism**
References


