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Decision Orientation of CEO Education and CEO Risk-Taking: The Moderating Effect of EPU

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Abstract

This thesis examines how CEO decision orientation, shaped by educational background, impacts corporate risk-taking. This study covers data from 3,083 firm-year observations of companies listed on the Malaysia Stock Exchange from 2015 to 2021. The study explores the decision orientations logical and intuitive and hypothesizes that logical CEOs would take on higher risks due to their structured, analytical approach. However, empirical findings indicate that logical CEOs are generally more risk-averse, preferring lower leverage and higher liquidity. Whereas, during periods of high uncertainty, measured by Economic Policy Uncertainty (EPU), logical CEOs demonstrate a mixed response while increasing leverage while other risk measures remain unchanged. The thesis also extends to assess whether cognitive complexity (categorized as Analytical or Conceptual) influences corporate risk-taking. The results show no significant link between cognitive complexity and risk-taking behaviour, suggesting that cognitive complexity alone may not be a major determinant of risk-taking.

Keywords: CEO education; Risk-taking; Economic policy uncertainty

1. Introduction

Various CEO's background has been studied to distinguish the relationship between CEO's background and corporate risk-taking. Ali (1989) documented that factor such as the education field, country, sector of enterprise, type of organization, age, social classes, and management function do play a role in affecting decision-making. Among the CEO's characteristics, the most reoccurring trait that is widely studied under the Upper Echelon Theory (UET) is the CEO's educational background. For example, Boulgarides and Oh (1985) have studied managerial decision-making styles in Japanese, Korean and American, and provides empirical evidence that cultural differences and the field of education play a vital role in decision-making styles. A study on United Arab Emirates by Yousef (1998) also indicates that variables such as CEO's education also act as a factor that dictates the CEO's decision-making. The UET builds on the foundation of bounded rationality (Hambrick and Mason, 1984), whereby, this theory states that an organization's outcome, can be predicted based on the background of its top executives (Hambrick and Mason, 1984). This is because the CEO's values and characteristics play a vital role in how the executives perceive problems as the CEO's mental representation of reality is a product of their "orientations" and eventually translates into their strategic choices which involve risk-taking (Child, 1972; Carpenter et al., 2004; Finkelstein et al., 2009).

However, there seem to be an inconsistent result to CEO education background and risk taking. On one hand, studies such as those by Barker and Muller (2002), Finkelstein and

Hambrick (1996), and Tyler and Steensma (1998), found that CEOs with backgrounds in STEM fields are more inclined to take risks, as reflected with higher levels research and development spending (Sanders, 2001; Greve, 2003; Brookman and Thistle, 2009). These findings imply that STEM-educated CEOs may have a higher appetite for risk, which could foster innovation and drive strategic growth initiatives.

Conversely, CEOs with scientific backgrounds often exhibit a cautious, risk-averse approach due to their structured and calculating nature. This left-brain oriented thinking tends to steer them towards mitigating uncertainty, making them less prone to taking risks in unpredictable environments. Despite this divergence in findings, CEO educational background has emerged as a significant factor in leadership selection. This is because many employers continue to use educational qualifications as primary indicators of a candidate's capabilities. This reliance persists due to the perceived reliability of degrees in signalling critical thinking and problem-solving skills, often favouring STEM disciplines. For instance, a 2018 article by The Washington Post reported that thirty-four percent of the top 100 CEOs in the United States had STEM backgrounds, primarily in engineering, compared to thirty-two percent from business fields. This growing emphasis on educational background highlights its perceived value in executive leadership, even in the absence of definitive evidence linking it to specific risk-taking outcomes (Washington Post, 2018). Thus, the challenge for organizations lies in determining whether a CEO's educational background genuinely correlates with greater risk-taking.

Economic Policy Uncertainty (EPU) is another key factor influencing CEO decision-making. During periods of uncertainty, such as financial crises or political turmoil, CEOs' risk-taking behaviors may deviate from their usual patterns due to heightened unpredictability (Baker et al., 2016). Research shows that in normal conditions, CEOs use their decision orientation to assess and manage risk; however, during times of crisis, uncertainty can cloud rational judgment and affect decision outcomes (Bloom, 2009; Li and Peng, 2017).

The impact of EPU on corporate risk taking has drawn considerable academic attention. For example, studies by Colak et al. (2017) demonstrate that EPU significantly affects firm outcomes, including financial leverage. Beyond leverage, other firm-level factors, such as the cost of debt and equity, are also impacted. Research by Francis et al. (2014), as well as Waisman et al. (2015), suggests that EPU contributes to information asymmetry, which raises the cost of debt and, in turn, reduces a firm's leverage (Zhang et al., 2015).

Under normal circumstances, risk-taking is often linked to a CEO's profile, particularly their decision orientation. CEOs typically possess the capacity to process information and analyse risks effectively, enabling them to make informed decisions based on their cognitive decision-making styles. However, this may not hold true during periods of extreme uncertainty and panic, where decision-making processes can be clouded by irrationality.

Given these considerations, this study aims to investigate whether a CEO's educational background affects firm risk-taking, particularly during times of heightened uncertainty. By further examining both logical and intuitive decision orientation, this research seeks to address existing gaps in understanding how CEO education impacts risk-taking behaviour, especially in times of uncertainty.

This study also aims to provide insights into intersection between cognitive complexity and risk-taking which is a critical aspect of the decision orientation. Cognitive complexity refers to the ability to process and integrate multiple dimensions of information when making decisions (Rowe and Mason, 1987). CEOs with high cognitive complexity are

capable of evaluating various perspectives, weighing different factors, and adapting their strategies based on nuanced insights. Thus, educational background that emphasize critical thinking and the synthesis of complex information such as fields in finance, commerce, law, business, arts and language tend to cultivate higher cognitive complexity. This ability to navigate complex information allows CEOs to better assess risks, especially in times of uncertainty, ultimately influencing their strategic choices and corporate outcomes.

The paper comprises five distinct sections. Part 1 serves as the introduction, elucidating the purpose and scope of the study. Subsequently, Part 2 delineates the theoretical framework and hypothesis development, offering a comprehensive review of pertinent literature. Part 3 is dedicated to the research methodology, presenting the approach adopted for thesis conduct and a meticulous exposition of the data extraction process. Following this, Part 4 presents the results and discussion, wherein a thorough analysis of data abstraction pertaining to CEO decision orientation and associated risk-taking components is undertaken. In conclusion, Part 5 of the paper summarizes the project's objectives and outcomes.

2. The Theoretical Framework and Hypothesis Development

This study employs the Decision Style Model developed by Rowe and Mason (1987), whereby decision orientation is the perception of how an individual interprets information to formulate a decision. In this research, we derived the CEO decision orientation focusing on the CEOs' educational backgrounds and risk-taking. Decision orientation is categorized into two primary domains: logical and intuitive (Rowe and Boulgarides, 1992). Simply put, decision orientation predicts how a CEO reacts in a given situation. To measure decision orientation derived from CEOs' educational backgrounds, this study utilizes Rowe and Mason's (1989) Decision Style Model, which probes the psychological structures influencing a CEO's decision-making.

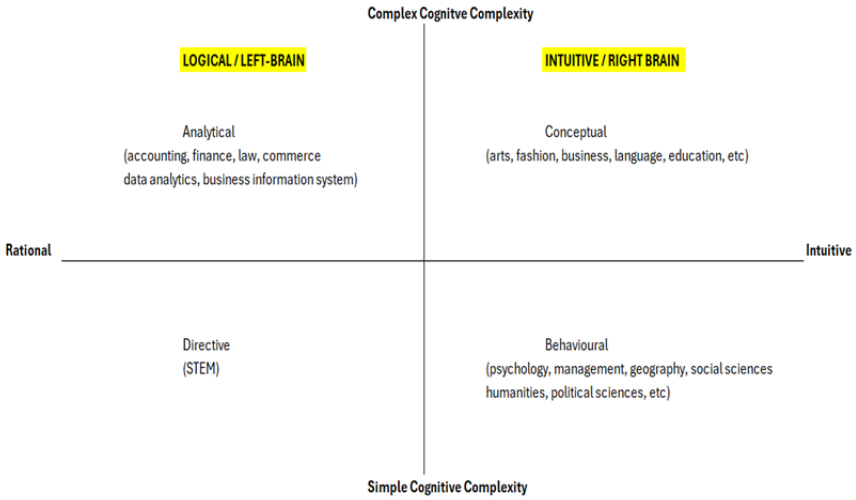

Figure 1: Decision orientation model (Rowe and Mason, 1987)

The Decision Style Model categorizes decision orientations into two dimensions where the y-axis reflects the CEOs cognitive complexity derived from their training from the education background, indicating an individual's propensity for nuanced analysis and multi-

perspective interpretation of information (Rowe and Mason, 1987). Higher cognitive complexity reflects an ability to integrate diverse dimensions and synthesize multi-layered data. As for the x-axis, it represents the educational environment that influences the CEO's decision-making style be it emphasizing quantitative evidence and logical reasoning or intuitive orientations, qualitative factors and humanized analysis, characteristic of intuitive decision-making. This nuanced understanding underscores the influence of decision orientation on CEO cognitive complexity and decision-making approaches, which are crucial factors in navigating risk-taking scenarios.

CEOs' educational backgrounds significantly shape their decision orientations, influencing their risk-taking behavior. Logical-oriented CEOs are trained to emphasizing quantitative metrics and structured analysis, approach risk with a systematic mindset. This orientation fosters confidence in managing risks through evidence-based decision-making (Rowe and Mason, 1987; Finkelstein and Hambrick, 1996). In contrast, intuitive-oriented CEOs, shaped by fields emphasizing creativity and qualitative factors, rely on pattern recognition and subjective insights, allowing them to navigate ambiguity and adopt innovative approaches to risk-taking (Kahneman, 2011; McGilchrist, 2019).

CEOs' decision orientation, shaped by their educational backgrounds, significantly influences their risk-taking behaviour due to the distinct cognitive and behavioural traits inherent in each field. Logical-oriented CEOs, with backgrounds in fields such as finance, accounting, commerce, and STEM, are characterized by rational, evidence-based decision-making that emphasizes thorough analysis and quantifiable metrics. This approach fosters calculated risk-taking, as these leaders are confident in their ability to manage risks through objective evaluation (Rowe and Mason, 1987; Finkelstein and Hambrick, 1996). In contrast, intuitive-oriented CEOs, with backgrounds in arts, humanities, business, or psychology, rely on subjective insights, pattern recognition, and a nuanced understanding of human behavior to navigate uncertainty. Their decision-making often incorporates qualitative factors and contextual ambiguity, emphasizing broader socio-economic considerations (Kahneman, 2011; McGilchrist, 2019). Consequently, we hypothesize that CEOs with logical-oriented educational backgrounds are more inclined toward risk-taking than their intuitive-oriented counterparts.

H1: CEOs in logical decision orientation (educational background in finance, accounting, commerce, and STEM) tend to take more risks compared to CEOs in intuitive decision orientation (educational background in arts, business, humanities, psychology, etc.).

In times of high uncertainty, CEOs' risk-taking behaviours differ based on their decision orientation, shaped by their educational background. CEOs with logical decision orientation (e.g., finance, accounting, commerce, STEM) exhibit lower risk-taking tendencies due to their structured, evidence-based training, which emphasizes quantifiable data and risk-averse frameworks (Gigerenzer and Brighton, 2009). For example, CEOs with logical decision orientations are trained to rely heavily on structured, evidence-based approaches to decision-making emphasizing quantifiable data, analytical rigor, and risk minimization. However, when faced with high levels of uncertainty and sufficient data is unavailable or unreliable, these CEOs may find their usual methods ineffective. As a result, they may adopt a "wait-and-see" approach, delaying decisions until more clarity or stability emerges. Consequently, logical CEOs are less likely to take bold risks in uncertain scenarios, instead opting to minimize exposure and maintain flexibility until they can rely on more

predictable, data-driven insights as compared to their counterpart, intuitive-oriented CEOs (e.g., psychology, humanities, arts) which training focused on leveraging abstract thinking, creativity, and qualitative insights, fostering adaptability and comfort with ambiguity (McGilchrist, 2019). These traits encourage intuitive CEOs to view uncertainty as an opportunity for innovation, embracing calculated risks by integrating instinct and a holistic perspective (Hayashi, 2001). Drawing on Upper Echelon Theory (Hambrick and Mason, 1984), this hypothesis posits that intuitive-oriented CEOs are better equipped for risk-taking in uncertain conditions compared to their logical-oriented counterparts.

H2: In times of uncertainty, CEOs in logical decision orientation (educational background in finance, accounting, commerce, and STEM) tend to take fewer risks compared to CEOs in intuitive decision orientation (educational background in arts, business, humanities, psychology, etc.).

Apart from that, cognitive complexity adds another layer to understanding risk-taking propensities. Logical CEOs with complex cognitive orientations, such as those in analytical quadrant (e.g. educational background in finance, accounting, commerce, law) are accustomed to navigating interdependent variables and synthesizing multilayered data. This exposure fosters a proactive approach to risk (Rowe and Mason, 1987; Fama and French, 1992). In contrast, CEOs with simpler cognitive orientations, such as those in directive fields like STEM, are trained to rely on framework and methodologies. Similarly, intuitive CEOs with a complex cognitive orientation, such as conceptual quadrant educational background in arts, fashion, business, language, education etc), thrive in environments requiring abstract thinking and decision-making under uncertainty which leads to a greater comfort with risk (Csikszentmihalyi, 1996; Sternberg, 2006). Conversely, intuitive CEOs from simpler cognitive fields, such as behavioral (e.g. educational background in psychology, management, geography, social sciences, humanities, political sciences, economics, etc) emphasize stability and structured frameworks, contributing to lower risk-taking tendencies compared to their counterparts in more abstract fields.

Overall, complex cognitive complexity, whether logical or intuitive, equips CEOs to navigate uncertainty, manage diverse elements, and synthesize multiple variables, making them more comfortable and proactive in risk-taking. Accordingly, we hypothesize that logical CEOs with complex cognitive complexity (finance, accounting, commerce, law) are more risk-prone than their counterparts with simple cognitive complexity (STEM). Similarly, intuitive CEOs with complex cognitive backgrounds (arts, fashion, business, education) are more inclined toward risk-taking compared to those in simpler cognitive fields (psychology, management, social sciences).

H3: Logical CEOs with complex cognitive complexity (educational background in finance, accounting, commerce, and law) tend to take more risks compared to logical CEOs with simple cognitive complexity (STEM education).

H4: Intuitive CEOs with complex cognitive complexity (educational background in arts, fashion, business, language, education, etc.) tend to take more risks compared to intuitive CEOs with simple cognitive complexity (educational background in psychology, management, geography, social sciences, humanities, political sciences, economics, etc.).

3. Research Methodology

The dependent variable for this study is the corporate risk-taking. This study examines corporate risk-taking using three widely recognized financial proxies: Debt to Asset, Cash to Asset, and Capital Expenditure (CapEx). Debt to Asset measures solvency risk, highlighting a firm's leverage level and its capacity to meet long-term obligations, while Cash to Asset assesses liquidity risk, reflecting a firm's ability to manage operational expenses and short-term liabilities. Capital Expenditure, derived from annual reports, captures investment policy risks, as higher CapEx often involves greater uncertainty about future returns (Coles et al., 2006; Serfling, 2014). This is because prior research underscores that leveraging debt optimally can boost growth but excessive debt heightens financial vulnerability, whereas robust cash reserves mitigate financial fragility and enhance adaptability. Building on this, the study hypothesizes that logical CEOs are positively associated with higher capital expenditure, reflecting their calculated risk-taking tendencies. This is also true for the case of studying the EPU. This variable is gathered for all sample firm using the Global S&P Capital IQ's Compustat database.

The independent variable in this study is CEOs' decision orientation, categorized based on their educational backgrounds using Rowe and Mason's (1989) decision orientation model. Logical decision orientation includes directive and analytical fields such as STEM, law, accounting, commerce, and finance, while intuitive decision orientation encompasses conceptual and behavioral fields like arts, psychology, economics, and business. Undergraduate education is used as a stable and unbiased indicator of core cognitive traits, as it reflects foundational decision-making tendencies and information processing abilities (Hambrick and Mason, 1984; Bertrand and Schoar, 2003). Unlike advanced degrees, which may introduce managerial or specialized influences, undergraduate education better captures the cognitive style shaping strategic choices (Barker and Mueller, 2002; Custódio and Metzger, 2014). This classification enables the prediction of CEOs' risk-taking behaviors based on the cognitive and behavioral traits linked to their educational backgrounds.

To further explore the role of cognitive complexity, the study introduces two additional independent variables: *Analytical* (a subset of logical decision orientation) and *Conceptual* (a subset of intuitive decision orientation). Analytical decision-makers, typically from fields like finance and law, exhibit complex cognitive processing by systematically evaluating alternatives and making data-driven decisions. Conceptual decision-makers, often from arts or business fields, rely on intuition to integrate diverse information and adopt a broad, future-oriented perspective. These distinctions enable the study to investigate how complex cognitive processes within logical and intuitive orientations shape CEOs' risk-taking behaviors.

As for the Economic Policy Uncertainty (EPU), the EPU is measured using the index constructed by Barker et al., 2016. It is constructed using a 12-month average of three components which are; broadcast on global uncertainty, the changes in tax code and finally the CPI dissent. This is done by extrapolating the data of these firms listed in the Malaysia Stock Exchange which are supported by the EPU through the Global S&P database. Prior the study, we will omit off samples with the said criteria; (1) utilities firms and financial firms, (2) firm-years without a complete financial information, (3) firm-years containing abnormal information namely negative total assets, net income and book equity and (4) firm-years with missing information (Ferris et al., 2009). For the control variables, there are certain

factors that are required to be controlled as these factors are traditionally bound to affect the performance of the underlining companies. Therefore, we select a handful of control variables which affects corporate risk taking. They are the firm size which is measured in the natural logarithm of the book value of the total asset of the firm. Besides, Return on Asset of the firm is also controlled. Return on Asset is measured using the earnings before interest, tax to the book value of the underlying firm. CEO diversity is also another variable that is controlled whereby the sex of the CEO is a binary variable with a value of 1 if they are female and 0 otherwise. Firm age is another variable that is controlled in this study and is measured using the period when the firm was founded. Finally, the growth rate is also kept constant and is derived from the growth rate of total revenue from the previous year.

Our data consists of firms listed in the Malaysia Stock Exchange (Bursa) from 2015 to 2021. With regards to that, financial institutions such as that of real estate investment trusts (REITs), closed-end funds and exchange-traded funds, banks, insurance companies and regulated utilities are excluded from our sample due to the different accounting practice and statutory requirements for firms in these industries which can further affect the data. This practice is common with studies in the field of risk-taking. After filtering and taking into consideration the entry and exit from panel within the period, the sample eventually lead to 3083 firm-year observations for the year 2015 to 2021. As for how we extrapolate the data, we will collect the data from the three statements of the companies (income statement, balance sheet and cashflow statement) which is retrieved from the Global S&P Capital IQ's Compustat database. The CEO's background such as their name, race, gender and other specific data such as their educational background of the CEOs will also be accessed. In scenarios whereby the data are not present in the Global S&P, hence, we obtained the data through reliable open sources which are reputable and trustworthy such as Bloomberg and the said companies' official website. The formula can be seen as below:

$$\text{risk} = \beta 0 + \beta 1\,\text{Logical} + \sum \beta\,\text{CONTROL} + \varepsilon \quad (1)$$

Whereby, Logical is a binary variable and have a value 1 if the CEOs' education is in left-brain domain such as that of Analytic and Directive (finance, law, accounting, commerce and data analytics and STEM) and 0 for otherwise. On the other hand, the Control is a matrix which signify a set of controlled variables and ε signifies the errors that are assumed to be independent between firms.

On the other hand, to study the level of uncertainty and how it affects CEOs' risk-taking ability, a study is conducted by taking into consideration of the various economic crisis and turmoil which can be seen based on the Economic Policy of Uncertainty Global Index. Therefore, the formula will be as below:

$$\text{risk} = \beta 0 + \beta 1\text{Logical} + \beta 2\,\text{EPU} + \beta 3\text{Logical} * \text{EPU} + \sum \beta\,\text{CONTROL} + \varepsilon \quad (2)$$

In line with past studies, the corporate risk-taking is measured by comparing the EPU. EPU is the economic policy uncertainty and is measured by using the weighted average of twelve month's score in a fiscal year (Demir and Ersan, 2017). A higher score indicates that there is a higher level of uncertainty. The EPU index score is a score-based measurement which according to Baker et al., 2016, the EPU is measured based on three aspects, and they are; the Economy, which is derived from broadcast and coverage on global uncertainty, Policies such as the level of uncertainty in future policy and finally the uncertainty such as CPI dissent among forecasters.

Logical is a binary variable and have a value 1 if the CEOs' education is in left-brain domain such as that of Analytic and Directive (finance, law, accounting, commerce and data analytics and STEM) and 0 for otherwise. On the other hand, the Control is a matrix which

signify a set of controlled variables while ε signifies the errors that are assumed to be independent between firms. This process is also repeated for intuitive CEOs with a complex cognitive domain such as conceptual segment (arts, fashion, mass communication, business and etc). This is also repeated within the intuitive decision orientation where Conceptual segment is chosen as this segment possessed a complex cognitive complexity (Rowe and Mason, 1989). Conceptual is a binary variable and have a value 1 if the CEOs possessed an intuitive decision orientation and possessed a complex cognitive complexity (art, fashion, business, language, education, etc.) and 0 for otherwise. Whereas the Control is a matrix which signify a set of controlled variables which is listed in appendix 4 while ε signifies the errors that are assumed to be independent between firms.

$$risk = \beta 0 + \beta 1 Analytical + \beta 2 Analytical * EPU + \sum \beta\, CONTROL + \varepsilon \quad (3)$$

$$risk = \beta 0 + \beta 1 Conceptual + \beta 2 Conceptual * EPU + \sum \beta\, CONTROL + \varepsilon \quad (4)$$

4. Results and Discussion

In order to study the first hypothesis, there are three variables representing corporate risk-taking and they are Debt to Assets (DTA), Capital Expenditure (CAPEX), and Cash to Assets (CTA) which are regressed separately with the main independent variable, CEO decision orientation, which is categorized into logical and intuitive. To analyse the impact of CEO decision orientation on corporate risk-taking, I conducted all three models; random effect model (REM) represented by (1), (3) and (5), Ordinary Least Square model represented by (2), (4) and (7) and fixed effects model (FEM) represented by (3), (6) AND (9) regression for each of the three dependent variables, with a binary variable indicating CEO decision orientation. The variable takes a value of 1 if the CEO has a logical decision orientation (encompassing directive and analytical) and 0 otherwise. The results are presented in Table 1.

The findings from Table 1 shows that CEO decision orientation significantly influences firm risk-taking behavior. Firms led by logical CEOs exhibit a consistently negative and statistically significant association with leverage (DTA), as the "LOGICAL" variable is significant at the 1% level (β = -0.0208, $p < 0.001$). This suggests that logical CEOs adopt a more conservative approach to leverage, aiming to minimize financial risk. Additionally, while firm size is negatively associated with leverage, return on assets (ROAW) does not show a significant relationship with DTA. These results underscore the risk-averse tendencies of logical CEOs in managing firm debt.

For capital expenditures (CAPEX), the presence of logical CEOs does not appear to have a significant impact, as the coefficients on the "LOGICAL" variable are small and statistically insignificant. Instead, firm growth (GROWTHW) shows a strong positive effect on CAPEX (β = 0.0025, $p < 0.05$), indicating that growing firms invest more in capital assets. Firm age, however, presents mixed results, with older firms generally being more cautious in their capital investments, as reflected in one column's significant negative coefficient.

When it comes to cash holdings relative to assets (CTA), logical CEOs are associated with significantly higher liquidity levels (β = 0.0116, $p < 0.05$), suggesting a preference for financial flexibility and risk mitigation. Higher firm performance (ROAW) and larger, older firms also positively influence cash holdings, further emphasizing a conservative, liquidity-focused approach by logical CEOs. These insights collectively highlight that logical CEOs

demonstrate risk aversion in leverage and liquidity decisions, while their influence on capital expenditure remains minimal.

Table 1: The effect of logical (vs intuitive) CEO on firm risk taking: Fixed effect model with different dependent variables controlling for year and industry effects

	Y_1=Debt/Asset			Y_2=CAPEX			Y_3=Cash/Asset		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
LOGICAL	-0.0208***	-0.0207***	-0.0208***	-0.0008	-0.0009	-0.0008	0.0116**	0.0116**	0.0116**
	(0.0003)	(0.0004)	(0.0003)	(0.7509)	(0.7255)	(0.7518)	(0.0279)	(0.0276)	(0.0275)
ROAW	-0.0011	-0.0034	-0.0015	0.0057	0.0061	0.0057	0.0590***	0.0613***	0.0587***
	(0.9050)	(0.7195)	(0.8739)	(0.1836)	(0.1531)	(0.1847)	(0.0000)	(0.0000)	(0.0000)
SIZEW	-0.0227***	-0.0225***	-0.0227***	0.0041***	0.0041***	0.0041***	0.0102***	0.0099***	0.0102***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
FIRMAGEW	-0.0216	0.0472***	-0.0245	-0.0246	-0.0458***	-0.0247	0.0864***	0.0493***	0.0849***
	(0.5298)	(0.0012)	(0.4756)	(0.1097)	(0.0000)	(0.1092)	(0.0056)	(0.0002)	(0.0065)
GROWTHW	-0.0009	-0.0013	-0.0008	0.0025**	0.0027**	0.0025**	0.0022	0.0026	0.0023
	(0.7510)	(0.6244)	(0.7677)	(0.0390)	(0.0274)	(0.0390)	(0.3636)	(0.2888)	(0.3569)
FEMALECEO	-0.0107	-0.0079	-0.0107	0.0021	0.0015	0.0021	-0.0045	-0.0063	-0.0045
	(0.2831)	(0.4270)	(0.2819)	(0.6360)	(0.7313)	(0.6358)	(0.6155)	(0.4848)	(0.6154)
2015.year	0		0	0		0	0		0
	(.)		(.)	(.)		(.)	(.)		(.)
2016.year	-0.0008		-0.0007	-0.0026		-0.0027	0.0001		0.0001
	(0.8485)		(0.8644)	(0.1459)		(0.1435)	(0.9770)		(0.9890)
2017.year	-0.0013		-0.0011	-0.0005		-0.0005	-0.0062		-0.0063
	(0.7768)		(0.8069)	(0.8166)		(0.8107)	(0.1292)		(0.1289)
2018.year	0.0035		0.0038	0		0	-0.0117**		-0.0116**
	(0.5054)		(0.4725)	(0.9922)		(0.9874)	(0.0138)		(0.0142)
2019.year	0.0094		0.0097	-0.003		-0.003	-0.0140**		-0.0139**
	(0.1189)		(0.1054)	(0.2589)		(0.2574)	(0.0104)		(0.0110)
2020.year	0.0153**		0.0158**	-0.0057*		-0.0058*	-0.0087		-0.0085
	(0.0255)		(0.0215)	(0.0613)		(0.0611)	(0.1637)		(0.1706)
2021.year	0.0116		0.0119	-0.0049		-0.0049	-0.0045		-0.0045
	(0.1323)		(0.1236)	(0.1570)		(0.1561)	(0.5165)		(0.5208)
0.industry		0	0		0	0		0	0
		(.)	(.)		(.)	(.)		(.)	(.)
1.industry		-0.0085	-0.0109		-0.0106	-0.0108		-0.0554	-0.0584
		(0.9019)	(0.8749)		(0.7328)	(0.7281)		(0.3783)	(0.3515)
2.industry		0	0		0	0		0	0
		(.)	(.)		(.)	(.)		(.)	(.)
3.industry		0	0		0	0		0	0
		(.)	(.)		(.)	(.)		(.)	(.)
4.industry		0	0		0	0		0	0
		(.)	(.)		(.)	(.)		(.)	(.)
5.industry		0	0		0	0		0	0
		(.)	(.)		(.)	(.)		(.)	(.)
6.industry		0	0		0	0		0	0
		(.)	(.)		(.)	(.)		(.)	(.)
7.industry		0	0		0	0		0	0
		(.)	(.)		(.)	(.)		(.)	(.)
8.industry		0	0		0	0		0	0
		(.)	(.)		(.)	(.)		(.)	(.)
9.industry		0	0		0	0		0	0
		(.)	(.)		(.)	(.)		(.)	(.)
_cons	0.3933***	0.1569***	0.4050***	0.0940*	0.1678***	0.0956*	-0.2600**	-0.1268***	-0.2472**
	(0.0010)	(0.0032)	(0.0007)	(0.0780)	(0.0000)	(0.0743)	(0.0162)	(0.0088)	(0.0228)
N	3881	3880	3880	3881	3880	3880	3881	3880	3880

R_2	0.0466	0.043	0.0467	0.0266	0.0232	0.0266	0.0363	0.0301	0.0362

*Note: DTA, CAPEX, and CTA represent the dependent variables. Figures in parentheses indicate the p-values. Statistical significance is denoted by ***, **, and * representing 1%, 5%, and 10% significance levels, respectively. Year and industry dummy variables are included in the mode*

In order to test H2 on CEO decision orientation derived from educational background on corporate risk-taking during periods of heightened uncertainty. Two proxies for uncertainty are used: Economic Policy Uncertainty (EPU) and the COVID-19 pandemic. The chapter examines how logical versus intuitive CEOs influence key risk-taking metrics, including Debt to Total Assets (DTA) represented by (1) and (4), Capital Expenditure (CAPEX) represented by (2) and (5), and Cash to Assets (CTA) represented by (3) and (6), under these uncertain conditions. The analysis employs a fixed effects model, controlling for year effects
According to Table 2, we study the role of economic policy uncertainty (EPU) and the COVID-19 pandemic in shaping the relationship between logical CEOs and corporate risk-taking. The interaction between logical CEOs and EPU (LOGICAL*EPU) reveals a positive and statistically significant effect on leverage (DTA), with $\beta = 0.0205$ ($p = 0.0069$). This indicates that during periods of heightened economic uncertainty, logical CEOs adopt a less conservative approach to leverage, strategically increasing debt to capitalize on favourable borrowing conditions such as lower interest rates. This calculated opportunism reflects the ability of logical CEOs to exploit uncertain environments to finance acquisitions, expansions, or investments in undervalued assets. However, the interaction between logical CEOs and EPU is insignificant for capital expenditures (CAPEX) and cash holdings (CTA), suggesting that uncertainty does not substantially influence firm investment or liquidity decisions under logical leadership.

Similarly, the interaction between logical CEOs and the COVID-19 pandemic (LOGICAL*COVID) demonstrates a significant positive effect on DTA ($\beta = 0.0111$, $p = 0.0228$), mirroring the findings for EPU. This suggests that logical CEOs also strategically increased leverage during the pandemic, potentially leveraging unique opportunities presented by the crisis. However, as with EPU, the effects on CAPEX and CTA remain statistically insignificant, indicating that logical CEOs maintained their typical approach to investment and liquidity management during this unprecedented period. These results underline the calculated and opportunity-driven nature of logical CEOs in leveraging uncertainty while maintaining consistency in other areas of corporate decision-making.

Table 2: The effect of logical (vs intuitive) CEO on firm risk taking during (moderated by) uncertainty time: Fixed effect model with different dependent variables controlling for year effects

	EPU as a proxy for uncertainty			COVID as a proxy for uncertainty		
	(1)	(2)	(3)	(4)	(5)	(6)
	Y_1	Y_2	Y_3	Y_1	Y_2	Y_3
LOGICAL	-0.1289***	-0.0038	-0.0244	-0.0243***	-0.0002	0.0097*
	(0.0014)	(0.8335)	(0.5064)	(0.0000)	(0.9417)	(0.0756)
ROAW	-0.0011	0.0057	0.0590***	-0.001	0.0056	0.0590***
	(0.9078)	(0.1836)	(0.0000)	(0.9173)	(0.1857)	(0.0000)
SIZEW	-0.0225***	0.0041***	0.0102***	-0.0225***	0.0041***	0.0103***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
FIRMAGEW	-0.019	-0.0245	0.0873***	-0.0195	-0.025	0.0876***
	(0.5799)	(0.1109)	(0.0051)	(0.5700)	(0.1045)	(0.0050)
GROWTHW	-0.0008	0.0025**	0.0023	-0.0008	0.0025**	0.0022
	(0.7757)	(0.0388)	(0.3574)	(0.7546)	(0.0392)	(0.3620)
FEMALECEO	-0.01	0.0021	-0.0043	-0.0099	0.002	-0.0041

	(0.3140)	(0.6332)	(0.6330)	(0.3188)	(0.6583)	(0.6484)
LOGICAL*EPUW	0.0071	-0.009	-0.0124			
	(0.6233)	(0.1655)	(0.3431)			
WLOGICAL*EPU	0.0205***	0.0006	0.0068			
	(0.0069)	(0.8678)	(0.3223)			
2015	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)
2016	-0.0082*	0.0006	0.0033	-0.0008	-0.0026	0.0001
	(0.0827)	(0.7630)	(0.4457)	(0.8441)	(0.1465)	(0.9796)
2017	-0.0086**	0.0028	-0.0032	-0.0013	-0.0005	-0.0063
	(0.0280)	(0.1186)	(0.3761)	(0.7658)	(0.8211)	(0.1270)
2018	-0.0055	0.0039**	-0.0080**	0.0033	0	-0.0118**
	(0.1624)	(0.0288)	(0.0254)	(0.5222)	(0.9993)	(0.0132)
2019	-0.0057	0.0034	-0.0079	0.0092	-0.003	-0.0141***
	(0.3634)	(0.2192)	(0.1659)	(0.1270)	(0.2648)	(0.0098)
2020	-0.0043	0.0026	-0.0008	0.0039	-0.0009	-0.004
	(0.5940)	(0.4709)	(0.9125)	(0.3352)	(0.6235)	(0.2673)
2021	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)
COVID				0.0042	-0.0036	-0.0086
				(0.6180)	(0.3442)	(0.2578)
LOGICAL*COVID				0.0111**	-0.002	0.0061
				(0.0228)	(0.3594)	(0.1707)
Constant	0.3555***	0.1369***	-0.2018***	0.3874***	0.0951*	-0.2633**
	(0.0000)	(0.0000)	(0.0031)	(0.0012)	(0.0748)	(0.0149)
N	3881	3881	3881	3881	3881	3881
R_2	0.0487	0.0266	0.0366	0.0481	0.0268	0.0368

*Note: DTA, CAPEX, and CTA represent the dependent variables. Figures in parentheses indicate the p-values. Statistical significance is denoted by ***, **, and * representing 1%, 5%, and 10% significance levels, respectively. Year and industry dummy variables are included in the model*

This study further examines how cognitive complexity within logical and intuitive CEO decision orientations such as that in the analytical and conceptual segments interacts with uncertainty to influence corporate risk-taking. The findings indicate that the moderating effects of economic policy uncertainty (EPU) and the COVID-19 pandemic on firm risk-taking metrics, such as Debt to Total Assets (DTA), Capital Expenditure (CAPEX), and Cash to Assets (CTA), are largely insignificant for both analytical and conceptual CEOs. For analytical CEOs, interaction with EPU (ANALYTICAL*EPU) shows no statistically significant impact on leverage, investment, or liquidity decisions. Similarly, conceptual CEOs (CONCEPTUAL*EPU) demonstrate no significant changes in their risk-taking strategies under EPU. These results suggest that heightened uncertainty does not substantively alter risk-taking behaviours, regardless of cognitive complexity.

However, the results reveal a notable exception: analytical CEOs exhibit a slight but significant increase in CAPEX during the COVID-19 pandemic (ANALYTICAL*COVID, β = 0.0698), indicating a propensity to capitalize on strategic investment opportunities during times of crisis. This aligns with their logical and data-driven decision-making style, which may allow them to identify and act on long-term value creation opportunities in uncertain environments. Conversely, conceptual CEOs do not show significant adjustments to financial strategies during the pandemic, suggesting a consistent approach to managing firm risk irrespective of uncertainty. Overall, the limited influence of uncertainty on the risk-taking behaviours of both analytical and conceptual CEOs highlights the stability of their decision-making frameworks, pointing to the need for further investigation into

organizational and contextual factors that may play a more significant role in shaping firm-level outcomes under uncertainty.

Table 3: Decomposing logical and intuitive CEO on firm risk taking during (moderated by) EPU index: Sub-sample test on analytical (vs directive) CEOs and conceptual (vs behavioral) CEOs

	Analytical (vs Directive) CEOs			Conceptual (vs Behavioral) CEOs		
	Y_1	Y_2	Y_3	Y_1	Y_2	Y_3
	(1)	(2)	(3)	(4)	(5)	(6)
ROAW	-0.0066	-0.0009	0.0563***	-0.0199	-0.0077	0.0287
	(0.5711)	(0.8585)	(0.0000)	(0.4456)	(0.4895)	(0.1342)
SIZEW	-0.0236***	0.0049***	0.0114***	-0.0175***	-0.0014	0.0118***
	(0.0000)	(0.0000)	(0.0000)	(0.0010)	(0.5501)	(0.0025)
FIRMAGEW	0.0843*	-0.0292	0.0498	0.0843	-0.1038**	0.1533*
	(0.0599)	(0.1270)	(0.2186)	(0.4529)	(0.0322)	(0.0639)
GROWTHW	-0.0051	0.0030**	0.0051*	0.0157**	0.0013	-0.0013
	(0.1300)	(0.0359)	(0.0946)	(0.0249)	(0.6567)	(0.7974)
FEMALECEO	-0.01	-0.004	-0.0035	-0.1061***	0.0462***	-0.0283
	(0.5295)	(0.5537)	(0.8050)	(0.0088)	(0.0081)	(0.3418)
LOGICALEPU	-0.0062	-0.0122	0.0056	-0.0313	0.0243	-0.0283
	(0.7308)	(0.1157)	(0.7333)	(0.4575)	(0.1806)	(0.3612)
ANALYTICAL	0.0247	-0.0324	0.0058			
	(0.6357)	(0.1455)	(0.9021)			
ANALYTICALEPU	-0.0043	0.0049	-0.0014			
	(0.6586)	(0.2391)	(0.8702)			
2015.year	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)
2016.year	-0.0001	0.0011	-0.004	-0.0012	-0.0141**	0.0201*
	(0.9825)	(0.6620)	(0.4594)	(0.9311)	(0.0192)	(0.0503)
2017.year	-0.0038	0.0032	-0.0061	-0.0035	-0.0099**	0.0038
	(0.4493)	(0.1381)	(0.1815)	(0.7571)	(0.0425)	(0.6495)
2018.year	-0.0022	0.0042**	-0.0095**	-0.0035	-0.0058	0.0048
	(0.6601)	(0.0498)	(0.0366)	(0.7547)	(0.2305)	(0.5601)
2019.year	0.0047	0.0056	-0.0125*	0.0035	-0.0166**	0.0009
	(0.5575)	(0.1055)	(0.0860)	(0.8476)	(0.0355)	(0.9442)
2020.year	0.0111	0.0036	-0.0058	0.0125	-0.0149	0.0091
	(0.2895)	(0.4177)	(0.5421)	(0.6010)	(0.1489)	(0.6071)
2021.year	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)
CONCEPTUAL				-0.3657*	0.0121	0.107
				(0.0503)	(0.8805)	(0.4359)
CONCEPTUALEPU				0.0536	-0.0013	-0.0101
				(0.1205)	(0.9299)	(0.6893)
_cons	0.0566	0.1684***	-0.1621*	0.164	0.2783***	-0.3703**
	(0.5641)	(0.0001)	(0.0677)	(0.4824)	(0.0058)	(0.0315)
N	2419	2419	2419	634	634	634
r2	0.0619	0.0419	0.0383	0.0532	0.0436	0.0641

*Note: DTA, CAPEX, and CTA represent the dependent variables. Figures in parentheses indicate the p-values. Statistical significance is denoted by ***, **, and * representing 1%, 5%, and 10% significance levels, respectively. Year and industry dummy variables are included in the model.*

Table 4: Decomposing logical and intuitive CEO on firm risk taking during (moderated by) COVID-19: Sub-sample test on analytical (vs directive) CEOs and conceptual (vs behavioral) CEOs

	Analytical (vs Directive) CEOs			Conceptual (vs Behavioral) CEOs		
	Y_1	Y_2	Y_3	Y_1	Y_2	Y_3
	(1)	(2)	(3)	(4)	(5)	(6)
ROAW	-0.0066	-0.0011	0.0563***	-0.0197	-0.0076	0.0286
	(0.5721)	(0.8291)	(0.0000)	(0.4492)	(0.4952)	(0.1359)
FIRMSIZEW	-0.0236***	0.0049***	0.0114***	-0.0178***	-0.0014	0.0119***
	(0.0000)	(0.0000)	(0.0000)	(0.0008)	(0.5433)	(0.0023)
FIRMAGEW	0.0846*	-0.0288	0.0502	0.08	-0.1009**	0.1514*
	(0.0590)	(0.1327)	(0.2153)	(0.4741)	(0.0365)	(0.0662)
GROWTHW	-0.0052	0.0031**	0.0051*	0.0157**	0.0014	-0.0014
	(0.1260)	(0.0339)	(0.0961)	(0.0251)	(0.6439)	(0.7904)
FEMALECEO	-0.0096	-0.0036	-0.0032	-0.1032**	0.0459***	-0.0286
	(0.5442)	(0.5978)	(0.8259)	(0.0107)	(0.0083)	(0.3351)
COVID	-0.0044	-0.0080*	0.0022	-0.0171	0.0128	-0.0153
	(0.6725)	(0.0738)	(0.8123)	(0.4728)	(0.2113)	(0.3836)
ANALYTICAL	0.0021	-0.0081**	-0.0022			
	(0.7990)	(0.0231)	(0.7709)			
ANALYTICAL*COVID	-0.0005	0.0047*	0.0011			
	(0.9295)	(0.0698)	(0.8353)			
2015	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)
2016	-0.0032	-0.0027	-0.0022	-0.0098	-0.0051	0.0089
	(0.5422)	(0.2276)	(0.6496)	(0.3724)	(0.2846)	(0.2729)
2017	-0.0068	-0.0006	-0.0042	-0.0122	-0.0011	-0.0072
	(0.2443)	(0.8098)	(0.4250)	(0.3376)	(0.8459)	(0.4401)
2018	-0.0059	-0.0004	-0.0073	-0.0142	0.0049	-0.0084
	(0.3858)	(0.9016)	(0.2340)	(0.3496)	(0.4575)	(0.4535)
2019	-0.0014	-0.002	-0.0088	-0.0149	0.0012	-0.021
	(0.8530)	(0.5419)	(0.2139)	(0.4052)	(0.8779)	(0.1122)
2020	0.0077	-0.0004	-0.0038	0.0018	-0.005	-0.0028
	(0.1264)	(0.8654)	(0.4087)	(0.8698)	(0.2848)	(0.7250)
2021	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)
CONCEPTUAL				-0.0910**	0.0041	0.0562**
				(0.0118)	(0.7895)	(0.0345)
CONCEPTUAL*COVID				0.0356	0.0036	-0.0112
				(0.1022)	(0.7013)	(0.4860)
_cons	0.0264	0.1081	-0.1361	0.0278	0.3850**	-0.4992*
	(0.8667)	(0.1081)	(0.3390)	(0.9426)	(0.0210)	(0.0795)
N	2419	2419	2419	634	634	634
R_2	0.0618	0.0428	0.0383	0.0537	0.0439	0.0648

*Note: DTA, CAPEX, and CTA represent the dependent variables. Figures in parentheses indicate the p-values. Statistical significance is denoted by ***, **, and * representing 1%, 5%, and 10% significance levels, respectively. Year and industry dummy variables are included in the model*

5. Conclusion

This study examines the influence of CEO decision orientation, shaped by educational background, on corporate risk-taking, both in normal conditions and during periods of heightened uncertainty. The findings reveal that logical CEOs significantly impact firm leverage and liquidity, evidenced by lower debt-to-asset ratios and higher cash holdings.

This suggests a more conservative risk-taking approach, emphasizing financial resilience and a focus on long-term sustainability. Logical CEOs tend to avoid drastic shifts in capital expenditures, instead favoring consistency in their strategic investments. This result aligns with previous literature, suggesting that logical decision-makers prioritize predictability and manageability in risk profiles.

When interacting with economic policy uncertainty (EPU) and the COVID-19 pandemic, logical CEOs exhibited calculated opportunism by increasing leverage during uncertain periods, indicating a strategic move to exploit market conditions, such as reduced borrowing costs. However, their approach to capital expenditures and liquidity management remained stable, pointing to a deliberate and data-driven approach to decision-making that remains consistent regardless of external shocks. Intuitive CEOs, particularly those in the conceptual domain, did not show significant changes in corporate risk-taking across any of the firm risk proxies, indicating a steady and adaptive decision orientation that remains largely unaffected by uncertainty.

The examination of cognitive complexity within logical and intuitive decision orientations further illustrates that analytical and conceptual CEOs do not inherently engage in higher levels of risk-taking. Instead, their complex cognitive abilities equip them with the flexibility to adapt their strategies according to situational factors, rather than pushing them towards consistent riskier behaviors. The findings suggest that, while CEO decision orientation and cognitive complexity play a role in shaping risk preferences, these traits alone are not definitive predictors of risk-taking. Future research may benefit from exploring additional factors, such as emotional intelligence and stakeholder influences, to gain a more comprehensive understanding of the dynamics influencing CEO decision-making in uncertain environments. Overall, the results underline the importance of context in evaluating CEO behavior, especially in a dynamic risk landscape.

In summary, this study highlights that CEO decision orientation, particularly within the logical and intuitive frameworks, has a nuanced impact on corporate risk-taking. While logical CEOs adopt a cautious yet opportunistic approach, they tend to maintain consistent strategies during times of uncertainty, regardless of external conditions such as in time of uncertainty. The role of cognitive complexity suggests that adaptability, rather than a predisposition towards risk, defines CEO behavior in uncertain environments. These insights contribute to a deeper understanding of the interplay between individual decision-making traits and corporate strategies, emphasizing the need to consider broader contextual influences when evaluating executive decision-making.

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