The Determinants of Corporate Cash Management Policy: Evidence from around the World

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Abstract

This paper examines the determinants of corporate cash management policy across a broad sample of international firms. Using financial data from more than 104,000 firm-year observations from 43 countries over the period 1985-2004, we find that firms in countries with strong legal protection of minority investors are more likely to decrease (increase) their cash holdings in response to an increase in cash flow (stock price) than are firms in countries with weak legal protection. In addition, financially constrained firms display higher sensitivities of cash to both cash flow and stock prices than do financially unconstrained firms. The results are robust to alternative specifications. Our findings highlight the importance of both country-level institutional factors and firm-level financial constraint in managers' corporate cash management policies.

***JEL classifications*:** G32; G34

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1. Introduction

The stream of research on corporate cash management policies has received increasing attention. Early studies by Keynes (1936), Jensen and Meckling (1976), Myers (1984), Jensen (1986) and Myers and Majluf (1986) have debated the potential costs and benefits of holding cash. Related studies by Kim et al. (1998) and Opler et al. (1999) have examined the effects of various financial variables on the *level* of cash reserves for U.S. firms. More recently, a number of papers have documented evidence that corporate governance both at the country and firm levels could potentially influence corporate cash holdings in both U.S. and international firms.[1] However, the conclusions from this strand of research are mixed.[2]

Almeida et al. (2004) argue that examining *changes* in cash holdings is perhaps a more viable means to determine a firm's demand for liquidity from a theoretical perspective. The imperfection in capital markets gives rise to a deviation between the costs of internal and external financing. Firms anticipating a higher cost of external financing are thereby constrained in their investments and financial policies. A survey by Graham and Harvey (2001) reveals that top managers value financial flexibility when making important corporate decisions. One way for constrained firms to achieve this flexibility is to alter their *current* financial policies to meet *future* investment needs. To be more specific, Almedia et al. (2004) propose that corporate demand for liquidity can be empirically tested by measuring the marginal propensity to save cash

[1] See Dittmar et al. (2003), Dittmar and Mahrt-Smith (2006), Harford et al. (2006), Pinkowitz et al. (2006) and Kalcheva and Lins (2007) for a sample of recent representative work on the relationship between corporate governance mechanisms and cash holdings.

[2] While Dittmar et al. (2003) document a significantly negative relationship between country-level legal protection and cash holdings in their sample of international firms, Harford et al. (2006) find an opposite relationship between firm-level shareholder rights and cash holdings in their U.S. sample. Combining both firm-level and country-level measures of corporate governance, Kalcheva and Lins (2007) confirm the evidence of a negative relationship between firm-level governance mechanisms (the degree of managerial control) and cash holdings in an international setting. Moreover, the negative effect of firm-level corporate governance on cash holdings is more pronounced for firms in countries with weak legal protection of investors.

out of current cash flows in order to fund future investments, i.e., the *sensitivity* of cash to cash flow.

Almeida et al. (2004) further argue that the cash-cash flow sensitivity is better at capturing the role of financial constraints than is the investment-cash flow sensitivity, a measure that has generated numerous critiques in the empirical corporate finance literature. They develop a model which predicts that the cash-cash flow sensitivity should be positive and significant only for financially constrained firms. Their empirical results strongly support their prediction, which attests to the importance of cash management for financially constrained firms as opposed to unconstrained firms.

The objective of this study is to test the effects of legal protection and financial constraints on cash management policies by firms around the world. We use three indices from La Porta et al. (1998) and La Porta et al. (2006) as our measures for country-level legal protection of investors. In addition, we use firm size, dividend payout ratios, and the *KZ* index originally developed by Kaplan and Zingales (1997) as our three alternative measures for firm-level financial constraints. Using financial data from more 104,000 firm-year observations from 43 countries over the period 1985-2004, we find that legal protection of investors is negatively related to the cash-cash flow sensitivity. Furthermore, the cash-stock price sensitivity is higher for firms in countries with strong legal protection than for firms in countries with weak legal protection. Finally, financially constrained firms (i.e., small firms and firms with low dividend payout ratios) exhibit higher cash-cash flow and cash-stock price sensitivities than do financially unconstrained firms.[3]

These findings are consistent with the notion that effective legal systems ease firms' access to the external capital markets. As a result, firms in countries with strong legal protection of

[3] Riddick and Whited (2006) also find in their OLS regressions that constrained firms display higher cash-cash flow sensitivities than do unconstrained firms in the U.S. and Japan.

investors face fewer restrictions in raising external capital and thus are less likely to save cash from current cash flows to fund their future investments than are their counterparts in countries with weak legal protection. On the other hand, the stock prices of firms in countries with strong legal protection reflect a more accurate proxy for their future growth options. This suggests that firms with higher stock prices should increase their cash holdings in anticipation of more value-added investments in the future. Likewise, since financially constrained firms have limited access to external financial markets, they need to rely more on internal funds to finance their future investments. As a result, financially constrained firms exhibit a higher propensity to increase their cash holdings in response to changes in both cash flows and stock prices to support their future investment needs.

In summary, we uncover evidence that supports our main hypotheses. Our results are robust to a series of alternative specifications. Our findings provide valuable contributions to the current literature by emphasizing the important roles of both legal protection and financial constraints in the cash management policies of firms around the world. Managers should recognize the roles of both factors in attaining optimal cash management policies for their firms.

Our paper contributes to the growing literature on corporate cash management policies. The study that is closest to ours is Khurana et al. (2006). They examine the effect of financial development on the cash-cash flow sensitivity in an international setting and document evidence that is consistent with the hypothesis that the cash-cash flow sensitivity is negatively related to the degree of financial development. Their argument is based on the premise that the presence of financial constraints deters economic growth and that economic development helps to mitigate this problem (Love (2003)). However, the previous literature has suggested that cross-country variation in stock market development is itself a function of the country-level legal protection of

minority investors (La Porta et al. (1997, 1998) and Beck and Levine (2005)). Moreover, Pinkowitz et al. (2006) stress the relevance of country-level legal protection in corporate governance studies. Therefore, we assert that legal protection should provide a first-order effect in influencing the cash-cash flow sensitivity.[4] More relevantly, what distinguishes our paper from Khurana et al. (2006) is that we extend the empirical analysis proposed by Almeida et al. (2004) to an international setting and that we document the first evidence of the impact of legal protection and financial constraints on the cash-stock price sensitivity.

The remainder of the paper is organized as follows. Section 2 develops our main hypotheses. Section 3 describes the data we use in our sample. Section 4 provides the empirical analysis and discusses our regression results. Finally, Section 5 concludes the paper.

2. Hypothesis Development

Keynes (1936) suggests that a firm's cash management policy should rely upon its access to external financing. A firm is considered to be financially unconstrained if it is able to obtain free and unlimited access to the external capital market. Consequently, it would not need to manage its cash holdings in terms of saving cash out of its internal cash flow. On the other hand, a firm is deemed to be financially constrained if it encounters higher costs in raising external capital. Such a firm would require active management of its cash reserves by stockpiling cash balances as a precautionary motive.

Beginning with the seminal paper by Fazzari et al. (1988), a large number of studies have examined the relationship between corporate investment and cash flow to test for the role of financial constraints. Most of these studies provide strong support for the existence of financial

[4] We test for the dual effects of financial development and legal protection in one of our robustness tests. While the coefficient on financial development is insignificant, our results on the effect of legal protection remain unchanged.

constraints.[5] In essence, they find that cash flow is a more important determinant of corporate investments for firms that are a priori identified as the most likely to be financially constrained. However, later studies by Kaplan and Zingales (1997) and Cleary (1999) provide conflicting results. They find that investment is the most sensitive to cash flow for firms that are the least likely to be financially constrained. Bushman et al. (2006) demonstrate that the existing results on the investment-cash flow sensitivity are not driven by financial constraints. Instead, the investment-cash flow sensitivity simply captures the role of firm growth in capital investments.

Almeida et al. (2004) develop a simple model of corporate cash management policies and propose a new measure that they think would be better to reflect the role of financial constraints than the investment-cash flow sensitivity: the marginal propensity to save cash out of *current* cash flows to finance *future* investment needs or *the cash-cash flow sensitivity*. Since firms have to forego current investments if they are to hold large amounts of cash balances, managers have to trade-off the costs and benefits of holding cash before deciding on optimal cash management policies that will maximize their firm values. Almeida et al. (2004) further contend that moving the center of attention from corporate investments to financial policies would help to circumvent the problems associated with the investment-cash flow sensitivity and offer a more theoretically sound implication about the role of financial constraints.[6]

2.1 Legal protection, cash-cash flow sensitivity, and the cash-stock price sensitivity

La Porta et al. (1997, 1998) develop a series of country-level indices that they consider measure the degree of legal protection of minority investors from possible expropriation by

[5] Hubbard (1998) provides an extensive summary of this literature. A recent paper by Stein (2003) also discusses the role of agency costs and information asymmetry on the efficiency of corporate investments.

[6] Recent work by Acharya et al. (2006) and Almeida et al. (2006) extends the theoretical framework set up in Almeida et al. (2004) to examine the implications of financial constraints on both corporate financial and investment policies.

insiders across 49 countries all over the world. They find that countries with strong legal protection and more effective enforcement of laws and regulations have more developed financial markets, which allow firms in those countries to have better access to external financing.[7,8] La Porta et al. (2006) further emphasize on the different aspects of enforcement of the securities laws (private and public enforcement) related to the issuance of new public offerings for the same set of 49 countries. One key finding is that securities laws matter to capital market development. In particular, private enforcement of laws in the form of disclosure requirements and liability rules is deemed to be more effective than is public enforcement in deterring corporate insiders from engaging in activities that are detrimental to minority investors. More importantly, Bushman and Piotroski (2006) assert that systematic differences in the legal environments and institutions across countries influence corporate decisions made by managers of firms in different countries.[9]

One of the main benefits of holding a large cash balance is that it helps to fund capital investments in the future, especially when there is a deviation between the internal and external costs of financing. This wedge is driven by agency conflicts (Jensen and Meckling (1976)), information asymmetry (Myers and Majluf (1984)), and potential financial distress if the firm is unable to repay its debt. Hence, the presence of cash reserves in the balance sheet allows firms to depend only on internal funds in making their investments.

[7] Subsequent studies by La Porta et al. (2002) and Leuz et al. (2003) further show that firms in countries with stronger legal protection of minority investors have higher valuation, better corporate governance, and less incidence of earnings management.

[8] Shleifer and Wolfenzon (2002) develop a simple model that yields similar predictions as the empirical findings in La Porta et al. (1997, 1998, 2002). Wurgler (2000) also find strong legal protection helps to mitigate overinvestment in declining sectors and to improve the efficiency of capital allocation subsequently.

[9] Specifically, firms in countries with strong legal protection in the form of securities laws and more effective legal systems are more likely to engage in conservative accounting (timely recognition of bad news in accounting numbers) than are firms in countries with weak legal protection and less effective legal systems. In addition, public enforcement is more effective than private enforcement in creating incentives for conservative accounting.

As mentioned earlier, the cost of external financing provides an indication of the extent of shareholder protection afforded by the legal institutions. Recent studies by Chen et al. (2006) and Hail and Leuz (2006) have further documented that firms in countries with strong legal protection of investors tend to enjoy a lower cost of equity than do those firms in countries with weak legal protection. Consequently, strong legal protection helps to reduce the constraints that firms face in gaining access to the external capital markets. This implies that firms in these countries should face relatively lower costs of external financing and thereby have fewer incentives to increase their current cash holdings to fund future investments. In other words, we postulate that there exists a negative relationship between legal protection and the cash-cash flow sensitivity:

Hypothesis 1: *The cash holdings of firms in countries with strong legal protection of investors are less sensitive to changes in the firms' cash flows than are the cash holdings of firms in countries with weak legal protection of investors*.

Recently, Gelb and Zarowin (2002) find that stock prices are more informative about future earnings for firms that provide more voluntary disclosure.[10] Fox et al. (2003) further report that mandatory securities disclosure improves the accuracy of stock prices and, in turn, the efficiency of capital allocation. In addition, Kusnadi and Wei (2007) find that the legal protection of investors is positively associated with the investment-stock price sensitivity. These studies imply that the stock prices of firms in countries with low legal protection are unlikely to affect firms' investment and cash management policies. Correspondingly, as the level of legal protection

[10] A related paper by Fan and Wong (2002) use the ownership structure of East-Asian firms as a proxy for the effectiveness of corporate governance and find that firms with concentrated ownership are associated with more agency conflicts and tend to have lower quality of accounting numbers.

increases, the stock prices of firms in these countries will be more reflective of their fundamentals. As a result, an increase in stock prices would be regarded as a signal of a more favorable future investment environment. Therefore, managers of these firms would increase their current cash holdings, expecting that they will take on more positive net present value (NPV) investments in the future. This suggests that the cash-stock price sensitivity should increase with the level of legal protection:

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Hypothesis 2: *The cash holdings of firms in countries with strong legal protection of investors are more sensitive to changes in the firms' stock prices than are the cash holdings of firms in countries with weak legal protection of investors*.

2.2 Financial constraints, the cash-cash flow sensitivity and the cash-stock price sensitivity

Almeida et al. (2004) predict that cash management policies should be different between financially constrained firms and financially unconstrained firms. Specifically, since constrained firms would face greater restrictions in terms of raising funds required to finance future investments, these firms would be better off by sacrificing marginal current investments in favor of hoarding cash and saving it for potentially more profitable future investments. On the contrary, unconstrained firms have no problems in financing their current and future investments. Thus, these firms are not likely to hoard cash in anticipation of using it to fund investments in the future. Their empirical findings are consistent with the predictions of their model. Khurana et al. (2006) also document similar findings in their sample of international firms.

Even though we argued earlier that firms in countries with strong legal protection of investors should in general face lower costs of external financing and thereby should be

considered as financially unconstrained, it is always possible that the impact of firm-level measures of financial constraints such as firm size and dividend payout ratios remain relevant. In this manner, small firms and firms with low dividend payout ratios will still find themselves constrained in terms of their access to external capital markets. Our prediction of the effect of firm-level financial constraints on changes in cash holdings in response to changes in cash flows follows that of Almeida et al. (2004). We conjecture that there exists a positive relationship between financial constraints and the cash-cash flow sensitivity:

Hypothesis 3: *The cash holdings of financially constrained firms are more sensitive to changes in the firms' cash flows than are the cash holdings of unconstrained firms*.

Since stock prices reflect a firm's future investment opportunities, firms with higher stock prices should save more cash out of current cash flows to fund their future investments. This suggests that firms' cash holdings are positively associated with their stock prices. In addition, financially constrained firms face difficulty in accessing the external markets than do financially unconstrained firms, which implies that constrained firms have to depend more on internal funds for their investments than do unconstrained firms. Therefore, constrained firms should exhibit a greater tendency to increase their current cash holdings to safeguard against potentially profitable investments in the future. The above arguments suggest that financial constraints should have a positive effect on the cash-stock price sensitivity:

Hypothesis 4: *The cash holdings of financially constrained firms are more sensitive to changes in the firms' stock prices than are the cash holdings of unconstrained firms*.

3. Data and Sample Statistics

Our sample comprises both country-level institutional variables and firm-level financial variables. The country-level legal protection variables are obtained from La Porta et al. (1998, 2006). They include (1) anti-director rights, (2) liability standards, (3) disclosure requirements, (4) private enforcement, (5) public enforcement, and (6) investor protection. We retrieve the firm-level financial data from Worldscope and Datastream, provided by Thomson Financial. The financial variables include cash holdings, changes in cash holdings, short-term debt, total debt, cash flow, capital expenditures, cash dividends, dividend payouts, total assets, book value of equity, and market capitalization. We require our sample to have non-missing firm-year observations. In addition, we also follow previous studies by excluding firms operating in the financial industry (SIC codes between 6000 and 6999) and firms with book values of total assets of less than US$10 million. Our final sample consists of an unbalanced panel data of 104,283 firm-year observations from 43 countries covering the period from 1985 to 2004.

Table 1 presents the summary statistics of both the institutional and financial variables for each country in our sample. From the second and third columns of Table 1, we observe that Japan and the United Kingdom have the largest total firm-year observations and the largest number of firms, while Egypt and Zimbabwe have the smallest. The average firm-year observations and the number of firms in our final sample are 2,425 and 386, respectively.

3.1 Country-level legal protection variables

As mentioned above, we obtain the legal protection variables from La Porta et al. (1998, 2006). In this subsection, we briefly describe the six indices we use in this study. Many studies have employed the anti-director rights index (*ANTIDIR*) as a measure of corporate governance. It

ranges from 0 to 5. Since the anti-director rights index is an "aggregated" index of shareholder rights, a higher anti-director rights score indicates that minority shareholders are legally protected from expropriation by the managers or controlling shareholders in corporate decisions (La Porta et al. (1998)). These rights include voting by mail, shares not blocked before shareholder meetings, cumulative voting of directors or proportional representation on the board, legal mechanisms to protect against possible oppression by managers or directors, preemptive rights, and a minimum share ownership requirement to call an extraordinary general meeting.

The other indices are taken from a recent paper by La Porta et al. (2006). The disclosure requirements index (*DISC*) ranges from 0 to 1. It is calculated by taking an arithmetic average of six sub-indices: prospectus, compensation, shareholders, inside ownership, irregular contracts and transactions. It captures regulations on the information that must be disclosed in an IPO transaction. The liability standards index (*LIAB*) also ranges from 0 to 1. Similarly, it is an arithmetic average of three sub-indices: liability standards for the issuer of securities and its directors, liability standards for distributors of securities and liability standards for accountants. It measures the procedural difficulty in recovering losses from directors, distributors and accountants. The fourth index is the private enforcement index (*PRIVENF*). It ranges from 0 to 1 and is calculated as the average of the disclosure requirements and liability standards indices. Essentially, it measures the costs that investors need to incur to recoup damage from corporate insiders, distributors of securities and accountants, when the information disclosed during the IPO is deemed to be erroneous or insufficient. A higher value of *PRIVENF* suggests more effective private enforcement of securities laws.

The fifth index is the public enforcement index (*PUBENF*), which is also taken from La Porta et al. (2006). It ranges from 0 to 1 and is calculated as the arithmetic average of six sub-

indices: the supervisor's characteristics, rule-making power, investigative power, orders and criminal indices. It measures the power of the capital market supervisory agency in regulating and enforcing the securities laws. Thus, a higher value of *PUBENF* indicates a more effective regulation and enforcement of the securities laws. The last index is the investor protection index (*INVPRT*), also taken from La Porta et al. (2006). It ranges from 0 to 1 and is calculated as the principal component of the disclosure requirements, liability standards and anti-directors rights indices. A higher value of *INVPRT* signals a more effective protection afforded by the legal systems.

We present the summary statistics on the legal protection indices in the last six columns of Table 1. We find that six countries (Hong Kong, India, Pakistan, Canada, Chile and South Africa) have the highest scores (5) on the anti-director rights index. Meanwhile, only Belgium has the lowest score (0) on the anti-directors rights index. The scores on the disclosure requirement index ranges from 0.17 (Venezuela) to 1.00 (Singapore). Germany has the lowest score of 0 and Canada and the Philippines both have the highest score of 1 on the liability standards index. Combining the two indices, we observe that Austria (0.18) has the lowest score on the private enforcement index and the Philippines (0.92) has the highest. For the public enforcement index, the score ranges from 0 (Japan) to 0.90 (Australia). Finally, Germany has the lowest score on the investor protection index (0) and Canada has the highest score (0.96).

[Insert Table 1 here]

3.2 Firm-level financial variables

We define cash holdings (*Cash Holdings*) as cash and equivalents divided by total assets (both at the end of year *t*). The change in cash holdings (Δ*CashHoldings*) is computed as the

change in cash and cash equivalents divided by total asset between year t and t-1. Q is Tobin's Q and is calculated as the market value of equity plus total assets minus total book value of equity divided by total assets. *CF* is cash flow and is calculated as income before extraordinary items plus depreciation and amortization divided by total assets. *SIZE* is the natural logarithm of total assets (in millions of US dollars). *CAPX* is capital expenditures divided by total assets. ΔSTD is the change in the short-term debt divided by total assets between year t and t-1. To alleviate the problems of outliers, we winsorize all financial variables at the 1st and the 99th percentile levels.

The summary statistics for the financial variables are presented in Columns 4 to 10 of Table 1. We report the median *Cash Holdings*, $\Delta CashHoldings$, Q, *CF*, *SIZE*, *CAPX* and ΔSTD for each of the 43 countries in our sample. In addition, we also compute the overall mean and standard deviation for each of these variables. Firstly, we observe that there is a substantial variation in each of the financial variables across the countries in our sample. We find that Egypt and Japan have the highest median ratio of cash to total assets of 23% and 13%, respectively, and Zimbabwe and New Zealand have the smallest ratios of 0.2% and 1.8%. The overall mean cash balance is about 7%, with a standard deviation of 4%. The average ratio for our sample is lower than that reported by Kalcheva and Lins (2007) for their international sample (12%).[11]

In general, the average change in the cash holdings ratio is zero in our overall sample, with a positive median value in all but eight of the countries. Egypt has the highest absolute change in the cash holdings ratio of 3.3%. For the remaining firm-level financial variables, the mean and standard deviation of Tobin's Q across our international sample is 1.09 and 0.16, respectively. Greece (1.42) has the highest median Tobin's Q and Venezuela (0.69) has the lowest. The median ratio of cash flow to assets is positive for all the countries in our sample, with an overall

[11] Note that the sample in Kalcheva and Lins (2007) is taken from only one financial year.

mean and standard deviation of 6.2% and 1.5%, respectively. Zimbabwe has the highest median cash flow ratio of 10% and Hong Kong has the lowest median cash flow ratio of 3.8%.

We use the natural logarithm of total assets (in millions of US dollars) as our measure of firm size. Switzerland (6.4) has the highest median firm size and Zimbabwe (3.4) has the smallest. The average ratio of capital investments to assets across our sample is 4.6%, with a standard deviation of 1.0%. Norway (6.9%) has the highest median capital investment ratio, while Hong Kong (2.9%) has the lowest value. The median change in the short-term debt ratio is positive for all the countries but one (Zimbabwe), with an overall mean and standard deviation of 0.2% and 0.6%, respectively.

Next, we present the correlations among the firm-level financial variables and the country-level legal protection measures in Table 2.[12] The cash holdings ratio is negatively and significantly correlated with both the change in cash holdings (-0.45) and cash flow (-0.37), and it is positively and significantly correlated with Tobin's *Q* (0.29). The change in cash holdings ratio has positive but insignificant correlations with both cash flow and size, and negative but insignificant with Tobin's *Q* and capital investments. It is only significantly positively correlated with the changes in short term debt (0.40). The correlations between the financial and legal-protection variables are in general small and insignificant. Only four of the correlations are negative and significant at least at the ten percent level. Finally, the legal protection variables are positively and significantly correlated with each other as we expect. The magnitude of the correlations ranges from 0.29 to 0.88.

[Insert Table 2 here]

4. Empirical Analysis and Discussion of Results

[12] We first compute the country-mean value for each financial variable; before computing the correlations.

In this section, we investigate whether international firms' corporate cash management policies are affected by the country-level legal protection variables and firm-level financial constraints. To be more specific, we explore how these two factors affect the relationship between the change in cash holdings with respect to the innovations in both cash flows (the cash-cash flow sensitivity) and stock prices (the cash-stock price sensitivity) for our international sample that covers a period of 20 years. Our empirical specifications build upon the earlier model developed by Almeida et al. (2004).

4.1 Legal protection of investors and the sensitivity of cash to cash flow

We first estimate the following baseline empirical model, which is adapted from Almeida et al. (2004), for our international sample:

$$\begin{aligned}\Delta CashHoldings_{it} = {} & a_{industry} + a_{country} + a_t + \alpha_1 CF_{it} + \alpha_2 Q_{it} + \alpha_3 SIZE_{it} \\ & + \alpha_4 CAPX_{it} + \alpha_5 \Delta STD_{it} + u_{it},\end{aligned} \tag{1}$$

where $\Delta CashHoldings_{it}$ is the change in cash holdings of firm i from year t-1 to year t. CF_{it} is firm i's cash flow in year t; Q_{it} is its Tobin's Q in year t; $SIZE_{it}$ is its size in year t; $CAPX_{it}$ is its capital investment in year t, and ΔSTD_{it} is its change in short-term debt from year t-1 to year t. $a_{industry}$ represents industry-specific intercepts, $a_{country}$ represents country-specific intercepts and a_t represents time-specific intercepts. These variables are defined earlier. The sensitivity of cash to cash flow and the sensitivity of cash to stock prices are captured by the regression coefficients of α_1 and α_2, respectively.

We estimate the fixed effects model for our panel data consisting of international firms. The regression specification also includes industry, country and time (year) dummies.[13] The purpose is to control for industry, country and year fixed effects, since these factors have been known to affect a firm's cash holdings. u_{it} is an error term that is assumed to be independent of the explanatory variables. In addition, we estimate the standard errors that are adjusted for the error structure in heteroskedasticity and for within-period error correlation using the Huber-White estimators.

Our main interests in this study lie in the regression coefficients α_1 and α_2. α_1 measures the sensitivity of a firm's cash holdings to changes in its cash flows. Almedia et al. (2004) call this measure the marginal propensity to save cash from current cash flows or the cash-cash flow sensitivity. When firms have access to a large pool of internal funds (their operating cash flows), they can afford to transfer these resources to their cash holdings, thereby building up their cash reserves. As a result, we expect that the sign of α_1 should be positive. In addition, Almeida et al (2004) further argue that the sensitivity of cash to cash flows should be positive and significant only for financially constrained firms as opposed to unconstrained firms. We defer the discussion on the effect of financial constraints on the cash-cash flow sensitivity to a later sub-section.

Correspondingly, α_2 measures the cash-stock price sensitivity or the sensitivity of a firm's cash holdings to changes in its stock prices, which is proxied by Tobin's *Q*. When firms experience an increase in *Q* (i.e., higher stock prices), this signals that the firms would bring in more earnings and face better investment opportunities. This translates to an increase in their cash holdings, which suggests that α_2 should also be positive.

[13] The industry classification follows that of Fama and French (1997).

We further include *SIZE* and *CAPX* in equation (3) to control for firm size and a firm's need for capital investment. Almeida et al. (2004) argue that there are economies of scale associated with a firm's cash management policy. Firms usually rely on their internal funds to finance their capital investment projects. Hence, we expect that α_4 should be negative. The last control variable that we include in equation (1) is ΔSTD because Almedia et al. (2004) argue that changes in short-term debt can be considered as a substitute for cash and that it is also used by firms in their cash management policies. We do not make apriori prediction on the coefficient of α_5.

We present the regression results of our baseline model in Model (1) of Table 3. For the sake of brevity, we do not report the coefficients on the industry, country and year dummies in all the subsequent tables. All the coefficients on the five control variables are significant at the one-percent level with expected signs. The results suggest that large firms, firms with better investment opportunities, low capital investments needs, and high cash flows and those experiencing an increase in short-term debt have the tendency to increase their cash holdings.

We next empirically examine the effect of the legal protection of minority investors on the cash-cash flow sensitivity. Essentially, this is a test of Hypothesis 1, which conjectures that the cash-cash flow sensitivity should decrease with the level of legal protection afforded to the investors. We expand the baseline model (equation (1)) by including an interaction term between cash flow and the measures of legal protection of investors. The regression specification to test Hypothesis 1 is as follows:

$$\begin{aligned}\Delta CashHoldings_{it} = {} & a_{industry} + a_{country} + a_t + \alpha_1 CF_{it} + \alpha_2 Q_{it} + \alpha_3 SIZE_{it} \\ & + \alpha_4 CAPX_{it} + \alpha_5 \Delta STD_{it} + \alpha_{11}(CF_{it} \times LP_i) + u_{it},\end{aligned} \tag{2}$$

where LP_i is one of the six country-level legal protection measures for firm *i*. All the other variables are defined earlier. We are particularly interested in the coefficient on the interaction term, α_{11}. The interaction term measures the effect of the legal protection of investors on the sensitivity of cash to cash flow. The prediction from our first hypothesis is that α_{11} should be negative. In particular, we wish to verify whether or not the presence of legal protection has a decreasing effect on the cash-cash flow sensitivity.

We report the results of the estimation of the fixed effects regressions in Models (2) to (7) of Table 3. The regression (equation (2)) is estimated by including the interaction of each of the six indices that we use as measures of legal protection of investors (*ANTIDIR*, *PRIENF*, *PUBENF*, *DISC*, *LIAB*, and *INVPRT*) with *CF* as an additional explanatory variable.

Despite the inclusion of the interaction term with the legal protection of investors, the coefficients on *CF* (α_1) remain positive and highly significant at the one-percent level in Models (2) to (7). Their magnitudes increase as a result of the addition of the interaction term. Firms with higher cash flows display a propensity to save more cash from their cash flows in order to fund future investment needs. As for the other control variables, the magnitudes of the coefficients (α_2 to α_5) are similar to those reported in Model (1) and they continue to show statistical significance with expected signs.

Our coefficients of interest (α_{11}) are negative and statistically significant at the conventional levels in all the models, which suggests that the change in cash holdings is negatively associated with the interaction term between cash flow and different measures of legal protection. The magnitudes of the coefficient on the interaction term range from -0.59 (*PUBENF*) to -0.01 (*ANTIDIR*). As an illustration, the magnitude of the interaction term between *CF* and *PUBENF* is estimated at -0.59, with a *t*-statistic of 2.28, which is significant at the one-percent level.

Therefore, our results are consistent with the prediction of Hypothesis 1 that the cash holdings of firms in countries with strong legal protection of investors are less sensitive to changes in their cash flows, as compared to the cash holdings of firms in countries with weak legal protection of investors.

In terms of economic significance, when we increase the public enforcement index by one standard deviation, the cash-cash flow sensitivity decreases by about 58 percent, which is very substantial.[14] As for the other measures of legal protection, a one standard deviation increase in the index value leads to about a 6 to 9 percent increase in the cash-cash flow sensitivity.

[Insert Table 3 here]

Previous studies have documented that countries with common-law legal traditions offer a stronger degree of legal protection to minority investors than do countries with civil-law traditions. Hence, we also estimate the following equation:

$$\begin{aligned}\Delta CashHoldings_{it} &= a_{industry} + a_{country} + a_t + \alpha_1 CF_{it} + \alpha_2 Q_{it} + \alpha_3 SIZE_{it} \\ &+ \alpha_4 CAPX_{it} + \alpha_5 \Delta STD_{it} + \alpha_{11}(CF_{it} \times LO_i) + u_{it},\end{aligned} \tag{3}$$

where LO_i is the legal origin dummy variable for firm i. The dummy variable is set to zero in civil-law countries and one in common-law countries. All the other variables are defined earlier. We predict that the coefficient on the interaction term between *CF* and *LO* should be negative. In other words, firms in countries with common-law legal traditions have lower cash-cash flow sensitivities than do firms in countries with civil-law legal traditions.

Following the regressions in Table 3, we estimate equation (3) using the fixed effects model. Our unreported results show that the interaction coefficient, α_{11}, is estimated at -0.036, with a *t*-statistic of -2.60, which is significant at the one-percent level. The result is consistent with our

[14] The computation is as follows: the change in the cash-cash flow sensitivity is [(0.220×-0.590)/0.224]×100 = -58%.

prediction and complements the results in Table 3. In terms of economic significance, the cash-cash flow sensitivity of firms in common-law countries is lower than that of firms in civil-law countries by about 17 percent.[15]

We also interact cash flow with both the legal origin dummy and the measures of legal protection as shown below:

$$\begin{aligned}\Delta CashHoldings_{it} &= a_{industry} + a_{country} + a_t + \alpha_1 CF_{it} + \alpha_2 Q_{it} + \alpha_3 SIZE_{it} \\ &+ \alpha_4 CAPX_{it} + \alpha_5 \Delta STD_{it} + \alpha_{11}(CF_{it} \times LO_i \times LP_i) + u_{it},\end{aligned} \tag{4}$$

where all the variables are defined earlier. Similarly, we predict that the coefficient on the interaction term (α_{11}) is negative. In other words, firms in countries characterized by common-law legal traditions and strong legal protection of minority investors exhibit smaller cash-cash flow sensitivity than do firms in countries characterized by civil-law legal traditions and weak legal protection of shareholders. We estimate equation (4) using the fixed effects model. In our unreported results, we continue to find that the coefficient on the interaction term, α_{11}, is significantly negative for all the measures of legal protection.[16] As an example, the interaction coefficient between *CF*, *LO* and *INVPRT* is estimated at -0.04, with a *t*-statistic of -2.38, which is significant at the five-percent level.

Overall, our findings so far have conveyed an important message that the legal protection of minority investors matters to international firms' corporate cash management policies. Specifically, we demonstrate that firms in countries with strong legal protection of investors have cash holdings that are less sensitive to changes in cash flows than do firms in countries with weak legal protection of investors.

[15] The computation is as follows: the change in the cash-cash flow sensitivity is (-0.036/0.211)×100 = -17%.
[16] Complete results are available at request from the authors.

4.2 Legal protection of investors and the sensitivity of cash to stock prices

Next, we turn our attention to the second coefficient of interest, α_2, which measures the sensitivity of cash to stock prices. Recall from the result of our baseline model (equation (1)) in Table 3 that α_2 is estimated at 0.052, with a *t*-statistic of 9.10, which is highly significant at the one-percent level. This indicates that firms will increase their cash holdings in response to increases in their stock prices.

We extend our analysis to test Hypothesis 2 on whether the legal protection of investors also has an impact on the cash-stock price sensitivity. We posit that there is a positive relationship between legal protection and the cash-stock price sensitivity. In other words, the cash holdings of firms in countries with strong legal protection of investors are more responsive to changes in stock prices than are the cash holdings of firms in countries with weak legal protection of investors.

We expand equation (2) to include an interaction term between Tobin's *Q* and the measure of legal protection as an additional regressor to test Hypothesis 2. The regression specification is as follows:

$$\begin{aligned}\Delta CashHoldings_{it} &= a_{industry} + a_{country} + a_t + \alpha_1 CF_{it} + \alpha_2 Q_{it} + \alpha_3 SIZE_{it} \\ &+ \alpha_4 CAPX_{it} + \alpha_5 \Delta STD_{it} + \alpha_{11}(CF_{it} \times LP_{it}) + \alpha_{22}(Q_{it} \times LP_{it}) + u_{it},\end{aligned} \tag{5}$$

where all the variables are defined earlier. We now have two interaction terms in the equation, which measure the effect of legal protection of investors on both the cash-cash flow and cash-stock price sensitivities. From Hypothesis 1, we predict that the first interaction term (α_{11}) should be negative. In contrast, Hypothesis 2 predicts that the second interaction term (α_{22}) should be positive. Specifically, we are interested in knowing if the cash-stock price sensitivity increases with the degree of legal protection of investors and if the result pertaining to the first

hypothesis, which we have documented in Table 3, is robust to the inclusion of the additional interaction term.

We use the fixed effects model, which controls for industry, country and year variations, in the estimation of equation (5) and report the results in Models (1) to (6) of Table 4. We first discuss the results with the control variables. Apart from the coefficient on Q (α_2), the magnitudes and significance of the other variables are stable and similar to those reported in Table 3. Moreover, the adjusted R^2 also remains stable at about 0.10 in all the six specifications.

[Insert Table 4 here]

After the inclusion of the interaction term between Q and the measures of legal protection, the coefficient on Q (α_2) remains positive in three out of six specifications and it is only significant at the one-percent level when *PUBENF* is used as the measure of legal protection. It becomes negative but insignificant in all the three remaining specifications.

Table 4 reveals that the results on the effect of legal protection on the cash-cash flow sensitivity, which we present in the previous table, are relatively robust to the inclusion of the additional interaction term between Tobin's Q and the legal protection measures. The interaction coefficient, α_{11}, remains negative and significant at least at the five-percent level in all the specifications. This implies that the negative relationship between the cash-cash flow sensitivity and legal protection of investors continues to hold. As an example, the coefficient on the interaction term between *CF* and *PUBENF* is estimated at -0.56 (-0.59 in Table 3), with a *t*-statistic of -2.10, which is significant at the five-percent level.

Interestingly, we find that the coefficient on the interaction term between Tobin's Q and legal protection (α_{22}) is positive and significant at least at the ten-percent level in all six specifications.

The magnitude of the coefficient ranges from 0.001 (*ANTIDIR*) to 0.012 (*PRIENF*). For example, the magnitude of the interaction term between *Q* and *PUBENF* is estimated at 0.03, with a *t*-statistic of 1.79, which is marginally significant at the ten-percent level. In terms of economic significance, one standard deviation change in the public enforcement index leads to a 9 percent increase in the cash-stock price sensitivity. [17]

In general, the results in Table 4 support Hypothesis 2 and demonstrate that the legal protection of investors has a positive effect on the cash-stock price sensitivity. Firms in countries with strong legal protection exhibit a higher propensity to increase their cash holdings when they experience increases in stock prices, which is driven by an improvement in their investment opportunities.

4.3 Robustness tests on the effect of legal protection of investors

In the previous sub-sections, we have established that the legal protection of investors plays an important role in international firms' corporate cash management policies, in terms of both the cash-cash flow and cash-stock price sensitivities. In this sub-section, we conduct a series of robustness checks to mitigate any concern that our results might be driven by omitted variables or measurement errors.

Firstly, following Almeida et al. (2004) and Khurana et al. (2006), we modify equations (2) and (5) by including two additional explanatory variables: the lagged cash-to-assets ratio and the interaction term between the lagged cash-to-assets ratio and cash flow. The regression specifications are as follows:

[17] The computation is as follows: the change in the cash-stock price sensitivity is [0.22*0.0029)/0.0068) × 100 = 9%.

$$\Delta CashHoldings_{it} = a_{industry} + a_{country} + a_t + \alpha_1 CF_{it} + \alpha_2 Q_{it} + \alpha_3 SIZE_{it} + \alpha_4 CAPX_{it} + \alpha_5 \Delta STD_{it} + \alpha_6 LCASHR_{it} + \alpha_7 (CF_{it} \times LCASHR_{it}) + \alpha_{11} (CF_{it} \times LP_{it}) + u_{it}, \quad (6)$$

$$\Delta CashHoldings_{it} = a_{industry} + a_{country} + a_t + \alpha_1 CF_{it} + \alpha_2 Q_{it} + \alpha_3 SIZE_{it} + \alpha_4 CAPX_{it} + \alpha_5 \Delta STD_{it} + \alpha_6 LCASHR_{it} + \alpha_7 (CF_{it} \times LCASHR_{it}) + \alpha_{11} (CF_{it} \times INVPRT_{it}) + \alpha_{22} (Q_{it} \times INVPRT_{it}) + u_{it}, \quad (7)$$

where $LCASHR_{it}$ is the lagged cash to assets ratio for firm *i* at time *t*. All the other variables are defined earlier. We use the investor protection index (*INVPRT*) and the fixed effects model to estimate equations (6) and (7).

The results are presented in Models (1) and (2) of Table 5. We note that the adjusted R^2 increases from 0.10 in the previous tables to 0.19 in Table 5. In both models, we find that the lagged cash-to-assets ratio is negatively and significantly related to the change in cash holdings (coefficient = -0.17). Conversely, the interaction term between the lagged cash-to-assets ratio and cash flow has a positive and significant association (coefficient = 0.61) with the change in cash holdings. More importantly, we obtain qualitative unchanged results on the effect of legal protection on the cash-cash flow and cash-stock price sensitivities. While the cash-cash flow sensitivity decreases with legal protection, the cash-stock price sensitivity increases with legal protection.

Recent research has highlighted numerous problems associated with using Tobin's *Q*. For example, Baker et al. (2003) point out that Tobin's *Q* can be used to proxy for both stock price mispricing and investment opportunities. At the same time, *Q* might be estimated with measurement errors due to the difficulty in measuring the replacement cost of physical capital.

One way to resolve this problem is to use another variable that provides a relatively reliable measure of investment opportunities. In this case, we replace Tobin's *Q* with the past one-year

change in total assets in the estimation of equations (2) and (5). The regression specifications are as follows:

$$\Delta CashHoldings_{it} = a_{industry} + a_{country} + a_t + \alpha_1 CF_{it} + \alpha_2 AG_{it} + \alpha_3 SIZE_{it} + \alpha_4 CAPX_{it} + \alpha_5 \Delta STD_{it} + \alpha_{11}(CF_{it} \times INVPRT_{it}) + u_{it}, \quad (8)$$

$$\Delta CashHoldings_{it} = a_{industry} + a_{country} + a_t + \alpha_1 CF_{it} + \alpha_2 AG_{it} + \alpha_3 SIZE_{it} + \alpha_4 CAPX_{it} + \alpha_5 \Delta STD_{it} + \alpha_{11}(CF_{it} \times INVPRT_{it}) + \alpha_{22}(Q_{it} \times INVPRT_{it}) + u_{it}, \quad (9)$$

where AG_{it} is the one-year percentage growth in total assets for firm *i* at time *t*. All the other variables are defined earlier. Similarly, we use the investor protection index and the fixed effects model to estimate equations (8) and (9).

The results are presented in Models (3) and (4) of Table 5. Consistent with our prediction on the coefficient of *Q*, the coefficient on *AG* (α_2) is positive and highly significant at the one-percent level. Firms that experience higher growth in total assets are more likely to increase their cash holdings. The magnitude of the coefficient more than doubles from 0.05 in Model (6) of Table 3 to 0.12 in Models (3) and (4) of Table 5. In terms of the main results, we do not detect any change with regard to the signs and significance of the coefficients of α_{11} and α_{22}. Likewise, we obtain the same pattern for the coefficients on the other control variables as we predicted earier.

In addition, we drop two countries with the largest number of firm-year observations from our sample, namely Japan and the United Kingdom, to check if our results are driven by observations from these two countries. We use the investor protection index and the fixed effects model to re-estimate equations (2) and (5).

The results are presented in Models (5) and (6) of Table 5. Similar to the previous specifications, we continue to find that the interaction coefficients retain their signs and

statistical significance levels in the regressions in this smaller sample. With the exception of the coefficient on *Q* in Model (6), all the other control variables remain significant with expected signs. Hence, we show that our main results are not caused by the observations from Japan and the United Kingdom.

Finally, we compute the ratio of stock market capitalization to GNP per capita (both variables are obtained from La Porta et al (1998)) as a measure of the level of capital market development. We then include this variable as an additional regressor into equations (2) and (5).[18] In our unreported results, we find that the level of capital market development does not alter the main effects of legal protection on firms' cash management policies. Firms in countries with strong legal protection of investors still display smaller cash-cash flow and higher cash-stock price sensitivities than do firms in countries with weak legal protection of investors.

[Insert Table 5 here]

4.4 The role of financial constraints

We now explore the role of firm-level measures of financial constraints on international firms' corporate cash management policies, which is also a test of our Hypothesis 3. Following Almeida et al. (2004), we classify firms into two groups (financially constrained and financially unconstrained) based on three measures that have been used in the previous literature: firm size (*SIZE*), the dividend payout ratio (*DIVPAYOUT*) and the Kaplan-Zingales (*KZ*) index.

Many studies have used firm size (the natural logarithm of total assets) as a proxy for financial constraints. Large firms are usually considered to have better access to external

[18] A related paper by Dittmar et al. (2003) has documented that capital market development is positively related to firm-level cash holdings.

financial markets than are small firms. As a result, we treat small firms as being financially constrained and large firms as being financially unconstrained.

We compute the dividend payout ratio as the total dividends distributed in a given year divided by operating income. Firms that have a high dividend payout ratio are deemed to be financially unconstrained, while those with a low ratio are deemed to be financially constrained.

The original *KZ* index is first constructed by Kaplan and Zingales (1997) for a small sample of 49 low-dividend manufacturing firms in the U.S. as a proxy for the level of financial constraint. They estimate the following equation to construct the index:

$$KZ_{it} = -1.002CF_{it} - 39.368DIV_{it} - 1.315CASH_{it} + 3.139LEV_{it} + 0.283Q_{it}, \quad (10)$$

where KZ_{it} is the *KZ* score for firm *i* in year *t*. LEV_{it} is leverage and is calculated as the sum of long-term debt and debt in current liabilities divided by the sum of long-term debt, debt in current liabilities, and book value of equity. DIV_{it} is dividends and is calculated as cash dividends paid in year *t* divided by total assets at the end of year *t*-1. All other variables are defined earlier.

Since there are problems associated with Tobin's *Q*, Baker et al. (2003) advocate the use of a four-variable *KZ* index that does not include *Q* in the estimation. Similar to Baker et al. (2003) and Almeida et al. (2004), we treat firms with higher *KZ* scores as being more financially constrained. The regression specification to estimate the modified *KZ* index is as follows:

$$KZ_{it} = -1.002CF_{it} - 39.368DIV_{it} - 1.315CASH_{it} + 3.139LEV_{it}, \quad (11)$$

There is one lingering concern about the *KZ* index that it might not be appropriate to use as a measure of financial constraints in our sample of international firms. Therefore, we have also constructed an equally weighted *KZ* index for each country in our sample. The weighting scheme

allows each variable to contribute equally to the total variation of the index, such that we have different weights assigned to each variable in the estimation of the *KZ* index for each country.[19]

We include the interaction term between the measures of financial constraints and cash flow and estimate the following equation below:

$$\begin{aligned}\Delta CashHoldings_{it} &= a_{industry} + a_{country} + a_t + \alpha_1 CF_{it} + \alpha_2 Q_{it} + \alpha_3 SIZE_{it} \\ &+ \alpha_4 CAPX_{it} + \alpha_5 \Delta STD_{it} + \alpha_6 (CF_{it} \times FC_{it}) + u_{it},\end{aligned} \tag{12}$$

where FC_{it} is one of the three measures of financial constraints for firm *i* at time *t*. All the other variables are defined earlier.

The coefficient of the interaction term, α_6, measures the effect of financial constraints on the sensitivity of cash to cash flow. Hypothesis 3 predicts that α_6 should be negative for the specifications that use firm size and dividend payout ratios and positive for the specification that uses the *KZ* index. In other words, the cash-cash flow sensitivity is decreasing in the level of financial constraints. Financially constrained firms are more likely than their counterparts to save cash from their current cash flows to fund future investments.

Similar to the previous specifications, we estimate equation (12) using the fixed effects model that controls for industry, country and year variations. Model (1) of Table 6 shows the results for the specification that uses firm size as a proxy for financial constraints. Models (2) and (3) show the corresponding results for the dividend payout ratio and the *KZ* index.

We find that the coefficient of interest (α_6) is negative and significant at least at the ten-percent level for all the three specifications. The results on firm size and the dividend payout ratio are consistent with our hypothesis that financially constrained firms display a higher

[19] Before we estimate the *KZ* index, we first winsorize the components of the *KZ* index at the 1st and 99th percentiles. We report the results based on the equally weighted *KZ* index. However, we still obtain similar results when we use the original and modified *KZ* index. This approach is also used by Baker et al. (2003) and their results are robust regardless of the *KZ* index used.

sensitivity of cash to cash flow. However, the result on the *KZ* index is puzzling and does not conform to our conjecture. Firms with higher *KZ* scores (financially constrained) actually show a lower propensity to save cash out of current cash flows. Almeida et al. (2004) also find a similar result and they attribute the contradictory finding to the fact that the *KZ* index may not be a good measure of financial constraints. As for the other control variables, the signs and significant levels of the coefficients remain unchanged.

We further examine the implications of both legal protection and financial constraints on the sensitivity of cash to cash flow. To do this, we modify equation (12) by introducing the interaction term between the investor protection index and cash flow and estimate the following equation:

$$\begin{aligned}\Delta CashHoldings_{it} &= a_{industry} + a_{country} + a_t + \alpha_1 CF_{it} + \alpha_2 Q_{it} + \alpha_3 SIZE_{it} \\ &+ \alpha_4 CAPX_{it} + \alpha_5 \Delta STD_{it} + \alpha_{11}(CF_{it} \times INVPRT_i) + \alpha_6 (CF_{it} \times FC_{it}) + u_{it},\end{aligned} \tag{13}$$

where all other variables are as defined earlier.

Our predictions with regard to the interaction coefficients are similar as before. We expect that both α_{11} and α_6 should be negative for the specifications that use firm size and dividend payout, while α_{11} should be negative and α_6 should be positive for the specification that uses the *KZ* index.

We use the fixed effects model to estimate equation (13) and present the results in Models (4) to (6) of Table 6. We find that the main results we obtain in the previous specifications are virtually the same as those that include both legal protection and financial constraints in the specifications. In fact, both interaction coefficients, α_{11} and α_6, display a negative association (with the significance level at least at the ten-percent level) with the change in cash holdings in Models (4) and (5). In terms of economic significance, a one standard deviation increase in the

dividend payout ratio (firm size) leads to a 38 (3) percent decrease in the cash-cash flow sensitivity.[20]

Finally, to test Hypothesis 4, we add two additional interaction terms: one is between the measures of financial constraints and Tobin's *Q* and the other between the investor protection index and *Q*. We estimate the following equation:

$$\begin{aligned}\Delta CashHoldings_{it} &= a_{industry} + a_{country} + a_t + \alpha_1 CF_{it} + \alpha_2 Q_{it} + \alpha_3 SIZE_{it} \\ &+ \alpha_4 CAPX_{it} + \alpha_5 \Delta STD_{it} + \alpha_{11}(CF_{it} \times INVPRT_i) + \alpha_{22}(Q_{it} \times INVPRT_i) \\ &+ \alpha_6 (CF_{it} \times FC_{it}) + \alpha_7 (Q_{it} \times FC_{it}) + u_{it},\end{aligned} \tag{14}$$

where all other variables are defined earlier.

The coefficient of the interaction term between *Q* and the measures of financial constraints, α_7, measures how financial constraints affect the cash-stock price sensitivity. The prediction from Hypothesis 4 is that α_7 should be negative for the specifications that use firm size and dividend payout, and positive for the specification that uses the *KZ* index. The predictions with respect to other interaction terms are similar as before.

The results form the estimation of equation (14) using the fixed effects model are reported in Models (7) to (9) of Table 6. Again, with the exception of the specification that uses the *KZ* index, we find evidence that supports Hypothesis 4. The results from Model (7) and (8) confirm that the interaction coefficient, α_7, is negative and significant at least at the five-percent level, as expected. Moreover, the results on the other interaction coefficients persist. In terms of economic

[20] The computation is as follows: for dividend payout ratio, the change in the sensitivity of cash to cash flow is [(-0.1513*0.6013)/0.2383]×100 = 38 percent. For size, the change in the sensitivity of cash to cash flow is [-0.0102*0.6990]/0.2249]×100 = 3 percent.

significance, a one standard deviation increase in the dividend payout ratio (firm size) leads to an 11 (35) percent decrease in the cash-stock price sensitivity.[21]

[Insert Table 6 here]

Overall, the results in Table 6 lend further support to our conjectures that international firms' corporate cash management policies are influenced by country-level institutional factors as well as firm-level measures of financial constraints.

5. Conclusions

Using a large cross-country sample that covers a period of twenty years, we seek to examine the determinants of international firms' corporate cash management policies. We find that firms in countries with strong legal protection of minority investors exhibit lower cash-cash flow and higher cash-stock price sensitivities than do firms in countries with weak legal protection. The results on the impact of financial constraints indicate that when firms become more financially constrained, they are more likely to experience an increase in both their cash-cash flow and cash-stock price sensitivities, which are consistent with our predictions. Our study adds to the literature on corporate cash management policies and provides new insights on the roles that legal protection and financial constraints play in the sensitivities of a firm's cash holdings to changes in both cash flows and stock prices.

Taken as a whole, our empirical findings are consistent with the notion that strong legal protection helps to ease the constraints encountered by firms in raising external financing. Hence, those firms in countries with strong legal protection face less pressure to hoard cash from their

[21] The computation is as follows: for dividend payout ratio, the change in the sensitivity of cash to stock prices is [(-0.0007*0.6013)/0.0048]×100 = -11 percent. For size, the change in the sensitivity of cash to cash flow is [-0.0008*0.6990]/0.0016]×100 = -35 percent.

internal funds in order to finance their future investments. On the other hand, the stock prices of these firms should provide a better signal of potential growth options available to the firms, which increase their tendency to increase their cash holdings in response to increases in their stock prices. Moreover, the presence of financial constraints also makes it necessary for firms to stockpile cash reserve, in anticipation of future investment needs.

One practical implication of our research is that managers should acknowledge the importance of both the legal protection afforded to them by regulators and their own firms' level of financial constraints before they decide on the optimal corporate cash management policies that best suit their firms.

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Table 1
Summary statistics

The table presents the summary statistics of the financial and legal protection variables. *Cash Holdings* is cash and equivalents divided by total assets. Δ *Cash Holdings* and is calculated as the change in *Cash Holdings* between year *t* and *t*-1. *Q* is Tobin's *Q* and is calculated as the market value of equity plus total assets minus total equity divided by total assets. *CF* is cash flow and is calculated as income before extraordinary items plus depreciation and amortization divided by total assets. *SIZE* is the natural logarithm of total assets (in millions of US dollars). *CAPX* is the capital expenditures divided by total assets. Δ *STD* is the change in short-term debt divided by total assets between year *t* and *t*-1. *ANTIDIR* is the anti-director rights index, a measure of shareholder protection from La Porta et al. (1998). *PRIVENF* is the private enforcement index calculated as the average of the disclosure requirement (*DISC*) and liability standard (*LIAB*) indices from La Porta et al. (2006). *PUBENF* is the public enforcement index calculated as the average of the supervisor characteristics, rule-making power, investigative powers, orders and criminal indices also from La Porta et al. (2006). *INVPRT* is the investor protection index calculated as the principal component of the disclosure requirements, liability standard, and anti-directors rights indices from La Porta et al. (2006). The sample consists of 43 countries and covers the period from 1985 to 2004.

Country	Number of firm-years	Number of firms	Cash Holdings	Δ Cash Holdings	Q	CF	SIZE	CAPX	Δ STD	ANTIDIR	DISC	LIAB	PRIVENF	PUBENF	INVPRT
Argentina	326	69	0.0337	0.0030	0.9690	0.0538	6.3171	0.0375	0.0049	4	0.50	0.22	0.36	0.58	0.48
Australia	3867	757	0.0517	0.0014	1.2607	0.0595	4.9412	0.0491	0.0000	4	0.75	0.66	0.71	0.90	0.78
Austria	766	114	0.0630	-0.0001	1.1362	0.0660	5.3449	0.0567	0.0001	2	0.25	0.11	0.18	0.17	0.10
Belgium	1054	137	0.0815	0.0020	1.1551	0.0719	5.4346	0.0536	0.0010	0	0.42	0.44	0.43	0.15	0.07
Brazil	1344	286	0.0575	0.0037	0.9063	0.0466	6.2836	0.0498	0.0113	3	0.25	0.33	0.29	0.58	0.44
Canada	6430	1032	0.0339	0.0000	1.2241	0.0643	5.4061	0.0602	0.0000	5	0.92	1.00	0.96	0.80	0.96
Chile	930	132	0.0289	0.0009	1.0813	0.0544	5.5944	0.0513	0.0031	5	0.58	0.33	0.46	0.60	0.61
Colombia	167	27	0.0463	0.0047	0.7950	0.0479	5.8410	0.0304	0.0043	3	0.42	0.11	0.26	0.58	0.35
Denmark	1610	189	0.1029	-0.0006	1.1254	0.0770	4.7345	0.0540	0.0005	2	0.58	0.55	0.57	0.37	0.36
Egypt	19	9	0.2300	-0.0332	1.2711	0.0390	5.5325	0.0546	0.0031	2	0.50	0.22	0.36	0.30	0.20
Finland	1177	155	0.0775	0.0005	1.1529	0.0714	5.5422	0.0637	0.0002	3	0.50	0.66	0.58	0.32	0.47
France	6099	920	0.0891	0.0021	1.1515	0.0676	5.3973	0.0453	0.0022	3	0.75	0.22	0.49	0.77	0.47
Germany	5159	734	0.0595	-0.0005	1.2438	0.0669	5.4721	0.0573	0.0001	1	0.42	0.00	0.21	0.22	0.00
Greece	256	119	0.0642	-0.0037	1.4159	0.0618	5.1852	0.0547	0.0057	2	0.33	0.50	0.41	0.32	0.32
Hong Kong	3383	638	0.1282	0.0027	0.9549	0.0379	5.0600	0.0293	0.0000	5	0.92	0.66	0.79	0.87	0.85
India	2101	350	0.0276	0.0015	1.0447	0.0731	5.1066	0.0511	0.0004	5	0.92	0.66	0.79	0.67	0.77
Indonesia	1321	225	0.0805	0.0004	1.0725	0.0604	4.5359	0.0400	0.0021	2	0.50	0.66	0.58	0.62	0.51

Ireland	718	78	0.0894	0.0053	1.2518	0.0654	4.9085	0.0460	0.0010	4	0.67	0.44	0.55	0.37	0.48
Israel	282	74	0.0776	0.0021	1.1141	0.0430	6.0075	0.0470	0.0103	3	0.67	0.66	0.66	0.63	0.59
Italy	2195	296	0.0813	0.0011	1.0886	0.0518	6.0527	0.0397	0.0027	1	0.67	0.22	0.44	0.48	0.20
Japan	18649	3039	0.1356	-0.0024	1.0368	0.0396	6.1726	0.0301	0.0000	4	0.75	0.66	0.71	0.00	0.42
Korea	3751	767	0.0710	0.0018	0.8937	0.0443	5.4965	0.0343	0.0048	2	0.75	0.66	0.71	0.25	0.36
Malaysia	3990	682	0.0646	0.0024	1.1112	0.0462	4.7226	0.0314	0.0009	4	0.92	0.66	0.79	0.77	0.73
Mexico	880	126	0.0542	0.0047	1.0476	0.0647	6.8445	0.0455	0.0042	1	0.58	0.11	0.35	0.35	0.10
Netherlands	2026	245	0.0489	0.0003	1.2149	0.0877	5.5235	0.0605	0.0000	2	0.50	0.89	0.69	0.47	0.54
New Zealand	605	101	0.0181	0.0001	1.1828	0.0573	4.9781	0.0467	0.0000	4	0.67	0.44	0.55	0.33	0.46
Norway	1279	214	0.1097	0.0000	1.1567	0.0631	5.0087	0.0689	0.0000	4	0.58	0.39	0.48	0.32	0.44
Pakistan	538	74	0.0605	0.0040	1.0949	0.0773	4.2458	0.0417	0.0026	5	0.58	0.39	0.48	0.58	0.63
Peru	279	62	0.0190	0.0003	0.8781	0.0590	4.5498	0.0392	0.0000	3	0.33	0.66	0.50	0.78	0.66
Philippines	669	110	0.0511	-0.0002	0.9240	0.0514	4.8422	0.0422	0.0008	3	0.83	1.00	0.92	0.83	0.81
Portugal	533	84	0.0263	0.0010	1.0266	0.0601	5.1246	0.0409	0.0032	3	0.42	0.66	0.54	0.58	0.57
Singapore	2355	436	0.1154	0.0036	1.0979	0.0472	4.7243	0.0377	0.0000	4	1.00	0.66	0.83	0.87	0.77
South Africa	2391	398	0.0759	0.0035	1.1757	0.0828	5.4041	0.0574	0.0000	5	0.83	0.66	0.75	0.25	0.60
Spain	1415	177	0.0409	0.0010	1.1413	0.0618	6.0322	0.0407	0.0010	4	0.50	0.66	0.58	0.33	0.55
Sri Lanka	89	16	0.0660	0.0038	0.9574	0.0586	3.9767	0.0504	0.0163	3	0.75	0.39	0.57	0.43	0.40
Sweden	1900	324	0.0919	0.0009	1.2350	0.0659	5.4203	0.0476	0.0000	3	0.58	0.28	0.43	0.50	0.39
Switzerland	1967	238	0.1111	0.0026	1.1384	0.0706	6.4069	0.0472	0.0000	2	0.67	0.44	0.55	0.33	0.30
Taiwan	2664	583	0.0887	0.0053	1.1944	0.0544	5.6412	0.0331	0.0040	3	0.75	0.66	0.71	0.52	0.55
Thailand	2146	330	0.0404	0.0003	1.0251	0.0595	4.3734	0.0353	0.0016	2	0.92	0.22	0.57	0.72	0.37
Turkey	546	156	0.0549	0.0072	1.3279	0.0992	4.4908	0.0466	0.0108	2	0.50	0.22	0.36	0.63	0.34
United Kingdom	16316	2078	0.0625	0.0001	1.3244	0.0674	4.6600	0.0521	0.0000	5	0.83	0.66	0.75	0.68	0.78
Venezuela	88	16	0.0521	0.0116	0.6903	0.0586	5.8312	0.0319	0.0129	1	0.17	0.22	0.19	0.55	0.22
Zimbabwe	3	1	0.0017	-0.0136	0.7475	0.1032	3.3571	0.0231	-0.0220	3	0.50	0.44	0.47	0.42	0.42
Mean	2425	386	0.0689	0.0007	1.0939	0.0618	5.2680	0.0455	0.0022	3.05	0.61	0.48	0.55	0.51	0.47
Std Dev	2475	394	0.0392	0.0064	0.1551	0.0145	0.6990	0.0103	0.0055	1.31	0.20	0.24	0.19	0.22	0.22

Table 2
Cross-country correlation analysis

The table presents the cross-country correlation analysis for the financial and legal protection variables. *Cash Holdings* is cash and equivalents divided by total assets. Δ *Cash Holdings* and is calculated as the change in cash and equivalents divided by total asset between year *t* and *t*-1. *Q* is Tobin's *Q* and is calculated as the market value of equity plus total assets minus total equity divided by total assets. *CF* is cash flow and is calculated as income before extraordinary items plus depreciation and amortization divided by total assets. *SIZE* is the natural logarithm of total assets (in millions of US dollars). *CAPX* is the capital expenditures divided by total assets. Δ *STD* is the change in short-term debt divided by total assets between year *t* and *t*-1. *ANTIDIR* is the anti-director rights index, a measure of shareholder protection from La Porta et al. (1998). *PRIVENF* is the private enforcement index calculated as the average of the disclosure requirement (*DISC*) and liability standard (*LIAB*) indices from La Porta et al. (2006). *PUBENF* is the public enforcement index calculated as the average of the supervisor characteristics, rule-making power, investigative powers, orders and criminal indices also from La Porta et al. (2006). *INVPRT* is the investor protection index calculated as the principal component of the disclosure requirements, liability standard, and anti-directors rights indices from La Porta et al. (2006). The sample consists of 43 countries and covers the period from 1985 to 2004. *, **, *** denote statistical significance at the 10, 5, and 1 percent levels, respectively.

	Cash Holdings	Δ in Cash Holdings	Q	CF	SIZE	CAPX	in STD	ANTIDIR	DISC	LIAB	PRIVENF	PUBENF
Δ Cash Holdings	-0.45***	1.00										
Q	0.29*	-0.17	1.00									
CF	-0.37***	0.07	0.20	1.00								
SIZE	0.19	0.15	0.02	-0.38***	1.00							
CAPX	0.13	-0.12	0.61***	0.29*	0.10	1.00						
Δ STD	0.11	0.40***	0.01	-0.37***	0.33*	0.12	1.00					
ANTIDIR	-0.12	0.07	0.07	-0.10	-0.21	-0.02	-0.19	1.00				
DISC	0.15	0.06	0.16	-0.18	-0.22	-0.13	-0.17	0.52***	1.00			
LIAB	-0.07	0.03	0.07	-0.05	-0.19	0.03	-0.20	0.42***	0.45***	1.00		
PRIVENF	0.03	0.05	0.13	-0.13	-0.24	-0.05	-0.22	0.55***	0.82***	0.88***	1.00	
PUBENF	-0.25*	0.22	-0.15	-0.15	-0.30**	-0.27*	0.07	0.37***	0.39***	0.29*	0.40***	1.00
INVPRT	-0.19	0.13	0.00	-0.13	-0.30***	-0.11	-0.15	0.81***	0.60***	0.76***	0.80***	0.71***

Table 3
Legal protection and the cash-flow sensitivity of cash

The table presents the coefficient estimates of regressions of change in cash holdings on *Q*, cash flow, size, capital expenditures, change in short-term debt, and the legal protection variables. The dependent variable is Δ *Cash Holdings* and is calculated as the change in cash and equivalents divided by total asset between year *t* and *t*-1. *Q* is Tobin's *Q* and is calculated as the market value of equity plus total assets minus total equity divided by total assets. *CF* is cash flow and is calculated as income before extraordinary items plus depreciation and amortization divided by total assets. *SIZE* is the natural logarithm of total assets (in millions of US dollars). *CAPX* is the capital expenditures divided by total assets. Δ *STD* is the change in short-term debt divided by total assets between year *t* and *t*-1. *ANTIDIR* is the anti-director rights index, a measure of shareholder protection from La Porta et al. (1998). *PRIVENF* is the private enforcement index calculated as the average of the disclosure requirement (*DISC*) and liability standard (*LIAB*) indices from La Porta et al. (2006). *PUBENF* is the public enforcement index calculated as the average of the supervisor characteristics, rule-making power, investigative powers, orders and criminal indices also from La Porta et al. (2006). *INVPRT* is the investor protection index calculated as the principal component of the disclosure requirements, liability standard, and anti-directors rights indices from La Porta et al. (2006). The *t*-statistics are reported in parentheses. The estimated standard-errors have been adjusted for error-structure in heteroskedasticity and for within-period error correlation using the Huber-White estimator. The sample consists of 43 countries and covers the period from 1985 to 2004. *, **, *** denote statistical significance at the 10, 5, and 1 percent levels, respectively.

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Q	0.0052***	0.0052***	0.0052***	0.0052***	0.0052***	0.0052***	0.0052***
	(9.10)	(9.08)	(8.92)	(8.96)	(9.07)	(8.84)	(8.94)
CF	0.1985***	0.2261***	0.2653***	0.2244***	0.2505***	0.2445***	0.2384***
	(10.88)	(6.63)	(6.19)	(7.35)	(5.77)	(7.11)	(6.93)
SIZE	0.0007***	0.0007***	0.0007***	0.0007***	0.0007***	0.0007***	0.0007***
	(3.13)	(3.17)	(3.17)	(3.16)	(3.15)	(3.17)	(3.19)
CAPX	-0.1830***	-0.1834***	-0.1834***	-0.1842***	-0.1834***	-0.1833***	-0.1841***
	(-16.08)	(-15.81)	(-15.76)	(-15.69)	(-15.89)	(-15.77)	(-15.60)
Δ STD	0.0665***	0.0668***	0.0669***	0.0664***	0.0668***	0.0669***	0.0668***
	(11.58)	(11.83)	(11.82)	(11.58)	(11.77)	(11.79)	(11.79)
CF × ANTIDIR		-0.0097**					
		(-1.98)					
CF × PRIVENF			-0.1124***				
			(-2.71)				
CF × PUBENF				-0.590**			
				(-2.28)			
CF × DISC					-0.0807**		
					(-2.12)		
CF × LIAB						-0.0929***	
						(-2.85)	
CF × INVPRT							-0.0800***
							(-2.61)
Country fixed-effect	YES	YES	YES	YES	YES	YES	YES
Year fixed-effect	YES	YES	YES	YES	YES	YES	YES
Industry fixed-effect	YES	YES	YES	YES	YES	YES	YES
Adjusted R-square	0.094	0.094	0.095	0.095	0.094	0.095	0.095
Number of observations	104,283	104,283	104,283	104,283	144,283	104,283	104,283

Table 4
Legal protection and corporate cash management policy

The table presents the coefficient estimates of regressions of change in cash holdings on *Q*, cash flow, size, capital expenditures, change in short-term debt and the legal protection variables. The dependent variable is Δ *Cash Holdings* and is calculated as the change in cash and equivalents divided by total asset between year *t* and *t*-1. *LCASHR* is the lagged cash holdings. *Q* is Tobin's *Q* and is calculated as the market value of equity plus total assets minus total equity divided by total assets. *CF* is cash flow and is calculated as income before extraordinary items plus depreciation and amortization divided by total assets. *SIZE* is the natural logarithm of total assets (in millions of US dollars). *CAPX* is the capital expenditures divided by total assets. Δ *STD* is the change in short-term debt divided by total assets between year *t* and *t*-1. *ANTIDIR* is the anti-director rights index, a measure of shareholder protection from La Porta et al. (1998). *PRIVENF* is the private enforcement index calculated as the average of the disclosure requirement (*DISC*) and liability standard (*LIAB*) indices from La Porta et al. (2006). *PUBENF* is the public enforcement index calculated as the average of the supervisor characteristics, rule-making power, investigative powers, orders and criminal indices also from La Porta et al. (2006). *INVPRT* is the investor protection index calculated as the principal component of the disclosure requirements, liability standard, and anti-directors rights indices from La Porta et al. (2006). The *t*-statistics are reported in parentheses. The estimated standard-errors have been adjusted for error-structure in heteroskedasticity and for within-period error correlation using the Huber-White estimator. The sample consists of 43 countries and covers the period from 1985 to 2004. *, **, *** denote statistical significance at the 10, 5, and 1 percent levels, respectively.

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Q	0.0012	-0.0031	0.0068***	-0.0013	-0.0006	0.0026
	(0.56)	(-1.15)	(6.74)	(-0.41)	(-0.37)	(1.60)
CF	0.2294***	0.2694***	0.2226***	0.2541***	0.2477***	0.2403***
	(6.49)	(6.21)	(7.22)	(5.66)	(7.19)	(6.86)
SIZE	0.0007***	0.0007***	0.0007***	0.0007***	0.0007***	0.0007***
	(3.19)	(3.15)	(3.12)	(3.15)	(3.13)	(3.21)
CAPX	-0.1839***	-0.1839***	-0.1839***	-0.1836***	-0.1838***	-0.1845***
	(-15.78)	(-15.82)	(-15.73)	(-15.88)	(-15.85)	(-15.59)
Δ STD	0.0670***	0.0673***	0.0664***	0.0670***	0.0672***	0.0669***
	(12.04)	(12.03)	(11.57)	(11.91)	(11.99)	(11.90)
CF × ANTIDIR	-0.0106**					
	(-2.03)					
Q × ANTIDIR	0.0011*					
	(1.87)					
CF × PRIVENF		-0.1179***				
		(2.80)				
Q × PRIVENF		0.0123***				
		(3.04)				
CF × PUBENF			-0.5623**			
			(-2.10)			
Q × PUBENF			0.0029*			
			(1.79)			
CF × DISC				-0.0852**		
				(-2.15)		
Q × DISC				0.0086**		
				(1.98)		
CF × LIAB					-0.0975***	
					(-3.01)	
Q × LIAB					0.0098***	
					(3.56)	
CF × INVPRT						-0.0828***
						(-2.62)

Q × INVPRT						0.0044*
						(1.65)
Country fixed-effect	YES	YES	YES	YES	YES	YES
Year fixed-effect	YES	YES	YES	YES	YES	YES
Industry fixed-effect	YES	YES	YES	YES	YES	YES
Adjusted R-square	0.095	0.096	0.095	0.095	0.096	0.095
Number of observations	104,283	104,283	104,283	144,283	104,283	104,283

Table 5
Robustness checks

The table presents the coefficient estimates of regressions of change in cash holdings on *Q*, cash flow, size, capital expenditures, change in short-term debt, and the legal protection variables. The dependent variable is Δ *Cash Holdings* and is calculated as the change in cash and equivalents divided by total asset between year *t* and *t*-1. *LCASHR* is the lagged cash holdings. *Q* is Tobin's *Q* and is calculated as the market value of equity plus total assets minus total equity divided by total assets. *CF* is cash flow and is calculated as income before extraordinary items plus depreciation and amortization divided by total assets. *SIZE* is the natural logarithm of total assets (in millions of US dollars). *CAPX* is the capital expenditures divided by total assets. Δ *STD* is the change in short-term debt divided by total assets between year *t* and *t*-1. *ASSET GROWTH* is the percentage change in total assets between *t* and *t*-1. *INVPRT* is the investor protection index calculated as the principal component of the disclosure requirements, liability standard, and anti-directors rights indices from La Porta et al. (2006). The *t*-statistics are reported in parentheses. The estimated standard-errors have been adjusted for error-structure in heteroskedasticity and for within-period error correlation using the Huber-White estimator. The sample consists of 43 countries and covers the period from 1985 to 2004. *, **, *** denote statistical significance at the 10, 5, and 1 percent levels, respectively.

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Q	0.0101***	0.0038***			0.0050***	-0.0011
	(11.64)	(2.69)			(9.09)	(-0.65)
ASSET GROWTH			0.1158***	0.1148***		
			(21.58)	(21.40)		
CF	0.1306***	0.1340***	0.1745***	0.1747***	0.2351***	0.2388***
	(8.18)	(8.38)	(5.97)	(6.01)	(6.93)	(6.99)
SIZE	-0.0004*	-0.0004*	0.0004*	0.0004*	0.0011***	0.0011***
	(-1.75)	(-1.73)	(1.75)	(1.90)	(3.67)	(3.69)
CAPX	-0.1757***	-0.1764***	-0.2460***	-0.2471***	-0.1718***	-0.1726***
	(-15.70)	(-15.76)	(-24.02)	(-24.34)	(-15.88)	(-15.99)
Δ in STD	0.0654***	0.0656***	-0.0271***	-0.0265***	0.0660***	0.0665***
	(12.43)	(12.62)	(-3.09)	(-3.02)	(10.96)	(11.19)
LCASHR	-0.1705***	-0.1709***				
	(-33.06)	(-33.40)				
CF × LCASHR	0.6065***	0.6129***				
	(13.32)	(13.85)				
CF × INVPRT	-0.0891***	-0.0959***	-0.0951***	-0.0958***	-0.0769**	-0.0820**
	(-4.00)	(-4.25)	(-3.58)	(-3.66)	(-2.29)	(-2.44)
Q × INVPRT		0.0105***				0.0106***
		(3.68)				(3.87)
ASSET GROWTH × INVPRT				0.0022***		
				(2.80)		
Country fixed-effect	YES	YES	YES	YES	YES	YES
Year fixed-effect	YES	YES	YES	YES	YES	YES
Industry fixed-effect	YES	YES	YES	YES	YES	YES
Adjusted R-square	0.191	0.192	0.169	0.191	0.099	0.099
Number of observations	104,283	104,283	104,283	104,283	69,218	69,218

Table 6
Legal protection, financial constraints and corporate cash management policy

The table presents the coefficient estimates of regressions of change in cash holdings on *Q*, cash flow, size, capital expenditures, change in short-term debt, measures of financial constraints and the legal protection variables. The dependent variable is Δ *Cash Holdings* and is calculated as the change in cash and equivalents divided by total asset between year *t* and *t*-1. *Q* is Tobin's *Q* and is calculated as the market value of equity plus total assets minus total equity divided by total assets. *CF* is cash flow and is calculated as income before extraordinary items plus depreciation and amortization divided by total assets. *SIZE* is the natural logarithm of total assets (in millions of US dollars). *CAPX* is the capital expenditures divided by total assets. Δ *STD* is the change in short-term debt divided by total assets between year *t* and *t*-1. *DIVPAYOUT* is total dividends divided by operating income. *KZ* Index is a measure of financial constraint, originally constructed by Kaplan and Zingales (1997). *INVPRT* is the investor protection index calculated as the principal component of the disclosure requirements, liability standard, and anti-directors rights indices from La Porta et al. (2006). The *t*-statistics are reported in parentheses. The estimated standard-errors have been adjusted for error-structure in heteroskedasticity and for within-period error correlation using the Huber-White estimator. The sample consists of 43 countries and covers the period from 1985 to 2004. *, **, *** denote statistical significance at the 10, 5, and 1 percent levels, respectively.

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Q	0.0054***	0.0065***	0.0013***	0.0054***	0.0064***	0.0013***	-0.0016	0.0038**	-0.0126***
	(9.37)	(9.54)	(2.07)	(9.37)	(9.32)	(2.03)	(-0.66)	(2.38)	(-4.97)
CF	0.2249***	0.1905***	0.2534***	0.2249***	0.2383***	0.3245***	0.2931***	0.2405***	0.2860***
	(6.28)	(10.82)	(15.24)	(6.28)	(6.93)	(7.49)	(5.15)	(6.87)	(5.76)
SIZE	0.0011***	0.0007***	0.0013***	0.0011***	0.0007***	0.0013***	0.0002	0.0007***	0.0017***
	(2.62)	(3.19)	(5.32)	(2.62)	(3.27)	(5.41)	(0.38)	(3.31)	(7.21)
CAPX	-0.1810***	-0.1826***	-0.1950***	-0.1810***	-0.1837***	-0.1954***	-0.1820***	-0.1847***	-0.1824***
	(-17.01)	(-16.27)	(-15.41)	(-17.01)	(-15.79)	(-15.15)	(-16.66)	(-15.76)	(-14.72)
Δ STD	0.0659***	0.0665***	0.0721***	0.0659***	0.0669***	0.07253***	0.0662***	0.0672***	0.0749***
	(11.13)	(11.56)	(12.28)	(11.13)	(11.76)	(12.56)	(11.40)	(11.96)	(13.70)
CF × INVPRT				-0.0874***	-0.0782***	-0.1058**	-0.0921***	-0.0804***	-0.1081***
				(-2.67)	(-2.59)	(-2.41)	(-2.71)	(-2.59)	(-2.30)
Q × INVPRT							0.0055*	0.0047*	0.0154***
							(1.93)	(1.84)	(3.98)
CF × SIZE	-0.0082*			-0.0102*			-0.0112**		
	(-1.69)			(-1.92)			(-2.02)		
Q × SIZE							-0.0008***		
							(-2.78)		
CF × DIVPAYOUT		-0.1523***			-0.1513***			-0.1449***	
		(-7.75)			(-7.67)			(-6.64)	
Q × DIVPAYOUT								-0.0007**	
								(2.03)	

CF × KZ Index			-0.0288***			-0.00288***			-0.0277***
			(-18.26)			(-17.99)			(-16.68)
Q × KZ Index									-0.0017***
									(-13.22)
Country fixed-effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed-effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed-effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Adjusted R-square	0.094	0.097	0.114	0.095	0.098	0.115	0.096	0.098	0.123
Number of observations	104,283	104,283	104,283	144,283	104,283	104,283	104,283	104,283	104,283