



## ARTICLE

# What makes firms embrace risks? A risk-taking capability perspective

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**Abstract** We adopt a risk-taking capability perspective to study the determinants of risk-taking behavior. We introduce the concept of “risk-taking capabilities”—absorptive capacity, network resources, and organizational slacks—arguing that recognition of threat and risk-taking capabilities will influence risk-taking behavior, while the theoretical debate on threat recognition needs to be clarified. Then, drawing from prospect theory, threat rigidity hypothesis, and resource-based views of firms (RBV), we hypothesize that firms’ performance, risk-taking capabilities, and their interaction will positively correlate with risk-taking behavior. We test our hypotheses using the data from Taiwan’s high technology industries. Our analyses lend support to the threat rigidity hypothesis, and risk-taking capabilities are indeed positively correlated with firms’ risk-taking behavior and also moderate the relationship between past performance and risk-taking behavior.

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## Introduction

It is generally agreed that risk-taking is an inevitable process for a firm, but what drives a firm’s risk-taking behavior remains a tangled issue. Scholars have adopted two different streams of risk-taking behavior research in the field

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of organization behavior. One line of argument is associated with prospect theory (Kahneman and Tversky, 1979), which argues that a firm will behave in a risk-taking manner when the firm is below a specific self-perceived reference point (Bowman, 1980; Fiegenbaum and Thomas, 1988; Singh, 1986; Wiseman and Gomez-Mejia, 1998). Furthermore, the firm's risk-taking attitude is influenced by the reference point (Kahneman and Tversky, 1979), aspiration level (Cyert and March, 1963), or strategic reference points (Fiegenbaum et al., 1996; Shoham and Fiegenbaum, 2002) that it adopts. On the other hand, the second body of research is associated with the threat-rigidity hypothesis (Meschi and Métais, 2015; Ocasio, 1995; Staw et al., 1981; Triana et al., 2013), which suggests that organizations will behave conservatively under threat conditions (D'Aveni, 1989; Fombrun and Ginsberg, 1990; Meschi and Métais, 2015). Staw et al. (1981) asserted that organizations will restrict information processing and constrict control under adverse environmental condition. These two theories predict alternative behavior concerning a firm's facing threat of uncertainty. Interestingly, the literature reports empirical support for each of these theories (Fiegenbaum and Thomas, 1988; Hu et al., 2011; Meschi and Métais, 2015; Palmer et al., 1995).

Furthermore, proposing the perspective of strategic reference points (SRP), Shoham and Fiegenbaum (2002) identified that Staw et al. (1981) and Dutton and Jackson (1987) offered the relationship among threats, references, and risks- "... They hypothesized that when confronted with threat (above the SRP), decision-makers will constrict information flow, become rigid by applying only tested repertoires, and engage in centralized decision-making. In contrast, decision-makers facing an opportunity (below the SRP) will tend to be more open to new information, more flexible and more willing to try new repertoires and to decentralize decision-making (p. 130)". Though SRP can be regarded an integrative theoretical points of view toward prospect theory and threat rigidity hypothesis, the definitions toward threat from SRP and threat rigidity hypothesis, however, differ with each other. Scholars basing on threat rigidity hypothesis identified threat as adverse environmental conditions a firm faces (Staw et al., 1981) whereas SRP regards threats as new issues (above SRP) suggesting a firm is satisfying with the present conditions. In this study, we employ the definition of threat from the argument of threat rigidity hypothesis to propose our hypotheses.

Prospect theory, in its original meaning, dealt with the relationship between risk attitude and the current position of a firm relative to a reference point. However, the threat-rigidity hypotheses were based on the principle that organizations were incapable of dealing with adverse environments. Thus, threat-rigidity is associated with uncertainty and uncontrollability, whereas prospect theory is associated with loss (Ocasio, 1995). This drives us to question whether organizational characteristics have a role in explaining "what are threats or opportunities?" We will emphasize that a firm's internal resources repertoire influences a firm's ability to identify new issues as threats or opportunities and, therefore, impact the firm's risk-taking decisions.

News about Foxconn (TW-2317), which is a major partner with Apple (US-APPL), infusing a great volume of unrelated investment in India<sup>1</sup> ignites us to investigate whether a firm considers its risky investment from the perspective of its growth of performance, risk-taking capabilities, or both. In this paper, we incorporate into our analysis the concept of risk-taking capabilities (Chatterjee and Hambrick, 2011; Miller and Lessard, 2000) built on the basis of a resources-based view of the firm (RBV). Firms are heterogeneous with regard to the different resources they possess, and this endowment influences their strategic choices (Rumelt, 1984; Wernerfelt, 1984; Wilson and Amine, 2009). Organizational actions are influenced by the firms' interpretation of their external environment and their internal organizational context (Chattopadhyay et al., 2001). Therefore, this paper aims to investigate the determinants of a firm's risk-taking behavior by introducing the perspectives of risk-taking capabilities.

The present study tests a sample from publicly listed firms in the electronics industry in Taiwan, and makes three principal contributions to literature and business practitioners. First, risk-taking capabilities can enhance decision-makers' confidence (Chatterjee and Hambrick, 2011) to make risky decisions. Hence, both a firm's past performance status and threat conditions and its risk-taking capabilities should be taken into account, as they and their interaction can influence a firm's risk-taking behavior. Second, the interactive effects of a firm's "domain" (gain or loss) and risk-taking capabilities can settle the theoretical debate between the prospect theory and threat rigidity hypothesis. The condition of "loss" and "few capabilities" implies a status of "nothing to lose", and that of "gain" and "more capabilities" can offer managers' "confidence". Both conditions offer consistent argument of the two theories. Third, following Fiegenbaum et al.'s (1996) proposition that "firms possessing both an internal and external reference point will outperform firms which are predominantly internally or externally focused" (p. 229), firms can make risky decisions more reasonably by taking both internal and external factors affecting risk-taking behavior.

This study is composed of six sections. The first addresses the purpose of the study, followed by a review of theoretical underpinnings and development of the hypotheses. The third section addresses the method used to analyze data from sampled firms in Taiwan. The fourth section explains the results from the empirical tests of the models and discussion of the findings from the empirical tests, and the last section addresses the conclusion and the contribution to research.

<sup>1</sup> <https://www.aruco.com/2015/06/actility-25m-ginkoventures-orange-swisscom-kpn-foxconn>; <http://www.lightreading.com/mobile/devices-smartphones/foxconn-plugs-into-indias-manufacturing-dreams-/d/d-id/717023>; <http://udn.com/news/story/7240/1083178-%E9%B4%BB%E6%B5%B7%E6%94%BB%E5%8D%B0%E5%BA%A6-%E5%BB%BA%E6%95%B8%E6%93%9A%E4%B8%AD%E5%BF%83>.

## Threats, capabilities and risk-taking behavior

### Prospect theory

Kahneman and Tversky (1979) criticized the traditional rationality assumption in classic economics by pointing out that attitudes toward risk are subject to different framing. This exemplifies and clarifies the assertion that people are inclined to risk-aversion under positive conditions and to risk-seeking under negative ones. These opposite preferences are termed the "reflection effect" (Tversky and Kahneman, 1981). Thus, managers facing threats may be expected to be risk-seeking and risk-averse when facing opportunity (Fiegenbaum and Thomas, 1988; Wiseman and Gomez-Mejia, 1998). In March and Shapira's (1987, p. 1409) studies on managerial attitudes toward risk, they argued that "managers believe that fewer risks should, and would, be taken when things are going well. They expect riskier choices to be made when an organization is failing."

Even though Kahneman and Tversky (1979) explored prospect theory at the individual level, researchers have found empirical support for their ideas at the organizational level (Fiegenbaum and Thomas, 1988; Palmer et al., 1995). Chattopadhyay et al. (2001) found a positive relationship between risky organizational actions and the threat of likely losses. Similarly, other researchers have observed that past poor performance would trigger risk-taking activities (Bromiley, 1991; Singh, 1986; Wiseman and Bromiley, 1996; Palmer et al., 1995). Thus, we propose the first hypothesis.

**Hypothesis 1a** (*Prospect theory*). Firms below their reference point (underperforming organizations) will conduct more risk-taking behavior.

### Threat rigidity hypothesis

In contrast to the arguments of the prospect theory, the threat rigidity hypothesis asserts that organizations will behave in a conservative manner under adverse environmental conditions (Staw et al., 1981). Under threat conditions, decision-makers are inclined to restrict information processing and constrict control until they can identify clearly the adverse events. Threat also leads firms to centralize authority and increase formalization of procedure. "The shift to a more rigid structure seems to be due to decision makers' attempt to enhance control so as to insure that organizational members act in a concerted way in meeting a threat situation (Staw et al., 1981, p. 515)". Especially, Hu et al. (2011) suggested that firm will become rigid and behave more risk-aversely. Firms may be less likely to take risks to initiate acquisitions (Iyer and Miller, 2008) and intend to conduct more divestitures (Shimizu, 2007).

Therefore, according to threat-rigidity hypotheses, organizations adopt a conservative style merely because they lack the capability or information to identify and hence deal correctly with a threat. The hypothesis that competes with Hypothesis 1a is proposed below.

**Hypothesis 1b** (*Threat rigidity hypothesis*). Firms below their reference point (underperforming organizations) will conduct less risk-taking behavior.

### Risk-taking capabilities

Concerning the definition of risk, Andretta (2014) indicated a lack of universally accepted definition of the principles and fundamental concepts of how to assess risk. However, the definition provided by Lowrance (1976), "Risk is a measure of the probability and severity of adverse effects", has offer foundation for succeeding research about risk. Some previous studies have mentioned the sources and types of risk. For instance, Baird and Thomas (1985) classified risk into five categories from the dimension of sources of risk, which includes external environment, industry, organization, decision maker, and problem. Kaufmann et al. (2013) analyzed four different ways of communicating risk. Different types of risks should be coped with different risk management strategies (Holzmann and Jørgensen, 2001). Risk-taking capabilities can be considered as one of strategic assets to deal with different types of risks. Regarding the risk-taking capability, Miller and Lessard (2000, p. 92) argued that "the ability to frame risks and strategies represents a core competence." Furthermore, they observed that this competence encompasses five layers of responses: (1) obtaining and framing information; (2) designing a process with a long front end; (3) building coalitions; (4) allocating risks to parties best able to bear it; and (5) building long-term coalitions with affected parties.

With these points in mind, we can further depict the resource side of risk-taking capabilities. If firms could completely anticipate the risks embedded in specific risky activities, they should categorize the risks into four parts: (1) risks that could be well handled within the organization; (2) risks that could be diverted to others such as suppliers, customers, and governance; (3) risks that could be allocated to partners; and (4) residual risks. We argue that internal resources create a base from which to generate valuable solutions for the organization. For example, Lee et al. (2001) found that internal financial resources and technological capabilities are positively associated with start-up performance. Spithoven and Teirlinck (2015) identified that absorptive capacity as internal resources can be regarded as one determinant of a firm's risky R&D investment. Even though internal resources are critical in the risk-taking process, external resources also offer an opportunity to diversify or internalize the risks. External contacts play an important role in the procurement of complementary resources such as information, knowledge, skills, technology, channels, and financial resources. Through social networks, a firm can find capable partners to deal with specific risks that the firm itself cannot deal with.

It follows that both internal resources and external networks form the basis of risk-taking capabilities. We should not overlook the fact that when unanticipated risks are manifesting, organizational slack as a kind of internal resource can buffer the impact of turbulence (Cyert and March, 1963) and therefore create the potential to take risk.

Above, we can generate Table 1 to decompose risk into three types along with specific risk-taking capabilities. Hence, from the perspectives of RBV, risk-taking capabilities composed of absorptive capacities, network resources, and organizational slack, will influence a firm's risk-taking behavior. Firms with higher levels of risk-taking capabilities

**Table 1** Decomposition of risk and risk-taking capabilities.

Decomposition of risk	The components of risk-taking capabilities	Three dimensions
Risk can be dealt within organization	Framing and strategizing risk	Absorptive capacity
Risk-can be dealt by capable parties	Allocating and diversifying risk	Network resources
Residual risk	Buffering risk	Organizational slack

can better identify valuable opportunities, buffer environmental threats, and internalize risks than others. In consequence, they are inclined to interpret environmental changes as control-enhancing opportunities rather than control-reducing threats. In a similar manner and consistent with the arguments of the threat-rigidity hypothesis, firms endowed with fewer risk-taking capabilities are prone to take risk-averse responses to new issues because they are unable to control the changes. Thus, it is important to recognize that internal risk-taking capabilities may trigger risky organizational actions.

In addition to a firm's internal risk-taking capabilities, its external links can also be deployable resources affecting the risk-taking behavior. Firms with higher risk-taking capabilities would have a higher propensity to embrace risky opportunities and make profits. In the following sections, we will consider the premise that risk-taking capabilities consist of available organizational absorptive capacities, network resources, and organizational slack.

#### The capabilities of framing and strategizing risk—absorptive capacities

Absorptive capacities were first demonstrated by [Cohen and Levinthal \(1990\)](#), who defined absorptive capacity as the ability to recognize the value of new, external information, assimilate it, and apply it to commercial ends. Previous researchers have tended to highlight the role of absorptive capacities on inter- or intraorganizational learning ([Lane and Lubatkin, 1998](#)). In this paper, we also emphasize the role of absorptive capacities in identifying and optimizing profitable opportunities.

At the individual level, absorptive capacity is connected to a person's knowledge and background, which implies that the development of absorptive capacity is "domain-specific" and "path-dependent" ([Cohen and Levinthal, 1990](#)). Every decision-maker has a distinct developmental path that shapes his or her unique cognitive style for reading the external environment. Such unique cognitive styles may contribute to easy recognition of valuable opportunities by some people, whereas other people under-recognize the same opportunities. Moreover, when external information is unrelated to an individual's prior knowledge and experience, that person may have difficulty predicting the consequences of strategic choice in forecasting the future and retrieving possible alternatives from memory. In

a similar manner, organizational absorptive capacities are accumulated through unique experiences and evolutionary paths and may facilitate a firm's ability to recognize valuable opportunities. [Tsai \(2001\)](#) and [Spithoven and Teirlinck \(2015\)](#) found that absorptive capacity was positively correlated with an organizational unit's innovation. Firms with high levels of absorptive capacity are more likely to take risks.

As [Cohen and Levinthal \(1990, p. 137\)](#) emphasized:

A firm's aspiration level in a technologically progressive environment is not simply determined by past performance or the performance of reference organizations. Thus, organizations with higher levels of absorptive capacity will tend to be more proactive, exploiting opportunities present in the environment, independent of current performance.

To sum up, absorptive capacities contribute to a firm's risk-taking capabilities in two ways. First, firms can perceive "windows of opportunity" in terms of the firm's endowment of absorptive capacities. Second, firms with high levels of absorptive capacity are more able to shape the whole risk-seeking process, especially risk understanding and risk assessment. Thus, we propose the following hypothesis.

**Hypothesis 2.** Firms equipped with more absorptive capacities will conduct more risk-taking behavior.

#### The capabilities of allocating and diversifying risk—network resources

According to the analysis of [Miller and Lessard \(2000, p. 88\)](#), "risk management is a sequential process that includes risk assessment, risk hedging, risk diversification, option creation, risk transformation, and the embrace of residual risks." Network resources may help firms with risk control. In the first place, firms may gain valuable information from a network of resources. It appears that the greater the information, the better the opportunities ([Gulati, 1999](#)). [Spithoven and Teirlinck \(2015\)](#) also suggested that network resources as external resources can be considered one of the determinants of a firm's risky R&D investment. Thus, resources embedded in networks supply the channel with information that is valuable for recognizing profitable opportunity as well as risk appraisal. In the second place, network resources enhance the ability of organizations to learn

about new alliance opportunities with reliable partners (Gulati, 1995). Firms can acquire complementary resources (e.g., knowledge, capital, technology, legitimacy, distribution channels, etc.) from cooperation. Furthermore, through strategic alliances, firms can transfer or share risk to competent partners that are capable of dealing with specific risks. For example, coalitions with host governments or affected parties may mitigate institutional risk. Likewise, building alliances with upstream manufacturers can stabilize input prices. Therefore, firms may attenuate the sources of uncertainty through partnership arrangements. Miller and Lessard (2000, p. 89) demonstrated that:

Relative superiority in risk bearing may arise for any one of three reasons: (1) some parties may have more information about particular risks and their impact than others; (2) parties or stakeholders may have different degrees of influence over outcomes; (3) investors may differ in their ability to diversify risks.

Thus, we see that organizations with more network resources can garner profitable opportunities more effectively and strategize risks, which tend to take more risks.

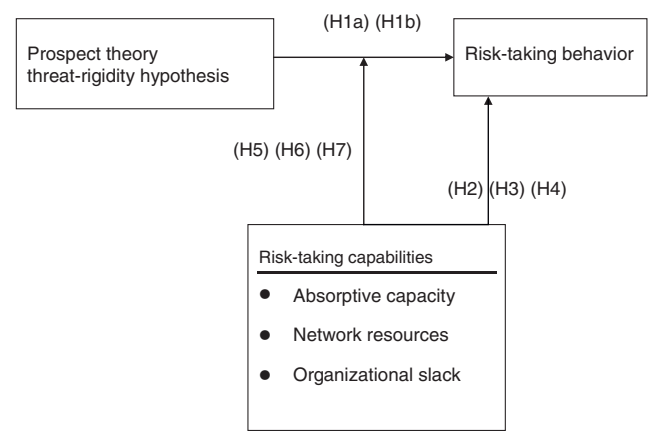
**Hypothesis 3.** Firms equipped with more network resources will conduct more risk-taking behavior.

#### The capabilities of buffering risk—organizational slack

Firms with high absorptive capacities may foresee valuable opportunities and therefore strategize risks. However, organizational changes may trigger resource competition within the organization. Several studies have agreed that organizational slack facilitates risk-seeking activities (Cyert and March, 1963; Singh, 1986; Nohria and Gulati, 1996; Mone et al., 1998; Chattopadhyay et al., 2001; Voss et al., 2008). For example, slack resources facilitate product exploration (Voss et al., 2008), risk-taking (Singh, 1986), and innovation (Nohria and Gulati, 1996). Without slack resources, firms are unlikely to create novelty. Possessing a stock of slack can protect organizations from uncertainty, allowing them to time to wait to realize improved performance after risk-taking strategies. In other words, the researchers suggested that slack, like a cushion, can buffer the impact of adverse environmental events. Holding more slack resources in an organization can increase the possibility of experimentation and organizational change (Cyert and March, 1963; Singh, 1986).

From the organizational theoretical points of view, the benefits of slack outweigh its costs. However, agency theory predicts a negative relationship between slack and performance because slack may cause agency problems that breed inefficiency (Tan and Peng, 2003). Even though the relationship between slack and performance is tangled, researchers generally believe that organizational slack initiates higher risk strategic behaviors such as diversifying to new products or new markets. Hence, we hypothesize that risk-seeking decisions are more likely to be supported and to gain legitimacy within an organization when there are sufficient slack resources in the firm.

**Hypothesis 4.** Firms equipped with more organizational slack will conduct more risk-taking behavior.



**Figure 1** The hypothesized model of the determinants of risk-taking behavior.

#### The moderating role of risk-taking capabilities on the relationship between past performance and risk-taking behavior

In line with the forgoing assertion, we will try to reconcile the arguments of threat-rigidity hypothesis with those of the RBV risk-based viewpoint to predict the risk-taking behavior of a firm. We see from the literature that prospect theory originally dealt with the relationship between risk attitude and current position compared to a reference point. However, the threat-rigidity hypothesis maintained that an organization was incapable of dealing with adverse environments. Thus, as Ocasio (1995) pointed out, threat-rigidity is associated with uncertainty and uncontrollability, whereas prospect theory is associated with loss. To reconcile these two arguments, we can determine that whether an environmental event is interpreted as a threat or an opportunity is contingent on an organization's resource endowments. That is, firms are inclined to interpret new issues as opportunities when they are able to deal with them. Thus, we hypothesize that risk-taking capabilities could moderate the relationship between past performance and risk-taking behavior, and depict the research framework as shown in Fig. 1.

**Hypothesis 5.** The relationship between past performance and risk-taking behavior is more positive for firms with more absorptive capacities than for firms with fewer absorptive capacities.

**Hypothesis 6.** The relationship between past performance and risk-taking behavior is more positive for firms with more network resources than for firms with fewer network resources.

**Hypothesis 7.** The relationship between past performance and risk-taking behavior is more positive for firms with more organizational slack than for firms with less organizational slack.

#### Data and method

The empirical context of this study considers the information technology and electronics industries for two reasons.

First, firms in these industries encounter much uncertainty regarding quickly shifting consumer demand and rapid developments in technology. Second, these firms are inclined toward high-risk strategic investments such as mergers, acquisitions, and vertical or horizontal integration because of the pressures of hyper-competition. Therefore, these high-technology industries are good examples for studying the drivers of risk-taking activities and the consequences on performance.

We collected data from the Taiwan Economic Journal (TEJ) Financial Data Bank and the Corporate Governance Data Set. The samples included firms that went IPO before 2003 and survived until at least 2007. After culling firms with missing values in the preliminary dataset-278 firms, we acquired the financial data and the corporate governance information of 230 firms. They come from 8 segmentations of high-tech industry-semiconductor, computer and peripheral equipment, optoelectronics, communications and Internet, electronic components, electronic products distribution, information services, and other electronics. Since [Chou and Yang \(2011\)](#) argued that "the story of Taiwan's rise to prominence in the high-tech sector provides an interesting example for other economies. After more than 50 years of joint endeavors between government and business, the high-tech industry is performing well. (p. 67)" so that Taiwan's high-tech industrial development can serve as fitted sample for this study. Then, a cross-sectional analysis was employed to test the hypotheses in this study.

## Measurements

### Risk-taking behavior

The risk behavior can reflect risky investment ([Kraiczy et al., 2015](#)), especially on related diversification, therefore, we tested our hypotheses in the context of diversification and measured risk-taking behavior at the firm level by three dimensions: (1) the proportion of investment, (2) variances of return on investment (ROI) of target firms, and (3) relatedness between focal firm and target firms.

We calculated the proportion of investment as investment in equity securities with significant influence over total assets in the year 2006. This definition eliminates investments in debt securities and available-for-sale securities, which are recorded as long-term investment accounts on balance sheets and do not concern us. When the focal firm acknowledges a substantive economic relationship with a target firm, for example a "significant influence" or "controlling interest" (generally an investment of 20% or more), the focal firm must account for the investments using the equity method in accounting. In the other words, the focal firm indicates high resource commitment (and therefore high-risk involvement) in the target firm via the equity method. Hence, it is reasonable to perceive increasing investment using the equity method as a measure of the degree of exposure risk. In other words, greater equity investment indicates greater risk exposure for the investing corporation. We divided equity investments by total assets to control firm size effect.

The second indicator is variances of ROI of target firms. Previous studies have defined risk as the unpredictability of

income stream ([Bowman, 1980](#); [Fiegenbaum and Thomas, 1988](#); [Bromiley, 1991](#)). The greater the variances of target firms' ROI, the less predictable the investing income stream and consequently the more risk. We averaged the variances of ROI within the five years before 2006 to measure the risk of target firms and averaged the number of each target firm to form a single number for measuring the focal firm's investing risk.

The third indicator of risk-taking behavior is relatedness between focal firm and target firms. Previous research has found that the performance of related diversification was better than unrelated diversification under the rationale of resources leverage or organizational synergy ([Rumelt, 1984](#); [Montgomery and Wernerfelt, 1988](#); [Simmonds, 1990](#)). Thus, focal firms will incur more risks when they enter unrelated businesses. We used the North American Industry Classification System (NAICS) six-digit code to find the industry code for focal firm and target firm and defined that two businesses are related if they are within the same four-digit code. We coded relatedness as "0" and otherwise "1," and then averaged the number of unrelatedness over the number of total target firms to form a single number to measure the focal firm's risk behavior. It is plausible to predict that the higher the ratio, the more risk the focal firm will have to bear.

We employed a factor analysis with the three measurements to form a single indicator for risk-taking behavior. The results showed that all are loaded above 0.5 on a single factor with an eigenvalue of 1.265, and the factor loading was 0.68, 0.50, and 0.75, respectively. Then we used factor score to measure the focal firm's risk-taking behavior. The factor score shows the degree of the focal firm's risk-taking behavior in the context of diversification.

We then discussed the measurements of independent variables. To stabilize the value of independent variables, we used the average number of the three years before 2006 to predict the dependent variable.

### Past performance

*Sales growth.* According to prospect theory, the choice of reference points will influence the perception of decision-makers about negatives or positives. In previous research, organizations commonly selected their reference point, aspiration level, or multidimensional strategic reference points on the basis of their own past performances and the average performance of the industry ([Bromiley, 1991](#); [Cyert and March, 1963](#); [Fiegenbaum and Thomas, 1988](#); [Fiegenbaum et al., 1996](#); [Shoham and Fiegenbaum, 2002](#); [Wiseman and Bromiley, 1996](#)). As the samples of this study present business-to-business relationships in the markets, sales growth can be regarded a suitable indicators to measure a firm's past performance as a reference point ([Tuli et al., 2010](#)). We chose sales growth to measure the focal firm's sales performance in its core business ([Stam and Elfring, 2008](#)). Sales growth was calculated as the percent change in total sales over the previous year. We averaged sales growth of the previous three years as the proxy of the focal firms' sales performance. To control industry effect, we separated our data into eight segments according to the categories of Taiwan Stock Exchange (TSE): semiconductor, computer and peripheral equipment, optoelectronics,

communications and Internet, electronic components, electronic products distribution, information services, and other electronics. We calculated the mean of sales growth in each segment as a benchmark, and then subtracted the industry mean from own performance to measure the focal firm's relative sales performance.

### Risk-taking capabilities

In the previous discussions, we deconstructed risk-taking capabilities into three dimensions—absorptive capacity, network resources, and organizational slack. The variables to measure these concepts are discussed below.

#### Absorptive capacity

*R&D intensity.* A firm's absorptive capacity is measured by R&D intensity, which is calculated as the ratio of R&D expenditures to sales (Cohen and Levinthal, 1990; Tsai, 2001; Luan and Tang, 2007; Ben-Oz and Greve, 2012). Cohen and Levinthal (1990) suggested that R&D expenditure contributes to a firm in two ways, first by creating new knowledge and then by broadening the firm's absorptive capacity. In high-technology industries, R&D expenditure is always related to a firm's internal capabilities (Spithoven and Teirlinck, 2015). Thus, it seems reasonable to suppose that R&D intensity correlates positively with identifying valuable opportunities and enabling the firm to engage in risk-taking activities.

*Investing experience.* In the context of investment decision-making, we adopted a different indicator to measure absorptive capacity, namely the firm's previous investing experience. The development of absorptive capacity is somewhat "domain-specific" and "path-dependent" (Cohen and Levinthal, 1990). Previous investing experience, whether successful or not, contributes to a firm's specific knowledge or rigidity (Meschi and Métais, 2015), or accumulate management capabilities (Geppert et al., 2013). Such experience is tacit and guides the cognitive formation of decision-makers. Furthermore, the experience can influence a firm's ability to map and face the risk landscape (Miller and Lessard, 2000). Meschi and Métais (2015) found that failure experience of M&A is negatively correlated with future acquisition performance. To sum up, the benefits of experience can translate into specific knowledge regarding management of project risk. We used average investing experience, calculated as the average ratio of long-term investments to total equity in the previous three years, to represent potential absorptive capacity, since a firm's investing experience is positively correlated with risk-taking capabilities.

#### Network resources

*Board size.* We use board size, the number of members on the board, to measure an organization's ability to acquire critical resources from external linkages. The relationship between board size and performance remains unclear. According to resource dependence theory, larger boards are positively associated with firm performance because larger boards have more potential for gathering complementary resources. However, larger boards may be less cohesive and less able to reach consensus, which leads to dysfunction in decision-making (Dalton et al., 1999). In this study, we

consider the benefit of larger boards with regard to improved acquisition of external information or resources. Thus, we assert that larger boards contribute to risk-taking capability by increasing potential channels of external resources.

*Linkages to government and banks.* Creating relationships with governments may generate support from related governmental institutions and sometimes protect focal firms from political and economic risk. Linkages to financial institutions often supply a channel to generate loans at a relatively lower market rate (Lee et al., 2001). Lee et al. (2001) hypothesized that linkages to commercial banks and government agencies will improve the performance of a technological start-up company. Stam and Elfring (2008) argued that bridge ties, such as financial institutions, law firms, and so on, will moderate the relationship between entrepreneurial orientation and performance. Thus, we assume that focal firms will benefit from linkages to governments and banks. We measured these linkages by the ratio of shares held by governments and banks over total shares.

#### Organizational slack

In the early research, organizational slack is usually divided into unabsorbed slack and absorbed slack. The former is related to excess, uncommitted, and easily redeployed resources; the later corresponds to excess cost and committed resources (Singh, 1986; Hambrick and D'Aveni, 1988; Tan and Peng, 2003). Other researchers divide organizational slack into recoverable slack, available slack, and potential slack (Bromiley, 1991; Cheng and Kesner, 1997; Reuer and Leiblein, 2000). One may notice that the measurements of recoverable slack and available slack are all connected to short-run indices such as current ratio, working capital, the ratio of accounts receivable to sales, the ratio of operating expenses over sales, etc. However, potential resources are related to long-term indices. For example, potential slack can be measured by the ratio of debt to equity (Bromiley, 1991) or by the ratio of equity to debt (Cheng and Kesner, 1997). In addition to financial slack, Voss et al. (2008) hypothesized that product exploration was related to other kinds of slack, such as customer relational slack, operational slack, and human resource slack.

In our empirical setting, we adopt two kinds of financial slacks to measure organizational slack.

*Current ratio.* A company's current ratio, i.e., current assets divided by current liabilities, can be used as an indicator of liquidity ratios that measure a company's short-run abilities to pay its maturing obligations. Researchers use current ratio to represent available slack that is uncommitted and easily redeployed within the organization (Bromiley, 1991; Cheng and Kesner, 1997). We assume that current ratio is positively correlated with risk-taking capabilities in the short-run.

*Debt ratio.* We employed debt ratio, calculated as the ratio of debt to total assets, as the proxy of a firm's potential slack, which represents the focal firm's borrowing capacities. A firm with a high debt to total assets ratio has a relatively low shield against long-term creditors and thus has little future borrowing potential. For the purpose of controlling a target firm, the focal firm should preserve sufficient financial slack to deal with turbulence or shock. Consequently, it is reasonable to predict that there is a

negative correlation between debt ratio and risk-taking capabilities.

### Control variables

Since the composition of a board can be highly correlated with firm's risk-taking behavior, we control for firm board independence. "Board independence implies a board is able or willing to provide guidance that does not necessarily mirror the will of the CEO" (Dalton et al., 1999, p. 678). It is plausible that top managers might take a high-risk investment at the expense of principals. The number of outside directors is usually a measurement of board independence, and a high proportion of outsiders is associated with higher financial performance. It is generally agreed that outsiders act as a monitoring mechanism that helps mitigate agency problems, but we should not overlook the fact outside directors are employed by the CEO. Thus, a high proportion of outsiders cannot guarantee a reduction of agency problems. We adopt two indices to measure board independence—shareholding ratio of major shareholders and seating-controlled ratio of major shareholders. We obtain this data from the TEJ Corporate Governance Dataset. We assumed that major stockholders will engage in high-risk activities if there are not appropriate monitoring mechanisms. We also control for firm age, because the age of a firm is generally thought to induce organizational inertia and thus reduce the possibility of organizational changes. That is, younger firms are more inclined to take risks than older firms.

### Method

We employed multiple regressions to test our hypotheses. To test the additive effects of past performance, risk-taking capabilities, and between interaction past performance and risk-taking capabilities, we ran several models for each set of independent variables. Model 1 consists of all control variables as a benchmark. Model 2 tests all of our hypothesized main effects. To test interaction effect of past performance and risk-taking capabilities, we created six interaction terms. To minimize collinearity, we mean-center the independent variables before creating interaction terms. We did not dump all interaction variables into a single model because the correlations between some interaction terms are too high (Lee et al., 2001). To avoid multicollinearity problems, we ran separate regression models to test our interaction items. Interaction effects of past performance and absorptive capacities, network resource, and organizational slack were added in Models 3, 4, and 5, respectively. Table 2 shows the descriptive statistics and correlation matrix of the variables in these models.

### Results and discussion

Table 3 shows the results of the regression analyses. Model 1 tests for the net effect associated with the control variables, which explains a significant share of the variance in risk-taking behavior (Model 1:  $R^2 = 0.381$ ,  $p < 0.001$ ). The results for the control variables are reasonable. High levels of share ownership or seats-controlled may result in high risk-taking

Table 2 Descriptive statistics and correlation matrix.

Variable	Mean	Std. deviation	1	2	3	4	5	6	7	8	9	10
1. Risk-taking behavior	.00	1.00										
2. Sales growth (%)	24.59	52.94	.030									
3. R&D intensity (%)	3.62	3.67	-.191**	.113								
4. Investing experience (%)	40.59	31.23	.282**	-.133*	-.212**							
5. Board size	9.39	1.90	-.045	.048	-.012	-.075						
6. Linkage to governance and banks (%)	2.46	3.20	.151*	-.004	-.064	.052	.192**					
7. Current ratio (%)	236.59	275.48	-.117	.673**	.461**	-.228**	-.037	-.036				
8. Debt ratio (%)	40.38	13.52	.012	.030	-.410**	.231**	.018	-.065	-.369**			
9. Seating-controlled ratio of major shareholders (%)	58.02	19.08	.349**	-.004	-.111	.194**	-.001	.076	-.086	.001		
10. Shareholding ratio of major shareholders (%)	14.95	8.12	.101	-.051	-.024	-.009	-.132*	.037	-.024	-.133*	-.134*	
11. Age	20.02	8.614	.116	-.077	-.220**	.203**	-.102	-.010	-.104	-.010	.225**	.001

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



**Table 3** Result of regression analyses.<sup>a</sup>

Dependent variable: risk-taking behavior					
Variables	Model 1	Model 2	Model 3	Model 4	Model 5
<i>Control variables</i>					
Age	.034	-.280	-.057	-.028	-.032
Seating-controlled Ratio	.361 <sup>***</sup>	.285 <sup>***</sup>	.270 <sup>***</sup>	.269 <sup>***</sup>	.272 <sup>***</sup>
Shareholding ratio of major shareholders	.150 <sup>†</sup>	.114 <sup>†</sup>	.111 <sup>†</sup>	.133 <sup>**</sup>	.079
<i>Main effects</i>					
Sales growth		.198 <sup>†</sup>	.177 <sup>†</sup>	.014	.169 <sup>†</sup>
R&D intensity		-.109	-.049	-.056	-.102
Investing experience		.217 <sup>***</sup>	.402 <sup>***</sup>	.225 <sup>***</sup>	.217 <sup>***</sup>
Board size		-.046	-.054	-.067	-.078
Linkage to governance and bank		.107 <sup>†</sup>	.104 <sup>†</sup>	.125 <sup>**</sup>	.097
Current ratio		-.172 <sup>†</sup>	-.183	-.286 <sup>**</sup>	-.266 <sup>†</sup>
Debt ratio		-.126 <sup>†</sup>	-.082	-.083	-.144 <sup>†</sup>
<i>Interactions</i>					
Sales growth * R&D Intensity			.428 <sup>**</sup>		
Sales growth * investing experience			.503 <sup>***</sup>		
Sales growth * board size				-.124 <sup>†</sup>	
Sales growth * linkage to government and bank				-.120	
Sales growth * current ratio					.483 <sup>**</sup>
Sales growth * debt ratio					.291 <sup>***</sup>
R <sup>2</sup>	.381	.484	.542	.512	.517
ΔR <sup>2</sup>		.103 <sup>***</sup>	.058 <sup>***</sup>	.028 <sup>†</sup>	.033 <sup>**</sup>
Adjusted R <sup>2</sup>	.134	.200	.255	.221	.267
F-value	12.792 <sup>***</sup>	6.715 <sup>***</sup>	7.526 <sup>***</sup>	6.409 <sup>***</sup>	6.594 <sup>***</sup>
N	230	230	230	230	230

<sup>a</sup> Standardized coefficients are reported.

<sup>†</sup>  $p < 0.1$ .

<sup>\*</sup>  $p < 0.05$ .

<sup>\*\*</sup>  $p < 0.01$ .

<sup>\*\*\*</sup>  $p < 0.001$ .

of firm because of lack of strong monitoring. Age is not significantly associated with risk-taking behavior in our model. Model 2 shows that the direct effects of past performance and risk-taking capabilities explain a significant portion of the variance in risk-taking behavior (Model 2:  $R^2 = 0.484$ ,  $p < 0.001$ ;  $\Delta R^2 = 0.103$ ,  $p < 0.001$ ).

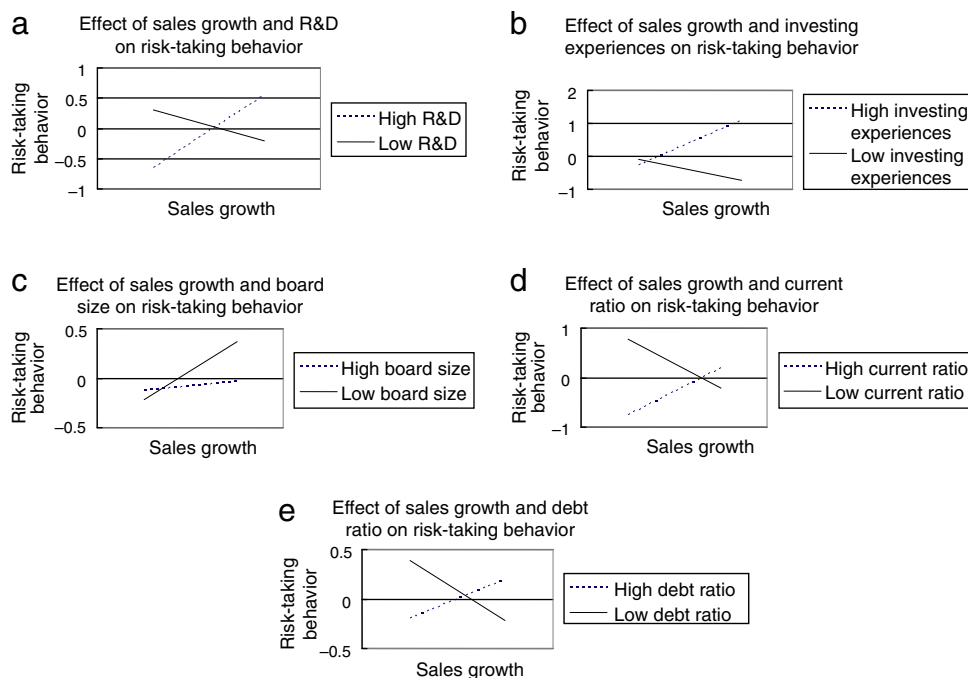
Model 2 reports the results for our hypotheses. **Hypothesis 1a**, which agrees with prospect theory by predicting a negative association between past performance and risk-taking behavior, is not supported by our data. In fact, our data indicates that the relationship between past performance and risk-taking behavior is positive. This result is consistent with the arguments of the threat-rigidity hypothesis ( $\beta = .198$ ,  $p < 0.05$ ), which implies that better past performance tends to increase risk-taking behavior. Thus, **Hypothesis 1b** received moderate support.

**Hypothesis 2** suggests that absorptive capacity is positively associated with risk-taking behavior. Using previous investing experience as a measurement of absorptive capacity, we found a positive association with increased risk-taking behavior i.e., the coefficient for previous investing experience is positive and strongly significant ( $\beta = .217$ ,  $p < 0.001$ ). Although we also predicted that R&D intensity should be positively related to risk-taking behavior, our

results produced diverse results ( $\beta = -.109$ , n.s.) that are not significant. Thus, **Hypothesis 2** is partially supported.

Regarding **Hypothesis 3**, which suggested that network resources are positively associated with risk-taking behavior, board size is found to have a negative effect on risk-taking behavior, but it is not significant ( $\beta = -.046$ , n.s.). We also predicted a positive relationship between linkages to governments and banks and risk-taking behavior, a prediction supported by our data. The coefficient for linkages is positive and marginally significant ( $\beta = .107$ ,  $p < 0.1$ ). Thus, **Hypothesis 3** is also supported partially.

In keeping with **Hypothesis 4**, which predicts a positive association between organizational slack and risk-taking behavior, the debt ratio shows significant influence on risk-taking behavior. The coefficient for the debt ratio is negative ( $\beta = -.126$ ,  $p < 0.1$ ), and the result is plausible. A firm with a high debt ratio will have reduced borrowing capacities in the future, hence inhibiting risk-taking investment. On the other hand, the relationship between current ratio and risk-taking behavior is also significant ( $\beta = -.172$ ,  $p < 0.1$ ), but it produced diverse results. The reason may be that the current ratio is a measure of short-term solvency that cannot satisfy the need for long-term cash flow. Thus, firms keep enough current assets to deal with short-term needs and



**Figure 2** Moderating effects of risk-taking capabilities on the relationship between past performance and risk-taking behavior.

hence crowd the need of long-term investments. The other reason may be that inventory accounts for a large portion of current assets, but inventory cannot supply the cash flow of long-term investments in time. Hence, [Hypothesis 4](#) is supported partially.

We test our contingency hypotheses in Models 3, 4, and 5. Model 3 shows that the interaction effects of past performance and absorptive capacities explain a significant portion of the variance in risk-taking behavior (Model 3:  $R^2 = 0.542$ ,  $p < 0.001$ ;  $\Delta R^2 = 0.058$ ,  $p < 0.001$ ). [Hypothesis 5](#) predicts that the association between past performance and risk-taking behavior will be more positive for firms with high absorptive capacities than for firms with low absorptive capacities. We found strong support for this hypothesis. The results in Model 3 showed that the interaction between sales growth and R&D has a statistically significant, positive effect on risk-taking behavior (Model 3:  $\beta = .428$ ,  $p < 0.01$ ). The interaction between sales growth and investing experience also has a statistically significant, positive effect on risk-taking behavior (Model 3:  $\beta = .503$ ,  $p < 0.001$ ).

Model 4 shows that the interaction effects of past performance and network resources explain a significant portion of the variance in risk-taking behavior (Model 4:  $R^2 = 0.512$ ,  $p < 0.001$ ;  $\Delta R^2 = 0.028$ ,  $p < 0.05$ ). [Hypothesis 6](#) predicts that the association between past performance and risk-taking behavior will be more positive for firms with high network resources than for firms with low network resources. The results in Model 4 show that the interaction between sales growth and board size has a marginally significant, negative effect on risk-taking behavior (Model 5:  $\beta = -.124$ ,  $p < 0.1$ ). Our data produced diverse results for [Hypothesis 6](#). The reason may be that larger boards may be less cohesive and less able to reach consensus, which leads to dysfunction in decision-making (Cheng, 2008; Dalton et al., 1999). Thus, firms with large boards will find it more difficult to facilitate

a high-risk strategy than firms with small boards. The interaction between sales growth and linkage to governments and banks has a negative but insignificant relationship with risk-taking behavior (Model 4:  $\beta = -.120$ , n.s.). Thus, [Hypothesis 6](#) is not supported.

Model 5 shows the interaction effects of past performance and organizational slack. The addition of this interaction term significantly increased the variance explained in risk-taking behavior (Model 5:  $R^2 = 0.517$ ,  $p < 0.001$ ;  $\Delta R^2 = 0.033$ ,  $p < 0.01$ ). [Hypothesis 7](#) predicts that the association between past performance and risk-taking behavior will be more positive for firms with high organizational slacks than for firms with low organizational slacks. As shown in Model 5, the interactive effect of sales growth and current ratio is positive and statistically significant (Model 5:  $\beta = .483$ ,  $p < 0.01$ ). The result is consistent with our prediction. However, we found diverse results of interactive effect between debt ratio and sales growth in risk-taking behavior (Model 5:  $\beta = .291$ ,  $p < 0.001$ ). Aggregating the results from Models 4 and 5, we also observed that linkage to governments and banks is strongly significant in Model 4 ( $\beta = .125$ ,  $p < 0.01$ ). Thus, the reason may be the focal firms could acquire support from government or banks, and therefore adopt a high debt policy. This can reflect that the business-government relationship has been highly correlated with loans of businesses in emerging economies (Chung, 2006; Park, 1990).

To better understand the interaction effects, we plotted the relationship between past performance and risk-taking behavior at high and low levels, separately, of absorptive capacities, network resources, and organizational slacks. We define the low level as the minus one standard deviation from the mean and high level as plus one standard deviation from the mean. [Fig. 2](#) shows the results. Supporting [Hypothesis 5](#), [Fig. 2a](#) shows that the relationship

between sales growth and risk-taking behavior is strongly positive when R&D is high and negative when R&D is low. Fig. 2b indicates that the relationship between sales growth and risk-taking behavior is strongly positive when investing experience is high and negative when investing experience is low.

Contrary to the prediction of Hypothesis 6, Fig. 2c indicates that the relationship between sales growth and risk-taking behavior is positive when board size is low and becomes insignificant when board size is high. However, partial supporting Hypothesis 7, Fig. 2d shows that the relationship between sales growth and risk-taking behavior is strongly positive when current ratio is high and negative when current ratio is low. Fig. 2e shows that the relationship between sales growth and risk-taking behavior is positive when debt ratio is high and negative when debt ratio is low.

## Conclusion and contribution

In conclusion, as far as the factors influencing a firm's risk-taking behavior are concerned, the good conditions of firm performance, investing experience, the linkages to governments and banks, slacks, and some joint efforts—interactions between firm performance and absorptive capacity, and slack—can further make firms embrace risks. However, are the two perspectives of prospect theory and threat rigidity hypothesis aligned with the opposite prediction signs about the impact of firm performance on risk-taking behavior? The evidence-based findings provide some insights toward this theoretical debate. As firms have a low level of R&D intensity, a low level of investing experience, and a low level of current ratio (see Fig. 2a, b and d), firm performance is negatively correlated with risk-taking behavior. This is consistent with the prospect theory argument (Kahneman and Tversky, 1979), implying that firms are inclined to risk seeking when they are in a negative condition and equipped with low risk-taking capabilities. Firms engage in high-risk activities because they feel they have little to lose, and then discount the impact of future losses in the hope of achieving substantial gains. The gambler-like intent presents that the firms have no choice. On the other hand, these figures above reveal positive slopes between firm performance and risk-taking behavior given a higher level of absorptive capacity and organization slack, and the positive slopes indicate that the predictions of threat-rigidity hypotheses are robust: firms perceiving threat will prefer less risky alternatives (Shimizu, 2007). Thus, this research contributes by incorporating the role of risk-taking capabilities to better understand factors affecting risk-taking behavior and to settle the theoretical debate between prospect theory and threat-rigidity hypotheses.

This study also contributes by categorizing risk-taking capabilities (i.e., absorptive capacity, network resources, and organizational slack). The evidence-based findings demonstrate that these capabilities can not only mitigate risks but also interact with status of firm performance so that firms equipping with these capabilities are likely to embrace risks. This kind of categorization concerning risk-taking capabilities is related to different levels of risks a firm can deal with. Albeit a pilot run, we propose this to

differentiate risks and classify risk-taking capabilities to apply for future research.

In addition, the empirical results may provide multiple managerial implications. First, decision makers should take the firm's performance as well as risk-taking capabilities into consideration as making risky strategic or investment decisions. Not only the performance level and risk-taking capabilities themselves but also their interactive effects can influence risk-taking behavior. To increase the level of a firm's risk bearing, managers should implement strategic plans to accumulate these risk-taking capabilities, for instance, via maintaining the competitive R&D investment, learning from investment experience, keeping a healthy financial status and loan borrowing capabilities, and building a good relationship with government and banks. For instance, CPC Corporation, Taiwan, with supports of MEGA International Commercial Bank, has cooperated with Japan Bank for International Cooperation, and conducted a risky investment to expand the firm's businesses.<sup>2</sup> These practices are beneficial to evaluate and establish risk-taking capabilities that can increase level of a firm's taking risks.

This paper also provides implications for investment institutions. High risk implies high returns (Kiyamaz, 2015), however, it also implies greater variance about the return of investment. To tolerate the risks, investment institutions can take these aspects of risk-taking capabilities into account to evaluate whether a firm's risk-taking behavior is in accordance with risk-taking capabilities. The capabilities can imply a firm's capabilities to bear risks as well as to accomplish its strategic intent. For example, the slack level of Foxconn (TW-2317) is quite high and has been appreciated by several foreign investment institutions (FII).<sup>3</sup> Moreover, governments of emerging economies have adjusted policies to invite FII to infuse investment into infrastructures and important industries, and the evidence-based findings from Taiwan can offer some critical evaluation criteria for these FII toward their investment decisions in emerging economies.

The paper has certain limitations, as follows. First, we only use specific measurements of risk-taking capabilities in a context of diversification. This method may, in fact, limit generalizability. Text mining techniques, such as natural language processing, could be useful to reach a higher level of consistency with the focal firm's strategic development paths. Hence, future research may consider a qualitative approach (obtained via in-depth interviews or natural language processing) to supplement the studies.

Second, we focus on firms' financial aspects about risk-taking for this study. Future researchers may extend the present assessment for a more comprehensive understanding of risk-taking capabilities and risk-taking behavior. Last but not least, the present study examines firms in the electronics sector in Taiwan and does not include firms from other sectors in other economies. Hence, the empirical findings may restrict generalizability of these results to other industries or other economies. In future research, this study

<sup>2</sup> <https://www.jbic.go.jp/ja/information/press/press-2015/0916-42312> (in Japanese).

<sup>3</sup> <http://www.chinatimes.com/newspapers/20151120001057-260202> (in Traditional Chinese).

should be extended to other sectors in other economies for comparative studies to validate the explanatory power of the current findings.

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