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The Effects of CEO Overconfidence on Speed of Internationalization and Extreme MNE Performance

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Abstract

This study examines how overconfident CEOs impact the speed of internationalization and extreme MNE performance. According to the CEO overconfidence literature, it proposes that overconfident CEOs tend to pursue a rapid pace of international expansion, thereby achieving extreme MNE performance. It also argues that vigilant boards weaken not only the relationship between overconfident CEOs and the speed of internationalization but also the relationship between overconfident CEOs and extreme MNE performance. The empirical results support the notion that CEO overconfidence is positively related not only to the speed of internationalization but also to the extreme performance of MNEs. However, this study does not find that board vigilance plays a moderating role in affecting the above relationships. To summarize, this study contributes to the field of international business by highlighting the importance of microfoundations. The implications of this study also facilitate our understanding of the impacts of cognitive bias in general, CEO overconfidence in particular, on the internationalization process, or the speed of internationalization, and MNE performance.

Keywords: CEO overconfidence, Performance extremeness, Speed of internationalization

1. Introduction

A Chief Executive Officer (CEO) determines critical strategic choices, which consequently affect firm performance (Child, 1972; Hambrick & Mason, 1984). Following this line of research, prior studies have extensively explored how observable characteristics of CEOs or corporate elites, such as their age, education, experience, abilities, and social ties, impact both strategic decisions and firm performance (Eisenhardt & Schoonhoven, 1996; Hambrick & Mason, 1984). In the field of international business, research also documents the importance

of micro-foundational rationale (Maitland & Sammartino, 2015). Most of these studies are based on rationality and have underexplored cognitive biases. Since CEOs are not always rational, as a key assumption of classic economics, recently, CEO overconfidence, a type of cognitive bias or psychological characteristics of CEO, has received great attention (e.g., Chen et al., 2015; Lee et al., 2023; Engelen et al., 2015; Kraft et al., 2025). However, the impact of CEO overconfidence on the speed of internationalization and, consequently, extreme performance remains unclear.

CEO overconfidence refers to the tendency of CEOs to overestimate their own abilities (Malmendier & Tate, 2005; Moore & Healy, 2008). It is a cognitive bias that influences managerial judgments and decisions. A growing body of literature has begun to explore its effects on organizational outcomes. For instance, prior research has documented that CEO overconfidence tends to associated with possessing greater entrepreneurial orientation (Engelen et al., 2015), taking risky R&D projects (Galasso & Simcoe, 2011; Hirshleifer et al., 2012), introducing pioneering products (Simon & Houghton, 2003), engaging in acquisitions frequently (Hayward & Hambrick, 1997). To sum up, prior research suggests that generally overconfident CEOs are more optimistic and likely to overestimate their abilities, as well as to underestimate the risks associated with external environments. Thus, they tend to engage in risky strategies in order to achieve greater positive outcomes, which are the potential outcomes of these strategies.

Entering foreign countries enables a multinational enterprise (MNE) to extend its capabilities or competencies from its countries of origin into other countries, thereby generating superior organizational performance (Hymer, 1976; Tallman & Li, 1996). However, prior literature has indicated that the rapid pace of internationalization may harm MNEs, and thus suggests that MNEs should adopt a gradual internationalization strategy, according to the theory of internationalization (Johanson & Vahlne, 1977 & 1990). Operating in foreign countries presents disadvantages relative to local firms, known as the liability of foreignness, which is primarily derived from adapting to environmental differences between the foreign country and the home country (Hymer, 1976; Zaheer, 1995). To mitigate the risks and uncertainties associated with making resource commitments in foreign countries, MNEs may first enter foreign markets with short psychic distance and then adopt an incremental or step-by-step approach to enter other foreign markets (Johanson & Vahlne, 1977 & 1990). This approach assists MNEs in accumulating adequate knowledge to adapt their operations in foreign countries

However, the theory of internationalization tends to overlook the competitive advantage created by time-based factors (Cohen et al., 1996; Stalk, 1988). Particularly, a firm that enters into foreign markets, specifically emerging markets, early relative to its competitors may receive the first-mover advantage (Lieberman & Montgomery, 1988). Additionally, not only many benefits of international exploitation, such as economies of scale and scope, enlargement of bargaining power, and risk reduction, but also many benefits of international exploration, such as usages of location-specific advantages as well as international networks of operations, are associated operations in multiple foreign countries (Contractor et al., 2003; Lu & Beamish, 2004). Rapid international expansion can help MNEs quickly gain these

benefits.

We also expect that CEO overconfidence may be associated with extreme performance. Most prior studies have only linked CEO overconfidence to strategic actions. However, these studies did not explore how CEO overconfidence impacts performance consequences. On the positive side of CEO overconfidence, it prompts firms to adopt riskier and more innovative strategies, resulting in extraordinary success (Hiller & Hambrick, 2005). However, one can also anticipate that overconfident CEOs may overestimate their firms' abilities and therefore pursue overly ambitious goals. Furthermore, these overconfident CEOs may overemphasize information that aligns with their beliefs and abilities, while ignoring information that contradicts them (Klayman & Ha, 1989; Koriat et al, 1980). Consequently, CEO overconfidence may also increase the likelihood of higher failure probabilities and substantial losses.

Accordingly, this study aims to gain a deeper understanding of the impact of CEO overconfidence in the context of international business. This study first proposes that firms with overconfident CEOs tend to undertake a rapid pace of internationalization rather than gradual international expansion. It further explores how overconfident CEOs impact extreme firm performance. Finally, this study examines how board vigilance moderates the impact of CEO overconfidence. Specifically, this study argues that a vigilant board tends to weaken the effect of CEO overconfidence on the speed of internationalization and stimulate the occurrence of extreme performance, particularly toward the positive and substantial gain side.

This study proceeds as follows. First, this study provides a theoretical foundation and then develops the proposed hypotheses. This section highlights how CEO overconfidence impacts the speed of internationalization, as well as the extremeness of performance. It also stresses that board vigilance may serve as a moderator, thereby modifying the impact of CEO overconfidence. This study then outlines its methodology, including sample selection, data sources, the use of statistical models, and the operationalization of measurements. Finally, following the methodology section, this study discusses its conclusions, contributions to the literature, managerial implications, and limitations.

2. Theory and Hypothesis Development

The overarching theoretical lens of this study is based on the upper echelons theory (Hambrick & Mason, 1984). According to the upper echelons theory, a CEO's personality influences how the CEO selects strategic actions and, consequently, the outcomes of these strategic actions (Hambrick & Mason, 1984). These strategic actions encompass not only strategic initiatives for domestic markets but also those for international markets (Carpenter et al., 2004). For instance, prior research has demonstrated that the characteristics of top executives, such as their international experience, impact a firm's international diversification (Tihanyi et al., 2000) as well as propensity to form international strategic alliances with foreign partners (Lee & Park, 2008). Consequently, we expect that overconfidence, a type of cognitive bias, can influence the strategic choices of executives (Kahneman et al, 1982).

Overconfidence has been proposed to possess several key characteristics (Grinblatt &

Keloharju, 2009; Picone et al., 2008). First, overconfidence is often associated with the better-than-average effect. It suggests that overconfident individuals tend to have an unrealistic self-confidence and believe that their skills and capabilities are superior to those of their peers. This effect drives overconfident individuals who often tend to have unrealistic optimism and thus suffer from optimistic bias. Second, it is also associated with miscalibration. In other words, overconfident individuals tend to believe they can predict uncertain situations accurately (Bazerman & Moore, 2012). Finally, overconfidence is related to the illusion of control, which suggests that overconfident individuals tend to believe they can influence the outcomes of their behaviors.

Applying the concept of overconfidence to business environments, scholars have begun to investigate how overconfident CEOs or top executives impact the strategic actions of firms. For instance, prior research widely proposed that overconfident top executives tend to impact acquisitions, including acquisition frequency (Billett & Qian, 2008; Brown & Sarma, 2007) as well as acquisition premiums (Hayward & Hambrick, 1997; Malmendier & Tate, 2008). Additionally, top executive overconfidence frequently links to risk-taking propensity of a firm, such as engagement of risky R&D projects (Hirshleifer et al, 2012), introductions of risky products (Simon & Houghton, 2003), propensity of entrepreneurial orientation (Engelen et al., 2015), and risk-taking tendency in general (Li & Tang, 2010; Roll, 1986). In this study, we argue that overconfident CEOs are inclined to pursue rapid internationalization and, consequently, experience extreme performance: either huge gains or huge losses. Additionally, this study proposes that board vigilance serves as a moderator that influences the relationships described above.

2.1 The Effects of CEO Overconfidence on Speed of Internationalization and Firm Performance Extremeness

Scholars tend to view rapid internationalization as a risky decision that firms undertake (Johnanson & Vahlne, 1977 & 1990; Zaheer, 1995). First, each foreign country has its own distinctive environment. These environmental dimensions, such as a country's regulations, social norms, customer preferences, and the behaviors of competitors, may differ from those in home countries. To succeed in foreign countries, firms face the challenge of building capabilities to learn and adapt to the local environments (Hymer, 1976; Zaheer, 1995). Since resources and capabilities are required to overcome the challenges faced by international expansion, the school of internationalization suggests that a firm's internationalization process should be incremental (Johnanson & Vahlne, 1977 & 1990). In other words, in the early stages, firms may enter foreign countries that are easier to learn and adapt to. After they have built and accumulated their capabilities to handle challenges caused by foreign environments, they may enter foreign countries with more complex and challenging environments.

Accordingly, this study argues that CEO overconfidence impacts the speed of internationalization. The underlying rationale is based on prior literature which proposes that overconfident CEOs are associated with three mechanisms: first, overestimation of his/her capabilities (Camerer & Lovallo, 1999; Hayward et al., 2006); second, underestimation of the

resources and capabilities needed (Shane & Stuart, 2002); and third underestimation of the uncertainties and complexities of external environments (Kahneman & Lovallo, 1993; March & Shapira, 1987). Thus, overconfident CEOs, through the above three mechanisms, tend to overlook risks and are therefore more willing to make riskier strategic decisions (Chatterjee & Hambrick, 2007; Li & Tang, 2010). The above three mechanisms help us understand how CEO overconfidence is linked to the speed of internationalization.

First, overconfident CEOs are more likely to overestimate their capabilities (Camerer & Lovallo, 1999; Hayward et al., 2006). Such positive illusions enable CEOs to focus on the potential benefits of a strategic decision (Hayward et al., 2006) and to overestimate the chances of success for the strategic implementation (Camerer & Lovallo, 1999; Malmendier & Tate, 2005). In determining the pace of internationalization, we may expect an overconfident CEO to concentrate their attention on the potential benefits of rapid international expansion, including first-mover advantage (Lieberman & Montgomery, 1988) or time-based competitive advantage (Cohen et al., 1996; Stalk, 1988). Since CEOs tend to have an unrealistically optimistic view of themselves, they also tend to overestimate the success rate of implementing rapid international expansions.

Additionally, an overconfident CEO is more likely to underestimate the resources and capabilities required for executing a strategic initiative (Shane & Stuart, 2002). For example, Malmendier and Tate (2005) have demonstrated that overconfident CEOs are more likely to underestimate the financial resources required for investment projects and, consequently, fail to acquire sufficient financial resources from external sources. Such underestimation of resources and capabilities also leads overconfident CEOs to overestimate the probability of implementing risky strategic initiatives (Chatterjee & Hambrick, 2007; March & Shapira, 1992). When facing the strategic decision on the pace of internationalization, overconfident CEOs may tend to believe that they possess sufficient resources and capabilities to overcome the liability of foreignness (Zaheer, 1995). Overconfident CEOs tend to prefer rapid international expansion.

Finally, an overconfident CEO also tends to underestimate the influences of external environments (Kahneman & Lovallo, 1993; March & Shapira, 1987). Scholars have proposed that overconfidence is associated with the “illusion of control” (Langer, 1975), which leads overconfident individuals to believe they have the capabilities to predict external events and thus receive positive outcomes from uncertain and complex environments (Schwenk, 1984, 1986). Consequently, overconfident CEOs tend to exhibit an internal “locus of control” (Hiller & Hambrick, 2005; March & Shapira, 1987), which proposes that they believe the success of a strategic action is determined by internal factors within their control rather than external factors that are beyond their control. In line with Acedo and Jones’ (2007) finding that lower perceptions of risk are associated with rapid internationalization, overconfident CEOs may fail to detect risks associated with external environments and be eager to take riskier strategic initiatives. Consequently, overconfident CEOs tend to overlook the challenges and risks associated with more complex and uncertain international environments when they take rapid international expansions.

The above arguments all expect that overconfident CEOs tend to overestimate the positive potential of rapid internationalization and neglect the greater risks associated with taking this strategic initiative. Therefore, this study argues:

H1: CEO overconfidence is positively associated with the speed of internationalization.

Since overconfident CEOs tend to overestimate their internal resources and capabilities, while also underestimating the challenges and risks associated with external environments, they may seek bold and grandiose strategies, which can negatively impact firm performance. The bold and grandiose strategic actions employed by overconfident CEOs may either yield first-mover advantages (Lieberman & Montgomery, 1988), leading to significant gains, or suffer from misinterpretations or misjudgments of the environment, resulting in huge losses. For instance, Chatterjee and Hambrick (2007) found that narcissistic CEOs tend to receive extreme performance. Similarly, we may expect that overconfident CEOs are more likely to lead to performance extremeness, which is either huge wins or huge losses.

Additionally, given the impact of the CEO on firm performance or performance extremeness is through strategic actions of the firm (Hambrick & Mason, 1984; Carpenter et al., 2004), this study further investigates how overconfident CEOs influence performance extremeness. This study specifically proposes that overconfident CEOs not only impact the speed of internationalization but also performance extremeness, based on the following rationales.

First, the level of firm extremeness is impacted by the resource deployment behavior of overconfident CEOs. CEOs are the ones who determine and allocate the internal resources necessary to support strategic actions, including international expansions (Child, 1972; Hambrick & Mason, 1984). Resource commitments are the fundamental basis for a firm to expand its territories into international markets (Johanson & Vahlne, 1977 & 1990). Since overconfident CEOs tend to overestimate the capabilities of their firms and underestimate the resources and capabilities required (Camerer & Lovallo, 1999; Hayward et al., 2006; Shane & Stuart, 2002), they are more likely to deploy their firms' resources to enter multiple international markets simultaneously. Once more resources can be allocated for international expansions, the pace of internationalization will be expedited. This study therefore expects that overconfident CEOs are more likely to deploy sufficient resources to support a rapid pace of internationalization, which in turn leads to a greater level of performance extremeness.

Another rationale for overconfident CEOs leading rapid international expansions and thus greater firm extremeness is associated with CEOs' risk perception. The rapid pace of internationalization is often associated with greater challenges and risks due to the simultaneous exposure to multiple international environments. However, overconfident CEOs are inclined to underestimate the risks and complexities associated with external environments (Kahneman & Lovallo, 1993; March & Shapira, 1987). They may underestimate the risks and challenges associated with the rapid pace of internationalization. In other words, overconfident CEOs' risk perception of rapid international expansions may be smaller. Consequently, they are more likely to accept the rapid pace of internationalization, which leads to greater performance extremeness. Taken together, we expect that

overconfident CEOs have a positive effect on extreme performance. We therefore argue:

H2: CEO overconfidence is positively associated with the extremeness of MNE performance.

2.2 The Moderating Effects of Board Vigilance

Board vigilance refers to the extent to which a board exercises its monitoring function (Finkelstein & D'Aveni, 1994). According to agency theory (Eisenhardt, 1989; Jensen & Meckling, 1976), the interests and risk preferences of CEOs and their shareholders are often misaligned due to the separation of ownership and control. For those vigilant boards, they receive fewer conflicts of interest and greater incentive to monitor CEOs (Fama, 1980; Fama & Jensen, 1983). Thus, prior research has demonstrated that vigilant boards can be used to handle the issues of agency problems and thus impact strategic actions which a firm undertakes, including the choice of foreign entry mode (Datta, Liang, & Musteen, 2009), the level of R&D investment (Baysinger et al., 1991), and the tendency of corporate entrepreneurship (Shimizu, 2012).

Although prior research has demonstrated that vigilant boards are an effective remedy for agency problems, these studies assume that CEOs are risk-averse and therefore encourage CEOs to undertake riskier strategic actions, based on the risk assumption of agency theory (Jensen & Meckling, 1976; Eisenhardt, 1989). However, overconfident CEOs tend to overestimate their capabilities and underestimate the risk associated with strategic actions. Thus, they often tend to take strategic alternatives in which the risk cannot be fully compensated in the hope of seizing the positive potential and thus undertake unnecessary risk (Busenitz & Barney, 1997; Camerer & Lovallo, 1999; Hiller & Hambrick, 2005). In this situation, the interests of CEOs and shareholders diverge. We therefore argue that highly vigilant boards can effectively exercise their monitoring function. Consistent with agency theory, highly vigilant boards should advocate for a slower pace of internationalization to their CEOs. This study, hence, expects:

H3: Board vigilance weakens the positive relationship between CEO overconfidence and the speed of internationalization.

Similarly, this study also proposes that a vigilant board plays a moderating role in the relationship between an overconfident CEO and performance extremeness. In line with the arguments of agency theory (Jensen & Meckling, 1976; Eisenhardt, 1989), this study predicts that highly vigilant boards can effectively monitor the strategic actions of CEOs. Since rapid international expansions, which are often associated with extremely high risk, may lead firms to suffer huge losses and even jeopardize their survival, highly vigilant boards may be more careful in monitoring overconfident CEOs. Thus, we expect that the occurrences of overconfident CEOs' overestimation of their firms' capabilities and underestimation of the risks and challenges associated with international environments will be reduced under the monitoring of highly vigilant boards. Consequently, this study proposes:

H4: Board vigilance weakens the positive relationship between CEO overconfidence and the extremeness of MNE performance.

3. Methodology

The sample of this study is drawn from Taiwanese publicly traded firms within the electronics industry. Taiwanese electronics firms are well known for providing their products globally. To seize international opportunities and deploy their resources and capabilities effectively, the speed of international expansion and its performance consequences have become a serious issue for CEOs of these firms. A single industry, the electronics industry, is chosen, because the use of such a sample can benefit from more insightful observations, without the contaminations resulted from industry effects. This study collects data from 2009 to 2011, spanning a three-year period. Data on the top executives, the board of directors, and firm information are collected from the Taiwan Economic Journal database, annual reports, firm websites, and press releases. The Taiwan Economic Journal database, a primary data source for this study, is a reliable and widely used data source among scholars (e.g., Chung & Luo, 2013). After dropping observations with missing data for the variables, the final sample comprises 823 observations from 337 Taiwanese electronic MNEs.

Since the sample of this study contains panel data, which includes repeated observations on the same firms, the panel regression models are employed. The first dependent variable of this study, speed of internationalization, is a count measure with non-negative integer values, many of which are equal to zero. Because the data on the speed of internationalization are skewed significantly to the right, regular linear regression models are not appropriate to use. Following prior research suggestions (Cameron & Trivedi, 1986; Greene, 2003), this study thus uses panel negative binomial regression analyses with random effects to test hypotheses 1 and 3. Additionally, because the second dependent variable is performance extremeness, this study employs random-effects panel regression models to test hypotheses 2 and 4. Since an interaction term is included in the models, this study employs the mean centering approach, entering mean-centered predictors into the regression models to alleviate the concern of multicollinearity caused by including the interaction term (Aiken & West, 1991).

3.1 Dependent Variable

Speed of internationalization. It is a critical issue for firms, as it is associated with the need to rapidly develop and deploy resources and capabilities in order to seize opportunities in foreign countries. Consequently, it is a challenging strategic decision for top executives to make. The speed of internationalization can be demonstrated by counting the number of international expansions a firm undertakes within a given time period. Prior research thus measures speed of internationalization as the average number of foreign subsidiaries per year (Lin, 2012; Vermeulen & Barkema, 2002). Following Chang and Rhee's (2011) suggestions, this study measures the speed of internationalization as the number of foreign subsidiaries a firm has created in the past three years, in order to weight recent counts heavily. Therefore, greater numbers of international expansions in the past three years reflect rapid paces of internationalization, while smaller numbers of international expansions in the past three years indicate incremental international expansions. To alleviate concerns about reversed causality, this study collects data on the speed of internationalization for the period 2010-2012 and creates a one-year lag for the independent and control variables.

MNE performance extremeness. This study uses return on assets (ROA), calculated as net income divided by total assets, to construct a measure of performance extremeness. This study collects data on ROA for the period 2010-2013 and uses the data on performance extremeness, calculated as the average of two years (t+1 and t+2). This design offers a temporal lag for CEO overconfidence to impact performance extremeness, thereby alleviating the concern of reversed causality. Similar to prior research (Chatterjee & Hambrick, 2007), this study uses the absolute difference in a firm's ROA from the sample average ROA to measure performance extremeness.

3.2 Independent Variable

CEO overconfidence. Since we are unable to directly measure the extent of CEO overconfidence, prior research has developed various operationalizations to proxy for it (Chen et al., 2015; Hill et al., 2014). For instance, Malmendier and Tate (2005, 2008) used CEO's stock option exercises to measure CEO overconfidence. This approach views CEOs' decisions to exercise their stock options as a proxy for overconfidence. Prior research has also used other approaches, such as media, recent firm performance, and CEO relative compensation to measure CEO overconfidence (Hayward & Hambrick, 1997).

Similar to prior research (Campbell et al., 2011; Malmendier & Tate, 2005), this study measures CEO overconfidence as the change in a CEO's stock holdings based on the CEO's net stock purchases during their service to MNEs. It is operationalized as a CEO's stock holding in his/her MNEs in period t minus the CEO's stock holding in his/her MNEs in period t-1. This approach views CEOs' decisions to change their stock holding as a proxy for overconfidence. Because of CEOs' equity compensation, stock holdings, and firm-specific human capital, CEOs generally bear significant risk associated with their firms. Therefore, in order to avoid being highly exposed to idiosyncratic risk associated with their firms, CEOs should diversify their wealth rather than concentrate their wealth within their own MNEs. However, overconfident CEOs are more likely to increase their stock holding in his/her services to MNEs since they overestimate the future performance of their firms. This study thus employs this behavior to be a proxy to measure CEO overconfidence.

3.3 Moderating Variable

Board vigilance. It is a key indicator to reflect the monitoring function of a board. Prior research has indicated that not only the presence of outside directors on a board, but also their ownership stakes, can reflect board vigilance (Finkelstein & D'Aveni, 1994). Similar to prior research (Lim, 2015), this study constructs an indicator that standardizes and then sums the ratio of outside directors as well as the ratio of outside director shares over the firm's total outstanding shares. Thus, a greater number of this indicator indicates higher board vigilance, while a smaller number of this indicator means a lower level of board vigilance.

3.4 Control Variables

In order to limit alternative explanations, this study includes the following control variables. At the CEO level, this study controls for CEO duality, CEO education level, and CEO tenure. Since CEO duality may reflect the power of the CEO in his or her firm (Finkelstein &

D'Aveni, 1994), it is controlled. It is a dummy variable. When a CEO also serves as the firm's chairperson of the board of directors, the value of 1 is assigned. Otherwise, the value of 0 is given. The CEO's education level may be associated with the risk preference of the CEO and the ability to confront complex international environments (Hambrick & Mason, 1984). It is also controlled by this study. This study creates a category variable to measure the education level of a CEO following prior research (Zhang & Rajagopalan, 2010). The value of 1 to 4 is given to a CEO, which is determined by whether the CEO's highest level of education is a high school diploma or below, an undergraduate degree, a master's degree, or a PhD, respectively. Finally, this study controls for CEO tenure by calculating the number of years a CEO holds the CEO position.

At the firm level, R&D intensity, firm size, and firm age are controlled. Technology capability is an important foundation for a firm to expand its scope into international markets and to build its international competitive advantages (e.g., Hitt, Hoskisson, & Kim, 1997). This study thus controlled for it. This study uses R&D intensity to indicate the technology capability of a firm. R&D intensity is measured by the ratio of R&D expenditure to total sales. Firm size may indicate the extent of resources that can be deployed into international markets within a firm and thus is controlled. This study uses the natural logarithm of the total assets of a firm to measure firm size. Additionally, firm age may reflect the legitimacy of the firm and thus is controlled. It is calculated by the number of years since a firm's inception. Finally, this study creates year dummies to control for time effects.

4. Results

Table 1 presents the means, standard deviations, and correlations for all variables. Table 2 shows the panel negative binomial regression analyses for speed of internationalization. In Table 2, Model 1 is the base model where only the control variables are included, i.e., CEO duality, CEO education level, CEO tenure, R&D intensity, firm size, firm age, board vigilance, and year dummies. The model is significant (Wald Chi-Square = 151.36; $p < 0.001$). Model 2 adds the predictor, CEO overconfidence, and the model is significant (Wald Chi-Square = 154.05; $p < 0.001$). Finally, Model 3 is the full model and adds the interaction, CEO overconfidence * board vigilance. It is also significant (Wald Chi-Square = 154.04; $p < 0.001$).

Table 1. Descriptive Statistics and Correlations

		Mean	*S.D.*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1	Performance extremeness	5.65	6.11	1.00									
2	Speed of internationalization	0.40	1.52	-0.06	1.00								
3	CEO duality	0.40	0.49	0.01	0.04	1.00							
4	CEO education level	2.50	0.79	0.18	-0.06	-0.04	1.00						
5	CEO tenure	14.77	7.99	-0.07	0.11	0.30	-0.24	1.00					
6	R&D intensity	5.32	6.96	-0.05	0.08	0.30	-0.08	1.00					
7	Firm size	15.14	1.26	-0.14	0.40	0.01	-0.05	0.08	-0.21	1.00			
8	Firm age	20.89	8.85	-0.15	0.09	0.12	-0.32	0.48	-0.26	0.16	1.00		
9	Board vigilance	0.00	1.53	0.11	-0.05	-0.04	0.10	-0.17	-0.02	-0.20	-0.28	1.00	
10	CEO overconfidence	-0.09	1.13	0.04	0.04	-0.03	0.03	-0.01	0.00	0.03	0.04	-0.04	1.00

Notes: 1. $N = 823$; 2. Correlations greater than 0.07 in absolute value are significant at the $p < 0.05$ level.

Table 2 Results of panel negative binomial regression analyses for speed of internationalization

		Model 1	***Model 2***	***Model 3***
H1	CEO overconfidence		0.14* [0.07]	0.14* [0.07]
H3	CEO overconfidence * board vigilance			-0.01 [0.04]
Controls				
	CEO duality	-0.18 [0.18]	-0.17 [0.18]	-0.18 [0.18]
	CEO education level	-0.20 † [0.11]	-0.20† [0.11]	-0.21† [0.11]
	CEO tenure	0.00 [0.01]	0.00 [0.01]	0.00 [0.01]
	R&D intensity	0.02 [0.01]	0.02 [0.01]	0.02 [0.01]
	Firm size	0.64*** [0.06]	0.64*** [0.06]	0.64*** [0.06]
	Firm age	0.01 [0.01]	0.01 [0.01]	0.01 [0.01]
	Board vigilance	0.07 [0.05]	0.07 [0.05]	0.07 [0.05]
	Year dummies	Included	Included	Included
	Constant	2.25 [1.90]	2.44 [2.29]	2.40 [2.21]
	Log likelihood	-557.23	-555.14	-555.12
	Wald x^2	151.36***	154.05***	154.04***
	No. of firms	337	337	337
	No. of observations	823	823	823

Notes: S.E. in square brackets; *** p< 0.001; ** p < 0.01; * p < 0.05; † p < 0.10; z test are all two-tailed tests.

In Model 1, the base model of Table 2, firm size (b = 0.64, p < 0.001) is positively associated with speed of internationalization, while CEO education level (b = -0.20, p < 0.1) has a

negative impact on speed of internationalization. Hypothesis 1 suggests that CEO overconfidence positively impacts the speed of internationalization. The coefficient for CEO overconfidence is significant in the full model, Model 3 (b = 0.14, p < 0.05). Hypothesis 1 is therefore supported. Hypothesis 3 expects that board vigilance negatively moderates the association between CEO overconfidence and speed of internationalization in such a way that the effects of CEO overconfidence are less positive in the contexts of greater board vigilance. The coefficient for the interaction between CEO overconfidence and board vigilance is not significant in the full model, Model 3 (b = -0.01, p > 0.10). The empirical results thus do not support Hypothesis 3.

Table 3 demonstrates the panel regression analyses for performance extremeness. In Table 3, Model 1 is the base model which contains only the control variables. The model is significant (Wald Chi-Square = 37.61; p < 0.001). Model 2 adds the predictor, CEO overconfidence, and it is significant (Wald Chi-Square = 40.70; p < 0.001). Finally, the full model, Model 3, adds the interaction, CEO overconfidence * board vigilance and the model is also significant (Wald Chi-Square = 40.80; p < 0.001).

Table 3. Results of panel regression analyses for performance extremeness

		Model 1	***Model 2***	***Model 3***
H2	CEO overconfidence		0.21† [0.12]	0.21† [0.12]
H4	CEO overconfidence * board vigilance			0.02 [0.08]
Controls				
	CEO duality	0.06 [0.54]	0.06 [0.54]	0.06 [0.54]
	CEO education level	0.98* [0.41]	0.96* [0.41]	0.96* [0.41]
	CEO tenure	0.00 [0.04]	0.00 [0.04]	0.00 [0.04]
	R&D intensity	0.11** [0.04]	0.11** [0.04]	0.11** [0.04]
	Firm size	-0.34 [0.26]	-0.33 [0.26]	-0.33 [0.26]
	Firm age	-0.02 [0.04]	-0.03 [0.04]	-0.03 [0.04]
	Board vigilance	0.45** [0.17]	0.46** [0.17]	0.46** [0.17]
	Speed of internationalization	-0.03 [0.15]	-0.04 [0.15]	-0.04 [0.15]
	Year dummies	Included	Included	Included
	Constant	5.61*** [0.40]	5.59*** [0.40]	5.60*** [0.40]
	Wald x^2	37.61***	40.70***	40.80***
	No. of firms	337	337	337
	No. of observations	823	823	823

Notes: S.E. in square brackets; *** p< 0.001; ** p < 0.01; * p < 0.05; † p < 0.10; z test are all two-tailed tests.

In Model 1, the base model of Table 3, CEO education level (b = 0.98, p < 0.05), R&D

intensity (b = 0.11, p < 0.01), and board vigilance (b = 0.45, p < 0.01) are positively associated with performance extremeness. Hypothesis 2 suggests that CEO overconfidence is positively associated with performance extremeness. The coefficient for CEO overconfidence is significant in the full model, Model 3 (b = 0.21, p < 0.1). The results support Hypothesis 2. Hypothesis 4 proposes that board vigilance negatively moderates the association between CEO overconfidence and performance extremeness in such a way that the effects of CEO overconfidence are less in the contexts of greater board vigilance. However, the results do not support Hypothesis 4 as the coefficient for the interaction between CEO overconfidence and board vigilance is not significant in the full model, Model 3 (b = 0.02, p > 0.10).

5. Discussion and Conclusion

Extending recent research which highlights the importance of CEO or executive characteristics on organizational activities and outcomes (Chen et al., 2015; Tang et al, 2011), this research intends to explore the effect of CEO overconfidence in the context of international business. Grounded by literature on cognitive bias broadly (Kahneman et al., 1982; Kahneman & Tversky, 1979) and CEO overconfidence specifically (Malmendier & Tate, 2005, 2008; Roll, 1986), it first indicates that overconfident CEOs tend to be associated with a rapid pace of internationalization. It further documents that overconfident CEOs lead to extreme performance, which can result in either huge gains or huge losses. It demonstrates that CEO overconfidence not only affects strategic behaviors, or the speed of internationalization, but also firm performance, or firm performance extremeness. However, this study did not find that board vigilance moderates the impacts of CEO overconfidence on the speed of internationalization or performance extremeness. The power of CEOs, which can override the board's monitoring mechanism, may lead to this null result.

This study may at least make the following three research contributions. First of all, this study echoes the importance of the role of microfoundations (Foss & Lindenberg, 2013; Teece, 2007). Although CEOs or top executives are critical drivers for strategic decision-making as well as firm outcomes (e.g., Child, 1972; Hambrick & Mason, 1984), traditional theories of international business do not take them into account. Consequently, scholars have recently begun to call for microfoundations of global strategy (Maitland & Sammartino, 2015). Although some research has echoed the call, this research assumes that CEOs or top executives are rational and without any cognitive bias (Maitland & Sammartino, 2015). This study is one of the pioneers to explore the effect of CEO overconfidence, a cognitive bias, in the context of international business.

Second, this study contributes to the CEO overconfidence literature by expanding its territory into the field of international business. Prior research has applied the concept of CEO overconfidence and documented how it influences various organizational outcomes. For example, prior research has found that overconfident CEOs are likely to possess greater entrepreneurial orientation (Engelen et al., 2015), take risky R&D projects (Hirshleifer et al., 2012), introduce pioneering products (Simon & Houghton, 2003), and engage in acquisitions frequently (Hayward & Hambrick, 1997). Extending this line of research, this study demonstrates that CEO overconfidence impacts not only a firm's domestic strategic behaviors

but also its international operations, or the speed of internationalization.

Finally, this study reconciles the positive and negative viewpoints of CEO overconfidence and empirically examines its association with extreme performance. The optimistic viewpoint of CEO overconfidence emphasizes their willingness to take risks and, therefore, may result in extraordinary success (e.g., Engelen et al., 2015; Hiller & Hambrick, 2005; Hirshleifer et al., 2012). However, its tendency to overestimate its own abilities may lead it to set overly ambitious goals or underestimate the challenges and risks associated with environmental circumstances. Prior research thus implicitly views it as a driving force of huge losses for firms (e.g., Malmendier & Tate, 2005; Picone et al., 2014). Based on these two aspects, this study proposes that an overconfident CEO is associated with extreme firm performance, characterized by either substantial gains or substantial losses.

This study also has important implications for managerial practice in at least two key areas. Firstly, we should consider CEO overconfidence when examining the driving forces of international strategy, the speed of internationalization, and the occurrence of extreme performance. In addition to the frequently discussed characteristics, such as CEOs' or top executives' age, education level, and international experience, this study documents that CEO overconfidence can impact both the speed of internationalization and the occurrence of extreme firm performance. Prior research has proposed that the experiences of CEOs or top executives form the basis of managerial cognition. However, this viewpoint neglects managerial cognitive bias, which may result from CEO overconfidence. Consequently, to better understand the effects of managerial cognition on MNEs, we should pay attention to CEO overconfidence.

This study also has practical implications for the boards of directors. Since the international process of a firm, undertaking incremental or rapid international expansions, as well as the occurrences of extreme firm performance, is determined by the extent of CEO overconfidence, boards of directors should consider this when they select and appoint a CEO. When boards of directors tend to be risk-averse or prefer a slow pace of internationalization, they may appoint a new CEO with less overconfidence to align their risk preferences and strategic actions better. However, when boards of directors are eager to take higher risks, implement rapid international expansions, and undertake a higher level of extreme performance —either huge gains or huge losses —these boards may recruit a new CEO who possesses greater overconfidence.

This study has some limitations that may offer potential directions for future research. First, this study only explores the speed of internationalization. However, international strategies of MNEs contain other aspects, such as international breadth, international depth, international diversity, and international connectivity. Future research therefore may investigate how CEO cognitive bias, CEO overconfidence, impacts other aspects of international strategy. Additionally, although this study did not find a moderating effect of board vigilance, future research may investigate other potential moderators, such as CEO international experience at the CEO level or national institutions or culture at the national level. Second, this study uses a CEO’s stock holding to proxy CEO overconfidence but there are other ways, such as CEO’s

stock option, CEO's talk in media, and CEO relative compensation to operationalize CEO overconfidence. Future research may compare the results of different operationalizations or use other proxies to triangulate and strengthen the validity of the measure of CEO overconfidence. To better capture the construct of CEO overconfidence, future research may also employ mixed approaches to collect data on CEO overconfidence from multiple sources. Finally, this study limits its setting in a single industry. However, MNEs within different industries may impact the effects of CEO overconfidence. Future research therefore may view the industry as a moderator and explore how it affects the effects of CEO overconfidence.

In conclusion, by linking managerial cognitive bias to international operations, this study aims to enhance our understanding of how CEO overconfidence affects international strategy and its consequences. This study demonstrates that CEO overconfidence affects not only the speed of internationalization but also the performance extremeness of MNEs. In other words, this study demonstrates that international strategies, as well as their performance consequences, are affected by managerial cognitive bias, which is beyond the explanations of traditional economic rationale. Specifically, this study reveals that CEO overconfidence is positively correlated with the speed of internationalization, as well as the performance extremeness of MNEs. We hope that this study paves the way and encourages further research to explore the effects of managerial cognitive bias in the field of international business.

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Competing interests

The author declares that he has no competing interests that could influence the work reported in this paper.

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