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Corporate Risk-Taking and Cash Holdings: The Moderating Effect of Investor Protection

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Abstract: **Research Question:** This paper investigates the association between corporate risk-taking and cash holdings and whether investor protection moderates this association. **Motivation:** The motives of cash holding have important implications for corporate decisions making and performance. Understanding the relationship between corporate risk-taking and cash holdings across firms in different institutional contexts enhances better comprehension of how companies manage their financial resources. **Idea:** The perspectives of the precautionary savings and agency theory are employed in setting the views on the link between corporate risk-taking, investor protection, and cash holdings. This study incorporates both sources of managerial incentive at the firm-level i.e. corporate risk-taking and country-level i.e. governance through investor protection in examining the determinants of corporate cash holdings. **Data:** The dataset comprises 104,687 firm-year observations from 58 countries from 2011-2020. Firm-level data were gathered from Thomson Reuters Fundamentals, while country-level data were extracted from the World Bank. **Method/Tools:** The regression model employs corporate cash holdings, measured by the proportion of cash and cash equivalents to total assets, as the dependent variable. The test variables are corporate risk-taking which is based on the standard deviation of the return on the asset over three years and investor protection which is based on the strength in control of corruption. **Findings:** The findings indicate that firms with higher risk incentives exhibit lower cash holdings while firms in countries with high levels of investor protection are shown to have lower cash holdings. However, the negative association between corporate risk-taking and cash holdings is attenuated for firms in stronger investor protection countries as compared to those in weaker investor protection countries. Our findings are robust to various specification tests, such as those that employ alternative variables. Overall, the findings reveal that the strength of country-level investor protection moderates the negative association between corporate risk-taking and cash holdings. **Contributions:** The findings provide

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insights into the way country-level governance, through the strength of investor protection, mitigates the agency costs in high-risk-taking firms concerning their cash management.

Keywords: Corporate risk-taking, corporate cash holdings, investor protection, corruption.
JEL Classification: G38, G18, M41, M43, M44

1. Introduction

In recent years, levels of corporate cash holdings (CCH) are witnessing a continuous increase all over the world (El-Halaby *et al*., 2021). Apparently, over the turn of the century, the common intuition was that firms with larger cash holdings should be safer due to the lower probability of financial distress (Chowdhury *et al*., 2021). The study on corporate cash management has become essential since failure to maintain liquidity position appropriately will risk firms facing bankruptcy even if they are profitable. The theoretical arguments for holding cash vary, supporting the fact that there are various motives for cash holdings, including transaction motive, precautionary motive, agency motive, and predation and speculative motives (Tran, 2020; Akhtar *et al*., 2018). While cash reserves are necessary to enable firms to capitalize on opportunities to invest in profitable projects to earn positive returns for shareholders, as well as a buffer against economic uncertainties, there are concerns that high cash reserves give rise to high agency costs because entrenched managers would be enticed to overinvest in unprofitable projects with the available liquid resources (Jensen, 1986; Opler *et al*., 1999). Our research is motivated by the dilemma associated with cash holdings, given the various managerial incentives across firms in different institutional settings. More specifically, we look at the link between corporate risk-taking and cash holdings using a large dataset of firms from various countries that allows us to also capitalize on the country-level institutional environment that influences managerial incentives.

CRT refers to the propensity to involve in activities that have equal potential benefits and harmful outcomes simultaneously, and hence it is fundamental to managerial decision-making. Prior studies suggest that CCH is determined by various aspects of corporate risks (e.g. Da Cruz *et al*., 2019; Weidemann, 2018), in which the mixed findings can be explained from two perspectives. The precautionary motive of cash asserts a positive association between CRT and CCH since the cash reserves can be efficiently employed by managers in potential investment opportunities including hedging against corporate downturns. However, the agency theory perspective asserts a negative association between CRT and CCH. High risk-taking behaviour would mean a greater probability of being too optimistic, which would result in the tendency to be involved in unprofitable investments, especially by entrenched managers.

Further, another source of managerial incentives is the country-level institutional contexts that influences managerial decisions and behaviours involving CRT and CCH. Studies that use samples of firms from various countries identify the strength of investor protection as the determinant of cash holding, albeit mixed findings on the direction of the associations (Dittmar *et al*., 2003; Iskandar-Datta and Jia, 2014; Tran, 2020). Investor protection serves as a source of governance that mitigates the agency problem (Kuan *et al*., 2012), but the effect could be complementary or substitutive on firm-level governance aspects surrounding firms. We attempt to further contribute to understanding on determinants of CCH by exploring whether, and how, CRT and investor protection affect CCH.

We examine the association between corporate risk-taking (CRT) and cash holdings (CCH) across firms in various institutional environments based on 104,687 firm-year observations from 58 countries from 2011-2020. CCH is proxied by the proportion of cash

and cash equivalents to the total assets while CRT is based on a standard deviation of the return on the asset over three years. Investor protection is measured by the indicator for Control of Corruption from the Worldwide Governance Indicators - World Bank. The results suggest a lower level of CCH for firms with higher levels of risk-taking, and a higher level of CCH for firms that are domiciled in high-level investor protection countries. We further find that the negative effect of CRT on CCH is attenuated for firms in countries with relatively stronger investor protection, suggesting that the strength of investor protection moderates the effect of CRT on CCH. The findings are shown to be consistent and robust across various tests.

Our study contributes to the prevalent literature in the following ways. First, to the best of our knowledge, this study is among the first to incorporate the perspective of CRT and investor protection on CCH. This approach adds to the empirical evidence on the direct impact of CRT and investor protection (Iskandar-Datta and Jia, 2014) on CCH. More specifically, the contribution is made to the literature on CCH, which currently suffers from inconsistent findings and theories. Second, is the use of a large sample of 104,687 firm-year observations from 58 countries from 2011-2020, an apparent addition to empirical evidence that uses a single-country setting and prior periods. Third, our study adds to the theory of cash holdings as we provide evidence on the agency theory of the holding of cash. We assert that managerial incentives that are sourced from CRT is mitigated by the governance from investor protection in assuring higher levels of cash holding. The findings that high-risk-taking firms in countries with strong investor protections exhibit high cash holdings provide practical implications for regulators in different countries regarding the need to set a strong institutional environment that protects investors.

The remainder of the paper is structured as follows. In Section 2, we review the related literature and develop our hypotheses. Section 3 describes the research design, while Section 4 presents the main results and results of robustness tests. We conclude in the final section.

2. Literature Review and Hypotheses Development

Theories acknowledge that the policy of CCH has both transaction and precautionary benefits (Keynes, 1936). The transaction benefits of cash refer to savings from the potential to incur the high cost of raising external capital, as cash is the least costly available capital for firms and hence, becomes a source of greater liquidity (Keynes, 1936). As for the precautionary benefits of cash, managers preserve cash for opportunities to invest in profitable projects and earn positive returns for shareholders when other sources of financing are unavailable or when cash flows are volatile (Opler *et al*., 1999). Nevertheless, there is evidence that cash holdings are associated with overinvestments in unprofitable projects and higher agency costs (Jensen, 1986; Opler *et al*., 1999) that may have an adverse impact on the potential returns to investors (Chen *et al*., 2015; Harford *et al*., 2014; Pinkowitz *et al.*, 2006). More recent literature shows that firms have various motives to reserve cash, including transaction motive, precautionary motive, agency motive, tax motive, and predation and speculative motives (Tran, 2020; Akhtar *et al.*, 2018). Firms of any size should maintain appropriate liquidity positions to avoid costly external financing for operational and investment needs but at the same time cater to the needs to minimize the agency conflicts associated with the holding of cash.

Managers play an important role as decision-makers in evaluating the costs and benefits of holding cash. A fundamental principle of finance is that managers should make investment and financing decisions that maximize the market value of equity to contribute positive net present values (Liu and Mauer, 2011). Yet, there is mixed evidence on whether managers employ value-increasing or value-decreasing cash holdings strategies. On one hand, managers generally prefer to hold large cash balances as part of precautionary motives, given that cash holdings are aimed at reducing overall firm risk and increasing managerial freedom to make

investment choices. It follows that managers presented with lucrative investment opportunities may choose to hold more cash (Opler *et al.,* 1999). On the other hand, the differential risk preference of managers and shareholders can entice non-accountable managers to hold more cash than those preferred by shareholders. Risk reduction is a typical agency problem as entrenched management is particularly prone to these risk differentials, choosing to hold cash rather than increase pay-outs to shareholders when faced with poor investment decisions (Bates *et al.,* 2009). In this paper, we look at the managerial incentives associated with CRT and investor protection as determinants of CCH. While CCH has garnered increased attention in the academic literature, limited works of literature address the linkage between corporate risk-taking and cash holdings especially by using a large sample of an international dataset in different institutional contexts.

2.1 Corporate Risk-Taking and Cash Holdings

Corporate risk-taking (CRT) is defined as conscious decision-making among alternative results under a probabilistic uncertainty situation (Dan-Jumbo, 2016). In this respect, CRT is a critical aspect of managerial decision-making since managers need to take risks that have important implications for corporate growth, performance, and survival (Kim and Buchanan, 2008). Formal economic assumptions of risk-taking suggest that if the expected values for two strategies are similar, but one is a greater gamble (uncertain), managers are more likely to choose the strategy with a more certain outcome. As long as managerial interests are aligned with those of the shareholders, CRT would yield positive future benefits. Yet, the misalignment of interests due to managerial self-serving behaviour and improperly designed incentives could cause CRT to adversely affect future performance.

The cash holdings are particularly appropriate to be adapted in exploring managerial incentives related to CRT because the decision to accumulate cash more than what is necessary is, to a large extent, at the discretion of managers with little scope for external scrutiny (Belghitar and Clark, 2014). It is a world phenomenon that firms hold cash due to some risk reasons, as shown by existing studies that applied various measurements of risk in understanding CCH. Some studies consider the perspective of risk associated with top management. This managerial risk preference is in line with the agency-based theoretic model that managerial risk-taking incorporates the idea of rationally risk-averse managers because a significant component of their wealth is tied to a particular organization. A study of US companies by Tong (2010) examines the implications of risk-related agency theory on CCH for a sample consisting of 1,768 observations during the period 1993-2000. The results suggest a negative relationship between CEO risk incentives and CCH. The easing pressure of higher risk-related agency problems alters the risk tolerance of the CEOs as it allows them to pursue riskier corporate policies. Hence, firms with higher CEO risk incentives hold less cash to assure lower managerial entrenchment, for which the CEOs would undertake managerial risk-increasing incentives in an efficient way to improve firm value.

Meanwhile, the links between risks and CCH have also been explored from the country-level perspective by, mostly, utilizing the economic risks and crisis. Hunjra *et al.* (2022) examine the impact of economic risk on CCH by using data from 552 listed firms in Pakistan, Sri Lanka, India, and Bangladesh from 2002 to 2018. The findings show that the variance of inflation has a negative effect while the variance of interest rate has a positive effect on CCH. Lozano and Yaman (2020) employ the precautionary motive perspective to analyse the relationship between the 2008 European financial crisis and CCH policies. By using a sample of 1,541 listed firms from 15 Western European countries, they found that the European financial crisis positively affects firms' cash holding policies in the short crisis period, where it was noted that volatility has a positive impact on cash holding. Yet, the European financial crisis negatively affects firms' cash holding policies during the long crisis period.

More relevant to our study are the empirical evidence that focuses on the link between firm-level risks and CCH. In general, a larger liquidity risk requires larger CCH, and higher solvency risk suggests lower CCH (Gryglewicz, 2011). Some studies identify the systematic risk implication on CCH. Systematic risk is also known as market risk, referring to the risk associated with changes that can be eliminated through diversification by investors (Azis *et al.*, 2021). There are two views on the relationship between systematic risk and CCH (Azis *et al.*, 2021). The first is that low systematic risk may reduce cash holdings as a low correlation with the shock of the aggregate risks tend to induce a shortage of cash flow in a situation where firms need it (Palazzo, 2012; Acharya *et al.*, 2013). The other view is that systematic risk can affect the way a company chooses to invest in cash. Additional cash functions as an alternative for declining leverage by corporations (Acharya *et al.*, 2011). Since banks are more inclined to grant a credit line to firms with low systematic risks, these high systematic risk firms consequently have more incentives to hold cash, and thus the systematic risk is positively associated with cash holding (Acharya *et al.*, 2013). However, in Azis *et al.* (2021), systematic risk is not shown to have an impact on CCH.

Further, the rising level of cash in the corporate's balance sheet could be due to lower investment (Acharya *et al.*, 2011). In Acharya *et al.* (2007), a firm that has high investment opportunities allocates its cash flow toward debt reductions to amplify its debt capacity, but firms prefer more cash to lower debt if their hedging needs are higher, that is, in a state of low future investment opportunities. Duchin (2010) shows that firms with cross-divisional diversification hold less cash to efficiently utilize their cash flows on better investment opportunities and to be less exposed to investment risks, while firms that are less diversified in their cash flows and investment opportunities face more investment risk and hold more cash for precautionary motives. Yet, Haushalter *et al.* (2007) show that firms with higher investment opportunities have higher predation risk, hold more cash, and use derivatives aiming to decrease the predation by cash-rich companies and gain market share on these rival groups, especially during economic downturns.

An aspect of risk that can explain our views is firm-level risks associated with financial constraints or distress. Almeida *et al.* (2004) indicate that a financially constrained may have to incorporate savings from incremental cash flows to protect its future and as a result would hold a considerable portion of cash as a hedging tool for downturns. Evidence indicates that the level of CCH increases when the probability of financial distress rises (Weidemann, 2018) and that financially constrained firms hold more cash as the volatility of cash flows increases (Han and Qiu, 2007) due to precautionary motives. Denis and Sibilkov (2010) posit that lower cash-constrained firms that are facing high costs of external financing tend to hold less cash than higher cash-constrained ones, particularly because the former produces lower cash flow than the latter. Similarly, Hugonnier *et al.* (2015) assert that the inability to raise external funds would cause firms with capital supply constraints to hold more cash to protect themselves against default risk. However, there are findings that financially constrained firms hold less cash than unconstrained firms (Arslan *et al.*, 2006).

Important empirical evidence, albeit limited, are those that employs international dataset with the view that the risks of having difficulty in accessing the capital market cause financial constraint that may exert influence on the precautionary motive of cash holding. Hoang *et al.* (2022) investigate the impact of COVID-19 exposure on CCH, using data across sixteen developing and developed economies. The results show that firms reserve more cash when their exposure to COVID-19 increases. They also find a cash burn effect during the COVID-19 pandemic, meaning that the cash holdings are drained when firm exposure to the pandemic exceeds a tipping point. Further analyses reveal that the cash burn effect is more pronounced in larger firms and firms with less cash reserve and tends to be stronger in countries with a

high level of individualism and weaker in countries with high levels of risk aversion, masculinity, and long-term orientation.

Considering all these factors and the mixed evidence addressed in the above-mentioned studies, it seems likely that the CCH is considerably sensitive to various aspects of corporate risks. The notable findings are the implicit support that mechanisms to manage the embodying risk related to agency cost of under-investment, financial constraints, and financial distress are likely to involve a significant adaptation in terms of CCH. We posit two differing perspectives on the way CRT determines CCH. On one hand, firms with high CRT can be predicted to have high CCH based on the precautionary motive of cash. In this regard, the holding of cash is aimed at fulfilling potential investment opportunities and serving as a buffer against the expected risk of liquidity, including the default risk from various potential investments. This is due to the risk preference behaviours of the managers that attempt to align their interests with those of the shareholders in generating more return. A given level of wealth related to cash holdings would help to lessen the effect of misalignment of risk preferences of shareholders which in turn fosters the growth and improve corporate performance. On the other hand, firms with high CRT may tend to hold less CCH due to the need to lower agency costs associated with potential managerial entrenchment from high risk-taking behaviours. In this sense, managers of high CRT firms are restricted from holding high cash to control the misappropriation of liquid assets. Further, it is expected that high CRT firms would ensure that cash is diverted into investments with better returns, including allocating debt reduction for opportunities and flexibilities in investment alternatives. Too much cash may contribute to the impairment of corporate performance because it insulates the firm from exogenous shocks and can engender managerial complacency or irrational optimism (O'Brien and Folta, 2009). Therefore, the impression of heightened risks and uncertainties will establish the importance of the less need for liquidity for firms. Given the mixed theoretical and empirical arguments, we propose the following hypothesis:

H_1: There is a relationship between corporate risk-taking and cash holdings

2.2 Investor Protection, Corporate Risk-Taking, and Cash Holdings

Literature on CCH introduces an aspect of governance that influences managerial incentives towards CCH, which is sourced from the country-level institutional contexts. Investor protection turns out to be crucial because, in many countries, the expropriation of minority shareholders and creditors by the controlling shareholders is extensive to the extent that the returns on their investments will never materialize due to the expropriation (La Porta *et al.*, 2000). Martins (2019) investigates whether investor protection is associated with how entrenched managers set corporate cash holdings. The results, which are based on an analysis involving 29 countries during the 2010 to 2013 period, find that the way shareholder protection shapes this association depends upon how managers become entrenched. Studies that employ investor protection as measures of country-level governance assert two opposing views on the way investor protection affects CCH.

From the view that investor protection serves as a control mechanism against managerial entrenchment, firms in strong investor protection regimes would be holding high cash reserves, and vice versa. Huang *et al.* (2013) show that a reduction in agency costs through strong investor protection plays a significant role in the corporate decisions of how much cash to hold. The agency costs are reduced in these countries because it is hard for managers to pursue their welfare over shareholders' interests, as there will be limited flexibility that possibly harms corporate assets (Bailey *et al.*, 2006; Hope *et al.*, 2007). Harford *et al*. (2008) find that US companies with better investor protection hold more cash, as they conclude that large amounts of cash are too visible to trigger shareholder action to pay more dividends.

Since better investor protection prevents overinvestment, firms are induced to keep high corporate cash holdings. Iskandar-Datta and Jia (2014) find a positive relationship between investor protection and corporate cash holdings, explained by the fact that firms in countries with low levels of investor protection tend to overinvest, which leads to lower CCH.

From the view that strong investor protection would mean a greater ability to exercise shareholders' rights, firms in a strong investor protection regime would be holding low cash reserves. Low monitoring of excessive cash holdings would result in personal benefits for managers (Jensen, 1986). Despite managers' preferences for higher levels of CCH, the extant literature shows that when investors are strongly protected, they can use their rights to pressure managers to use the excess cash to lower the cost of operations as well as to avoid the loss from under-investment due to the scarcity of funds (Akhtar *et al.*, 2018; Opler *et al.*, 1999). Dittmar *et al.* (2003) argue that investors would try to limit the cash at managers' discretion, and they must do so when managers have adequate power to raise easy funds and hold higher cash for empire-building motives and over-investment that harm the interests of shareholders. Seifert and Gonenc (2018) conclude that strong country-level and firm-level governance reduce cash holdings.

While extant literature highlights the role of investor protection in affecting CCH (Dittmar *et al.*, 2003; Harford *et al.*, 2008; Chen *et al.*, 2015; Iskandar-Datta and Jia, 2014), to the best of our knowledge, no studies to date have investigated how investor protection could moderate the effect of CRT on CCH. In line with the views above on the effect of CRT on CCH and investor protection on CCH, we posit that investor protection at the country level helps in establishing a governance framework to further minimize the level of agency conflicts, thus reducing the over- and under-investment of the free cash flow. When investor protection is high, investors can enforce strong monitoring mechanisms to control the managers' discretionary powers on CRT and CCH. In these environments, it is hard for managers to pursue their personal preferences over shareholders' interests. It means that, if firms possess effective governance to protect shareholder interests, or if investors are well protected, shareholders of high CRT firms would be willing to accept higher levels of cash holdings. On the other hand, in weak investor protection countries, there is lesser control over the managers that would allow the managers to invest in sub-optimal projects and hold cash for their benefits resulting in the need for high CRT firms to force lower levels of cash holding. We, therefore, expect the association of CRT and CCH to be mitigated by the impact of investor protection. We propose the following hypothesis:

H_2: Investor protection moderates the relationship between corporate risk-taking and cash holdings

3. Research Design

3.1 Sample Selection

Our sample includes non-financial firms from 58 countries covering the period of 2011 to 2020. We extract firm-level data from Thomson Reuters Fundamentals, while the country-level data are extracted from the World Bank. In deriving the sample, we follow the approaches of the prior studies (e.g., Ariff and Kamarudin, 2019; Wan Ismail *et al.*, 2015) to exclude highly regulated industries. They are the (i) financial institutions (SIC code between 6000 and 6999) and (ii) utility companies (SIC code between 4900 and 4999). Further, we winsorize the observations that fall in the top and bottom one percent of all continuous variables to mitigate the influence of outliers. Our final sample consists of 104,687 firm-year observations from 58 countries.

3.2 Regression Model

We regress Equation (1) to test the hypotheses set above on i) the relationship between corporate risk-taking and cash holding, and ii) the moderating effect of investor protection on the relationship between corporate risk-taking and cash holdings.

$$CCH_{it} = \beta_0 + \beta_1 CRT_{it} + \beta_2 D_{CCE\,it} + \beta_3 (CRT_{it} * D_{CCE\,it}) + \sum_k \beta_k FIRM_{it} + \sum_j \beta_j COUNTRY_{it} + \gamma_t + \varepsilon_{it} \quad (1)$$

where *i* and *t* denote firm *i* at the end of year *t*, *CCH* proxies for corporate cash holdings, *CRT* is a variable for corporate risk-taking, and D_{CCE} proxies for investor protection. We have included a range of control variables, which are commonly used in the literature (e.g., Bates *et al*., 2009; Phan *et al.,* 2019; Opler *et al*., 1999), to explain CCH. The firm-level control variables (*FIRM*) are *FSIZE* which is the natural logarithm of total assets; *LEV* which is the total liabilities over the total assets, *GROWTH* which refers to firm-specific growth based on changes in sales; *LOSS* which is an indicator for loss firms; *MKTBK* which is the ratio of the market-to-book value profit, *QUICK* which is the ratio of the current assets minus the inventory divided by the total current liabilities; *LIT* which is a dummy variable of high-litigation industries, classified as 1 if the SIC codes are between 2833–2836, 3570–3577, 3600–3674, 5200–5961, and 7370–7370, otherwise 0 (Ashbaugh *et al.,* 2003); *AGE* which is the natural log of the number of years since incorporation; and *RETEQ* which is the ratio of the retained earnings to total equity. We also employ cash flow patterns as a proxy for firm life cycle (*LIFECYCLE*) following Dickinson's (2011) vector for firm lifecycle namely, INTRODUCTION, GROWTH, MATURE, DECLINE, and SHAKE-OUT. This is in line with the findings of Faff *et al.* (2016) on the importance of the life cycle as a determinant of corporate policies including liquidity.

The country-level control variables (*COUNTRY*) are *GDP* which is the gross domestic product per capita to proxy for fluctuations in economic outcomes and inflation rate (*INF*) to proxy for monetary uncertainty that could affect CCH. The model includes fixed effects to control for unobserved time and industry-wide common factors.

3.3 Measurement for Dependent and Test Variables

The dependent variable in this study is corporate cash holdings, measured by the proportion of cash and cash equivalents to the total assets, as the measurement is extensively used in the literature (e.g., Acharya *et al.*, 2013; Palazzo, 2012). For the robustness analysis, we employ CCH2, which is measured by the total cash and cash equivalents divided by the total assets minus cash and equivalents, as used in Phan *et al.* (2019).

The test variables are corporate risk-taking (CRT) and investor protection (D_{CCE}). Following prior studies (e.g., Ahmad and Azhari, 2021; Bhuiyan *et al.,* 2021; Habib and Hasan, 2017; Li *et al.,* 2013), we measure corporate risk-taking based on the standard deviation of the return on the asset over three years. We employ CRT2, which is the standard deviation of the return on the asset over five years, for the robustness analysis. The standard deviation of the return on the asset is commonly used to proxy for the overall corporate risk-taking measures where higher values reflect greater risk-taking by the firms as compared to their counterparts.

In this paper, country-level investor protection is proxied by the strength concerning control of corruption. We employ an index for Control of Corruption (CCE) from the Worldwide Governance Indicators - World Bank. The focus on the perspective of the country-level strength in controlling corruption is made for the following reasons. First, corruption

has been shown to affect managerial incentives such as reflected in corporate investment efficiency (Nguyen and Tran, 2022). Second, corporate financial policies, such as cash holding, are potential channels through which firms can avoid rent seeking, as evidenced by studies on corruption and cash holdings (Thakur and Kannadhasan, 2019; Tran, 2020). Further, the strength in controlling corruption is the core feature in ensuring strong investor protection because corruption could undermine the ability of the established law enforcement and judicial systems. We create a dummy variable for a high-level investor protection country (D_{CCE}), in which we assign the value 1 if the score for control of corruption is higher than the median, and 0 otherwise. In an alternative analysis, we also employ alternative measures for investor protection using five (5) key dimensions of governance using the data from the Worldwide Governance Indicators - World Bank. They are Voice and Accountability (VAE), Political Stability and Lack of Violence (PVE), Government Effectiveness (GEE), Regulatory Quality (RQE), and Rule of Law (RLE).

4. Discussion of Results

4.1 Descriptive Statistics

Table 1 presents the descriptive statistics; Panel A depicts the statistics for the firm-level variables and Panel B provides the statistics for the country-level variables. In Panel A, the mean for CCH is 0.133 and CCH2 is 0.202. CRT and CRT2 are shown to have an average value of 0.044 and 0.053, respectively. For the control variables, the mean for FSIZE is 19.553, with a range between 15.014 and 24.735. The variables LEV, GROWTH, and MKTBK have mean values of 0.207, 0.079, and 2.531, respectively. QUICK has a mean value of 1.97 while RETEQ has a mean value of 0.027. The average value for the dummy variables of LOSS is 0.204 indicating that loss firms constitute 20.4 percent of the sample. Meanwhile, the mean for LIT is shown to be 0.03 showing that 3.0 percent of the sample are those from highly litigious industries. AGE has a mean value of 9.151. For the country-level variables in Panel B, the statistics show that Japan is the most heavily represented in the sample (n = 19,484), followed by China (n = 19,168). Meanwhile, the countries with the lowest observations are Cyprus (n = 6) and Malta (n = 2). For investor protection, Norway, Sweden, Singapore, and Switzerland are ranked among the countries with the highest scores for CCE while Nigeria, Ukraine, and Russian Federation are among the countries with the lowest score for CCE.

Table 1: Descriptive statistics

Panel A: Firm-level variables

Variable	Obs	Mean	Std. Dev.	Min	Max
CCH	104806	0.133	0.139	0	0.700
CCH2	104806	0.202	0.315	0	2.336
CRT	104806	0.044	0.086	0.001	0.997
CRT2	104806	0.053	0.080	0.002	0.663
FSIZE	104806	19.553	1.956	15.014	24.735
LEV	104806	0.207	0.176	0	0.684
GROWTH	104806	0.079	0.372	-0.731	3.402
LOSS	104806	0.204	0.403	0	1
MKTBK	104806	2.531	3.351	0.152	30.525
QUICK	104806	1.970	2.366	0.165	20.610
LIT	104806	0.030	0.171	0	1
AGE	104806	9.151	0.706	7.022	10.610
RETEQ	104806	0.027	2.080	-18.555	1.912

Table 2 presents the result of the pairwise correlation analysis among the dependent and independent variables. The results reveal that CCH is positively correlated with CRT, GROWTH, MKTBK, QUICK, LIT, and GDP. CCH is shown to be negatively associated with FSIZE, LEV, AGE, RETEQ, and INF. Although the results show several significant correlations between the independent variables, none of the correlations suggest any concern for multicollinearity.

4.2 Main Results

Table 3 presents the regression estimates that test for hypothesis 1 on the association between CRT and CCH and hypothesis 2 on the moderating effect of investor protection on the association between CRT and CCH. The results for the samples in low ($D_{CCE} = 0$) and high ($D_{CCE}=1$) levels of investor protection are reported in column (1) and column (2), respectively. The results show that CRT is positive and significant for both samples of firms. Column (3) reports the estimation for the pooled sample, where we include both test variables; CRT and D_{CCE}. Both CRT and D_{CCE} are shown to be positive and significant.

The results for the full regression analysis can be seen in Column (4). The results show that the coefficient for CRT is significantly negative, suggesting that firms with a higher level of CRT have a lower level of CCH. This finding is in support of hypothesis 1, where an association is expected to exist between CRT and CCH. Meanwhile, D_{CCE} is positive and significant, indicating that firms in high-level investor protection countries have higher cash holdings than firms in low-level investor protection countries.

The coefficient for CRT*D_{CCE}, which is positive and significant, is in line with the expectation set in hypothesis 2. The results suggest the moderating effect of investor protection on the association between CRT and CCH. More specifically, the results imply that the negative effect of CRT on CCH diminishes in firms in stronger institutional environment regimes, which is proxied by the countries' strength in controlling corruption. Hence, the strength of investor protection attenuates the agency costs arising from greater risk-taking on CCH.

For the control variables, the results in Table 3 report that GROWTH, MKTBK, QUICK, and GDP have positive relationships with CCH. Meanwhile, FSIZE, LEV, LOSS, LIT, AGE, RETEQ, and INF are negatively associated with CCH. Overall, the results for the control variables indicate a significant influence of these variables on CCHs, as shown by prior studies on CCH.

Taken together, the results in Table 3 support the hypothesis that i) there is an association between CRT and CCH, and ii) investor protection affects the relationship between CRT and CCH. The results indicate that while CRT has a negative effect on CCH, the effect is attenuated for firms in countries with high-level investor protection. In other words, in high-level investor protection countries, the negative impact of CRT on CCH becomes weaker, suggesting evidence of a moderating effect of investor protection on the agency cost arising from high CRT.

Table 1 ***(continued)***

Panel B: Country-level variables

Country	Obs	CCH	CCH2	CRT	CRT2	VAE	PVE	GEE	RQE	RLE	CCE	GDP	INF
Argentina	338	0.044	0.049	0.056	0.060	0.446	0.064	-0.079	-0.660	-0.531	-0.307	9.404	13.563
Australia	2023	0.173	0.331	0.152	0.165	1.365	0.952	1.593	1.860	1.752	1.829	10.949	1.794
Austria	208	0.102	0.139	0.025	0.030	1.395	1.100	1.550	1.456	1.856	1.519	10.798	1.860
Bangladesh	191	0.051	0.065	0.031	0.033	-0.636	-1.110	-0.746	-0.872	-0.678	-0.904	7.484	6.889
Belgium	169	0.070	0.113	0.042	0.050	1.343	0.653	1.456	1.269	1.432	1.520	10.720	1.583
Brazil	374	0.089	0.109	0.026	0.031	0.415	-0.321	-0.218	-0.099	-0.135	-0.268	9.212	6.416
Bulgaria	153	0.015	0.017	0.026	0.032	0.381	0.260	0.116	0.576	-0.094	-0.234	9.006	3.106
Canada	1681	0.129	0.220	0.105	0.120	1.451	1.116	1.756	1.736	1.781	1.854	10.757	1.387
Cayman Islands	22	0.267	0.489	0.036	0.049	0.502	1.192	1.199	0.942	0.797	0.830	11.279	1.279
Chile	830	0.043	0.053	0.035	0.041	1.029	0.337	1.101	1.362	1.227	1.261	9.589	3.903
China	19168	0.170	0.249	0.035	0.042	-1.598	-0.429	0.332	-0.224	-0.345	-0.303	9.002	2.368
China, Hong Kong	354	0.131	0.189	0.030	0.040	0.430	0.720	1.811	2.038	1.690	1.662	10.665	2.617
Colombia	140	0.026	0.028	0.022	0.027	0.073	-0.963	-0.012	0.389	-0.357	-0.310	8.793	3.621
Cyprus	6	0.106	0.120	0.081	0.098	1.016	0.506	0.954	1.006	0.791	0.712	10.193	0.120
Czechia	24	0.149	0.213	0.017	0.027	0.944	0.991	1.007	1.159	1.072	0.535	9.943	2.113
Germany	354	0.103	0.139	0.043	0.053	1.397	0.711	1.572	1.684	1.660	1.844	10.721	1.680
Greece	565	0.077	0.097	0.024	0.030	0.729	-0.062	0.306	0.430	0.289	-0.067	9.903	-0.390
Hungary	138	0.095	0.135	0.077	0.095	0.538	0.750	0.565	0.715	0.537	0.162	9.578	3.613
India	7768	0.035	0.044	0.035	0.041	0.362	-0.957	0.088	-0.300	-0.029	-0.317	7.480	4.162
Indonesia	1173	0.081	0.111	0.044	0.053	0.109	-0.544	-0.063	-0.176	-0.428	-0.479	8.209	4.131
Ireland	165	0.120	0.150	0.050	0.062	1.315	0.958	1.443	1.637	1.576	1.599	11.088	1.750
Israel	872	0.147	0.248	0.084	0.093	0.686	-0.960	1.284	1.253	1.035	0.862	10.561	1.325
Italy	63	0.052	0.061	0.024	0.031	0.975	0.420	0.481	0.719	0.368	0.203	10.430	1.147
Japan	19484	0.218	0.351	0.026	0.033	1.014	1.024	1.655	1.270	1.498	1.552	10.602	0.461
Jersey	119	0.148	0.214	0.077	0.095	1.279	1.354	1.285	0.902	1.730	1.132	.	.
Kuwait	605	0.068	0.095	0.042	0.052	-0.639	0.097	-0.090	-0.009	0.208	-0.193	10.468	0.291
Malaysia	1150	0.122	0.174	0.038	0.048	-0.279	0.152	0.976	0.709	0.548	0.220	9.272	1.327
Malta	2	0.059	0.064	0.028	0.028	1.106	1.118	1.003	1.278	0.985	0.476	10.317	1.847
Mauritius	141	0.060	0.092	0.034	0.042	0.814	0.905	0.931	1.035	0.838	0.314	9.200	1.580

Table 1 ***(continued)***

Country	Obs	CCH	CCH2	CRT	CRT2	VAE	PVE	GEE	RQE	RLE	CCE	GDP	INF
Mexico	331	0.058	0.067	0.034	0.041	0.010	-0.746	0.113	0.294	-0.558	-0.691	9.188	4.391
Morocco	302	0.056	0.073	0.021	0.026	-0.657	-0.385	-0.104	-0.169	-0.151	-0.281	8.024	0.906
Netherlands	163	0.092	0.127	0.051	0.063	1.536	0.978	1.842	1.857	1.847	1.958	10.829	1.344
New Zealand	332	0.089	0.150	0.067	0.087	1.570	1.480	1.760	1.944	1.917	2.240	10.638	2.233
Nigeria	208	0.089	0.124	0.053	0.056	-0.447	-1.973	-1.040	-0.857	-0.934	-1.095	7.730	8.395
Norway	424	0.121	0.195	0.065	0.076	1.691	1.221	1.888	1.692	1.987	2.187	11.320	1.435
Oman	115	0.053	0.065	0.031	0.037	-1.071	0.600	0.207	0.468	0.489	0.263	9.888	-1.619
Pakistan	111	0.089	0.134	0.042	0.051	-0.793	-2.406	-0.688	-0.662	-0.771	-0.891	7.342	8.676
Panama	13	0.007	0.007	0.019	0.018	0.543	0.319	0.129	0.362	-0.061	-0.483	9.571	1.594
Peru	326	0.043	0.051	0.034	0.042	0.203	-0.440	-0.187	0.496	-0.504	-0.466	8.789	2.503
Philippines	526	0.104	0.161	0.037	0.048	0.046	-1.061	0.062	-0.037	-0.437	-0.508	8.024	1.923
Poland	882	0.050	0.063	0.050	0.056	0.880	0.729	0.612	0.966	0.632	0.680	9.546	1.728
Portugal	113	0.060	0.068	0.018	0.022	1.142	0.936	1.132	0.854	1.106	0.886	9.981	1.383
Qatar	175	0.101	0.132	0.016	0.022	-1.150	0.886	0.838	0.665	0.833	0.891	11.108	-1.155
Republic of Korea	14059	0.095	0.123	0.050	0.058	0.727	0.368	1.192	1.061	1.101	0.573	10.305	1.232
Russian Federation	623	0.040	0.046	0.052	0.061	-1.047	-0.800	-0.178	-0.419	-0.770	-0.931	9.390	7.857
Saudi Arabia	565	0.048	0.058	0.032	0.039	-1.774	-0.533	0.159	0.041	0.160	0.134	10.026	0.542
Singapore	1466	0.183	0.297	0.074	0.085	-0.127	1.430	2.217	2.134	1.819	2.124	11.000	0.814
South Africa	854	0.091	0.117	0.043	0.050	0.639	-0.185	0.332	0.245	0.024	0.007	8.800	5.297
Spain	207	0.066	0.076	0.035	0.043	1.031	0.218	1.064	0.923	1.013	0.790	10.258	0.586
Sweden	144	0.095	0.153	0.032	0.037	1.592	1.059	1.765	1.834	1.917	2.172	10.927	1.703
Switzerland	849	0.116	0.160	0.038	0.046	1.568	1.327	1.977	1.731	1.884	2.064	11.368	-0.236
Thailand	3082	0.055	0.070	0.040	0.048	-0.804	-0.896	0.316	0.190	-0.041	-0.401	8.770	1.452
Turkey	1291	0.070	0.093	0.050	0.054	-0.537	-1.396	0.172	0.199	-0.149	-0.151	9.271	10.279
Ukraine	37	0.029	0.032	0.067	0.076	-0.148	-1.128	-0.583	-0.553	-0.788	-0.998	8.057	10.864
United Arab Emirates	231	0.069	0.081	0.044	0.052	-1.086	0.726	1.356	0.940	0.735	1.155	10.617	-1.424
United Kingdom	2661	0.132	0.210	0.058	0.070	1.308	0.399	1.537	1.712	1.686	1.783	10.672	2.095
USA	13023	0.144	0.224	0.061	0.075	1.038	0.421	1.491	1.393	1.557	1.312	10.965	1.676
Vietnam	3413	0.070	0.095	0.030	0.038	-1.398	0.111	-0.025	-0.434	-0.193	-0.473	7.944	3.325
Total	104806	0.133	0.202	0.044	0.053	0.208	0.179	0.958	0.716	0.753	0.627	9.801	2.007

Table 2: Correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) CCH	1.000														
(2) CCH2	0.940*	1.000													
(3) CRT	0.162*	0.196*	1.000												
(4) CRT2	0.191*	0.224*	0.824*	1.000											
(5) FSIZE	-0.155*	-0.182*	-0.255*	-0.294*	1.000										
(6) LEV	-0.343*	-0.296*	-0.058*	-0.082*	0.238*	1.000									
(7) GROWTH	0.048*	0.041*	0.064*	0.091*	0.008*	-0.016*	1.000								
(8) LOSS	0.002	0.040*	0.337*	0.364*	-0.216*	0.122*	-0.095*	1.000							
(9) MKTBK	0.157*	0.155*	0.201*	0.220*	0.014*	0.036*	0.112*	0.062*	1.000						
(10) QUICK	0.438*	0.455*	0.127*	0.171*	-0.206*	-0.419*	0.010*	0.038*	0.016*	1.000					
(11) LIT	0.055*	0.042*	0.031*	0.048*	0.087*	-0.057*	0.005	0.040*	0.113*	0.030*	1.000				
(12) AGE	-0.070*	-0.089*	-0.148*	-0.195*	0.108*	-0.021*	-0.119*	-0.096*	-0.160*	-0.084*	-0.057*	1.000			
(13) RETEQ	-0.131*	-0.158*	-0.486*	-0.518*	0.258*	-0.058*	-0.033*	-0.359*	-0.372*	-0.038*	-0.075*	0.145*	1.000		
(14) GDP	0.214*	0.168*	0.093*	0.117*	0.216*	-0.092*	-0.009*	0.079*	0.028*	0.069*	0.176*	0.120*	-0.089*	1.000	
(15) INF	-0.123*	-0.089*	0.003	0.000	-0.066*	0.051*	0.048*	-0.011*	0.002	-0.035*	-0.023*	-0.091*	0.001	-0.393*	1.000

Notes: *** p<0.01, ** p<0.05, * p<0.1

4.3 Results using Alternative Measurements of Variables

We employ alternative measurements of the variables in our study to test whether our results could potentially be confounded by the choice of variables used in the main analysis in Table 3. The results are reported in Table 4; Panel A where D_{CCE} is replaced with five (5) dimensions of governance using the data from the Worldwide Governance Indicators - World Bank namely VAE, PVE, GEE, RQE, and RLE; Panel B where we replace CCH with CCH2, which is measured by the total cash and cash equivalents divided by the total assets minus cash and equivalents; and Panel C where CRT is replaced with CRT2, which is the standard deviation of the return on the asset over five years.

Overall, most of the results reported in Table 4 are consistent with those reported in Table 3. Mostly, CRT has significant and negative associations with CCH and significant associations are shown between proxies for investor protection and CCH. The results that employ these alternative measurements of variables also support hypothesis 2, on the moderating effect of investor protection on the association between CRT and CCH. Hence, our results are robust to alternative measurements of variables.

4.4 Robustness Tests

We also perform several analyses to ensure the robustness of our results, as presented in Table 5. In the first analysis that is reported in Column (1), we control for the impact of the COVID-19 crisis period due to the likelihood that COVID-19 would cause exogenous shock to CCH. This is because there is an increase in uncertainty and greater restrictions on firms' access to external financing because of crises (Tran, 2020) such as those that arise from the COVID-19 pandemic. Hence, we perform an analysis that excludes the COVID-19 sample. The results are similar to those reported as the main results in Table 3.

Second, we exclude firms from countries with less than 100 observations. We also exclude firms from the United States. We re-run equation (1) with the revised samples and the results are shown in Column (2) and Column (3) of Table 5. Again, we find results that are similar to our main results. The coefficients of CRT are significant and negative, while the coefficients of D_{CCE} are significant and positive. The coefficients for the interaction variable, $CRT*D_{CCE}$, are significant and positive, showing support for hypothesis 2. These results further validate our main findings.

Third, we employed weighted least squares (WLS) regression to address the concern that our results were biased by countries that were heavily represented since our number of observations varied substantially across countries. The approach, to using WLS, follows those of the prior studies (e.g., Jaggi and Low, 2011; Kamarudin *et al.*, 2020). In employing the WLS regression, we use the inverse of the number of observations in each country as a weight so that each country receives equal weight in the estimation. From the results shown in column (4), we further observe similar results that support hypothesis 1 and hypothesis 2.

Taken together, the robustness analyses that we employed validate our results on the relationship between corporate risk-taking and cash holding, and the moderating effect of investor protection on the relationship between corporate risk-taking and cash holdings. Firms with higher CRT are those with lower CCH, but the negative association between CRT and CCH is attenuated by the strength of investor protection.

Table 3: Main results

	(1) $D_{CCE}=0$	(2) $D_{CCE}=1$	(3) Full	(4) Full
Intercept	0.097***	0.008	0.108***	0.095***
	(9.502)	(0.403)	(13.259)	(11.706)
CRT	0.025***	0.089***	0.073***	-0.071***
	(3.458)	(13.633)	(14.592)	(-8.939)
D_{CCE}			0.020***	0.010***
			(16.215)	(7.660)
CRT*D_{CCE}				0.217***
				(23.451)
FSIZE	0.010***	-0.016***	-0.004***	-0.004***
	(35.824)	(-51.727)	(-17.371)	(-17.239)
LEV	-0.109***	-0.136***	-0.125***	-0.124***
	(-36.500)	(-38.042)	(-51.748)	(-51.470)
GROWTH	0.005***	-0.000	0.005***	0.004***
	(4.078)	(-0.307)	(5.445)	(4.479)
LOSS	-0.016***	-0.018***	-0.021***	-0.020***
	(-12.700)	(-11.875)	(-19.877)	(-19.320)
MKTBK	0.006***	0.006***	0.005***	0.005***
	(34.762)	(34.012)	(41.981)	(43.714)
QUICK	0.016***	0.022***	0.019***	0.019***
	(76.025)	(87.867)	(110.741)	(110.668)
LIT	0.021	-0.018***	-0.028***	-0.029***
	(1.347)	(-7.266)	(-12.545)	(-12.963)
AGE	-0.026***	0.009***	-0.005***	-0.004***
	(-31.412)	(12.827)	(-9.326)	(-7.443)
RETEQ	0.001	-0.001***	-0.003***	-0.002***
	(1.399)	(-4.687)	(-13.804)	(-10.871)
GDP	0.007***	0.030***	0.012***	0.013***
	(12.332)	(16.655)	(20.925)	(21.884)
INF	-0.001***	-0.008***	-0.003***	-0.002***
	(-9.366)	(-22.258)	(-16.788)	(-16.468)
2.LIFECYCLE	0.008***	0.013***	0.005***	0.006***
	(5.185)	(5.779)	(3.318)	(4.023)
3.LIFECYCLE	-0.001	0.010***	-0.004***	-0.003**
	(-0.380)	(4.720)	(-3.044)	(-1.990)
4.LIFECYCLE	-0.007***	0.010***	-0.011***	-0.009***
	(-3.455)	(3.350)	(-6.186)	(-4.928)
5.LIFECYCLE	0.025***	0.029***	0.019***	0.021***
	(14.014)	(12.066)	(12.806)	(13.932)
Industry Effects	Included	Included	Included	Included
Year Effect	Included	Included	Included	Included
Adj.R2	0.29	0.38	0.31	0.32
N	51439	53248	104687	104687
F-stat	631.569	957.880	1362.767	1347.139

Notes: t statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Table 4: Alternative measurements

Panel A: Regression estimates using five (5) other country governance replacing D_{CCE}

	(1)	(2)	(3)	(4)	(5)
MV	VAE	PVE	GEE	RQE	RLE
Intercept	0.053***	0.046***	0.100***	0.115***	0.128***
	(6.573)	(5.949)	(12.231)	(13.568)	(15.413)
CRT	-0.044***	-0.018**	-0.067***	-0.073***	-0.053***
	(-5.873)	(-2.338)	(-8.457)	(-9.337)	(-6.899)
D_{VAE}	-0.003**				
	(-2.107)				
CRT*D_{VAE}	0.190***				
	(2179)				
D_{PVE}		-0.003***			
		(-2.613)			
CRT*D_{PVE}		0.145***			
		(16.215)			
D_{GEE}			0.012***		
			(8.692)		
CRT*D_{GEE}			0.212***		
			(22.930)		
D_{RQE}				0.012***	
				(9.246)	
CRT*D_{RQE}				0.223***	
				(24.245)	
D_{RLE}					0.020***
					(14.597)
CRT*D_{RLE}					0.198***
					(2853)
FSIZE	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***
	(-18.670)	(-18.427)	(-16.796)	(-17.136)	(-16.146)
LEV	-0.124***	-0.124***	-0.125***	-0.124***	-0.124***
	(-5391)	(-5577)	(-5767)	(-5494)	(-5701)
GROWTH	0.004***	0.005***	0.005***	0.005***	0.004***
	(4.351)	(4.608)	(4.534)	(4.523)	(4.484)
LOSS	-0.021***	-0.021***	-0.020***	-0.020***	-0.020***
	(-20.037)	(-20.013)	(-19.499)	(-19.171)	(-19.669)
MKTBK	0.005***	0.005***	0.005***	0.005***	0.005***
	(42.749)	(42.545)	(43.632)	(44.100)	(43.404)
QUICK	0.019***	0.019***	0.019***	0.019***	0.019***
	(110.409)	(110.597)	(110.657)	(110.423)	(110.478)
LIT	-0.026***	-0.025***	-0.029***	-0.029***	-0.028***
	(-1834)	(-1174)	(-12.915)	(-13.174)	(-12.641)
AGE	-0.003***	-0.003***	-0.005***	-0.005***	-0.005***
	(-6.215)	(-6.111)	(-8.213)	(-8.616)	(-9.088)
RETEQ	-0.003***	-0.003***	-0.002***	-0.002***	-0.003***
	(-1688)	(-12.700)	(-1069)	(-10.769)	(-1898)
GDP	0.018***	0.018***	0.012***	0.012***	0.009***
	(32.505)	(34.382)	(20.340)	(19.079)	(15.801)
INF	-0.003***	-0.003***	-0.002***	-0.003***	-0.003***
	(-16.968)	(-17.095)	(-15.703)	(-18.971)	(-17.114)
2.LIFECYCLE	0.006***	0.006***	0.006***	0.006***	0.006***
	(4.316)	(3.991)	(4.229)	(4.332)	(4.199)
3.LIFECYCLE	-0.002	-0.002	-0.002	-0.002	-0.002*
	(-244)	(-628)	(-643)	(-587)	(-764)
4.LIFECYCLE	-0.009***	-0.010***	-0.009***	-0.009***	-0.009***
	(-5.025)	(-5.476)	(-4.964)	(-4.714)	(-4.963)
5.LIFECYCLE	0.021***	0.021***	0.022***	0.022***	0.022***
	(14.133)	(13.602)	(14.194)	(14.330)	(14.253)
Adj.R2	0.31	0.31	0.32	0.32	0.32
N	104687	104687	104687	104687	104687
F-stat	1333.765	1325.366	1346.777	1350.694	1354.683

Notes: Industry and year effects are included. *t* statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Table 4 ***(continued)***

Panel B: Regression estimates replacing dependent variable CCH with CCH2

	(1)	(2)	(3)	(4)	(5)	(6)
MV	VAE	PVE	GEE	RQE	RLE	CCE
Intercept	0.187***	0.163***	0.285***	0.324***	0.318***	0.284***
	(10.166)	(9.229)	(15.121)	(16.687)	(16.762)	(15.260)
CRT	-0.056***	0.024	-0.126***	-0.138***	-0.081***	-0.131***
	(-3.281)	(1.395)	(-6.952)	(-7.691)	(-4.648)	(-7.205)
D_{VAE}	0.004					
	(1.313)					
$CRT*D_{VAE}$	0.501***					
	(24.370)					
D_{PVE}		0.003				
		(1.092)				
$CRT*D_{PVE}$		0.364***				
		(17.772)				
D_{GEE}			0.032***			
			(10.327)			
$CRT*D_{GEE}$			0.574***			
			(27.076)			
D_{RQE}				0.034***		
				(11.068)		
$CRT*D_{RQE}$				0.596***		
				(28.266)		
D_{RLE}					0.041***	
					(13.401)	
$CRT*D_{RLE}$					0.526***	
					(25.354)	
D_{CCE}						0.033***
						(10.707)
$CRT*D_{CCE}$						0.579***
						(27.260)
FSIZE	-0.011***	-0.011***	-0.011***	-0.011***	-0.010***	-0.011***
	(-22.722)	(-22.144)	(-20.958)	(-21.371)	(-20.762)	(-21.304)
LEV	-0.175***	-0.176***	-0.176***	-0.174***	-0.175***	-0.174***
	(-31.586)	(-31.826)	(-31.925)	(-31.589)	(-31.743)	(-31.595)
GROWTH	0.005**	0.006**	0.005**	0.005**	0.005**	0.005**
	(2.083)	(2.414)	(2.290)	(2.294)	(2.219)	(2.264)
LOSS	-0.033***	-0.033***	-0.031***	-0.030***	-0.032***	-0.031***
	(-13.752)	(-13.668)	(-13.122)	(-12.744)	(-13.374)	(-12.890)
MKTBK	0.011***	0.011***	0.011***	0.011***	0.011***	0.011***
	(38.514)	(38.553)	(39.615)	(40.144)	(39.204)	(39.721)
QUICK	0.048***	0.048***	0.048***	0.048***	0.048***	0.048***
	(122.639)	(122.897)	(122.972)	(122.708)	(122.732)	(123.016)
LIT	-0.055***	-0.049***	-0.060***	-0.061***	-0.057***	-0.061***
	(-10.758)	(-9.589)	(-11.796)	(-12.094)	(-11.222)	(-11.971)
AGE	-0.011***	-0.011***	-0.013***	-0.014***	-0.014***	-0.012***
	(-8.759)	(-8.471)	(-10.376)	(-10.874)	(-10.703)	(-9.717)
RETEQ	-0.007***	-0.007***	-0.006***	-0.006***	-0.007***	-0.006***
	(-13.390)	(-14.662)	(-12.512)	(-12.199)	(-13.428)	(-12.331)
GDP	0.027***	0.029***	0.015***	0.013***	0.012***	0.015***
	(21.256)	(23.151)	(10.848)	(9.508)	(8.674)	(11.160)
INF	-0.004***	-0.004***	-0.003***	-0.005***	-0.004***	-0.004***
	(-10.927)	(-11.031)	(-9.715)	(-13.579)	(-11.403)	(-10.516)
2.LIFECYCLE	0.002	0.001	0.002	0.003	0.002	0.001
	(0.761)	(0.368)	(0.737)	(0.844)	(0.713)	(0.455)
3.LIFECYCLE	-0.006**	-0.008***	-0.007**	-0.007**	-0.007**	-0.009***
	(-2.137)	(-2.617)	(-2.432)	(-2.383)	(-2.464)	(-2.946)
4.LIFECYCLE	-0.023***	-0.026***	-0.023***	-0.022***	-0.023***	-0.023***
	(-5.578)	(-6.157)	(-5.475)	(-5.199)	(-5.504)	(-5.460)
5.LIFECYCLE	0.032***	0.030***	0.032***	0.033***	0.032***	0.031***
	(9.236)	(8.532)	(9.312)	(9.452)	(9.328)	(8.963)
Adj.R2	0.30	0.30	0.30	0.30	0.30	0.30
N	104687	104687	104687	104687	104687	104687
F-stat	1233.587	1220.628	1249.959	1254.428	1251.451	1251.945

Notes: Industry and year effects are included. *t* statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Table 4 ***(continued)***

Panel C: Regression estimates replacing independent variable CRT with CRT2

	(1)	(2)	(3)	(4)	(5)	(6)
MV	VAE	PVE	GEE	RQE	RLE	CCE
Intercept	0.046***	0.041***	0.094***	0.109***	0.122***	0.088***
	(5.744)	(5.342)	(11.389)	(12.780)	(14.637)	(10.837)
CRT2	-0.059***	-0.016*	-0.083***	-0.086***	-0.069***	-0.090***
	(-6.951)	(-1.912)	(-9.419)	(-9.846)	(-8.073)	(-10.241)
D_{VAE}	-0.006***					
	(-4.520)					
CRT2*D_{VAE}	0.216***					
	(21.774)					
D_{PVE}		-0.005***				
		(-3.627)				
CRT2*D_{PVE}		0.147***				
		(14.975)				
D_{GEE}			0.008***			
			(5.940)			
CRT2*D_{GEE}			0.242***			
			(23.738)			
D_{RQE}				0.009***		
				(6.433)		
CRT2*D_{RQE}				0.249***		
				(24.724)		
D_{RLE}					0.016***	
					(11.671)	
CRT2*D_{RLE}					0.226***	
					(22.627)	
D_{CCE}						0.006***
						(4.534)
CRT2*D_{CCE}						0.253***
						(24.962)
FSIZE	-0.004***	-0.004***	-0.004***	-0.004***	-0.003***	-0.004***
	(-18.177)	(-17.937)	(-16.285)	(-16.675)	(-15.738)	(-16.744)
LEV	-0.124***	-0.124***	-0.124***	-0.124***	-0.124***	-0.124***
	(-51.313)	(-51.510)	(-51.698)	(-51.372)	(-51.658)	(-51.335)
GROWTH	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***
	(4.123)	(4.453)	(4.388)	(4.393)	(4.334)	(4.310)
LOSS	-0.021***	-0.021***	-0.021***	-0.020***	-0.021***	-0.020***
	(-20.254)	(-20.229)	(-19.823)	(-19.499)	(-19.920)	(-19.701)
MKTBK	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***
	(42.759)	(42.427)	(43.712)	(44.140)	(43.464)	(43.849)
QUICK	0.019***	0.019***	0.019***	0.019***	0.019***	0.019***
	(109.826)	(109.964)	(110.080)	(109.796)	(109.812)	(110.063)
LIT	-0.027***	-0.025***	-0.029***	-0.030***	-0.029***	-0.030***
	(-12.157)	(-11.395)	(-13.273)	(-13.536)	(-12.974)	(-13.357)
AGE	-0.003***	-0.003***	-0.004***	-0.004***	-0.004***	-0.003***
	(-5.159)	(-5.362)	(-7.090)	(-7.530)	(-8.004)	(-6.234)
RETEQ	-0.003***	-0.003***	-0.002***	-0.002***	-0.003***	-0.002***
	(-11.486)	(-12.736)	(-10.585)	(-10.111)	(-11.603)	(-10.212)
GDP	0.018***	0.018***	0.012***	0.012***	0.009***	0.013***
	(32.477)	(34.086)	(20.265)	(19.048)	(15.797)	(21.837)
INF	-0.003***	-0.003***	-0.002***	-0.003***	-0.003***	-0.002***
	(-17.034)	(-17.164)	(-15.753)	(-19.033)	(-17.222)	(-16.554)
2.LIFECYCLE	0.006***	0.006***	0.006***	0.006***	0.006***	0.006***
	(4.511)	(4.174)	(4.486)	(4.517)	(4.413)	(4.325)
3.LIFECYCLE	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002
	(-0.835)	(-1.305)	(-1.170)	(-1.190)	(-1.346)	(-1.469)
4.LIFECYCLE	-0.008***	-0.009***	-0.008***	-0.008***	-0.008***	-0.008***
	(-4.635)	(-5.136)	(-4.531)	(-4.353)	(-4.543)	(-4.443)
5.LIFECYCLE	0.022***	0.021***	0.022***	0.022***	0.022***	0.022***
	(14.505)	(13.918)	(14.618)	(14.676)	(14.672)	(14.379)
Adj.R2	0.31	0.31	0.32	0.32	0.32	0.32
N	104687	104687	104687	104687	104687	104687
F-stat	1333.846	1322.915	1347.188	1350.568	1354.887	1349.026

Notes: Industry and year effects are included. *t* statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Table 5: Robustness analysis

	(1) ExclCOVID	(2) More100	(3) NonUSA	(4) REGWLS
Intercept	0.119***	0.095***	0.047***	0.112***
	(14.087)	(11.652)	(5.534)	(14.486)
CRT	-0.072***	-0.071***	-0.056***	-0.061***
	(-8.516)	(-8.932)	(-7.070)	(-7.613)
D_{CCE}	0.013***	0.010***	0.019***	0.010***
	(9.290)	(7.603)	(14.367)	(7.687)
CRT*D_{CCE}	0.215***	0.217***	0.187***	0.200***
	(21.780)	(23.454)	(19.168)	(21.368)
FSIZE	-0.003***	-0.004***	-0.002***	-0.005***
	(-14.970)	(-17.140)	(-8.707)	(-22.688)
LEV	-0.123***	-0.124***	-0.109***	-0.134***
	(-48.403)	(-51.349)	(-42.166)	(-55.165)
GROWTH	0.004***	0.004***	0.005***	0.006***
	(3.538)	(4.495)	(4.348)	(5.636)
LOSS	-0.020***	-0.020***	-0.022***	-0.020***
	(-18.400)	(-19.373)	(-19.588)	(-19.217)
MKTBK	0.006***	0.005***	0.007***	0.006***
	(42.012)	(43.680)	(47.963)	(46.590)
QUICK	0.019***	0.019***	0.019***	0.019***
	(105.404)	(110.577)	(106.074)	(112.015)
LIT	-0.028***	-0.029***	-0.030***	-0.009***
	(-11.968)	(-12.959)	(-4.794)	(-4.010)
AGE	-0.005***	-0.004***	-0.006***	-0.007***
	(-8.864)	(-7.387)	(-9.779)	(-11.961)
RETEQ	-0.003***	-0.002***	-0.000	-0.002***
	(-10.712)	(-10.916)	(-0.668)	(-9.304)
GDP	0.010***	0.013***	0.015***	0.016***
	(17.373)	(21.787)	(26.198)	(26.856)
INF	-0.003***	-0.002***	-0.002***	-0.002***
	(-16.056)	(-16.388)	(-12.402)	(-14.210)
2.LIFECYCLE	0.005***	0.006***	0.007***	0.006***
	(3.316)	(4.013)	(5.093)	(4.245)
3.LIFECYCLE	-0.002	-0.003**	0.001	-0.004***
	(-1.530)	(-2.030)	(0.609)	(-3.174)
4.LIFECYCLE	-0.009***	-0.009***	-0.008***	-0.010***
	(-4.798)	(-4.946)	(-4.288)	(-5.442)
5.LIFECYCLE	0.022***	0.021***	0.023***	0.020***
	(14.063)	(13.901)	(14.431)	(13.334)
Adj.R2	0.32	0.32	0.32	0.30
N	92984	104520	91664	104687
F-stat	1231.811	1344.429	1192.330	2487.428

Notes: Industry and year effects are included. *t* statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01

5. Conclusion

We attempt to investigate the corporate cash holdings decisions in the implication of ambiguity and uncertainty due to corporate risk-taking strategies. This paper employs data from 104,687 firm-year observations from 58 countries from 2011-2020 to examine the associations involving CRT, investor protection, and CCH. The hypothesis is set based on the mixed findings of the prior studies on the way CCH is determined by CRT and investor protection. The precautionary motives explain managerial incentives causing high CRT firms to hold high cash reserves, but the agency costs concern suggest that firms with high CRT would hold low cash reserves due to potential entrenchment of holding the liquid assets. We incorporate both sources of managerial incentive at the firm-level i.e. CRT and country-level i.e. governance through investor protection (that is measured by control of corruption) in examining whether, and how, CRT and investor protection determine CCH.

Our findings add to the empirical evidence on the link between corporate risk and CCH, as we show that high CRT is associated with low CCH. Higher risk-taking firms would tend to hold lesser cash reserve, as the agency costs associated with the holding of high cash reserve becomes a concern in firms with the tendency towards greater risk taking. Our findings contradict the notion that high CRT firms would employ precautionary motive strategies to be prepared for potential investments and safeguard against firms' future funding requirements. We further find that the strength of investor protection gives rise to the greater holding of cash, in line with Iskandar-Datta and Jia (2014) and Tran (2020). The most notable finding reported in this paper is the moderating effect of investor protection on the association between CRT and CCH. We provide evidence that the governance that is sourced from a country-level institutional environment serves to minimize the agency costs of holding high cash among high-risk-taking firms.

As with any empirical study, our findings are subject to several caveats. Most notably, the managerial risk incentives literature is still emerging, and researchers have not yet reached a consensus on the commonly accepted conceptual and/or operational definitions of risk-taking strategies. Although we focus on a notion of corporate risk-taking that relates to the dispersion of potential outcomes on cash holdings from managerial risk incentives, we note that this is a more holistic view of corporate risk-taking. As such, our conceptualization and operationalization of corporate risk-taking are homogeneous as we treat all types of risky behaviours equivalently. This may not capture other dimensions of multifaceted constructs of risks which might be influential to lead managerial incentives at the varying degree of efforts and risks, and that may appreciate or depreciate the firm values in the long run. Going forward, we encourage more research on CRT and CCH such as those that consider the concept of 'reasoned risk-taking' that focuses on the behavioural theories (Carpenter *et al.*, 2003) to explain managerial incentives related to CRT. It would also be beneficial to explore more on the life-cycle effect (Faff *et al.*, 2016) in understanding the link between CRT and CCH in various institutional contexts. Further, it is recommended for future research to focus on the regional economic level, such as ASEAN and MENA, to capture more of the institutional contexts that influences managerial incentives related to CRT including by incorporating other institutional variables, such as culture (Li *et al.*, 2013; Chen *et al.*, 2015), trust (Dudley and Zhang, 2016) and politics (Feng and Johansson, 2014).

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