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Perceived environmental threats and strategic choices: Evidence from pharmaceutical firms in China

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This paper aims to explore the non-linear relationship between perceived environmental threats and strategic choices in a dynamic environment. Based on secondary data from pharmaceutical companies listed on Shenzhen or Shanghai Stock Exchange in China, this study adopts a Heckman selection model to test the hypothesis. The first stage of the model assesses the likelihood of top managers to perceive environmental threats based on a series of firm-specific and TMT-specific factors. One factor from this first model that captures the confounding effect of strategy self-selection is used in second stage of the model which estimates the complicated relationship between perceived threats and strategic choice. The empirical results indicate that when perceived threats are larger than opportunities, the perception of threats has a U-shaped relationship with proactiveness of strategic choice. When perceived threats are smaller than opportunities, the perceived threat has an inverse U-shaped relationship with proactiveness of strategic choice. The findings contribute to managerial cognition literature by arguing the non-linear relationship between perceived threats and strategic choice. Also this study makes an empirical contribution by measuring the degree of perceived threats and proactiveness of strategic choice in continuous variables rather than in categorical variables.

Key words: Perceived environmental threats, strategic choice, non-linear relationship, Heckman selection model.

INTRODUCTION

Explaining how firms behave is one of the fundamental issues in the field of strategy. According to the cognitive approach, decision making of top manager is a function of how they notice and interpret complex issues in a particular situation and translate their perspectives into actions (Daft and Weick, 1984; Thomas et al., 1994). It is interesting that different top managers have their unique interpretations even if they operate in the same industry or are exposed to similar environmental stimuli (Yan and Chew, 2011). Therefore, understanding managerial cognition and its effect is critical for gaining insights into organizational actions and firm performance.

Top managers appear to categorize many environmental issues as either threats or opportunities (Dutton and Jackson, 1987; Jackson and Dutton, 1988; Fouskas and Drossos, 2010). Opportunities represent issues that managers see as situations offering gains and over which one has control. In contrast, threats are invoked to represent situations entailing loss and lack of control. Both threats and opportunities imply a sense of urgency and difficulty and, thus, are likely to evoke some form of organizational action (Jusoh, 2010). Early studies proposed that managerial cognition had a linear relationship with strategic choice (Sharma, 2000; Chattopadhayay et al., 2001). However, the following questions need to be
examined further. First, the relationship between perceived environmental opportunities or threats and strategic choice is more complicated than conceptualized linear relationship in the existing literature (Sharma, 2000). Perceived threats and opportunities of varying magnitudes have had different impacts on organizational actions (Chattopadhyay et al., 2001). Second, the existing literature has examined impacts of threats and opportunities in terms of categorical variables (Thomas et al., 1994; Chattopadhyay et al., 2001), which limits the understanding of managerial cognition. The perceived threats must not only be recognized, but also evaluated on degree of seriousness (Lazarus and Folkman, 1984). Third, perceptions of opportunities or threats are endogenously determined and not randomly assigned (Kumar et al., 2001). For instance, high performance expectation and efforts to achieve goals may lead to positive environmental perceptions. Organizations with differentiated or prospector business strategy are more attuned to opportunities for growth and customer needs, while organizations employing a cost-leadership or defender business strategy are attuned to monitoring threats from competitors and regulators (Jennings and Lumpkin, 1992). Thus, it is essential to consider empirical techniques to solve unobserved heterogeneity and reverse causality when assessing the key relationship between perceptions of threats and opportunities and strategic choices.

In this study, we attempt to explicate and empirically assess the link between perception of threats and opportunities and the subsequent strategic choice, a topic that scholars have suggested needs further empirical examination (Ocasio, 1995). We used pharmaceutical firms listed on either Shenzhen Stock Exchange or Shanghai Stock Exchange in China as our sample. Chinese pharmaceutical industry is experiencing significant regulatory changes and market changes which provide an interesting research context to examine managerial cognition and strategic choices.

**THEORY AND HYPOTHESIS DEVELOPMENT**

**Environmental perceptions of top managers**

Identifying strategic issues helps decision makers impose order on the environment. The categorization theory was proposed by Rosch and her colleagues (Mervis and Rosch, 1981; Rosch and Mervis, 1975) as an empirical theory to examine the process of strategic issues diagnosis by organizational decision-makers. A critical assertion of this theory is that decision makers form cognitive categories based on their observations of features or attributes of objects (issues) so as to reduce the complexity of their surroundings. The two most commonly used categories of environmental information in strategic management literature are opportunities and threats (Dutton and Jackson, 1987; Jennings and Lumpkin, 1992). Three dimensions differentiate opportunity and threat labels: (1) Whether decision makers evaluate an issue in positive or negative terms; (2) whether they see it as representing potential gain or loss for their organizations; and (3) whether they see it as controllable or uncontrollable (Jackson and Dutton, 1988). Thus, opportunities may be described as “positive situations in which gain is likely and over which one has a fair amount of control” and threats as “a negative situation in which loss is likely and over which one has relatively little control” (Dutton and Jackson, 1987). Due to bounded rationality and organizational filters not all environmental information may be categorized in the same manner by all organizations. The same issue could be categorized by one organization as an opportunity and by another as a threat, based on the organization’s filters.

Opportunity and threat are like two ends of a continuum and they may coexist in reality. The differences among top managers’ environmental perceptions are the varying perceived magnitudes of opportunities versus threats. That is, more perceived environmental threats may mean less perceived environmental opportunities. Therefore, we regard the magnitude of perceived threats as the independent variable in our research.

**The strategic choice of top managers**

The Miles and Snow’s typology, being one of the dominant frameworks to categorize strategies that an organization can pursue at business level, was considered academically acceptable and internally consistent and has been the focus of extensive empirical research (Kabanoff and Brown, 2008; Hambrick, 2003). The Miles and Snow’s typology has been validated across various industries (including automobile, plastic, semiconductor, air transportation, computer, electric utility, retailing and banking) and various countries (including Spain, China, Japan and United States) (Aragon-Sanchez and Sanchez-Marin, 2005; DeSarbo et al., 2005; Rajagopalan, 1997; Rogers et al., 1999).

Miles and Snow (1978) identified four strategic approaches used by firms, which they labeled as “prospectors”, “defenders”, “analyzers” and “reactors”. A key discriminating factor between these different strategy types is the rate at which firms change their products or markets (Hambrick, 1983; Zahra and Pearce, 1990). By definition, prospectors are firms that compete primarily based on innovation. They have an external orientation, make relatively frequent changes in their product-market domain and play a pioneering role in development of new products and markets. Defenders, in contrast, emphasize efficiently positioning themselves in the competitive domain. They represent internally oriented firms that
emphasize cost control and engage in limited new product or market development (Boyd and Salamin, 2001). Compared to prospectors, defenders have limited proclivity for change and attempt to seal off a portion of the total market to create a stable set of products and customers. Analyzers, representing a hybrid approach, seek to balance exploration of new opportunities with exploitation of current markets through efficiency seeking behavior. Reactors represent unsuccessful firms that lack a clear and consistent approach to dealing with fundamental organizational problems. The extensive empirical studies based on the Miles and Snow typology demonstrate that prospectors and defenders reside at opposite ends of the continuum of strategic choice, while analyzers occupy an intermediate position between the two extremes. Prospectors and defenders are systematically different along multiple dimensions, including investment patterns (Hambrick, 1983; Bendetto and Song, 2003), technological sophistication (Borch et al., 1999), risk orientations (James/Hatten, 1995; Shortell and Zajac, 1990; Rajagopalan, 1997), aggressive product development (Shortell and Zajac, 1990; Slater and Olson, 2001) and planning and control processes (Rogers et al., 1999; DeSarbo et al., 2005). The proactiveness may be used as a measure covering the above dimensions to describe the difference between prospectors and defenders (Miles and Snow, 1978) (Figure 1).

In our study, we apply the Miles and Snow (1978) business-level strategy typology and limit our investigation to only prospectors and defenders.

**Prospectors**
- Main focus: Entrepreneurial, innovate and new opportunity orientated

**Defenders**
- Main focus: Defends existing market (often a niche market)

**Figure 1.** A continuum of strategic choice.

The relationship between perceived threats and proactiveness of strategic choice

The prospect theory and the threat-rigidity hypothesis are two theoretical positions dominating organizational scholarship concerning managerial responses to threats and opportunities. Past research has proposed that perceived threats have a linear relationship with proactiveness of strategic choice, that is, top managers often adopt defender strategy when they categorize environmental issues as threats. However, we argue that there are different relationships between perceived threats and proactiveness of strategic choice under different conditions.

In the condition of perceived threats being greater than opportunities, attributes of environmental issues are negative, loss consideration and uncontrollable. The threat-rigidity hypothesis posits that in the face of threat, organizations and individuals tend to “rigidly” pursue routine activities. This argument may be explained by two types of effects. First, a threat may result in restricted information processing, such as a narrowed field of attention, simplification of information codes, or reduction in the number of channels used. Second, when a threat occurs, there may be a constriction in control, such that power and influence can become more concentrated in higher levels of a hierarchy (Staw et al., 1981). Consequently, familiar or well-established patterns of behavior are strictly followed. By adhering to these well-established routines, decision makers attempt to regain control over that which seems to be uncontrollable.

Therefore, with the magnitude of perceived threats increasing, organizations adopt less proactive strategies as defenders, such as cost reduction or narrowing the existing product or market.

However, when the magnitude of perceived threats is greater than a reference point (for example, in a highly threatening environment), the prospect theory has more power of predicting organizational strategic choice. According to this perspective, individuals become risk takers and focus more on new opportunities and innovative strategies.
seeking when they face great loss and uncertainty because they predict the maximum loss they can bear even if they adopt more proactive strategies and fail. On the contrary, they expect more potential gains than potential loss from their proactive strategies. As Dutton and Jackson (1987) suggested, the prospect of loss accelerates individual information processing and problematic search, increasing the likelihood of the decision maker considering more risky alternatives. In sum, we propose the following hypothesis:

H₁: In the condition of perceived threats being larger than opportunities, the perception of threats has a U-shaped relationship with the proactiveness of strategic choice.

In the condition of perceived threats being smaller than opportunities, the attributes of environmental issues are positive, gains consideration and controllable. The prospect theory argues that the pursuit of opportunities accelerates individual information processing and problematic search than does categorizing them as crises or threats (Nutt, 1984). However, when the perceived threats are greater than a reference point, top executives adopt more reactive strategies. In this situation, executives are reluctant to jeopardize their career potential by championing risky entrepreneurial projects (Tan and Litschert, 1994). Top managers are well aware of their precarious employment situations. They know that they have to be responsible for any loss occurring in the condition of perceived opportunities. If they do not adopt appropriate strategic choice, they are more likely to suffer criticism in a positive environment than in a negative environment. Thus, executives who value their positions like to work to ensure their own job security and they prefer conservative actions rather than taking risks and facing the prospect of losing what they already own.

Therefore, we propose the following hypothesis:

H₂: In the condition of perceived threats being smaller than opportunities, the perception of threat has an inverse U-shaped relationship with proactiveness of strategic choice.

**METHODOLOGY**

**Sample selection and data collection**

We chose pharmaceutical industry in China as our research context because the pharmaceutical industry is one of the leading industries in China, covering synthetic chemicals and drugs, prepared Chinese medicines, medical devices and instruments, hygiene materials, packing materials and pharmaceutical machinery. The Chinese pharmaceutical industry has been growing at an average annual rate of 16.7% over the last few years. The pharmaceutical industry is closely related with social and ethical issues (such as health care) and is still subject to extensive government regulation and supervision, such as licensing and certification requirements and procedures, periodic renewal and reassessment processes, registration of new drugs and environmental protection (Liu and Cheng, 2000). The regulatory framework regarding the pharmaceutical industry in China has been subject to change and amendment from time to time in recent years. In addition, we focused on the research context in the year of 2008 when a series of banks and insurance companies’ failures triggered a financial crisis that effectively halted global credit markets in 2008. In sum, the highly competitive and regulated environment in pharmaceutical industry of China and the global financial crisis background provide the interesting and appropriate context for studying the relationship between perceived threats and strategic choice.

We used pharmaceutical companies publicly listed on either Shanghai Stock Exchange or Shenzhen Stock Exchange as our sample because publicly listed companies are required to report their strategic analysis of external environment and future strategic plans in their annual reports, which are the available source of high quality data for our research. The original dataset contained 139 companies and we deleted 29 companies according to the following criteria: (1) Companies should be listed as of 31 December 2004 so that they have at least three years of stable operating experience; (2) Companies changing more than one third of top management team members in 2008 were deleted because the new top managers often propose new business ideas in China (Barker and Patterson, 2001). The remaining 110 companies constituted the final dataset for testing our hypothesis.

We collected data from firms’ annual reports by the approach of content analysis. Two approaches have been used in past research to assess environmental perceptions and strategic choice based on the Miles and Snow typology. One way is to survey or interview. For example, some researchers (Shortell and Zajac, 1990; Snow and Hrebiniak, 1980) have directly surveyed managers to assess business strategies (prospector or defender). Qualitative inferences of cognitions from interviews or other sources have the problems of uncertain reliability and replicability and it is impractical for anything beyond a small number of case studies. Surveys of top managers are often limited by low response rates and this method cannot be used to study past cognitions (Cho and Hambrick, 2006). The other way is by using archival data to infer business strategies and environmental perceptions based on their characteristics. Content analysis is based on the assumption that word choice reflects the “cognitive categories” individuals use to allocate their attention (Cho and Hambrick, 2006). Words frequently used are cognitively central and reflect what is most on the user’s mind (Cho and Hambrick, 2006; Tuggle et al., 2010). Researchers have used such analysis in numerous organizational studies, often examining publicly available firm documents such as letters to shareholders or annual reports (Abrahamson and Park, 1994). Prior empirical studies have supported the usefulness of analyzing organizational communications (for example letters to shareholders) to investigate phenomena such as managerial cognition, competitive aggressiveness (Chen and Hambrick, 1995), and total number of actions (Young et al., 1996).

The method has many advantages for the study of strategic cognition, including its unobtrusive nature, rigor and transparency and the access it offers to cognitions of people who are difficult to access (Duriau et al., 2007). By analyzing sentences containing keywords, we can describe the relative importance of various cognitive categories in the content. One possible criticism of the approach is that since annual reports are prepared by communication departments, consultants or PR practitioners, they may not reflect cognitions of senior managers, and even if senior
managers influence the content, it is more likely to reflect their attempts at impressing the management rather than their actual cognition. There is evidence against these criticisms, suggesting that an information-processing interpretation of annual report content is more appropriate than an impressing-the-management interpretation when we are dealing with non-evaluative comments (Duriaux et al., 2007; Yadav et al., 2007). As in our case, Huff and Schwenk (1990) found that patterns of managerial attributions in letters to shareholders accurately reflect executives’ attempts at making sense, especially during uncertain and turbulent times. Even though professional writers are involved, we can expect that senior executives direct the writers and carefully review and refine their drafts (Abrahamson and Hambrick, 1997). Therefore, our study adopted the latter approach.

Analysis technique

Our empirical approach was to estimate the relationship between perceived threats and proactiveness of strategic choice. As the perception of environmental threats is endogenously determined (not randomly assigned), it is essential that we account for the perception process before assessing the key relationship. Overlooking the unobserved variables that lead to the initial choice can result in a potentially mis-specified model and inaccurate conclusions (Shaver, 1998). Therefore, we must be careful and consider unobserved heterogeneity that may be presented in order to properly identify the appropriate effect.

To correct for the endogenous choice, we adopt a Heckman selection model (Heckman, 1979). The first stage of the model assesses the likelihood that top managers perceive environmental threats based on a series of firm-specific and TMT-specific factors. A factor from this first model that captures the confounding effect of strategy self-selection is then used for estimating the relationship between perceived threats and strategic choice. This correction factor is commonly referred to as the inverse mills ratio and is the ratio of probability density function and cumulative distribution function of the standard normal distribution.

In addition to controlling for the selection of choice we also include a series of fixed effects to capture unobservable differences that may vary within our sample. We have included firm and TMT specific fixed effects in the models to allow us to better identify the key relationship.

The specifications of the two models that we test are:

\[
\text{Threat}_{\text{dummy}} = \beta_0 + \beta_1 X_1 + \epsilon_1
\]  
(1)

\[
\text{Proactiveness}_1 = \beta_0 + \beta_1 \text{Threat}_1 + \beta_2 \text{Threat}^2_1 + \beta_3 Z_1 + \beta_4 \lambda_1 + \epsilon_2
\]  
(2)

Equation 1 is the selection model where we estimate whether top managers perceive threat or not. As a result, the dependent variable is an indicator distinguishing firms that perceive the environment as a threat or opportunity. It is assessed using a logistic regression and \(X_1\) is a vector of firm-specific and TMT-specific variables that may explain the likelihood of top managers’ perception of threat. Equation 2 tests our key predictions and the perceived threat is now a continuous measure of the degree of perceived threats. The quadratic is also included to capture the possibility of a non-linear effect. In this second model \(Z_1\) is a series of firm-specific and TMT-specific control variables and \(\lambda_1\) is the inverse mills ratio.

Independent variable

Stage one

Independent variables used in the first stage of our empirical model, including TMT- and firm-specific characteristics, were chosen for estimating the likelihood of influencing the perceived threats. Managements rely heavily on their own experiences and values when interpreting their environments (Johannesson and Palona, 2010). Finkelstein and Hambrick (1996) proposed that demographic attributes are associated with their cognitions and risk taking propensity. Therefore, aggregated demographic variables such as age, educational level and tenure of top management team (TMT) members are used to assess group composition as control variables (Carpenter, 2002). TMT average age was defined as the average age of TMT members. TMT educational level was defined as the average educational level of the TMT. We categorized managers into five educational levels, as follows: 5 = PhD, 4 = Master’s, 3 = Bachelor of arts, 2 = High school, 1 = Elementary school or less. Then we averaged the various categories of educational levels of managers in a TMT. TMT average tenure was defined as the average number of years for which managers in a team had been with the company.

Besides TMT-specific characteristics, firm specific characteristics such as firm size, slack and leverage were included. Firm size can affect strategic choice through economies of scale, resources and superior bargaining position with external stakeholders and resource providers (Chen and Hambrick, 1995; Thomas et al., 1994). Firm size is operationalized as the natural log of a firm’s total assets in RMB. Slack represents resource endowments which have been shown to affect strategic choice and financial performance (Kraatz and Zajac, 2001), and slack variable was operationalized as the natural log of the cash balance in RMB. We include a measure for financial leverage that is the ratio of total liabilities to total assets.
Table 1. Summary statistics and correlation matrix.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S.D</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>proactiveness</td>
<td>0.484</td>
<td>0.154</td>
<td></td>
<td>-0.947***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived threat</td>
<td>0.584</td>
<td>0.115</td>
<td>-0.947***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TMT average age</td>
<td>46.021</td>
<td>2.938</td>
<td></td>
<td></td>
<td>0.027</td>
<td>-0.073</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TMT average tenure</td>
<td>3.905</td>
<td>1.733</td>
<td></td>
<td></td>
<td>0.123</td>
<td>-0.181*</td>
<td>0.348***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TMT average educational level</td>
<td>3.362</td>
<td>0.426</td>
<td></td>
<td></td>
<td>0.006</td>
<td>-0.024</td>
<td>0.004</td>
<td>-0.204**</td>
<td></td>
</tr>
<tr>
<td>Firm size</td>
<td>20.677</td>
<td>1.179</td>
<td>0.471***</td>
<td>-0.497***</td>
<td>0.228**</td>
<td>0.249***</td>
<td>0.176*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leverage</td>
<td>0.413</td>
<td>0.193</td>
<td>0.400***</td>
<td>-0.430***</td>
<td>0.096</td>
<td>0.097</td>
<td>-0.056</td>
<td>0.222**</td>
<td>-0.028</td>
</tr>
<tr>
<td>Slack</td>
<td>6.774</td>
<td>22.476</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

***p = 0.01; ** p = 0.05; * p = 0.1.

Table 2. Logistic regression estimates for Heckman first-stage sample selection model of perceived environmental threats.

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Model 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>14.139*** (5.127)</td>
</tr>
<tr>
<td>TMT average age</td>
<td>0.074 (0.072)</td>
</tr>
<tr>
<td>TMT average tenure</td>
<td>-0.033 (0.121)</td>
</tr>
<tr>
<td>Edu</td>
<td>-0.982* (0.540)</td>
</tr>
<tr>
<td>Size</td>
<td>-0.602** (0.237)</td>
</tr>
<tr>
<td>Ratio</td>
<td>-0.407 (1.072)</td>
</tr>
<tr>
<td>Cash</td>
<td>-0.054*** (0.013)</td>
</tr>
</tbody>
</table>

Log likelihood = -32.631; Pseudo R-squared = 0.447; Number of observation =110. ***p = 0.01; ** p= 0.05; * p= 0.1.

Stage two

Our key independent variable in the second stage of the model is perceived threats. We used content analysis of annual report to measure the perceived threats. We followed the four step procedure to measure the perceived threats as the steps for measuring proactiveness of strategic choice. The keywords of opportunities and threats are listed in Appendix II. We calculated the perceived threat as the ratio of number of sentences describing threats divided by the sum of both opportunities and threats. Unlike the variable threat_dummy used in the first stage, this variable is a continuous measure. To identify a possible non-linear relationship, we have also included a squared term in the model, named threat squared. In addition to the perceived threats, we include two levels (including organizational level and TMT level) of control variables that are likely to be correlated with strategic choice. Summary statistics and a correlation table for these variables are presented in Table 1.

RESULTS

Table 2 presents the results of Model 1, which is the first stage of the Heckman selection model where the dependent variable is a firm's perception of environmental threats and independent variables include factors that influence managers' perceptions. As a result, the dependent variable is an indicator set to 1 when a firm perceives the environment as threat and 0 otherwise.

Results of the logistic regression identified that the coefficient on TMT average education level was statistically significant (p < 0.1) and negatively related with perceived environmental threats. The coefficient of firm size was statistically significant (p < 0.05) and negatively related with perceived environmental threats. The coefficient of cash was statistically significant (p < 0.01) and negatively related with perceived environmental threats. The results indicated that TMT average education, firm size and cash decrease the degree of perceived environmental threats. Results from this model were used to construct the inverse mills ratio used in the strategic choice model.

The second stage of Heckman selection model focused on testing the predictions that we made earlier with respect to proactiveness of strategic choice. We include the inverse mills ratio to account for the endogenous choice, which allowed us to control for firm-specific unobservable factors correlated with both strategic choice and perceived environmental threats; these unobservable factor may otherwise lead to biased results. We separated the sample into two subgroups. One group was the firms which adopted prospectors and the other was the firms
Table 3. Ordinary least squares regression estimates for Heckman Second-stage strategic choice model.

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Subgroup: firms adopting prospectors</th>
<th>Subgroup: firms adopting defenders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 2</td>
<td>Model 3</td>
</tr>
<tr>
<td>Intercept</td>
<td>1.133*** (0.157)</td>
<td>0.846*** (0.216)</td>
</tr>
<tr>
<td>Threat</td>
<td>-0.847*** (0.127)</td>
<td>0.856 (0.912)</td>
</tr>
<tr>
<td>Threat 2</td>
<td>-1.927* (1.022)</td>
<td>-1.001 (1.022)</td>
</tr>
<tr>
<td>age</td>
<td>-0.002 (0.002)</td>
<td>-0.002 (0.002)</td>
</tr>
<tr>
<td>Tenure</td>
<td>-0.001 (0.003)</td>
<td>-0.001 (0.003)</td>
</tr>
<tr>
<td>Edu</td>
<td>-0.001 (0.006)</td>
<td>-0.005 (0.012)</td>
</tr>
<tr>
<td>Size</td>
<td>-0.001 (0.006)</td>
<td>-0.003 (0.006)</td>
</tr>
<tr>
<td>Ratio</td>
<td>-0.022 (0.023)</td>
<td>-0.025 (0.023)</td>
</tr>
<tr>
<td>Cash</td>
<td>-0.001 (0.001)</td>
<td>-0.001 (0.001)</td>
</tr>
<tr>
<td>Inverse mills ratio</td>
<td>-0.008 (0.010)</td>
<td>0.001 (0.011)</td>
</tr>
<tr>
<td>No. of obs.</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>F(9, 44)</td>
<td>19.53</td>
<td>18.70</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.769</td>
<td>0.785</td>
</tr>
</tbody>
</table>

***p < 0.01; **p < 0.05; *p < 0.1. obs, Observation.

which adopted defenders.

Table 3 presents the results of Models 2 and 3 that used an OLS estimator to examine the link between perceived environmental threats and proactiveness of strategic choice. The dependent variable was the proactiveness of strategic choice. Models 2 and 4 were baseline models that included the perceived environmental threats with a set of control variables and the inverse mills ratio. In Models 3 and 5, the square term of perceived environmental threats was included separately to test the non-linear relationship between perceived environmental threats and proactiveness of strategic choice.

In the subgroup of firms adopting prospectors, results of Model 3 show that the coefficient of squared term of perceived environmental threat was -1.927, significant at level of 0.1, which supports Hypothesis 2. In the subgroup of firms adopting defenders, results of Model 5 indicate that the coefficient of squared term of perceived environmental threat was 2.961 and it is significant at the level of 0.05, which supports Hypothesis 1. In addition, results of Model 5 support the positive effects of firm size and cash on proactiveness of strategic choice. Coefficients of firm size and cash were 0.024 and 0.002, respectively, significant at the level of 0.05. Figure 2 depicts the relationship between perceived environmental threats and proactiveness of strategic choice based on our results.

**DISCUSSION**

Previous studies have suggested that managers’ cognition (perceived opportunities and threats) has significant implications for firms’ strategic choice (Dutton et al., 1983; Daft and Weick, 1984). Our study provides empirical evidence from China to support the notion that environmental perception may be the first link for strategic management to adapt to its environment. Managerial perceptions regarding the business environment affect organizational strategic choice and thus can be used as predictors of responses to competitive actions (Foukas and Drossos, 2010). Extending these works, this study argues and identifies the complicated non-linear relationship between the degree of perceived threat and proactiveness of strategic choice.

Our results distinguish the relationship between perceived threats and proactiveness of strategic choice under two different conditions, distinguished by the degree of perceived threats, and our results show that 0.57 to 0.60 may be the thresholds. That is to say, when managers’ perception of environmental threats was smaller than 0.57 to 0.60, they perceived the environment as less of a threat and when managers’ perception of environmental threats was greater than 0.57 to 0.60, they perceived the environment as more of a threat. The threshold was a little higher than 0.5, indicating that managers were optimistic about the external business environment. This finding coincided with rapid development of the Chinese economy. Over the past several years, China has been one of the world’s fastest growing economies and has been a major contributor to world economic growth. After the global financial crisis happened, on 27 September 2008, Chinese Premier Jiabao Wen reportedly stated that “what we can do now is to maintain the steady and fast growth of the national economy, and ensure that no major fluctuations will
happen.” China has implemented a number of policies to stimulate and rebalance the economy and increase consumer spending, which improved the optimism of managers’ environmental perception.

In the condition of low perceived environmental threats, our results indicate that the perceived threats have an inverse U-shaped relationship with proactiveness of strategic choice. The right part of the inverse U-shape (Figure 2) demonstrated that with increase of perceived threats, firms adopted less proactive strategies. We argue that this finding can be attributed to the rapid development of Chinese economy and the pharmaceutical industry. The positive economic developments buffered managers’ perceptions of threats, prompting them to adopt a more proactive strategy. In the condition of high perceived environmental threats, our results (Figure 2) indicate that the perceived threats have a U-shaped relationship with proactiveness of strategic choice. The left part of the U-shape shows that the consideration of career safety pushes managers to adopt less proactive strategies. Our argument can be supported by previous studies of Chinese managers which have indicated that they shared a common concern for security and were likely to avoid proactive and risk-taking decisions when faced with uncertain environments (Adler et al., 1992; Tan and Litschert, 1994). In addition, we found the non-linear relationship inflected where the perceived threats were at about 0.778 and proactiveness of strategic choice was at about 0.2. The right part of the U-shape indicated that managers adopt more proactive strategies when they perceive greater environmental threats. Our finding is consistent with results based on American and Canadian companies. Miles and Snow (1978) studied the competitive U.S. electronics industry and found that increased environmental uncertainty prompted firms to adopt more innovative strategies. Miller and Friesen (1983) also found in their studies of competitive industries in the U.S. and Canada that firms were more likely to engage in innovative activities as environmental uncertainty and hostility increased.

Comparing the shape of the two curves under different conditions (Figure 2), we may find that the U-shape curve in the condition of greater perceived threats has a much steeper slope. Our finding is consistent with Jackson and Dutton (1988) who conducted a scenario experiment with managers and found a strong threat bias such that respondents were more sensitive to threat-consistent information than to opportunity-consistent information. Managers were quick to acknowledge the presence of threats but reluctant to disavow them and were quick

![Figure 2. Relationship between perceived environmental threats and proactiveness of strategic choice.](image-url)
to disavow the presence of opportunities and reluctant to acknowledge their presence.

In addition, our results demonstrated that TMT average educational level, firm size and cash influence managerial cognition, which provides evidence from China for antecedents of managerial cognition (Hambrick, 2003; Jennings and Lumpkin, 1992). That is, TMT with high educational level, firms with larger size and more cash perceive environmental issues as more of opportunities than those with low educational level, smaller firm size and less cash.

In an effort to probe the relationship between perceived threats and proactiveness of strategic choice, this empirical research, based on evidence from the Chinese pharmaceutical industry, has made several theoretical and empirical contributions. First, we contributed to the managerial cognition theory by exploring the non-linear relationship between perceived threats and proactiveness of strategic choice. Further, our research identified the different relationships of perceived threats and proactiveness of strategic choice under different conditions, from two theoretical perspectives of threat-rigidity and the prospect theory. Secondly, we measured the degree of perceived threats and proactiveness of strategic choice (prospectors and defenders) in continuous variables which empirically contributes to measures of managerial cognition and the Miles and Snow (1978) typology. Thirdly, our empirical evidence from the Chinese pharmaceutical industry provides the special context, which is complementary to the western context covered in current literature, to understand the relationship between managerial cognition and strategic choice.

As with most research, our study had its limitations. First, only one industry is included in our sample which may bias the results. Although, one industry sample can control variance among different industries, it may be useful for future research to empirically research multi-industries contexts. Secondly, we did not measure the perceived threats directly. Rather, we depended on judgments concerning interpretations of environmental events on decision makers' descriptions of environmental events published in annual reports. Despite our overall confidence in the results, we feel that it is important to note this limitation so that readers would be careful to interpret our results in light of our specific methodology.

Notwithstanding the aforementioned limitations, our study may provide some practical implications for managers, especially for managers of foreign companies which compete in Chinese markets. First, Chinese managers are optimistic about economic development of China. Even when facing the same environmental stimuli, various firms may adopt different strategies. Secondly, our results indicate that the attention allocation and issues explanation are closely related with firm strategic choice in China. Managers may be advised to pay more attention to competitors' news, analytical reports on future market development and managers' public speeches so as to predict competitors' moves.

Conclusions

In conclusion, this article provides empirical evidence on the relationship between perceived environmental threats and proactiveness of strategic choice. Our findings indicate that there is an inverse U-shaped relationship between perceived threats and proactiveness of strategic choice in the condition of lower perceived threats, while there is a U-shaped relationship between perceived threats and proactiveness of strategic choice in the condition of higher perceived threats. Our arguments expand the managerial cognition literature by measuring the degree of perceived threats and proactiveness of strategic choice and exploring the non-linear relationship between them based on evidence from the Chinese pharmaceutical industry.

ACKNOWLEDGEMENT

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REFERENCES

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### APPENDIX

#### Appendix I. Keywords of prospector and defender.

<table>
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<tr>
<th>Strategy</th>
<th>Trait</th>
<th>Keyword</th>
<th>Example</th>
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<tbody>
<tr>
<td>Prospector</td>
<td>External orientation, environment scanning, maximizing new opportunities; Flexibility and freedom from constraining company rules and regulations; Welcomes change and sees the environment as “uncertain”</td>
<td>Product innovation; Technology alliance; Technology cooperation; Domestic market expanding; Foreign market expanding; Investment; Acquisition and merger; New plant establishment; Customer relationship development; Supplier relationship development.</td>
<td>The company invested 138 million RMB to develop new products, which reached 9.5% of total sales. The company was working on the cooperation with international partners so as to actively expand international market. The company succeeded in acquiring Longshun Company so as to enter the health market, which was new market for it. The company established the new plant to expand the product capacity. The company strengthened the cooperation relationship with hospitals and suppliers.</td>
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<tr>
<td>Defender</td>
<td>Narrow range of products/services; Internal orientation based on efficiency measures and avoiding unnecessary risk; Centralized control and a functional structure are common</td>
<td>Focusing on the existing product; Focusing on the existing market; Cost reduction; Avoiding risk; Strengthening internal management; Improving production efficiency; Improving product quality.</td>
<td>The company improved the production process according to the wastewater discharge standard. The company applied the information management system so as to reduce the distribution cost and improve the distribution efficiency. The company improved the internal budget management so as to control the cost. The company kept its attention on the current market and customer demand. The company strengthened the synergistic relationship between purchasing and marketing departments to improve the management efficiency.</td>
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#### Appendix II. Keywords of perceived opportunities and threats.

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<tr>
<th>Strategy</th>
<th>Keywords</th>
<th>Examples</th>
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<tr>
<td>Perceived threats</td>
<td>Risk, threat, challenge, bad, worse, intense market competition, pressure, regulation, cost pressure</td>
<td>The external business environment was worse because of global financial crisis. The worse business environment created the challenge for firm’s financial management, for example, larger accounts receivable, less working capital. Many multinational companies made their efforts to compete in Chinese market and some of them were working on acquiring Chinese pharmaceutical companies, which created great challenges for Chinese firms. Pharmaceutical industry suffered the greater pressure from medical product safety regulation and environmental protection standards. The prices of raw materials were increasing which created the challenge for firms’ cost management.</td>
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<tr>
<td>Perceived opportunities</td>
<td>Opportunity, chance, good, better, extend, increase, consumer demand, new technology development</td>
<td>China has taken numerous steps to further advance the development of its primary healthcare services system. Through Chinese healthcare reform program, China will, by 2011, have extended its healthcare coverage to 90 percent of the country’s 1.3 billion people. Chinese government regulated the drug prices so as to avoid virulent price competition. The relative rigidity demand of consumers would increase the total market sales in pharmaceutical industry. The technology development provided the chance for developing new drugs in pharmaceutical industry.</td>
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