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Corruption and corporate cash holdings: international evidence

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ABSTRACT

Although many prior studies document consistently negative effects of corruption on macroeconomic issues, the relationship between corruption and corporate financial decisions is debatable. In this paper, we investigate how corruption environment affects corporate cash holdings. With a sample of 199,333 observations across 46 countries, we find that corruption is positively associated with both cash holdings and the cash flow sensitivity of cash. Robustness tests with a reduced sample without US and Chinese firms, different measures of cash holdings and various regression approaches show that our research findings are stable. We also find that the effects of corruption are stronger if legal protection of shareholders is adequate. In addition, our additional analysis shows that corruption reduces value of cash. This paper shows that bribery motive of cash holdings is consistent around the world and firms tend to balance agency motive and bribery motive in their corporate liquidity management.

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1. Introduction

Corruption is public officials' behavior to exploit public power for their own benefits (Jain, 2001). Corruption undermines public trust in government, wastes public resources and causes social injustice. World Bank (2017) estimates that enterprises and individuals pay about \$1.5 trillion (equivalent to 2 % of the global GDP) per year in bribes. Therefore, corruption has become one of the most problematic issues in the real world and the academic world. Several prior studies document that corruption negatively affects a wide range of macroeconomic issues namely national investment and economic growth (Brunetti et al., 1998; Doh and Teegen, 2003; Mauro, 1995; Zakharov, 2018), health care and education services (Gupta and Tiongson, 2000), foreign direct investment and economic growth (Lambdsdorff and Cornelius, 2000). However, at the micro level, the relationship between corruption environment and corporate financial decisions is debatable. On the one hand, some prior studies posit that corporate financial policies are a potential channel to avoid rent seeking (McChesney, 1987). Firms tend to use more opaque disclosure policies as a response to higher corruption environment (Durnev and Fauver, 2008; Stulz, 2005). On the other hand, other studies argue that firms consider corruption environment as an opportunity to obtain competitive advantage. Firms are willing to pay bribes to receive favorable public service ("grease money") and/or to mitigate state predation ("protection money") (Claessens et al., 2008; Tahoun, 2014; Wei and Kaufmann, 1999; Xu et al., 2017). In addition, Svensson (2003) find that firms in Uganda pay "grease money" to public officials whose power directly affect their business operations. Cai et al. (2004), Wang and You (2012) find supporting evidence for both mechanisms in China. However, prior studies also find that corruption sands the wheels of corporate decisions and performance. Nguyen

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and Van Dijk (2012) show that corruption is negatively related to corporate investment of private firms in Vietnam. Sharma and Mitra (2015) also find that the association between bribe payment and firm performance is mixed in India. Besides, Asiedu and Freeman (2009) find that there is also a negative relationship between corruption and corporate investment growth in transition countries. In this paper, we focus on the effect of corruption on corporate cash holdings.

Prior empirical research on corporate liquidity originally focuses on firm-level variables. Firms are likely to hold cash due to transaction costs avoidance (C.-S. Kim et al., 1998; Opler et al., 1999), precautionary motive (Bates et al., 2009; Opler et al., 1999), agency motive (Harford et al., 2008; Seifert and Gonenc, 2018; Yun, 2008), tax motive (Fritz Foley et al., 2007) and predation motive (Haushalter et al., 2007). Then, this line of research is extended with institutional factors namely national culture (Chang and Noorbakhsh, 2009; Chen et al., 2015), shareholder protection (Dittmar et al., 2003; Ferreira and Vilela, 2004; Iskandar-Datta and Jia, 2014; Seifert and Gonenc, 2018), creditor protection (Yung and Nafar, 2014) and uncertainty of economic policy (Demir and Ersan, 2017). Recently, Thakur and Kannadhasan (2019) document that firms in greater corruption environment tend to hold more cash with a sample of 4236 firms from 16 emerging markets.

This study contributes to the literature on cash holdings as follows. First, we investigate how corruption influences corporate liquidity policy around the world rather than a group of countries. Second, we examine the relationship between corruption and cash-cash flow sensitivity. We argue that firms in higher corruption countries tend to accumulate more cash from cash flow due to both bribery motive and agency motive. The former states that firms increase cash-cash flow sensitivity to prepare for paying bribes as "grease money" and/or "protection money" (Claessens et al., 2008; Tahoun, 2014; Thakur and Kannadhasan, 2019; Wei and Kaufmann, 1999; Xu et al., 2017). The latter posits that under high corruption environment, firms are more likely to prepare for bribery payment and their managers experience more flexible in corporate liquidity management. Corporate managers may take this opportunity to expropriate shareholders by holding more cash out of cash flow (Jensen, 1986; Jensen and Meckling, 1976; Tran, 2019). Third, we examine how shareholder protection affects the effects of corruption on cash holdings and cash-cash flow sensitivity. Thakur and Kannadhasan (2019) find that firms in Common law countries witness insignificant impacts of corruption on cash holdings; however, we argue that firm managers tend to balance shareholder rights and bribery motive in corporate liquidity management. When shareholders are protected adequately, firm managers are more flexible to pursue bribery motive and thus firms hold more cash. In this study, we employ two corruption measures based on Corruption Perception Index provided by Transparency International and Corruption Control Index provided by World Bank. With a sample of 199,333 firm-years across 46 countries, we find that corruption is positively related to both cash holdings and cash-cash flow sensitivity. Robustness checks with a reduced sample, various measures of cash holdings and alternative regression models show consistent results. Moreover, unlike Thakur and Kannadhasan (2019), we find the effects of corruption are stronger in countries of strong shareholder rights. In addition, based on our supporting evidence for bribery motive of cash holdings, following Pinkowitz, Stulz, and Williamson (2006), we continue to investigate how corruption affects value of cash holdings. We find that both increases in cash holdings in the current period and the next period contribute less to firm value under higher corruption environment.

The rest of this paper is as follows. Section 2 reviews the prior research on motives of cash holdings and develops hypotheses to investigate the relationship between corruption and corporate liquidity management. Section 3 develops research models based on research hypotheses. Section 4 presents data collection and describes the research sample. Section 5 reports regression results and robustness checks. Section 6 is additional analysis and Section 7 presents main conclusions.

2. Literature review and hypothesis development

2.1. Motives of cash holdings

In a perfect market, firms hold an optimal positive level of cash without negative implications. Nevertheless, corporate cash holdings matter due to several market frictions in the real world. The extant literature shows that firms reserve cash due to many reasons including transaction motive, precautionary motive, agency motive, tax motive and predation motive. Transaction motive assumes that corporate cash holdings are a means to avoid transaction costs. When firms face inadequate internal finance, they able to convert non-cash assets to cash, issue new securities and decrease dividends. However, these approaches lead to transaction costs that firms are reluctant to incur. C.-S. Kim et al. (1998) initially examine determinants of cash holdings in US market and document that costs of external funds are positively related to corporate liquid assets. Then, Opler et al. (1999) find that firms with greatest access to external funds (e.g. large firms and firms with high credit ratings) tend to reserve lower cash since they incur lower transaction costs.

Precautionary motive refers to cash reserves as a safety buffer. Firms save cash to seize emerging profitable projects and meet unpredictable contingencies. By contrast, firms with cash shortage may struggle to survive and forgo profitable investment opportunities (Campello et al., 2010). Investigating corporate liquidity management of firms listed in US from 1971 to 1994, Opler et al. (1999) find that firms with higher growth rate and riskier cash flows tend to hold more cash. Almeida et al. (2004) argue that financially constrained firms should have higher cash saving propensity in order to secure future investment opportunities compared to financially unconstrained firms. Their research findings show that the relationship between cash holdings and cash flow are significantly positive. Bates et al. (2009) examine why US firms hold much more cash between 1980 and 2006 and find that corporate cash holdings increase sharply when cash flows are riskier. Besides, Hugonnier et al. (2014) document that that firms reserve more cash if their capital supply is uncertain and those with hefty cash can seize promising investment opportunities. Several prior studies find supporting evidence for both transaction and

precautionary motives of cash holdings. Ferreira and Vilela (2004), Kim et al. (2011) find that investment opportunities and cash flows have positive effects on cash reserves while asset liquidity, firm leverage, firm size, capital expenditure, dividend payment and bank debt have negative effects.

Agency motive refers to agency problem that may arise with cash holdings. According to Jensen and Meckling (1976) due to the separation of the rights to control and ownership of firms, managers tend to employ corporate resources to serve their own interest with investment in negative-NPV projects instead of maximizing owners' wealth. Jensen (1986) shows that firms with large cash holdings are more likely to conduct inefficient mergers and acquisitions while those with restricted access to cash are valued higher. Harford et al. (2008) find that weaker corporate governance structures result in smaller cash holdings since managers tend to exploit corporate cash to build their empire (Jensen, 1986). On the other hand, managers of firms with poor governance may prefer large cash holdings that make them more convenient and free from market scrutiny (Easterbrook, 1984). Yun (2008) find that firms prefer non-monitored cash rather than bank credit when they have weak corporate governance. Besides, Seifert and Gonenc (2018) document that firm-level governance is negatively related to cash holdings and positively related to cash value.

Tax motive considers cash holdings as a means to reduce tax burden. Many countries like US levy high tax rates on foreign income that firms repatriate; therefore, firms prefer holding large amount of cash. Fritz Foley et al. (2007) find that the firms facing more repatriation constraints are more likely to have large cash reserves. Moreover, subsidiaries charged with higher repatriation tax tend to maintain larger cash balance than similar subsidiaries levied lower tax. Furthermore, Bigelli and Sánchez-Vidal (2012) investigate cash holdings in Italian private firms and show that cash holdings are negatively associated with effective tax rates.

Predation motive posits that firms hold a large amount of cash when they have similar investment opportunities as their competitors. Failing to invest in a project may lead to higher costs than the costs of cash holdings if competitors take the first mover advantage. Haushalter et al. (2007) measure predation by industry concentration and find a positive relationship between predation and cash reserves. In addition, this effect is stronger in industries with more investment projects. Hoberg et al. (2014) also find supporting evidence for predation motive with a positive impact of competitive threats on cash holdings.

These studies show that corporate liquidity management has remained an interesting topic in corporate finance over the past decades. In this paper, we further investigate how corruption as an important institutional factor affects corporate cash holdings around the world and how agency motive of holding cash influences this relationship.

2.2. Institutional environment and cash holdings

From traditional studies mainly focus on the effects of firm-specific variables on corporate cash reserves, the literature on corporate liquidity is broadened further with institutional factors including national culture, shareholder protection, creditor protection and corruption. First, as a system of beliefs and norms guiding people's behavior, culture affects both managers' and investors' financial decisions. However, many prior studies documents that national culture tends to influence corporate decisions mainly via managers' view and preferences since these decisions are mainly at managers' discretion (Bae et al., 2012; Chui et al., 2002; Shao et al., 2010, 2013b; Zheng and Ashraf, 2014). Chang and Noorbakhsh (2009) employ Hofstede's cultural dimensions to investigate how national culture affects corporate liquidity across 45 countries between 1995 and 2004. Their research results show firms incorporated in countries with higher uncertainty avoidance, masculinity and long-term orientation are more likely to hold cash and liquid balances. Furthermore, Chen et al. (2015) find that corporate cash reserves are negatively and positively related to individualism and uncertainty avoidance respectively in 41 countries over the period 1989–2009. Besides, individualism and uncertainty avoidance also affect precautionary motive of cash holdings.

Second, shareholder protection affects firm cash holdings via agency motive. Prior research shows that legal protection of shareholders may influence corporate liquidity via two opposite channels including managers' empire building preference and convenience preference. Based on the convenience hypothesis, Dittmar et al. (2003) argue that shareholders in countries of poor shareholder rights fail to pressure firm managers to disgorge excessive cash. They use anti-director rights index developed by La Porta et al. (1998) as a proxy of investor protection find that investor protection is negatively related to corporate cash holdings across 45 countries. Chang and Noorbakhsh (2006, 2009) also find that firms tend to have a smaller proportion of cash and equivalents in total assets in countries that have stronger shareholder rights or belong to the Common law system. Recently, Seifert and Gonenc (2018) also find that stronger country-level governance decreases cash holdings. Moreover, Kalcheva and Lins (2007), Pinkowitz et al. (2006) document that cash holdings are valued lower when shareholder protection is poor. However, Iskandar-Datta and Jia (2014) posit that managers' empire building preference dominates corporate cash holdings and managers in firms of poor investor protection quickly use cash for unprofitable investment projects to serve their personal benefits. Previous supporting evidence of the convenience hypothesis is a bias due to coding mistakes in the original anti-director index (Spamann, 2010) and small sample size. Using a research sample of 115,945 observations collected from 18,192 firms in 41 countries between 1996 and 2008, they find that both corrected and revised anti-director indices positively affect firm cash reserves.

Third, strong creditor protection aggravate agency problem and pressure managers to save more cash in order to serve their personal interests (Yung and Nafar, 2014). With a sample of 5,519 unique firms from 57 countries during the period 1990–2010, Yung and Nafar (2014) document a positive impact of creditor rights on corporate cash holdings and this effect is mitigated in countries of strong investor protection. These results indicate that shareholders have concerns about agency

motive of cash reserves when creditor protection is strong. Finally, Demir and Ersan (2017) argue that economic policy uncertainty affects corporate cash reserves through precaution motive and investigate the relationship between economic policy uncertainty and cash holdings in BIRC countries. Using firm-level data over the period from 2006 to 2015, they find that firms prefer to accumulate more cash when they face higher economic policy uncertainty. In addition, their research findings show that global economic policy uncertainty also positively impacts corporate cash holdings. These studies show that institutional factors play an important role in corporate cash holdings.

2.3. Corruption and cash holdings

Corruption is defined as exploiting public power to serve personal interest (Jain, 2001). Main causes of corruption include rent and market competition (Ades and Di Tella, 1999); macro environment (Paldam, 2002; Treisman, 2000); quality of institutions (Acemoglu et al., 2001) and effectiveness of legal system (Herzfeld and Weiss, 2003). Corruption leads to several damages in the society such as eroding public trust in government, destructing public resources and creating social injustice. Consequently, it attracts the interest of both policy makers and academics. Prior macroeconomic research shows that corruption has negative impacts on different economic issues. Mauro (1995) initially investigates the effect of corruption on investment and finds that corruption environment is detrimental for investment that in turn deteriorates economic growth. Following studies also find supporting evidence for the negative impact of corruption on national investment and economic growth (Brunetti et al., 1998; Doh and Teegen, 2003; Zakharov, 2018). In addition, Gupta and Tiongson (2000) posit that corruption often accompany with government intervention to rectify market failures of public services such as health care and education. They find that corruption negatively influence health care and education services. Lambsdorff and Cornelius (2000) also find that corruption dampens foreign direct investment and economic growth.

Although several prior studies show a consistent effect of corruption on economic efficiency at the macro level, the relationship between corruption and corporate financial decisions is still debatable. On the one hand, some studies argue that firms may avoid rent seeking with their corporate financial policies (McChesney, 1987). Durnev and Fauver (2008) investigate how government predation interact with managers' incentives in shaping corporate governance structure and find that firms use information disclosure is a means to mitigate predatory policies. Caprio et al. (2011) also document that firms have less assets in liquid form in countries of higher political extraction. Many prior studies show that corruption may sand the wheels of corporate economic efficiency. Méon and Sekkat (2005) find negative effects of corruption on firm growth and investment separately. Nguyen and Van Dijk (2012) analyze how corruption affects firm growth in 741 private firms in Vietnam and find supporting evidence for "sand the wheels" hypothesis. Using World Bank enterprises surveys database, Sharma and Mitra (2015) point out that the effect of bribery payment on firm profitability is rather mixed despite but it positively affects export performance and innovation. On the other hand, other studies find that corruption environment is an opportunity for firms to improve their competitive advantage. Firms pay bribes to government officials as "grease money" and "protection money" (Xu et al., 2017). "Grease money" is paid to mitigate red tape and obtain better access to scarce production factors (Wei and Kaufmann, 1999). "Protection money" helps firms mitigate government predation (e.g. stronger protection of intellectual property rights and lower tax rates). Svensson (2003) investigates corruption in Uganda and find that firms pay bribes when they deal with government officials that directly influence their business operations. These bribes are not fixed but relies on their ability to pay. Cai et al. (2004) employ entertainment and travel expenses as a proxy for corruption and find that some elements of these costs generate significant positive returns despite their overall negative effect on productivity. Wang and You (2012) also document a positive effect bribery payment on firm growth in China.

Recently, Thakur and Kannadhasan (2019) use a sample of 4236 firms incorporated in 16 emerging markets to investigate the relationship between corruption and cash holdings. They find that corruption measures are positively related to corporate cash holdings and this effect is stronger in Common law countries. In addition, Almeida et al. (2004) show that firms accumulate cash out of cash flows; consequently, in this paper, we extend this line of research by investigating how corruption affects cash holdings and the cash flow sensitivity of cash around the world. We argue that corruption may affect the cash flow sensitivity of cash through two mechanisms. First, in line with Svensson (2003), Thakur and Kannadhasan (2019), Wang and You (2012), Xu et al. (2017), corporate managers have higher incentives to accumulate more cash from cash flow to prepare for bribery payment in order to get benefit from the corrupting opportunities. Second, corporate managers may take advantage of corruption environment to increase shareholder expropriation by saving more cash from cash flow. According to agency theory, managers tend to use corporate resources to invest in unprofitable projects to serve their own benefits instead of maximizing shareholders' wealth (Jensen and Meckling, 1976) and thus they are likely to hold more cash that is necessary for their overinvestment in these unprofitable projects (Jensen, 1986). Under high corruption environment, firms are more likely to pay bribes. Although the value of a bribery dollar is higher or lower than a dollar of profit, corruption may lead to more severe agency problem between managers and shareholders (Tran, 2019). Since corporate managers are more flexible to accumulate cash from cash flow in order to prepare for bribery payment, they take this chance to expropriate shareholders by saving more cash from cash flow. As a result, firms in higher corruption environment tend to accumulate more cash and have higher cash-cash flow sensitivity.

H1. Corruption is positively related to corporate cash holdings.

H2. Corruption is positively related to the cash flow sensitivity of cash.

Table 1
Definitions of research variables.

Variables	Variable names	Definitions
CH	Cash holdings	Total cash and short-term investment divided by total assets
CF	Cash flow	Earnings after interest, taxes and dividends but before depreciation and amortization divided by total assets
CI	Corruption index	Calculated from Transparency International's Corruption Perception Index or World Bank's Control of Corruption Index
NW	Net working capital	Current assets minus current liabilities, cash and short-term investment divided by total assets
TQ	Tobin's Q	Market value of equity plus book value of debt divided by total assets
LV	Financial leverage	Total debt to total assets
TC	Asset tangibility	Property, plant and equipment to total assets
SZ	Firm size	Natural logarithm of sales in USD
CE	Capital expenditure	Capital expenditure to total assets
DP	Dividend payment	Assigned 1 if firms pay dividends and 0 otherwise
ΔCH	Change in cash holdings	Cash holdings to assets in the current year minus cash holdings to assets in the previous year
ΔNW	Change in networking capital	Net working capital to assets in the current year minus net working capital to assets in the previous year
ΔSD	Change in short-term debt	Short-term debt to assets in the current year minus short-term debt to assets in the previous year
UA	Uncertainty avoidance culture	Uncertainty avoidance score from Hofstede (2001)
AD	Anti-self-dealing	Anti-self-dealing index provided by Djankov et al. (2008)
CR	Creditor rights	Revised creditor right index from Djankov et al. (2007).
Credit	Private credit	Domestic private credit to GDP published by World Bank
Mcap	Stock market capitalization	Stock market capitalization to GDP published by World Bank
GDPcap	GDP per capita	Natural logarithm of GDP in USD
GDPgro	GDP growth rate	Annual GDP growth rate published by World Bank

Moreover, Shao et al. (2013a) show that firm managers tend to balance shareholder rights and creditor rights. When shareholder (creditor) rights are strong, firms are more likely to serve creditors (shareholders). However, Thakur and Kannadhasan (2019) find no significant relationship between corruption and cash holdings in Common law countries that have stronger shareholder protection. In this study, we argue that firm managers tend to balance agency motive and bribery payment motive. When shareholders are protected adequately, managers focus more on payment motive. Therefore, corruption is more effective in corporate cash holdings and cash-cash flow sensitivity in countries of strong shareholder rights.

H3. The effects of corruption on cash holdings and cash-cash flow sensitivity are stronger in countries of strong shareholder rights.

3. Research models

In line with Chen et al. (2015), Thakur and Kannadhasan (2019), we employ cash holdings as the dependent variable and corruption index is an exploratory variable to investigate how corruption influences corporate cash holdings. Both firm-level and country-level characteristics are used as control variables. In addition, we also control industry, year and country effects with dummy variables.

$$CH = \alpha + \beta_1 CI + \beta_2 CF + \delta_1 F.con_i + \eta_1 C.con_i + \gamma Industrydummies + \theta Yeardummies + \phi Countrydummies + \varepsilon \quad (1)$$

Where CH is cash holdings. CI is corruption index. F.con is the vector of firm-specific control variables including net working capital (NW), Tobin's Q (TQ), financial leverage (LV), asset tangibility (TC), capital expenditure (CE) and dividend payment dummy (DP). C.con is the vector of country-specific control variables namely uncertainty avoidance index (UA), anti-self-dealing index (AD), creditor right index (CR), private credit (Credit), market capitalization (Mcap), GDP per capita (GDPcap) and GDP growth (GDPgro).

Moreover, following Almeida et al. (2004), we use the change in cash holdings as the dependent variable and an interaction between corruption index and cash flow to examine how corruption affects cash-cash flow sensitivity.

$$\Delta CH = \alpha + \beta_1 CI + \beta_2 CI * CF + \beta_3 CF + \beta_4 \Delta NW + \beta_4 \Delta SD + \delta_1 F.con_i + \eta_1 C.con_i + \gamma Industrydummies + \theta Yeardummies + \phi Countrydummies + \varepsilon \quad (2)$$

Where ΔCH is the change in cash holdings. ΔNW is the change in net working capital. ΔSD is the change in short-term debt. Definitions of key research variables are shown in Table 1.

Furthermore, to investigate whether the effects of corruption on cash holdings and cash-cash flow sensitivity are stronger when shareholders are adequately protected, we divide the full sample into sub-samples of strong and weak shareholder protection and replicate regression models (1) and (2) without shareholder protection variable for each sub-sample. A country is classified into the weak (strong) shareholder protection group if its anti-self-dealing index is equal to or smaller than (greater than) 0.5¹. Moreover, we also use investor protection index from [La Porta et al. \(2006\)](#) and legal origin as classification criteria for robustness checks.

4. Research data

We use Compustat database to construct our research data. Our research data excludes Japanese firms that may biased results. Japan is the second largest contributor in the database. However, Japanese firms have large cash holdings ([Kato et al., 2017](#); [Pinkowitz and Williamson, 2001](#)) and corruption in Japan is extremely low. Therefore, a sample with Japanese firms tend to witness a negative impact of corruption on corporate cash holdings. In addition, for subsequent analysis, we eliminate observations meeting the following criteria: (1) firm-years belonging to utilities industry (SIC 4900–4999) and financial (SIC 6000–6999); (2) firm-years without information from consolidated financial statements ([Mahajan and Tartaroglu, 2008](#)); (3) firm-years with multiple issues of equity ([Ferris et al., 2009](#)); (4) firm-years with missing data, (5) firm-years with abnormal information including negative values of book equity and total assets and (6) firms having fewer than 5 years of consecutive data ([Thakur and Kannadhasan, 2019](#)). The final research data includes 199,333 observations from 46 countries over the period from 2001 to 2016. All firm-level financial variables are winsorized at 3 % to eliminate the outlier effect.²

In this study, we use two hybrid measures of corruption namely Corruption Perception Index (CPI) annually published by Transparency International and World Bank's Corruption Control Index (CCI). These hybrid measures are composite indices created from different sources of corruption-related information reflecting both internal and external measures. Therefore, they are deemed as the best proxies of corruption ([Asiedu and Freeman, 2009](#)) and employed commonly in prior studies ([Chen et al., 2015](#); [Thakur and Kannadhasan, 2019](#)). Before 2012, CPI's scale is from 0 to 10. However, from 2012 its scale is replaced with a range from 0 to 100. Lower values of CPI represent higher corruption. Moreover, CCI originally varies from –2.5 to 2.5 and its lower values of CCI represent higher corruption. Consequently, we rescale and reverse both CPI and CCI to create a consistent scale from 0 to 10 and their higher values indicate higher corruption.

[Table 2](#) shows description of research data. Descriptive statistics of key research variables in Panel A indicate that cash holdings vary considerably from 0.3%–68.8% of total assets and the average cash to assets ratio is 16.6 %. Cash flow to assets also ranges significantly and its mean and standard deviation are –0.85 % and 23.2 % respectively. Panel B illustrates the distribution of observations by year. In the first two years, the annual number of firm-years is from 7,500 to 8,000 and the following years have at least 10,571 observations. Panel C shows that the number of observations contributed by different industries is extremely unbalanced. Manufacturing is the largest with 112,440 firm-years while the smallest is Construction with only 5,632 observations. Panel D presents research data at country level. Australia has the highest average cash to assets ratio with 22.9 % and Portugal is the lowest with only 6.6 %. US contribute the largest number of firm-years in the research sample (51,339), followed by China (23,695) while Kenya has 79 observations only. Since US and China account for 37.64 % of the full sample, we also present regression results with a reduce sample without US and Chinese firms as robustness checks.

5. Research results

5.1. Corruption and corporate cash holdings

[Table 3](#) presents results of pooled OLS regression clustered by firms to investigate the effect of corruption on corporate cash holdings. In line with [Thakur and Kannadhasan \(2019\)](#), two measures of corruption are positively related to cash holdings at 1 % of significance in the full sample and the reduced sample without US and Chinese firms. These findings imply that firms in greater corruption environment need to save more cash so that they are more flexible to pay bribes to public officials ([Svensson, 2003](#); [Xu et al., 2017](#)).

In addition, supporting transaction costs avoidance motive and precautionary motive of cash holdings ([Bates et al., 2009](#); [Kim et al., 1998](#); [Opler et al., 1999](#)), we find that cash flow, Tobin's Q and capital expenditure are positively associated with cash reserves while leverage, firm size and asset tangibility have negative effects on cash holdings. The negative relationship between net working capital and cash ratio indicates that net working capital is a substitute for cash. Moreover, in consistent with [Iskandar-Datta and Jia \(2014\)](#), we find a positive impact of shareholder protection on corporate cash reserves. This finding empirically supports the empire building hypothesis. Managers tend to exploit firm resources quickly to server their personal interest; therefore, firms with weaker investor protection have less cash.

¹ Anti-seal-dealing index ranges from 0 to 1. Many prior studies employ the median value of shareholder protection as the classification criterion. However, the median value is affected by the number of countries in the research sample. In addition, [Shao et al. \(2013a\)](#) show that the value of 0.5 is a good classification criterion. In addition, we also use the median value and find that our research findings remain unchanged.

² We also winsorize these variables with 5% and find consistent research results.

Table 2
Research data description.

Panel A. Firm-level data							
Variables	N	Mean	SD	Median	Min	Max	
CH	199,333	0.166	0.173	0.105	0.003	0.688	
CF	199,333	-0.085	0.232	-0.001	-0.833	0.176	
NW	199,333	0.011	0.197	0.017	-0.542	0.387	
TQ	199,333	1.875	1.662	1.292	0.533	8.432	
LV	199,333	0.503	0.261	0.492	0.073	1.226	
TG	199,333	0.296	0.226	0.251	0.011	0.813	
SZ	199,333	11.646	2.360	11.761	5.755	16.131	
CE	199,333	0.052	0.055	0.033	0.001	0.233	
DP	199,333	0.532	0.499	1.000	0.000	1.000	
NW	179,313	-0.007	0.098	-0.002	-0.285	0.228	
SD	179,313	0.008	0.096	0.003	-0.232	0.289	
Panel B. Annual number of firms							
Year	N	Year	N	Year	N	N	
2001	7,628	2005	12,133	2009	13,152	2013	14,105
2002	7,944	2006	12,718	2010	13,702	2014	13,941
2003	10,571	2007	13,420	2011	14,421	2015	13,202
2004	11,431	2008	13,439	2012	14,739	2016	12,787
Panel C. Industry Distribution							
Industry	2-digit SIC	N	Industry	2-digit SIC	N	N	
Mineral industries	10-14	14,823	Wholesale trade	50-51	8,156	8,156	
Construction industries	15-17	5,632	Retail trade	52-59	9,286	9,286	
Manufacturing	20-39	112,440	Service industries	>=70	35,806	35,806	
Transportation,communications	40-48	13,190					
Panel D. Country-level data							
Country	No. obs	No. firms	CH	ASD	IP	CR	UA
<i>Civil law</i>							
Austria	653	56	0.143	0.213	0.479	3	70
Brazil	2,234	222	0.139	0.274	0.784	1	76
Chile	1,163	104	0.075	0.625	0.104	2	86
China	23,695	2,305	0.205	0.763	0.068	2	30
Colombia	172	19	0.083	0.573	0.442	0	80
Croatia	454	55	0.091	0.246	0.959	3	80
Egypt	516	78	0.129	0.204	0.304	2	80
France	6,350	538	0.154	0.379	0.610	0	86
Germany	5,878	530	0.167	0.282	0.000	3	65
Greece	2,416	219	0.080	0.217	0.355	1	112
Hungary	167	15	0.107	0.181	0.000	1	82
Indonesia	3,295	311	0.111	0.653	0.202	2	48
Italy	2,149	202	0.114	0.421	0.553	2	75
Jordan	494	79	0.081	0.165	0.473	1	65
Korea	10,871	1,156	0.153	0.469	0.776	3	85
Mexico	986	82	0.098	0.172	0.319	0	82
Morocco	107	17	0.075	0.563	0.851	1	68
Netherlands	1,569	134	0.115	0.203	0.000	3	53
Norway	1,680	170	0.163	0.421	0.000	2	50
Peru	608	60	0.078	0.450	0.507	0	87
Philippines	1,219	121	0.138	0.215	0.769	1	44
Poland	3,261	355	0.104	0.288	0.478	1	93
Portugal	533	43	0.066	0.444	0.594	1	104
Russia	574	90	0.103	0.440	0.197	2	95
Spain	1,172	108	0.094	0.374	0.244	2	86
Switzerland	2,184	177	0.176	0.267	0.534	1	58
Turkey	1,646	172	0.104	0.429	0.358	2	85
<i>Common law</i>							
Argentina	458	41	0.085	0.342	0.403	1	86
Australia	12,561	1,321	0.229	0.757	0.000	3	51
Belgium	983	82	0.134	0.544	0.098	2	94
Canada	4,848	700	0.161	0.642	0.729	1	48
Hong Kong	1,433	116	0.201	0.963	0.362	4	29
India	18,080	2,043	0.086	0.579	0.537	2	40
Ireland	404	38	0.176	0.789	0.436	1	35
Israel	2,466	284	0.213	0.725	0.465	3	81
Kenya	79	11	0.124	0.208	0.625	4	50

Table 2 (Continued)

Malaysia	8,707	756	0.143	0.950	0.656	3	36
New Zealand	753	76	0.103	0.950	0.812	4	49
Nigeria	557	64	0.110	0.433	0.000	4	55
Pakistan	2,084	216	0.091	0.408	0.574	1	70
Singapore	5,822	528	0.197	1.000	0.000	3	8
South Africa	1,719	153	0.129	0.813	0.770	3	49
Sri Lanka	1,687	176	0.092	0.392	0.373	2	45
Thailand	5,014	416	0.115	0.813	0.338	2	64
UK	4,293	611	0.154	0.950	1.000	4	35
US	51,339	4,843	0.209	0.654	0.599	1	46

CH is cash holdings. CF is cash flow. NW is networking capital. TQ is Tobin's Q. LV is financial leverage. TG is asset tangibility. CE is capital expenditure. DP is dividend payment dummy. Δ NW is the change in net working capital. Δ SD is the change in short-term debt. UA is uncertainty avoidance index. AD is anti-self-dealing index. CR is creditor right index. Credit is private credit. Mcap is market capitalization. GDPcap is GDP per capita. GDPgro is GDP growth.

Table 3

Corruption and corporate cash holdings.

Variables	CI is based on Corruption Perception Index		CI is based on Corruption Control Index	
	Full sample	Reduced sample	Full sample	Reduced sample
Intercept	0.5425*** (12.84)	0.4304*** (7.89)	0.4918*** (11.30)	0.4884*** (8.93)
CI	0.0074*** (6.11)	0.0075*** (5.88)	0.0102*** (6.78)	0.0048*** (2.86)
CF	0.1915*** (45.34)	0.1552*** (28.00)	0.1936*** (44.93)	0.1561*** (27.62)
NW	-0.4119*** (-83.54)	-0.3545*** (-56.24)	-0.4104*** (-82.36)	-0.3539*** (-55.38)
TQ	0.0166*** (34.65)	0.0169*** (25.62)	0.0167*** (34.31)	0.0171*** (25.47)
LV	-0.3362*** (-90.17)	-0.3185*** (-66.42)	-0.3337*** (-88.29)	-0.3172*** (-65.38)
TG	-0.3876*** (-98.60)	-0.3431*** (-71.17)	-0.3873*** (-97.61)	-0.3424*** (-70.20)
SZ	-0.0093*** (-23.24)	-0.0073*** (-15.66)	-0.0093*** (-22.98)	-0.0072*** (-15.25)
CE	0.0863*** (8.92)	0.0719*** (6.33)	0.0849*** (8.63)	0.0719*** (6.21)
DP	-0.0027** (-2.12)	0.0025* (1.78)	-0.0020 (-1.54)	0.0030** (2.12)
UA	-0.0008*** (-2.65)	-0.0008*** (-2.75)	-0.0007** (-2.50)	-0.0008*** (-2.65)
AD	0.0000*** (0.00)	0.0000*** (0.00)	0.0000*** (0.00)	0.0000*** (0.00)
CR	-0.0243*** (-2.96)	-0.0113 (-1.17)	-0.0196** (-2.18)	-0.0306*** (-3.66)
Credit	-0.0001 (-1.59)	0.0001*** (3.04)	0.0000 (-0.67)	0.0002*** (3.63)
Mcap	0.0000** (2.48)	0.0000*** (3.21)	0.0000*** (3.02)	0.0000*** (3.15)
GDPcap	0.0051** (2.26)	0.0080** (2.20)	0.0092*** (3.96)	0.0045 (1.23)
GDPgro	-0.0001 (-0.83)	0.0001 (0.62)	-0.0001 (-0.51)	0.0000 (0.01)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes
R-squared	0.4950	0.4725	0.4941	0.4724
N	199,333	106,219	191,705	101,817

The dependent variable is cash holdings (CH). CI is corruption index. CF is cash flow. NW is networking capital. TQ is Tobin's Q. LV is financial leverage. TG is asset tangibility. CE is capital expenditure. DP is dividend payment dummy. UA is uncertainty avoidance index. AD is anti-self-dealing index. CR is creditor right index. Credit is private credit. Mcap is market capitalization. GDPcap is GDP per capita. GDPgro is GDP growth. * is significant at 10 %. ** is significant at 5 %. *** is significant at 1 %. t-statistics are in parentheses.

Furthermore, we conduct robustness checks for the relationship between corruption and cash holdings. First, we use alternative measures of cash holdings including the natural logarithm of cash to assets, cash to net assets and cash to sales. Second, we employ different regression techniques namely fixed-effects, random-effects and weighted least squares. [Chen et al. \(2015\)](#) argue that cash holdings' variance may vary considerably among a group of countries; therefore, weighted least squares regression should be used to control the heteroscedasticity problem. The weight is the inverse value of cash

Table 4
Robustness checks for the effect of corruption on cash holdings.

	CI is based on Corruption Perception Index		CI is based on Corruption Control Index	
	Full sample	Reduced sample	Full sample	Reduced sample
Panel A. Alternative measures of cash holdings				
Ln(CH)	0.0780*** (7.01)	0.0892*** (8.05)	0.0652*** (5.00)	0.0655*** (4.27)
Cash to net assets	0.0146*** (4.36)	0.0129*** (3.82)	0.0203*** (4.72)	0.0042 (0.94)
Cash to net sales	0.0770*** (6.89)	0.0727*** (6.43)	0.0081 (0.66)	-0.0057 (-0.43)
Panel B. Alternative regression techniques				
Random effects	0.0032*** (2.91)	0.0043*** (3.64)	0.0094*** (7.20)	0.0058*** (3.85)
Fixed effects	0.0026** (2.35)	0.0037*** (3.11)	0.0092*** (6.96)	0.0058*** (3.77)
WLS	0.0061*** (7.12)	0.0062*** (6.87)	0.0101*** (8.47)	0.0064*** (4.73)

The dependent variable is cash holdings (CH). CI is corruption index. * is significant at 10 %, ** is significant at 5 %, *** is significant at 1 %. t-statistics are in parentheses.

holdings' within-country variance. For brevity, Table 4 presents results of corruption index only. We find that all regression results are consistent with our research findings.

5.2. Corruption and cash-cash flow sensitivity

Table 5 shows results of pooled OLS regression clustered by firms to examine how corruption influences the cash flow sensitivity of cash. The interaction between corruption index and cash flow is positively associated with the change in corporate cash reserves at the significant level of 1 %. This finding can be explained that firms in higher corruption environment tend to accumulate more cash out of cash flow due to bribery motive and/or agency motive. Bribery motive makes firms save more cash out of their cash flow to pay bribes to government officials in order to get benefit from corrupting opportunities (Claessens et al., 2008; Tahoun, 2014; Thakur and Kannadhasan, 2019; Wei and Kaufmann, 1999; Xu et al., 2017). Agency motive makes corporate managers take advantage of high corruption environment to expropriate shareholders by holding more cash from cash flow (Jensen, 1986; Jensen and Meckling, 1976). Under high corruption environment, corporate managers are more flexible in corporate liquidity management to prepare for bribery payment (Tran, 2019). Therefore, they have higher incentives to increase cash-cash flow sensitivity in order to have more cash for investment in unprofitable projects. Besides, in line with Almeida et al. (2004), we find a positive relationship between cash flow and the change in corporate cash holdings.

In addition, the robustness checks presented in Table 6 shows that regardless of measures of cash reserves, corruption still positively affect cash-cash flow sensitivity. Furthermore, estimation results of fixed effects, random effects and weighted least squares reported in Panel B indicate that our research findings remain stable.

5.3. The role of shareholder protection

Table 7 shows regression results to compare the effects of corruption on corporate cash holdings between strong and weak shareholder protection countries. We find that the coefficient of corruption is higher for the sub-sample of strong shareholder rights. This indicates that bribery motive is more effective in corporate cash holdings when shareholders are protected adequately.

In addition, Table 8 shows estimation results to investigate whether the relationship between corruption and cash-cash flow sensitivity changes by levels of shareholder protection. We find that the interaction between corruption index and cash flow has higher coefficients in countries of strong shareholder rights. This finding also implies that firms save more cash out of cash flow to follow bribery motive when investors are protected strongly.

6. Additional analysis: the effect of corruption on value of cash

Based on our supporting evidence for bribery motive of cash holdings, following Pinkowitz et al. (2006), we argue that increases in cash holdings in both the current period and the next period contribute less to firm value when corruption is higher since investors understand that firms increase cash holdings to pay bribes. In line with Pinkowitz et al. (2006), we develop a valuation model to examine how corruption affects the contribution of the change in cash holdings in the current

Table 5
Corruption and cash-cash flow sensitivity.

Variables	CI is based on Corruption Perception Index		CI is based on Corruption Control Index	
	Full sample	Reduced sample	Full sample	Reduced sample
Intercept	0.0204 (1.30)	0.2018*** (7.24)	0.0385** (2.43)	0.1941*** (6.91)
CI	0.0019*** (3.61)	0.0013** (2.50)	-0.0026*** (-3.68)	-0.0010 (-1.29)
CI*CF	0.0052*** (8.04)	0.0047*** (6.88)	0.0053*** (8.06)	0.0053*** (7.26)
CF	0.0915*** (19.34)	0.0853*** (17.12)	0.0419*** (21.44)	0.0393*** (15.85)
ΔNW	-0.3765*** (-90.68)	-0.3578*** (-71.84)	-0.3766*** (-90.70)	-0.3579*** (-71.84)
ΔSD	-0.3823*** (-90.97)	-0.3389*** (-67.49)	-0.3823*** (-90.96)	-0.3389*** (-67.48)
NW	-0.0274*** (-23.15)	-0.0199*** (-13.54)	-0.0273*** (-23.06)	-0.0198*** (-13.48)
TQ	0.0013*** (9.96)	0.0012*** (7.48)	0.0013*** (10.00)	0.0012*** (7.43)
LV	0.0036*** (4.39)	-0.0021** (-1.97)	0.0037*** (4.49)	-0.0021* (-1.92)
TG	-0.0136*** (-13.63)	-0.0179*** (-15.04)	-0.0135*** (-13.60)	-0.0179*** (-15.02)
SZ	0.0009*** (10.26)	0.0014*** (13.27)	0.0009*** (10.50)	0.0014*** (13.42)
CE	-0.2600*** (-59.80)	-0.2272*** (-45.34)	-0.2599*** (-59.80)	-0.2272*** (-45.33)
DP	-0.0015*** (-4.43)	-0.0027*** (-6.69)	-0.0015*** (-4.46)	-0.0027*** (-6.74)
UA	-0.0002** (-2.40)	-0.0008*** (-6.73)	0.0001 (0.95)	-0.0006*** (-4.16)
AD	-0.0114 (-1.37)	-0.0479*** (-4.59)	0.0080 (0.93)	-0.0328*** (-2.92)
CR	-0.0036*** (-3.40)	-0.0120*** (-4.58)	-0.0027** (-2.55)	-0.0099*** (-3.75)
Credit	0.0000 (0.61)	-0.0001*** (-3.50)	0.0000 (0.22)	-0.0001*** (-3.29)
Mcap	0.0000*** (3.46)	0.0000 (1.35)	0.0000*** (2.93)	0.0000 (1.14)
GDPcap	0.0001 (0.14)	-0.0097*** (-7.49)	-0.0030*** (-3.22)	-0.0110*** (-8.51)
GDPgro	-0.0001 (-1.19)	-0.0003** (-2.45)	-0.0002** (-2.26)	-0.0003*** (-2.79)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes
R-squared	0.202	0.1884	0.202	0.1884
N	179,313	110,612	179,313	110,612

The dependent variable is the change in cash holdings (ΔCH). CI is corruption index. CF is cash flow. ΔNW is the change in net working capital. ΔSD is the change in short-term debt. NW is networking capital. TQ is Tobin's Q. LV is financial leverage. TG is asset tangibility. CE is capital expenditure. DP is dividend payment dummy. UA is uncertainty avoidance index. AD is anti-self-dealing index. CR is creditor right index. Credit is private credit. MC is market capitalization. GDPcap is GDP per capita. GDPgro is GDP growth. * is significant at 10 %. ** is significant at 5 %. *** is significant at 1 %. t-statistics are in parentheses.

period and the change in cash holdings the next period to firm value as follows.

$$\begin{aligned}
 MV_t = & \alpha + \beta_1 CI * dCH_t + \beta_2 CI * dCH_{t+1} + \beta_3 CI + \beta_4 dCH_t + \beta_5 dCH_{t+1} + \beta_6 EN_t + \beta_7 dEN_t + \beta_8 dEN_{t+1} + \beta_9 RD_t \\
 & + \beta_{10} dRD_t + \beta_{11} dRD_{t+1} + \beta_{12} dNA_t + \beta_{13} dNA_{t+1} + \beta_{14} IN_t + \beta_{15} dIN_t + \beta_{16} dIN_{t+1} + \beta_{17} DV_t + \beta_{18} dDV_t + \beta_{19} dDV_{t+1} \\
 & + \beta_{20} dMV_t + \varepsilon
 \end{aligned} \tag{3}$$

Where X_t is the value of variable X in year t deflated by total assets in year t. dX_t is the annual change of X in year t deflated by total assets in year t. dX_{t+1} is the annual change of X in year t + 1 deflated by total assets in year t. MV is firm value measured by market value of equity plus book value of debt. CA is cash holdings measured by total cash and short-term investment. EN is earnings before interest and extraordinary items. RD is research and development expenditure. NA is net assets measured by total assets minus total cash and short-term investment. IN is interest expense divided by total assets. DV is cash dividend. The coefficients of the interactions between corruption index and both changes in the current period

Table 6
Robustness checks for the effect of corruption on cash-cash flow sensitivity.

	CI is based on Corruption Perception Index		CI is based on Corruption Control Index	
	Full sample	Reduced sample	Full sample	Reduced sample
Panel A. Alternative measures of cash holdings				
<i>Ln(CH)</i>				
CI	0.0015 (0.30)	0.0030 (0.60)	-0.0245*** (-3.72)	-0.0148* (-1.90)
CI*CF	0.0501*** (9.25)	0.0458*** (7.73)	0.0514*** (9.25)	0.0506*** (8.05)
CF	0.7020*** (17.41)	0.6859*** (15.26)	0.2246*** (14.76)	0.2396*** (12.70)
<i>Cash to net assets</i>				
CI	0.0066*** (4.83)	0.0047*** (3.46)	-0.0066*** (-3.45)	-0.0014 (-0.71)
CI*CF	0.0026 (1.56)	0.0025 (1.42)	0.0028 (1.64)	0.0034* (1.81)
CF	0.1533*** (13.16)	0.1407*** (11.74)	0.1281*** (22.01)	0.1142*** (14.98)
<i>Cash to net sales</i>				
CI	0.0170*** (6.68)	0.0128*** (4.85)	-0.0022 (-0.68)	0.0058 (1.59)
CI*CF	-0.0192*** (-7.21)	-0.0203*** (-6.79)	-0.0185*** (-6.77)	-0.0199*** (-6.39)
CF	0.0314* (1.74)	0.0241 (1.30)	0.2111*** (21.46)	0.2152*** (15.63)
Panel B. Alternative regression techniques				
<i>Random effects</i>				
CI	0.0019*** (3.61)	0.0013** (2.50)	-0.0026*** (-3.68)	-0.0010 (-1.29)
CI*CF	0.0052*** (8.04)	0.0047*** (6.88)	0.0053*** (8.06)	0.0053*** (7.26)
CF	0.0915*** (19.34)	0.0853*** (17.12)	0.0419*** (21.44)	0.0393*** (15.85)
<i>Fixed effects</i>				
CI	0.0033*** (5.40)	0.0025*** (4.08)	-0.0029*** (-3.76)	-0.0016* (-1.87)
CI*CF	0.0061*** (5.30)	0.0078*** (5.75)	0.0059*** (5.05)	0.0087*** (5.96)
CF	0.1362*** (17.26)	0.1412*** (15.28)	0.0791*** (19.41)	0.0652*** (11.98)
<i>WLS</i>				
CI	0.0019*** (3.55)	0.0014** (2.44)	-0.0023*** (-3.37)	-0.0010 (-1.21)
CI*CF	0.0042*** (9.14)	0.0038*** (7.46)	0.0042*** (8.99)	0.0040*** (7.53)
CF	0.0839*** (26.09)	0.0797*** (22.88)	0.0443*** (28.16)	0.0434*** (21.62)

The dependent variable is the change in cash holdings (ΔCH). CI is corruption index. CF is cash flow. * is significant at 10 %. ** is significant at 5 %. *** is significant at 1 %. t-statistics are in parentheses.

and in the next period are expected to be negative. As suggested by [Drobetz et al. \(2010\)](#), [Pinkowitz et al. \(2006\)](#), we use [Fama and MacBeth \(1973\)](#) regression method to estimate Eq. (3).

Table 9 presents regression results to investigate how corruption influences the contribution of the change in cash holdings in the current period and the change in cash holdings the next period to firm value. We find that the value of both increases in cash holdings in the current period and the next period is lower in when corruption is higher. These findings imply that investors recognize that firms may increase their cash reserves due to bribery motive; therefore, they tend to value increases in cash holdings lower under higher corruption environment.

7. Conclusions

Although many prior studies document consistently negative effects of corruption on macroeconomic issues, the relationship between corruption and corporate financial decisions is debatable. In this paper, we investigate how corruption environment affects corporate cash holdings. With a sample of 199,333 observations across 46 countries, we find that corruption is positively associated with both cash holdings and the cash flow sensitivity of cash. Robustness tests with a reduced sample without US and Chinese firms, different measures of cash holdings and various regression approaches show that our research findings are stable. We also find that the effects of corruption are stronger if legal protection of shareholders

Table 7
The effects of corruption on corporate cash holdings by levels of shareholder protection.

	Anti-self-dealing index		Legal origin		Investor protection index	
	Weak (AD <= 0.5)	Strong (AD > 0.5)	Weak (Civil law)	Strong (Common law)	Weak (IP <= 0.5)	Strong (IP > 0.5)
Panel A. Full sample						
<i>CI is based on Corruption Perception Index</i>						
CI	0.0057*** (3.75)	0.0060*** (3.08)	0.0041*** (2.87)	0.0066*** (3.09)	0.0032 (1.56)	0.0057*** (3.75)
N	52,479	146,854	76,046	123,287	48,085	151,248
<i>CI is based on Corruption Control Index</i>						
CI	-0.0024* (-1.66)	0.0095*** (7.65)	0.0025 (1.64)	0.0037*** (3.36)	0.0041 (1.44)	0.0047** (2.44)
N	50,617	141,088	74,071	117,634	46,270	145,435
Panel B. Reduced sample without US and China						
<i>CI is based on Corruption Perception Index</i>						
CI	0.0057*** (3.75)	0.0112*** (5.19)	0.0067*** (4.42)	0.0084*** (3.83)	0.0032 (1.56)	0.0076*** (4.63)
N	52,479	71,820	52,351	71,948	48,085	76,214
<i>CI is based on Corruption Control Index</i>						
CI	-0.0024* (-1.66)	0.0049*** (2.99)	-0.0086*** (-3.18)	0.0125*** (5.51)	0.0041 (1.44)	0.0006 (0.27)
N	50,617	69,280	50,376	69,521	46,270	73,627

The dependent variable is cash holdings (CH). CI is corruption index. * is significant at 10 %. ** is significant at 5 %. *** is significant at 1 %. t-statistics are in parentheses.

Table 8
The effects of corruption on cash-cash flow sensitivity by levels of shareholder protection.

	Weak (AD <= 0.5)	Strong (AD > 0.5)	Weak (Civil law)	Strong (Common law)	Weak (IP <= 0.5)	Strong (IP > 0.5)
Panel A. Full sample						
<i>CI is based on Corruption Perception Index</i>						
CI	-0.0003 (-0.49)	0.0065*** (7.57)	0.0033*** (4.87)	0.0038*** (3.93)	0.0010 (1.10)	0.0028*** (4.21)
CI*CF	0.0035*** (2.92)	0.0057*** (7.36)	0.0048*** (5.61)	0.0050*** (4.70)	0.0032*** (2.69)	0.0056*** (7.33)
CF	0.0809*** (9.70)	0.0953*** (16.58)	0.0949*** (13.04)	0.0884*** (13.70)	0.0816*** (9.49)	0.0943*** (16.67)
N	47,294	132,019	69,174	110,139	43,501	135,812
<i>CI is based on Corruption Control Index</i>						
CI	-0.0028*** (-2.62)	-0.0007 (-0.68)	-0.0021** (-2.18)	-0.0012 (-1.02)	-0.0013 (-0.98)	-0.0021** (-2.11)
CI*CF	0.0039*** (3.21)	0.0057*** (7.19)	0.0049*** (4.50)	0.0050*** (5.73)	0.0039*** (3.08)	0.0056*** (7.18)
CF	0.0473*** (11.98)	0.0412*** (18.39)	0.0481*** (12.49)	0.0421*** (17.93)	0.0495*** (12.20)	0.0411*** (16.50)
N	47,294	132,019	69,174	110,139	43,501	135,812
Panel B. Reduced sample excluding US and China						
<i>CI is based on Corruption Perception Index</i>						
CI	-0.0003 (-0.49)	0.0036*** (3.74)	-0.0003 (-0.42)	0.0035*** (3.50)	0.0010 (1.10)	0.0008 (1.22)
CI*CF	0.0035*** (2.92)	0.0046*** (5.54)	0.0023** (2.06)	0.0052*** (5.96)	0.0032*** (2.69)	0.0047*** (5.69)
CF	0.0809*** (9.70)	0.0834*** (13.27)	0.0722*** (9.42)	0.0880*** (13.31)	0.0816*** (9.49)	0.0831*** (13.55)
N	47,294	63,318	47,117	63,495	43,501	67,111
<i>CI is based on Corruption Control Index</i>						
CI	-0.0028*** (-2.62)	0.0002 (0.18)	-0.0026** (-2.52)	0.0005 (0.33)	-0.0013 (-0.98)	-0.0020* (-1.74)
CI*CF	0.0039*** (3.21)	0.0053*** (5.92)	0.0024** (2.09)	0.0060*** (6.51)	0.0039*** (3.08)	0.0053*** (6.04)
CF	0.0473*** (11.98)	0.0377*** (12.36)	0.0506*** (13.02)	0.0365*** (11.87)	0.0495*** (12.20)	0.0370*** (12.20)
N	47,294	63,318	47,117	63,495	43,501	67,111

The dependent variable is the change in cash holdings (Δ CH). CI is corruption index. CF is cash flow. * is significant at 10 %. ** is significant at 5 %. *** is significant at 1 %. t-statistics are in parentheses.

Table 9
The effect of corruption on value of cash.

Variables	CI is based on Corruption Perception Index		CI is based on Corruption Control Index	
	Full sample	Reduced sample	Full sample	Reduced sample
Intercept	1.0181*** (17.35)	0.9016*** (26.15)	1.0311*** (18.39)	0.9166*** (27.37)
CI*dCA _t	-0.5177*** (-5.23)	-0.5220*** (-4.87)	-0.5467*** (-4.88)	-0.5745*** (-4.63)
CI*dCA _{t+1}	-0.3367*** (-5.54)	-0.3331*** (-5.38)	-0.3659*** (-5.33)	-0.3592*** (-5.17)
CI	0.0067 (0.43)	0.0082 (1.14)	0.0021 (0.13)	0.0051 (0.71)
dCA _t	2.5156*** (8.15)	2.3601*** (6.67)	2.2267*** (8.73)	2.1830*** (6.36)
dCA _{t+1}	1.9105*** (6.79)	1.7891*** (5.19)	1.7560*** (7.06)	1.6613*** (4.92)
EN _t	-3.1137*** (-54.16)	-2.4078*** (-18.41)	-3.1163*** (-53.89)	-2.4002*** (-18.55)
dEN _t	1.1672*** (12.08)	0.9163*** (5.95)	1.1669*** (11.96)	0.9114*** (5.90)
dEN _{t+1}	-0.5132*** (-7.20)	-0.4673*** (-6.47)	-0.5131*** (-7.16)	-0.4651*** (-6.45)
RD _t	0.8595*** (15.22)	0.6106*** (15.49)	0.8595*** (15.26)	0.6105*** (15.45)
dRD _t	0.9991*** (11.02)	0.7279*** (5.91)	1.0016*** (10.99)	0.7297*** (5.93)
dRD _{t+1}	5.4734*** (13.20)	5.9185*** (12.83)	5.4381*** (13.34)	5.9086*** (12.82)
dNA _t	6.3962*** (7.06)	2.6806*** (3.20)	6.4033*** (7.02)	2.6692*** (3.18)
dNA _{t+1}	12.5114*** (10.97)	10.6208*** (11.37)	12.5017*** (10.93)	10.6126*** (11.38)
IN _t	7.3743*** (8.50)	5.6608*** (5.76)	7.3145*** (8.45)	5.6962*** (5.89)
dIN _t	-12.4616*** (-12.25)	-9.6081*** (-6.20)	-12.4386*** (-12.31)	-9.5881*** (-6.16)
dIN _{t+1}	-0.0793 (-1.00)	-0.0201 (-0.50)	-0.0894 (-1.14)	-0.0271 (-0.67)
DV _t	18.5021*** (19.72)	18.6068*** (18.91)	18.6394*** (20.53)	18.6043*** (19.01)
dDV _t	-2.2086*** (-3.43)	-1.4349** (-2.29)	-2.3184*** (-3.65)	-1.4540** (-2.33)
dDV _{t+1}	13.1186*** (21.64)	13.6813*** (23.54)	13.1630*** (21.79)	13.6748*** (23.59)
dMV _t	-0.0628 (-0.99)	0.0171 (0.22)	-0.0634 (-1.00)	0.0172 (0.22)
Average R-squared	0.3198	0.2316	0.3022	0.2314
N	162,322	104,874	162,322	104,874

The dependent variable is MV_t. CI is corruption index. X_t is the value of variable X in year t deflated by total assets in year t. dX_t is the annual change of X in year t deflated by total assets in year t. dX_{t+1} is the annual change of X in year t+1 deflated by total assets in year t. MV is firm value measured by market value of equity plus book value of debt. CA is cash holdings measured by total cash and short-term investment. EN is earnings before interest and extraordinary items. RD is research and development expenditure. NA is net assets measured by total assets minus total cash and short-term investment. IN is interest expense divided by total assets. DV is cash dividend. * is significant at 10 %. ** is significant at 5 %. *** is significant at 1 %. t-statistics are in parentheses.

is adequate. In addition, our additional analysis shows that corruption reduces value of cash. This paper shows that bribery motive of cash holdings is consistent around the world and firms tend to balance agency motive and bribery motive in their corporate liquidity management.

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