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How entrepreneurial orientation, environmental dynamism, and resource rareness influence firm performance

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Abstract

Prior studies on strategic management and entrepreneurship have argued that entrepreneurial orientation (EO) is positively associated with performance when firms face certain contingencies, specifically, the dynamism of the external environment and the attributes of resources/capabilities owned by the firm. However, the current empirical evidence is inconclusive. This study advances the argument that the interactive effects of EO, environmental dynamism, and the rareness of resource–capability (rareness) combinations positively influence firm performance. By combining data collected via a secondary database and a questionnaire survey from 237 public firms in Taiwan, this study finds that EO positively influences firm performance. The EO–performance relationship is further moderated by the rareness of resource–capability combinations and environmental dynamism. It is also found that firm performance is collectively determined by the three-way interactions of EO, rareness, and environmental dynamism. That is, when firms own rare resources and are located in a dynamic environment, EO will lead to improved performance.

Keywords: entrepreneurial orientation, rareness, resource–capability combinations, environmental dynamism, performance

INTRODUCTION

Over the past two decades, the relationship between entrepreneurial orientation (EO) and firm performance has gained increasing attention in contemporary strategic management and organization research (Davidsson, Delmar, & Wiklund, 2002; Wiklund & Shepherd, 2005; Tang, Tang, Marino, Zhang, & Li, 2008). Although a high level of EO may enhance firms' abnormal returns and growth, solely pursuing a strong EO strategy may not be sufficient to improve firm performance (Covin & Slevin, 1989; Ireland, Hitt, & Sirmon, 2003; Stam & Elfring, 2008). Therefore, several questions are raised: does EO foster a set of processes or activities that improve firm performance? Or is the EO–performance relationship less straightforward? What contextual variables might influence the EO–performance relationship? Based on the prior literature, this study argues that the external environment (specifically, environmental dynamism) and internal resources (specifically, the rareness of resource–capability combinations) may influence the relationship between EO and firm performance.

Regarding the EO–performance relationship, Lumpkin and Dess (1996) have proposed three alternative models: the independent effect model, the mediating effect model, and the moderating effect model. The independent effect model views EO as an independent variable that directly influences firm performance. The mediating effect model suggests that internal organizations may

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mediate the association between EO and firm performance. The moderating effect model proposes that the EO–performance relationship varies depending on a number of contingency variables, such as environmental factors and internal organizational factors (Covin & Slevin, 1991; Zahra, 1993; Lumpkin & Dess, 1996).

The conceptual arguments of Lumpkin and Dess (1996) have been examined in several empirical studies. However, the findings to date are inconsistent. Some studies report that firms with strong EO perform better than firms without strong EO (Miller, 1983; Miller & Friesen, 1983; Wiklund, 1999), confirming the independent effect model of the EO–performance relationship. Some empirical studies find an insignificant relationship between EO and firm performance (Covin & Slevin, 1989; Smart & Conant, 1994). Furthermore, some scholars argue that there are inconsistent interaction effects between EO, performance, and contextual factors. For instance, Miller (1988) finds that firms that have a strong EO and compete in a dynamic environment outperform other firms that have strong EO but that compete in a relatively stable environment. However, Hart (1992) argues that EO may be associated with poor performance in dynamic and complex environments because the innovative and proactive activities of organizational members in such contexts are less controlled by top managers in such situations. Moreover, Lumpkin, and Dess (2001) and Wiklund and Shepherd (2005) present similar findings. Given all of these findings, the association between EO and firm performance remains an open research question. More empirical evidence is needed.

In addition to external factors, internal factors such as the rareness of resource–capability combinations (rareness) may also influence the EO–performance relationship. Rareness refers to a valuable resource that can be possessed by many firms, but this resource is paired with the appropriate capability by only a few firms (Barney, 1991; Newbert, 2008). To improve performance, firms with EO would have to be aware of the value of their resources and capabilities, and such awareness may differ from that of these firms' competitors (Schumpeter, 1934; Busenitz & Barney, 1997). This argument is consistent with the resource-based view (Barney, 1991; Newbert, 2008). Wu, Chang, and Chen (2008) argue that when firms have strong EO, the positive influence of human capital (a rare combination of resources and capability) on innovation performance is increased. In other words, the relationship between EO and performance is influenced by resource attributes (Lumpkin & Dess, 1996).

This study thus proposes two different contingency models. First, it proposes a two-way interaction model that views the EO–performance relationship as being influenced by external environment and/or internal resource attributes. However, some scholars argue that neither the external environment nor resources alone adequately explain the relationship between EO and abnormal returns (Dess, Lumpkin, & Covin, 1997; Wiklund & Shepherd, 2003, 2005). Therefore, this study proposes a second model, a three-way interaction model, which states that firm performance is determined by the interactions between EO, environmental dynamism, and rareness (Dess, Lumpkin, & Covin, 1997).

Therefore, the following research questions are raised: does EO directly influence firm performance? Or is the association between EO and firm performance moderated by environmental dynamism and/or the rareness of the resource–capability combination? By answering these questions, this study expects to make several contributions. First, although previous studies have stated that EO has a positive influence on the performance of firms with specific resources, the empirical evidence is limited and inconclusive. Second, this study constructs several contingency models to investigate explicitly how environmental dynamism and rareness moderate the association between EO and firm performance. It also uses the three-way interaction model to examine the overall associations between EO, environmental dynamism, rareness, and firm performance. Finally, this study is expected to confirm whether EO leads to improved performance in the context of an emerging market economy such as Taiwan because entrepreneurial performance is an important source of Taiwan's economic growth (Valliere & Peterson, 2009).

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This study uses four dimensions to measure EO: innovation, proactiveness, risk taking, and competitive aggressiveness (Lumpkin & Dess, 1996; Wang, 2008). Regarding the resource attributes, this study focuses on the rareness of resource–capability combinations (Newbert, 2008), whereas the environmental factor refers to environmental dynamism. Based on the data collected from a secondary database, the Taiwan Economic Journal, and questionnaire data collected from 237 public firms, this study uses the ordinary least squares hierarchical regression model to empirically test our hypotheses.

THEORETICAL BACKGROUND

EO and performance

With respect to the entrepreneurial strategy-making process, Mintzberg (1973) notes that firms make decisions on the basis of their entrepreneurial propensity and that in developing strategies, they link the environment and entrepreneurial propensity together. Some scholars insist that a firm's entrepreneurial strategy making, which is a strategy-making process, can be viewed as an EO (Lumpkin & Dess, 1996; Dess & Lumpkin, 2005). EO refers to a firm's strategic orientation with respect to the processes, practices, and decision-making activities that lead to new entry; it involves the intentions and actions of a firm that is willing to grasp new market opportunities in a dynamic process (Lumpkin & Dess, 1996)[1]. Miller (1983) highlights the characteristics of entrepreneurial firms and argues that an entrepreneurial firm is willing to engage in the innovation of products and technological processes, to undertake risky ventures, and to provide proactive innovations to pursue first-mover advantages.

Prior studies have measured EO with four dimensions: innovation, proactiveness, risk taking, and competitive aggressiveness (Lumpkin & Dess, 1996; Wang, 2008). Innovation refers to a firm's tendency to create resources and capabilities (Drucker, 1985), to support new ideas, novelty, and experimentation (Lumpkin & Dess, 1996), and to introduce new products and services that capitalize on market opportunities (Hage, 1980; Miller, 1983). When existing markets are disrupted by the discovery of new products, services, and processes, the wealth of firms can be created (Schumpeter, 1934; Miller, 1983). Second, proactiveness refers to the manner of enterprises in attempting to track changes in customer tastes and technology and to seize new opportunities, implying a forward-looking perspective that may or may not be related to current operations (Miller & Friesen, 1982; Lumpkin & Dess, 1996, 2001). Third, risk taking refers to the firm's propensity to engage in risky projects and managers' preferences for bold acts to achieve the firm's objectives (Lumpkin & Dess, 1996). Finally, competitive aggressiveness refers to a firm's effort to outperform competitors, either through exploiting existing resources or creating new resource–capability combinations (Lumpkin & Dess, 2001).

In most conceptual studies, EO is viewed as an independent effect that creates or sustains firm performance (Covin & Slevin, 1991; Lumpkin & Dess, 1996). Previous empirical studies often report a positive impact of EO on firm performance in various contexts. For instance, by using small Swedish firms as the sample, Wiklund (1999) finds that a high level of EO is positively related to firm performance. A study by Tang et al. (2008) on Chinese firms also reports that the association between EO and performance is positive and significant.

However, different research findings are also reported. For instance, Hart (1992) argues that having an entrepreneurial strategy-making mode may lead to poor performance for firms in certain

[1] The term 'entrepreneurship' was first introduced in the literature by Schumpeter (1934). Lumpkin and Dess (1996) made a distinction between the concept of entrepreneurship and EO. They suggest that entrepreneurship involves new entry or business venturing and corresponds to strategic content, that is, 'What business shall we enter'? EO, by contrast, refers to the processes, practices, and decision-making activities that improve the new entry. In other words, entrepreneurship implies the content of various factors, whereas EO indicates how these factors are undertaken. Therefore, EO can be viewed as the manipulative process of entrepreneurship.

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circumstances. Covin and Slevin (1988, 1989) find that the relationship between EO and performance is insignificant. Smart and Conant (1994) and Stam and Elfring (2008) also report an insignificant EO–performance relationship. These inconsistent empirical findings imply that the relationship between EO and firm performance may be less straightforward. Some factors may moderate the EO–performance relationship.

EO has become an increasingly central concept in the domain of entrepreneurship and has received a substantial amount of theoretical and empirical attention (Covin, Green, & Slevin, 2006). Within this body of research, the EO–firm performance relationship has emerged as one of the most intriguing topics. Previous studies have examined the direct effect of EO on firm performance, but other studies suggest that the relationship is contingent on various factors such as the external environment (Covin & Slevin, 1989; Dess, Lumpkin, & Covin, 1997) and internal-organization factors that include strategy (Covin, Green, & Slevin, 2006; Wang, 2008), financial resources (Wiklund & Shepherd, 2005), social capital (Lee & Sukoco, 2007), family involvement (Casillas & Moreno, 2010), managerial characteristics (Richard, Wu, & Chadwick, 2009), and knowledge-based resources (Wiklund & Shepherd, 2003). However, few studies focus on the effects of resource characteristics on the EO–performance relationship. We examine these effects and also examine whether firms' environmental dynamism can influence the relationship between EO and the profitability of the firm because previous studies present inconsistent findings regarding this moderating effect (Covin & Slevin, 1991; Wiklund & Shepherd, 2005; Kreiser & Davis, 2010).

The moderating effect of environmental dynamism

In the strategic management and organization theory literature, the external environment has been viewed as a critical contingency factor (Thompson, 1967; Child, 1972). Environmental dynamism can influence the EO–firm performance relationship (Covin & Slevin, 1991; Lumpkin & Dess, 1996). Environmental challenges often refer to the degree of dynamism in the environmental settings that a company faces (Miller & Friesen, 1982; Lumpkin & Dess, 2001). Miller (1983) argues that environmental dynamism is associated with the unpredictability of customer tests, aggressive competitor actions, product/service shifts, and high rates of change in markets and industry innovation. Miller (1990) further argues that firms with a higher degree of EO are more likely to pursue success when they face the stimulation of environmental dynamism, which is related to enhancing customer satisfaction by providing a premium on innovation and unique services. In fact, firm profits are derived from EO with the following attributes: higher self-efficacy, ambition and achievement, readiness to change, interest in innovation, as well as a forward-looking perspective in future markets. These attributes allow the firm to recognize and grasp opportunities in environmental dynamism (Sadler-Smith, Hampson, Chaston, & Badger, 2003). Hamel (2000) suggests that the life cycle of products and business models has been shortened in today's competitive and dynamic environment. Firms with EO are thus encouraged to earn profit by introducing novel products and services that provide opportunities to respond to the changes of competitors and customers and to reduce the threat resulting from environmental dynamism. For example, the study by Wiklund and Shepherd (2005) emphasizes that EO leads to business performance in the context of environmental dynamism, even though the authors find that EO leads to relatively high performance in a non-dynamic environment.

It is argued that there is a positive relationship between EO and firm performance in a dynamic environment. Some existing studies suggest that environmental dynamism magnifies the link between EO and firm performance. For example, based on empirical results from a sample of 607 Chinese firms, Li, Guo, Liu, and Li (2008) reveal an important finding that technological turbulence significantly and positively moderates the relationship between EO and firm performance. Frese, Brantjes, and Hoorn (2002) report that in a dynamic and hostile environment, EO is positively related to

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firm growth. Similarly, in an empirical study by Miller (1988), whose sample is composed of 89 firms from the province of Quebec, innovative strategies in a dynamic environment were found to be associated with higher performance. That is, firms facing a higher level of environmental dynamism are more likely than firms facing a relatively stable environment to make profits from innovation (Miller, 1988; Kreiser & Davis, 2010), from making risky resource commitments (Kreiser & Davis, 2010), and from responding to the changes of competitors and customers (Lumpkin & Dess, 1996).

Therefore, this study argues that when a firm is facing an environment characterized by high dynamism, EO is expected to lead to improved firm performance. That is, firms with strong EO are more likely to seize new market opportunities and respond to customer needs and competitor actions in a dynamic environment than in a stable one. In dynamic environments, firms with high EO are more likely to explore a variety of markets and seize abundant opportunities, causing their performance to improve. Therefore, the following hypothesis is presented:

> Hypothesis 1: Environmental dynamism positively moderates the relationship between EO and firm performance.

The moderating effect of rareness

In addition to environmental dynamism, the internal resources and capabilities of firms are another variable that may also moderate the relationship between EO and performance (Covin & Slevin, 1991; Lumpkin & Dess, 1996). The resource-based view has been adopted extensively in the strategic management literature and increasingly so in entrepreneurship studies (Barney & Arikan, 2001; Ireland, Hitt, & Sirmon, 2003). However, the influence of rare resource–capabilities combinations on the success of entrepreneurial firms is seldom examined because the focus of traditional resource-based studies is mainly on how specific combinations of resources and capabilities influence EO and firm performance (Wiklund & Shepherd, 2005; Richard, Wu, & Chadwick, 2009).

According to Barney (1991), rareness refers to a valuable resource that can be possessed by a large number of firms, but only a few firms are able to implement strategies to exploit such a resource and to promote performance. If we view EO as a 'strategic orientation' (Naldi, Nordqvist, Sjöberg, & Wiklund, 2007), although firms with such an orientation possess valuable resources, their abnormal returns may not be improved unless they can effectively implement these resources (Barney, 1991; Chandler & Hanks, 1994; Chrisman, Bauerschmidt, & Hofer, 1998). It is argued that firms with EO are more likely to create their performance in a situation of devoting internally rare resources and capabilities (Covin & Slevin, 1991; Zahra, 1993). Brown, Davidsson, and Wiklund (2001) and Stevenson and Gumpert (1985) also argue that firms with EO are able to exploit opportunities to maximize returns when they deploy rare resources and capabilities in a multi-stage manner with minimal exposure at each stage. Therefore, providing rare resource–capability combinations can lead to the translation of EO into superior performance.

As mentioned earlier, in addition to research on the positive influence of EO on firm performance (Covin & Slevin, 1991; Lumpkin & Dess, 1996), a widely held view in the academic literature suggests that a firm's competitive advantage stems from rare resource–capability characteristics (Barney, 1991). For this entire chain to yield beneficial results for EO, there must be a fit with the organization's resource–capabilities rareness (Covin & Slevin, 1991; Zahra, 1993). A study by Wu, Chang, and Chen (2008) on 170 Taiwanese firms reports an increased influence of EO on innovation performance when firms have intellectual/human resources. Lee and Sukoco (2007), whose study is based on 152 Taiwanese firms listed in the Taiwanese 'Top 1000' firms find that social capital, a tacit and rare resource–capability combination, moderates the EO–performance relationship.

Alvarez and Busenitz (2001) argue that entrepreneurial opportunities exist primarily because the agents of some firms have views or beliefs about the heterogeneity of resources that decision makers in

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other firms do not have when they decide which resources to invest in their production. According to the resource-based model (Barney, 1991), the attributes of resources are based on an assumption that resources (capabilities) are heterogeneously distributed among firms. Therefore, firms with rare resources facilitate the development of the EO and its translation into enhanced performance by combining rare resources with the capabilities of employing these resources, including physical, financial, human, intellectual, and organizational resources and capabilities. Based on 53 samples from 51 studies, Rauch, Wiklund, Lumpkin, and Frese (2009) suggest that firms with high EO improve firm performance when they take risks to achieve a situation of rare resources (capabilities). Using a sample of small- and medium-sized Swedish businesses, Wiklund and Shepherd (2003) suggest that a firm with EO can obtain profits when employing rare resources and capabilities; furthermore, they also find that the interaction between EO and knowledge-based resources leads to improved performance.

All of these studies indicate that firms with strong EO are likely to enhance their profitability by combining rare resources and capabilities. Therefore, the rareness of resource–capability combinations is proposed to positively moderate the association between EO and firm performance. Therefore, the following is hypothesized:

> Hypothesis 2: The rareness of resource–capability combinations positively moderates the relationship between EO and firm performance.

The interactive effect of environmental dynamism and rareness

So far, we have argued that some contingency factors (specifically, environmental dynamism and rareness) will advantage firms with EO in terms of achieving improved performance. However, environmental dynamism may also disadvantage firms (Dess, Lumpkin, & Covin, 1997). Firms may need the ability to control limited or rare resources to reduce the environmental dynamism that they face (Jones, 2007). In other words, environmental dynamism and internal resources act simultaneously to influence the relationship between EO and performance (Lumpkin & Dess, 1996). To increase profits in dynamic environments, firms often employ an EO strategy to access rare tangible/intangible resource–capability combinations (Stevenson & Gumpert, 1985; Brown, Davidsson, & Wiklund, 2001; Sirmon, Hitt, & Ireland, 2007). Therefore, it is important to examine how the three-way interaction of EO, rareness, and environmental dynamism influence firms' performance.

As mentioned above, the profitability of firms may be enhanced through the alignment of rare resource–capability combinations and dynamic environments. For instance, sustained competitive advantages may result from exploiting rare resources/capabilities via the implementation of a differentiation strategy to respond to opportunities and threats in the industrial environment (Barney, 1991; Newbert, 2008). With respect to the definition of the rare resources, a valuable resource possessed by only a few potential competitors may be a source of competitive advantage (Barney, 1991). This phenomenon implies that rare resources should involve valuable attributes rather than obsolete attributes. Under a dynamic environment that is rapidly changing, products and services easily become obsolete (Miller & Friesen, 1982), making it important for firms' EO to lead them to recognize and grasp rare resources and capabilities. In this way, firm performance can be promoted (Covin & Slevin, 1989).

Miller and Shamsie (1996) find that in an unpredictable environment, firms that possess knowledge, a resource that is valuable and rare, can achieve superior financial performance; however, the moderating effect of knowledge becomes weak in a stable environment. Bierly and Daly's (2007) empirical study on small- and medium-sized manufacturing firms confirms the notion that environmental dynamism plays a moderating role in the relationship between knowledge exploration/exploitation and firm performance. The exploration/exploitation of knowledge has a stronger

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influence on the effectiveness of firms in a high-tech environment than in a low-tech environment. Wu (2006) reports that some resources, such as reputation and know-how, correspond to rare resource–capability combinations, which in turn improve the performance of firms competing in a dynamic environment.

Overall, although some concerns have been raised about the possibility of underperformance resulting from high resource commitment in a dynamic environment (Miller & Friesen, 1982, 1983; Miller, 1983), it is reasonable to suggest a three-way interaction relationship. In other words, if firms with EO would like to enhance their performance under dynamic environments, the level of rareness of resource–capability combinations must be considered. Therefore, the following is hypothesized:

Hypothesis 3: The positive relationship between EO and firm performance will be magnified by the interactions of environmental dynamism and the rareness of resource–capability combinations.

METHODOLOGY

Sample and data

This cross-sectional study uses a sample from Taiwanese public firms for several reasons. First, Taiwan represents an emerging market economy with relatively limited natural production factors, whereas its advanced factors, such as innovativeness and entrepreneurship, play an important role in its economic development (Wu, Chang, & Chen, 2008). Moreover, Taiwanese firms have a long-held reputation of developing core competencies based on intellectual and human resources. Additionally, Taiwanese firms recently underwent a so-called Financial Tsunami and have been under the pressure of dynamic environments; therefore, several firms have developed practices and business models to cope with the challenges of uncertain environments (Tseng & Goo, 2005).

In 2009, 716 non-financial-sector Taiwan Stock Exchange (TSE) companies and 531 non-financial-sector Over-The-Counter (OTC) companies provided complete data for analysis. Financial service firms were excluded from the research sample because their accounting practices were incompatible with those of other industries. Two methods were used for data collection. First, data on EO and rareness were obtained via a questionnaire survey with members of top management as the respondents. The CEOs and top management of firms were initially contacted via telephone or personal visits to explain the purpose of this study. We sent a total of 1,247 questionnaires to the non-financial-sector TSE/OTC companies via post mail. Of these questionnaires, 247 were returned, for a response rate of 20%. After eliminating some incomplete questionnaires, the final sample consists of 237 firms.

Second, dependent variables (return on assets, ROA and return on sales, ROS) and some control variables were collected via a secondary database maintained by the Taiwan Economic Journal, a leading credit analysis research agent and the most comprehensive business database in Taiwan, which is subscribed to by several international research agents, such as Datastream, Dialog, Reuters, and Capital International.

Measurements

Firm performance

Firm performance is the dependent variable in this study. Consistent with prior studies, this study uses two indices to measure firm performance: ROA and ROS (Venkatraman & Ramanujam, 1986; Beal & Yasai-Ardekani, 2000; Fitzsimmons, Douglas, Antoncic, & Hisrich, 2005; Luke, Verreynne, & Kearins, 2007). First, the averaged annual rate of profit after taxes but before interest on total assets (ROA) during 2005–2009 is used. This is the most appropriate measure for estimating the effectiveness of business operations (Combs & Ketchen, 1999) due to the high debt-equity ratio and

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imperfect capital markets in developing economies (Chang & Choi, 1988). The second index is the averaged ROS during 2005–2009, a measure of profitability that is commonly used in studies of developing countries (Cuervo-Cazurra & Dau, 2009).

EO

The independent variable in this study is EO. Four dimensions are used to measure EO, including innovation, proactiveness, risk taking, and competitive aggressiveness (Miller, 1983; Lumpkin & Dess, 1996). The four dimensions are measured with 11 questions developed by Miller (1983), Covin and Slevin (1988, 1989), Lumpkin and Dess (2001), and Lumpkin, Cogliser, and Schneider (2009)[2] (see appendix). Following these studies, a semantic differential method is used in the questionnaire. That is, for each question, two opposite phrases are offered[3]. A higher score indicates a stronger EO of the firm. The Cronbach's α values of these four dimensions are 0.836, 0.850, 0.883, and 0.743, respectively, with an overall Cronbach's α of 0.79. The fit indexes of the four first-order factors (the four dimensions) plus the second-order factor fell within an acceptable range ($\chi^2/df = 2.57$, RMSEA = 0.08, GFI = 0.93, CFI = 0.97, NFI = 0.95), supporting the notion that the four dimensions are distinctive.

Rareness

The rareness of resource–capability combinations is a moderating variable in this study. It is operationalized as a firm's exploitation of a common resource (or capability) with a unique capability (or resource) or a firm's exploitation of unique resource–capability combinations, to reduce costs, to utilize market opportunities, or to withstand competitive threats. Following the studies of Barney (1991, 1997), Amit and Schoemaker (1993), and Galbreath and Galvin (2006), and the measurement of rareness developed by Newbert (2008), this study primarily focuses on how the EO–performance link is contingent on rareness. This construct is measured with three questions for each with five items, including financial, human, intellectual, organizational, and physical resources and capabilities (Cronbach's α = 0.918, 0.907, 0.928, 0.898, and 0.899, respectively) (see appendix). Similarly, an averaged score of the questions is then calculated to indicate the overall rareness of a firm's resource–capability combination. A higher score indicates a higher rareness of the firm's resource–capability combination. This construct has an overall Cronbach's α of 0.94.

Environmental dynamism

Environmental dynamism is also a moderating variable in this study. It is measured by using five questions, including extreme changes in marketing practices, a rapid rate of obsolescence in fashion goods/semi-conductors, the unpredictability of competitors, unpredictable demand and tastes of customers, and changes in the modes of production/service. The scales of environmental dynamism developed by Miller and Friesen (1982) and a semantic differential method are used in the questionnaire. Each question offers two opposite phrases. The overall Cronbach's α is 0.81.

Control variables

Several variables that may influence firm performance are controlled in the regression models, including firm size, firm age, R&D intensity, and industry affiliation. First, firm size reflects

[2] Among the 11 questions, three questions are used to measure innovation (Covin & Slevin, 1989; Lumpkin, Cogliser & Schneider, 2009), three questions are used to measure proactiveness (Covin & Slevin, 1989; Lumpkin, Cogliser, & Schneider, 2009), three questions are used to measure risk (Covin & Slevin, 1989; Lumpkin, Cogliser, & Schneider, 2009), and two questions measure competitive aggressiveness (Lumpkin & Dess, 2001).

[3] The respondents were asked to rank the extent to which they agree on a 7-point Likert scale (1 = 'extremely disagree' to 7 = 'extremely agree').

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economies and diseconomies of scale, which may form barriers to entry (Bain, 1968), and is operationalized as the natural logarithm of the five-year average of total assets. Firm age is controlled because prior studies suggest that established organizations are more bureaucratic, and these attributes may influence performance (Hannan & Freeman, 1989). A firm's age is measured as the natural logarithm of a company's age since its establishment. R&D intensity is defined as the five-year averaged ratio of R&D expenditures over sales between 2005 and 2009. This variable is controlled because a firm's R&D investment in innovation may lead to products/services differentiation as well as profitability. Finally, the total sample is classified into four industry categories: biotechnology and chemical, electronic manufacturing, traditional manufacturing, and others (dummy coded as 1 and 0) due to possible profitability differences deriving from different industrial characteristics[4].

Table 1 reports the mean, standard deviations, and correlation coefficients of all variables. To attenuate possible multi-collinearity problems in our data, mean-centred variables are used in the interaction terms through subtracting the mean from each value of the variable (Aiken & West, 1991). After this procedure, the correlation coefficients among all variables are relatively low. In addition, we assess the variance inflation factors and find that all variance inflation factors values are smaller than 2. This finding implies that no serious multi-collinearity problems exist in our models.

This study uses self-reported data collected from CEOs or top managers, so it may be vulnerable to common method variance. Using *ex ante* preventive methods, we guaranteed anonymity and mailed the questionnaires directly to the managers. To avoid respondents guessing the relationship between variables, we also reduced item ambiguity and separated related items (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). For the *ex post* testing methods, we used Harman's single-factor test, a widely adopted *post hoc* remedy, to estimate whether our data have a common method variance problem (Podsakoff & Organ, 1986). The result showed that the first factor accounted for only 10.34% of variance among variables. Furthermore, potential common method variance problems are most likely to occur when data from the same source are used for the independent variables and the dependent variables (Podsakoff et al., 2003), but in our study, the dependent variables rely on secondary sources rather than self-reporting performance, so our data do not have a serious common method variance problem.

Analytical methods

Hierarchical linear regression analyses were used to test the hypotheses. Hierarchical linear regressions are appropriate when analyzing multiple terms in the regression equations. Following Cohen and Cohen (1983), three processes were used to test the main-effect models, two-way interaction models, and three-way interaction models. The three-way interaction models were constructed with the interactions of EO, environmental dynamism, and rareness, simultaneously included in the equations. In this study, each interaction term is expected to make a significant contribution to firm performance.

RESULTS

Table 2 shows the results of the hierarchical regression models undertaken to test the hypotheses. Models 1 and 5 are the null models that contain only control variables. Models 2 and 6 are the main-effect models. This study then introduces the combination of EO and environmental dynamism and the combination of EO and rareness into Models 3 and 7, respectively, to construct the two-way

[4] Respondent firms in the biotechnology and chemical industry, chemicals, and biotechnology account for 19% of all firms in this sector. Respondent firms in the electronic manufacturing industry, information, and electronics account for 14% of all firms in this sector. Traditional manufacturing is a composite of many industries, such as cements, food and beverage, wire and cable, electric machinery and textile, and respondent firms account for 27% of all firms in these industries. Respondent firms in other industries account for 27% of all firms in these industries.

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Table 1. Descriptive statistics and correlation coefficients of study variables (N = 237)

	Mean	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1. ROA	7.59	7.69	1										
2. ROS	−3.13	148.85	0.39**	1									
3. Firm age	29.30	13.58	−0.15*	0.07	1								
4. Firm size	6.64	0.60	0.16*	0.03	0.36**	1							
5. RD	0.03	0.04	0.04	0.01	−0.33**	−0.25**	1						
6. EO	4.21	1.01	0.14*	0.13*	−0.06	0.02	0.16*	1					
7. Environmental dynamism	3.90	1.15	−0.00	−0.16*	−0.33**	−0.08	0.23**	0.48**	1				
8. Rareness	16.36	2.29	−0.01	−0.12†	−0.05	−0.06	0.03	0.25**	0.10	1			
9. EO × environmental dynamism			0.06	0.24**	0.05	0.03	−0.06	−0.11†	−0.08	−0.02	1		
10. EO × rareness			0.20**	0.21**	0.12†	0.07	−0.09	0.03	−0.02	−0.02	0.12**	1	
11. Environmental dynamism × rareness			−0.01	−0.19**	0.01	0.03	−0.02	−0.02	−0.05	0.11	0.27**	0.40**	1
12. EO × environmental dynamism × rareness			0.17**	0.23**	−0.10	−0.14*	0.02	0.24**	0.26**	0.30**	−0.08	−0.06	−0.19**

Note. EO = entrepreneurial orientation; RD = R&D intensity; ROA = return on assets; ROS = return on sales.
† $p < .1$, * $p < .05$, ** $p < .01$.

Table 2. Hierarchical regression results of firm performance (N = 237)

	Dependent: ROA			
	Null model	*Main-effect model*	*Two-way interaction model*	*Three-way interaction model*
	Model 1	*Model 2*	*Model 3*	*Model 4*
	β	β	β	β
Constant	−16.38	−15.86	−15.95	−19.17
Control variables				
Firm age	−0.10*	−0.13**	−0.14**	−0.15**
	(0.05)	(0.05)	(0.05)	(0.05)
Firm size	3.90**	3.84**	3.80**	4.42**
	(1.10)	(1.09)	(1.05)	(0.98)
Biotechnology industry	3.91†	3.95†	4.58*	3.84†
	(2.21)	(2.17)	(2.10)	(1.99)
Electronic manufacturing industry	1.98	3.07*	3.48*	2.96*
	(1.49)	(1.51)	(1.46)	(1.39)
Other industries	−1.12	−0.60	−0.28	−1.29
	(1.85)	(1.85)	(1.79)	(1.70)
RD	1.59	−0.11	0.51	3.68
	(13.32)	(13.23)	(12.75)	(12.07)
Main variable				
EO		1.63**	1.72**	1.49*
		(0.61)	(0.59)	(0.57)
Moderating variables				
Environmental dynamism		−1.60**	−1.60**	−1.92**
		(0.55)	(0.53)	(0.52)
Rareness		−0.22	−0.17	−0.35
		(0.23)	(0.23)	(0.23)
Two-way interactions				
EO × environmental dynamism			0.21	0.40
			(0.35)	(0.34)
EO × rareness			0.88**	1.07**
			(0.22)	(0.22)
Environmental dynamism × rareness				−0.20
				(0.20)
Three-way interaction				
EO × environmental dynamism × rareness				0.53**
				(0.14)
R^2	0.11	0.15	0.22	0.29
Adjusted R^2	0.08	0.11	0.17	0.24
Significant F	0.00	0.00	0.00	0.00
ΔR^2		0.04	0.07	0.07
F of ΔR^2		3.68*	8.72**	10.05**

	Dependent: ROS			
	Null model	*Main-effect model*	*Two-way interaction model*	*Three-way interaction model*
	Model 5	*Model 6*	*Model 7*	*Model 8*
	β	β	β	β
Constant	14.90	39.94	42.75	−47.70
Control variables				
Firm age	0.56	−0.17	−0.37	−0.85
	(1.08)	(1.04)	(0.98)	(0.85)

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TABLE 2 *(Continued)*

Firm size	−9.27	−12.33	−15.88	1.84
	(23.07)	(22.03)	(20.78)	(18.13)
Biotechnology industry	6.43	7.61	17.96	−1.61
	(46.40)	(43.95)	(41.55)	(36.04)
Electronic manufacturing industry	−5.25	25.08	36.19	19.21
	(31.32)	(30.62)	(28.95)	(25.10)
Other industries	−13.09	−0.38	5.41	−24.28
	(38.75)	(37.48)	(35.37)	(30.83)
RD	156.76	90.42	74.96	186.86
	(279.50)	(267.78)	(252.65)	(218.71)
Main variable				
EO		51.25**	57.94**	50.88**
		(12.31)	(11.72)	(10.16)
Moderating variables				
Environmental dynamism		−45.33**	−43.57**	−52.38**
		(11.18)	(10.55)	(9.21)
Rareness		−12.05*	−11.19*	−13.88**
		(4.71)	(4.45)	(4.06)
Two-way interactions				
EO × environmental dynamism			26.57**	35.10**
			(6.89)	(6.06)
EO × rareness			12.61**	21.98**
			(4.34)	(4.01)
Environmental dynamism × rareness				−16.47**
				(3.51)
Three-way interaction				
EO × environmental dynamism × rareness				12.90**
				(2.41)
R^2	0.01	0.13	0.23	0.43
Adjusted R^2	0.00	0.09	0.19	0.39
Significant F	0.89	0.00	0.00	0.00
ΔR^2		0.12	0.10	0.20
F of ΔR^2		8.89**	13.54**	34.78**

Note. Unstandardized regression coefficients are presented. Standard errors are in parentheses.
EO = entrepreneurial orientation; RD = R&D intensity; ROA = return on assets; ROS = return on sales.
$^{\dagger}p < .1$, $*p < .05$, $**p < .01$.

interaction models for testing Hypotheses 1 and 2. The influences of the three-way interactions of EO, environmental dynamism, and rareness are examined in Models 4 and 8 to test Hypothesis 3.

The results of Models 2 and 6 show that EO is positively associated with ROA and ROS. The results are consistent with the findings of Wiklund (1999) and Tang et al. (2008), indicating that high EO is associated with high performance. Hypothesis 1 focuses on the moderating effects of environmental dynamism and predicts that under high environmental dynamism, EO will lead to improved performance. The results of Model 3 show that the interaction of EO and environmental dynamism is not significant for ROA but that their interaction is significant for ROS. Therefore, Hypothesis 1 is partially supported. Hypothesis 2 focuses on the moderating effects of resource rareness and suggests that EO will lead to improved performance when rareness is high. Models 3 and 7 show that the interactions between EO and rareness positively influence ROA and ROS. Therefore, Hypothesis 2 is strongly supported.

Hypothesis 3 focuses on the three-way interaction effects and predicts that the combination of EO, environmental dynamism, and rareness will lead to improved performance. We introduce the three-way interaction terms into Models 4 and 8 and find them to be significant in both ROA and ROS. Hypothesis 3 is thus strongly supported.

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Additional Tests on Moderating Effects

To further explain the interaction between EO and environmental dynamism, we plot these interaction effects for two levels of environmental dynamism, where the low level is defined as below the mean ($N = 127$) and the high level is defined as above the mean ($N = 110$). Figures 1a and 1b show that EO has a significantly positive relationship with ROA and ROS when environmental dynamism is high. That is, a strong EO is more likely to promote high returns in the context of high environmental dynamism than in the context of low environmental dynamism. To explain the interaction between EO and rareness, we plot these interaction effects for two levels of rareness, where the low level is defined as below the mean ($N = 98$) and the high level is defined as above the mean ($N = 139$). Figures 1c and 1d show that EO positively promotes ROA and ROS when the rareness is high. As we expected, a strong EO is more likely to promote high returns in high rareness than in low rareness.

We then perform a simple slope analysis for each line to examine whether its slope is significantly different from zero. With respect to the interaction of EO and environmental dynamism, the result again confirms that EO has a strong positive effect on ROA ($\beta = 0.18$, $t = 1.85$) and ROS ($\beta = 0.22$, $t = 2.36$) when environmental dynamism is high. However, firms' high EO is unrelated to performance when environmental dynamism is low. These results provide additional support for Hypothesis 1. With respect to the interaction between EO and rareness, the result again confirms that EO has a strong positive effect on ROA ($\beta = 0.33$, $t = 4.01$) and ROS ($\beta = 0.22$, $t = 2.59$) when rareness is high. However, when rareness is low, firms' high EO is unrelated to performance. Therefore, these results also support Hypothesis 2.

To advance the interpretation of Hypothesis 3, we plot these interaction effects for a high level of rareness and environmental dynamism ($N = 67$) and for a low level of rareness and environmental dynamism ($N = 55$). We then plot these interaction effects, and a simple slope test is again conducted. Figures 2a and 2b show that the EO has a significantly positive relationship with ROA ($\beta = 0.46$, $t = 4.22$) and ROS ($\beta = 0.36$, $t = 3.11$) when environmental dynamism and rareness are both high. All of these results indicate that a high level of rareness generates a positive effect when environmental dynamism is high. Therefore, the results of Figures 2a and 2b support Hypothesis 3.

DISCUSSION AND CONCLUSION

Entrepreneurship has been viewed as a central research topic in strategic management (Meyer, Neck, & Meeks, 2002). Prior literature has noted that a favourable EO–performance relationship is determined by several contingency factors, such as the external environmental challenges faced by firms as well as firms' internal specific resources. In other words, the associations between EO and these contingency factors will lead to firm effectiveness. This study tries to go beyond existing studies and argues that the three-way interaction effects between EO, environmental dynamism, and the rareness of resource–capability combinations positively influence firm performance.

Based on the data collected from 237 public Taiwanese firms, this study finds that EO has a significant influence on the ROA and ROS of firms. This result provides an opportunity to further examine whether there are complexly contextual variables that may influence the EO–performance relationship. By using the two-way interaction models and the three-way interaction models to detect moderating effects, this study obtains three main findings. First, with respect to the relationships between EO, environmental dynamism, and performance, although environmental dynamism directly leads to negative performance, the interaction between EO and environmental dynamism positively influences firm performance. This finding is surprising and interesting because our study's results are not completely consistent with Wiklund and Shepherd (2005) but instead are similar to Dess, Lumpkin, and Covin (1997).

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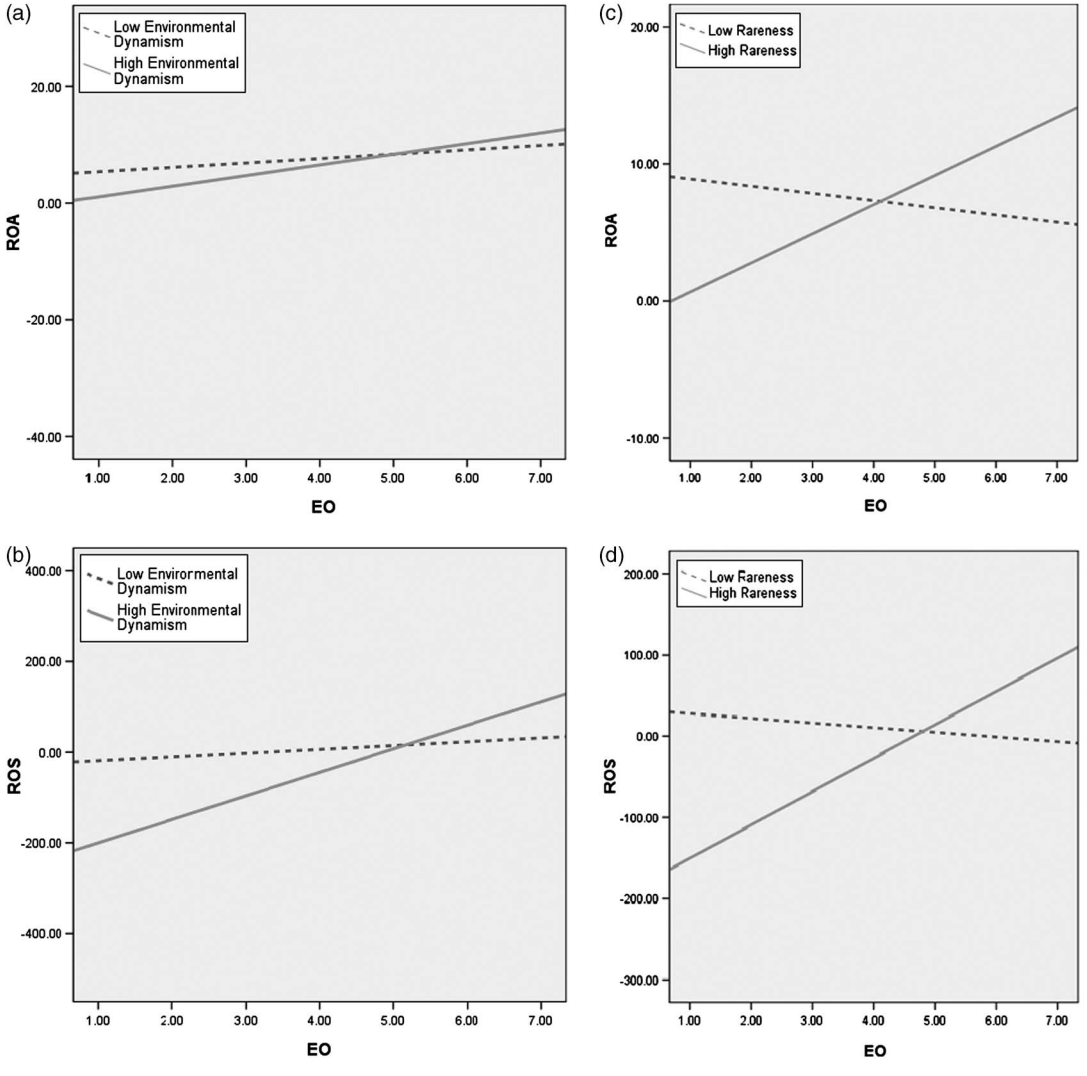

FIGURE 1. (A) INTERACTION EFFECTS OF ENTREPRENEURIAL ORIENTATION (EO) AND ENVIRONMENTAL DYNAMISM ON RETURN ON ASSETS (ROA). (B) INTERACTION EFFECTS OF EO AND ENVIRONMENTAL DYNAMISM ON ROS. (C) INTERACTION EFFECTS OF EO AND RARENESS ON ROA. (D) INTERACTION EFFECTS OF EO AND RARENESS ON ROS

Environmental dynamism may have a higher probability of hurting firm performance due to the differences in risk taking between various firms. The study by Galbreath and Galvin (2006) shows that the industrial environment by itself is insufficient to sustain a firm's sales growth and profitability. However, the advantages of a firm with EO are more likely to be realized when its EO is combined with a highly dynamic environment (see Figures 1a and 1b). To earn profit, firms' EO should involve higher levels of self-efficacy, higher ambition and achievement, readiness to change, interest in innovation, and competitive aggressiveness because all of these attributes favour the perception of opportunities in an environment characterized by rapid change (Sadler-Smith et al., 2003).

Second, despite the negative relationship between rareness and firm performance, this study confirms that rareness greatly influences the EO–performance relationship. Based on our sample,

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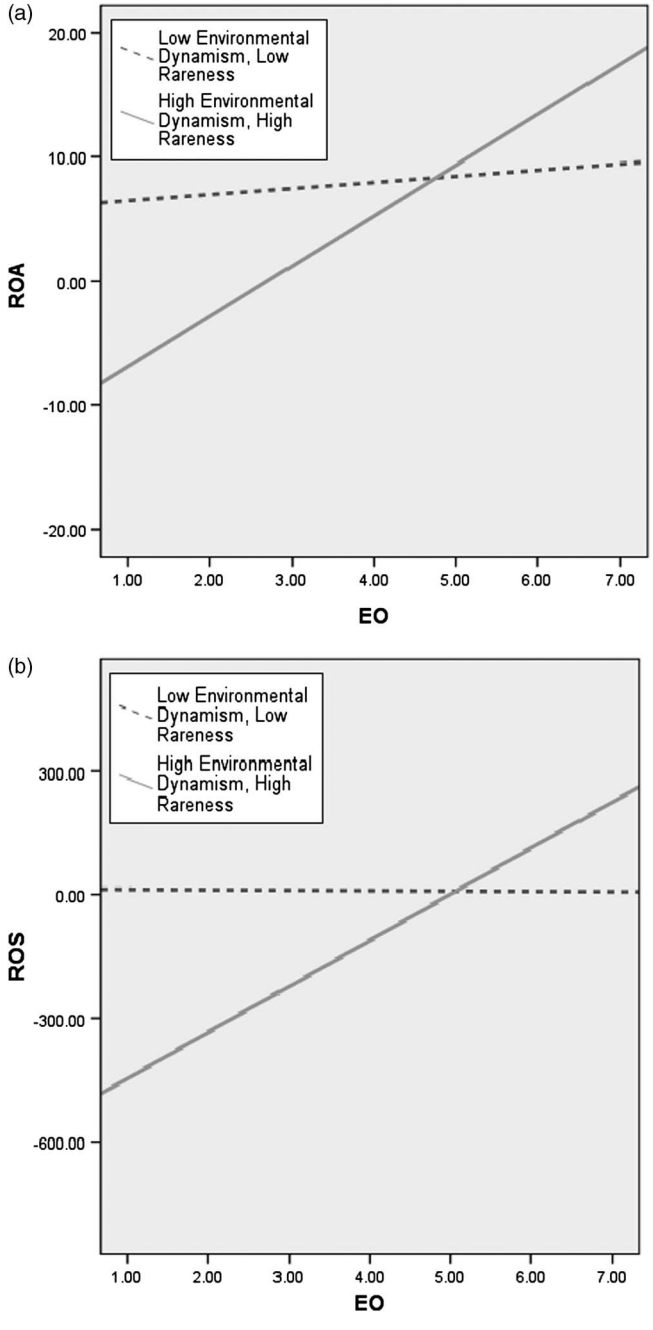

Figure 2. (a) Interaction effects of entrepreneurial orientation (EO) and environmental dynamism and rareness on return on assets (ROA). (b) Interaction effects of EO and environmental dynamism and rareness on return on sales (ROS)

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rareness has a limited, direct, and positive effect on profitability for the possible reason that rareness includes tangible and intangible resources and capabilities. Some scholars have found that intangible resources can sustain profits but that tangible resources cannot explain a significant share of the variation in performance (Galbreath & Galvin, 2006). Our results lend some credence to the hypothesis that a firm with a strong EO is inclined to take business-related risks and to have a forward-looking perspective in facing rare resources and capabilities, thus enhancing the firm's performance (see Figures 1c and 1d). As has been suggested by Wiklund and Shepherd (200, EO can challenge and employ rare resources to bring about high performance.

Finally, this study introduces a configurational approach except a contingency approach. In addition to the moderating role of environmental dynamism (Wiklund & Shepherd, 2005; Hmieleski & Baron, 2009), rareness can be viewed as a supplementary mechanism to create effectiveness (Lumpkin & Dess, 1996; Dess, Lumpkin, & Covin, 1997). As expected, we find that the combination of high environmental dynamism and high rareness does indeed strengthen the impact of EO on firm profits. One possible reason for this finding may be derived from Schumpeter's (1934) insights. Schumpeter argues that entrepreneurship facilitates unique resource–capability combinations in dynamic and high-risk environments, which in turn make it possible for some firms to distinguish themselves from others by reducing costs or differentiating their products and services. This argument is largely consistent with the central notion of the resource-based view, which asserts that a firm's competitive advantage lies in the rare combination of resources and capabilities, as well as in its response to the opportunities and threats of the external environment (Barney, 1991).

Limitations

This study has two limitations. First, although it does suggest that these two variables (i.e., environmental dynamism and rareness of resource–capability combinations) could explain a significant share of the variance in the relationship between EO and firm performance, it is not mean to be an exclusive one. It is possible that other contingency factors, such as institutional transitions, organizational slack, other environmental factors, and valuable resources, may influence this linkage (Lumpkin & Dess, 1996). Future studies should thus examine how the interactions between EO and these contingency factors influence the EO–performance relationship. Second, the data evaluated in this study were obtained from diverse industries in Taiwan. It may not be appropriate to generalize to the situations in other developed or developing countries on the basis of empirical evidence derived from a single country. Future researchers may consider collecting data from various countries to achieve a more generalizable research finding.

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APPENDIX

All items are measured on a 7-point Likert scale (1 = 'extremely disagree' to 7 = 'extremely agree')

Innovation		
In general, the top managers of my firm favor…		
A strong emphasis on the marketing of tried and true products or services	1–7	A strong emphasis on R&D, technological leadership, and innovations
How many new lines of products and services has your firm marketed in the past several years?		
No new lines of products services	1–7	Very many new lines of products or services
Changes in product or service lines have been mostly of a minor nature	1–7	Changes in product or service lines have usually been quite dramatic
Proactiveness		
In dealing with its competitors, my firm…		
Typically responds to actions which competitors initiate	1–7	Typically initiate which competitors then respond to
Is very seldom the first business to introduce new products/services, administrative techniques, operating technologies, etc.	1–7	Is very often the first business to introduce new products/services, administrative techniques, operating technologies, etc.
A strong tendency to 'follow the leader' in introducing new products or ideas	1–7	A strong tendency to be ahead of other competitors in introducing novel ideas or products
Risk taking		
In general, the top managers of my firm have…		
A strong proclivity for low-risk projects with normal and certain rates of return	1–7	A strong proclivity for high-risk projects with chances of very high returns
In general, the top managers of my firm believe that…		
Owing to the nature of the environment, it is best to explore it gradually via timid, incremental behaviour	1–7	Owing to the nature of the environment, wide-ranging acts are necessary to achieve the firm's objectives
When confronted with decision-making situations involving uncertainty, my firm…		
Typically adopts a cautious, 'wait-and-see' posture in order to minimize the probability of making costly	1–7	Typically adopts a bold, aggressive posture in order to maximize the probability of exploiting potential opportunities
Competitive Aggressiveness		
In dealing with its competitors, my firm…		
Typically seeks to avoid competitive clashes, preferring a 'live-and-let-live' posture	1–7	Typically adopts a very competitive 'undo-the-competitors' posture
My firm makes no special effort to take business from the competition	1–7	My firm is very aggressive and intensely competitive
Environmental dynamism		
Our firm must rarely change its marketing practices to keep up with the market and competitors	1–7	Our firm must change its marketing practices extremely frequently (e.g., semi-annually)
The rate at which products/services are getting obsolete in the industry is very slow (basic metal like copper)	1–7	The rate of obsolescence is very high (e.g., as in some fashion goods and semi-conductors)
Actions of competitors are quite easy to predict (as in some primary industries)	1–7	Actions of competitors are unpredictable
Demand and consumer tastes are fairly easy to forecast (e.g., for milk companies)	1–7	Demand and tastes are almost unpredictable (e.g., high fashion goods)
The production/service technology is not subject to very much change and is well established (e.g., in steel production)	1–7	The modes of production/service change often and in a major way (e.g., advanced electronic components)

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All items are measured on a seven-point Likert scale (1 = 'extremely disagree' to 7 = 'extremely agree')
Rareness
1 Compared to companies with similar capabilities, my firm uses them to exploit very different resources when attempting to reduce costs, exploit market opportunities, and/or defend against competitive threats
   a. Financial Resources
   b. Human Resources
   c. Intellectual Resources
   d. Organizational Resources
   e. Physical Resources
2 Compared to companies that possess or have access to similar resources, my firm exploits them with very different capabilities when attempting to reduce costs, exploit market opportunities, and/or defend against competitive threats
   a. Capabilities to exploit Financial Resources
   b. Capabilities to exploit Human Resources
   c. Capabilities to exploit Intellectual Resources
   d. Capabilities to exploit Organizational Resource
   e. Capabilities to exploit Physical Resource
3 Compared to my firm's competitors, my firm exploits very unique combinations of resources and capabilities when attempting to reduce costs, exploit market opportunities, and/or defend against competitive threats
   a. Financial Resources and Capabilities
   b. Human Resources and Capabilities
   c. Intellectual Resources and Capabilities
   d. Organizational Resources and Capabilities
   e. Physical Resources and Capabilities

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