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FIRM'S FINANCING CONSTRAINTS AND INVESTMENT-CASH FLOW SENSITIVITY: EVIDENCE FROM COUNTRY LEGAL INSTITUTIONS

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Abstract*. In this paper, we investigate whether high investment-cash flow sensitivity can be interpreted as evidence that firms are facing binding financing constraints. Using institutional features and an intuitive measure of stock price informativeness to distinguish between most constrained and least constrained firms, we document that firms that are supposed to be more financially constrained exhibit greater investment-cash flow sensitivity. Our findings support the results of Fazzari et al. (1988) who also find that investment spending of firms with high levels of financial constraints is more sensitive to the availability of cash flow.*

Keywords: *Investment decisions, stock price informativeness, investment-cash flow sensitivity, financing constraints*

JEL Classifications*: E22; G31; G3*

Introduction

Under the perfect and complete capital markets assumptions, Modigliani and Miller (1958) argue that firm's investment decisions are independent from the financing sources. However, many studies appeal to problems in capital markets, especially asymmetric information, to suggest that financial structure is relevant to investment decisions. For example, Myers and Majluf (1984), Greenwald et al. (1984), and Myers (1984) provide strong support of the fact that external funds are not a perfect substitute for internal capital. As a result, the cost of external finance may differ substantially from internal capital. According to this view, investment expenditures may depend on financial factors such as the availability of internal capital (Fazzari et al. 1988); and firms are considered as financially constrained when the wedge between internal and external cost of capital increases.

Considerable research relies on the association between investment and internal capital to test for the presence and importance of firm's financing constraints. However, from the existing literature, it's not clear whether greater investment-cash flow sensitivity can be interpreted as evidence that firms are facing more or less financing constraints. For instance, Fazzari et al. (1988) argue that such sensitivity increases with the degree of firm's financing constraints. On the other hand, Kaplan and Zingales (1997) disagree with Fazzari et al. (1988) interpretation. According to Kaplan and Zingales (1997), firms with stronger financial positions exhibit high investment-cash flow sensitivity in comparison to firms with weaker financial positions.

This work represents an attempt to solve the financing constraints hypothesis controversy. It's motivated by the fact that many authors (e.g. Moyen, 2004 and Cleary et al. 2007) consider that the source of such controversy lies in the disagreement in identifying appropriate factors to distinguish between financially constrained and unconstrained firms. We argue that the traditional classification scheme based on firm-level data (dividend payout, size, leverage, etc.) is not without drawbacks. First, firm-level financial variables can be regarded as endogenous and time-variant (firms identified now as facing binding financial constraints can change their financial status in the future). Second, tests based on firm-level data do not provide a direct evidence that it's asymmetric information that explains the cost differential between internal and external capital. Therefore, we propose new empirical approaches to examine the investment-cash flow sensitivity controversy. In our tests, we use more exogenous factors and account for varying degrees of information asymmetry.

We make several contributions to the literature. First, our classification scheme attempts to overcome the problem of endogeneity of the standard classification approach. In fact, we choose to sort firms into financially constrained and unconstrained according to country-level data related to legal environment. We claim that such factors are less endogenous (our classification is based on measures less correlated with firm's internal funds) and more stable over time. In addition, we use country-level variables because there is a growing literature supporting the fact that national capital markets impact firms' cost of capital, despite increasing markets integration. Stulz (2009) considers that firms can raise funds at lower cost in their country and not elsewhere if their capital market performs better than capital markets of other countries. According to Stulz (2009), a major reason why national capital markets remain an important factor for optimal resource allocation and investment decisions is that they have different securities laws. We argue that equity valuation and cost of external capital should differ across countries because securities laws impact production decisions, the cost of trading and information acquisition costs. Indeed, the findings of many papers in the literature suggest that strong securities regulation helps diminish firms' cost of capital and relax financing constraints (Hail and Leuz, 2006; and Qian and Strahan, 2007). Given the significant body of research recognizing the importance of legal institutions in shaping the financial sector, we base our first firms' classification methodology on legal origin (common law versus civil law countries). In 2006, Laporta et al. find significant differences in capital markets development based on legal origin. According to them, common law countries have more developed stock markets compared to civil law countries because common law systems focus on market discipline and private litigation. Furthermore, legal systems with common law origin offer better protection to investors (Laporta et al. 2006). In the same vein, Aggarwal et al. (2008) show that firms from common law countries are more likely to adopt governance practices that restrict the discretion of insiders. Therefore, in our tests, we consider common law firms as facing lower financing constrained and civil law firms as more constrained. Our second measure of legal environment is the anti-director rights index from Djankov et al. (2008) that proxies the level of minority investors' protection. We propose to partition our sample into two subsamples based on anti-director rights scores. Firms from countries with scores above the sample median are considered as financially unconstrained because stronger investors' protection laws are linked to better functioning capital markets. For instance, Morck et al. (2000) find that capital allocation efficiency is positively correlated to the level of investors' protection. Similarly, Laporta et al. (2002) show that strong investors' protection laws reduce the ability of firm's insiders to expropriate outsiders, and thus enhance investors' confidence in firms managers. In this paper, we stress the importance of such bonding mechanism in relaxing firms' financing constraints. Therefore, if countries can be ranked by the

strength of their legal system, firms originating from countries where minority investors are better protected should face lower binding financial constraints. It's worth mentioning that our classification methodology assumes that firms' cost of capital is set in centralized capital markets and is not dependant on firms' particular characteristics. To overcome this limitation, we propose, for robustness, to sort firms based on both firm-level and institutional characteristics. To our knowledge, our research is the first study that uses country legal institutions to distinguish between financially constrained and unconstrained firms.

Second, we focus on asymmetric information issues by using an intuitive and direct measure of stock price informativeness. We consider that greater stock price informativeness is related to more information about future earnings being reflected in current stock prices. To measure this relation, we regress currents returns against both current and future earnings, in accord with a growing literature (Collins et al. 1994; Gelb and Zarowin, 2002; Lundholm and Myers, 2002; and Durnev et al. 2003). Theoretically, more informative stock prices should reflect more information about future earnings (firm fundamentals). This reasoning leads us to choose future earnings response coefficients as our proxy of the severity of a firm's information problems. We argue that firms with stock prices reflecting more information about future earnings should face less asymmetric information problems. Hence, we consider these firms as unconstrained because many theoretical and empirical studies imply a cost premium for external capital based on asymmetric information (Myers and Majluf, 1984; Barry and Brown, 1985; and Merton, 1987). Should we find negative associations between our proxy of price informativeness and investment-cash flow sensitivity, we can infer that transparent firms (with more informative stock prices and less financial constraints) exhibit lower investment-cash flow sensitivity. Despite its common sense appeal, our approach has yet to appear in the literature.

Finally, we test and validate our hypotheses using a large sample of firms originating from 44 countries (developed and emerging countries) over the period 1995-2007. Sampling stops in 2007 instead of 2010 because some of our variables require three years of data beyond any sampling year. It is worth mentioning that most studies in the literature provide either US evidence or limited international evidence. For instance, Kadapakkam et al. (1998) study is based on firms originating from six developed countries and Cleary (2006) provides evidence for seven developed countries.

Our results suggest that investment decisions of companies originating from countries that provide strong legal protection to minority investors are less sensitive to the availability of cash flow. Further, transparent companies exhibit lower investment-cash flow sensitivity in comparison to opaque companies. Finally, additional analysis shows negative associations between our proxy of stock price informativeness and investment cash-flow sensitivity. Our large sample evidence supports the results of Fazzari et al. (1988) who also find that investment spending of firms that are less financially constrained is less sensitive to internal funds.

The remainder of the paper is organized as follows. Section 2 reviews the existing literature. In section 3, we develop our empirical model and outline the construction of some of our variables. In section 4, we present the main results including robustness' tests results. Section 5 concludes.

Previous Research Work

In the literature, the investment-cash flow sensitivity has been extensively used as a measure of firm's financial constraints. This sensitivity is measured by regressing investment on cash flow, controlling for investment opportunities. According to Fazzari et al. (1988), firm's internal cash flow may impact investment because of a financing hierarchy (Pecking Order Theory) in which internal capital have a cost advantage over external capital. Following this argument, a value maximizing firm will issue new debt or shares only after it exhausts internal capital (Fazzari et al. 1988). In fact, more financially constrained firms will increase investment when they have enough cash flow to do so. Therefore, we should expect high investment-cash flow sensitivity for constrained firms. In contrast, unconstrained firms have the possibility to increase their investment expenditures even when they do not have enough cash flow because the cost differential between internal and external capital is small. Hence, unconstrained firms should exhibit low investment-cash flow sensitivity. A related argument is that the premium on external capital is also linked to the collateral represented by the net worth of the firm. Gilchrist and Himmelberg (1995) argue that an increase in cash flow signals an increase in firm's net worth. Hence, as net worth rises, the cost of external capital should decrease, and investment spending should respond more to cash-flow innovation. On the other hand, in periods when cash-flows are low, the cost of capital is high, and firms invest less (Gilchrist and Himmelberg, 1995).

A large number of empirical studies have provided strong support for the financing hierarchy hypothesis. The standard approach of this research is to categorize firms according to a variety of firm-level financial variables (dividend payout, size, Leverage, etc.) before measuring the investment-cash flow sensitivity. The main results of these papers suggest that investment is more sensitive to cash flow for firms with high levels of financial constraints. For instance, Fazzari et al. (1988) consider firms with high dividend payout ratios as unconstrained and firms with low ratios as financially constrained. They show that investment is less sensitive to internal funds for firms with high dividend payout ratios. Other papers sort companies according to firm size and age. Smaller and young firms are considered to be more financially constrained because they face high information asymmetry problems. In 1992, Oliner and Rudebusch use proxies of information asymmetry based on firm age, exchange listing and firm's patterns of insider trading. Their results show greater investment-cash flow sensitivity for stocks traded over-the-counter, firms that tend to be young, and that exhibit patterns of insider trading behaviour. Scaller (1993) shows that investment decisions of young firms are more influenced by internal funds in comparison to mature firms. In addition, Scaller findings suggest that firms with unspecialized assets, which can serve as collateral, have lower investment-cash flow sensitivity. As for Gilchrist and Himmelberg (1995), they show that investment spending of firms with limited access to public debt markets appear to be highly sensitive to fluctuations in cash flow. On the other hand, other contributions challenge the conclusions summarized above. In 1997, Kaplan and Zingales have reached opposite conclusions suggesting that corporate investment is less sensitive to fluctuations in cash flow for financially constrained firms. In addition, Kadapakkam et al. (1998) provide international evidence supporting Kaplan and Zingales (1997) results. They find that investment-cash flow sensitivity is higher for large firms and lower for small firms. In 1999, Cleary shows that corporate investment is more sensitive to cash flow for firms with high credit worthiness. In addition, Cleary (2006) uses an international data set to further examine the investment-cash flow controversy. His results suggest that companies with stronger financial

positions are more investment-cash flow sensitive than companies with weaker financial positions.

As for us, we fashion our own way to provide a valuable setting that clarifies the role of cash flow in investment equations. In fact, we propose to sort firms according to various institutional factors rather than firm-level factors.

Empirical Methodology

The major focus of our methodology is to compare investment-cash flow sensitivity across two different groups of firms (constrained versus unconstrained firms). Our first contribution to the literature consists of differentiating companies according to a variety of country-level variables related to legal environment. The second contribution is to examine the relation between our cash flow coefficients and an intuitive measure of stock price informativeness.

We conjecture that a country's legal system can affect firm's financing constraints for many reasons. For instance, Stulz (2009) considers that securities laws remain an important determinant for equity valuation because strong national regulations help reduce agency costs. In addition, we argue that legal institutions are also tied to firms' disclosure quality. In countries where disclosure laws are more extensive and more strictly enforced, we should expect firms to provide high levels of disclosure. The latter should reduce information asymmetries between market participants and ultimately lower firms' cost of capital (Diamond and Verrecchia, 1991; Leuz and Verrecchia, 2000; and Verrecchia, 2001). A related argument is that increased levels of disclosure broaden firm's investors' base because investors are more confident that stock transactions occur at "fair" prices (Bailey et al. 2006). As a consequence, risk is more widely shared, which should reduce firm's cost of capital (Merton, 1987). The literature also suggests that the enhanced transparency linked to stricter disclosure rules and potential legal exposure may influence negatively cost of capital through cash flow effects. In fact, the threat of shareholder litigation makes it harder and more costly for firm's insiders to expropriate outside shareholders. Such bonding (Coffee, 1999 and Stulz, 1999) should increase investors' expectation about future cash-flows and improve firm's ability to raise capital. Finally, legal institutions may also impact corruption. We argue that lower corruption engenders lower risks for investors because it makes firms' creditors and shareholders better able to monitor potential violations in financial contracts.

The estimation of investment-cash flow sensitivity across our two different groups (constrained and unconstrained firms) is based on the following equation:

$$(I/K)_{i,t} = \beta_0 + \beta_1 (CF/K)_{i,t} + \beta_2 (M/B)_{i,t} + \beta_3 (Size)_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where $I_{i,t}$ represents investment in plant and equipment for firm *i* during period *t*; K denotes the beginning-of-period value of total assets; CF is the sum of income before extraordinary items and depreciation net of cash dividends (for robustness, we also measure CF as : net income + depreciation and/or amortization + changes in deferred taxes); M/B denotes the market to book ratio, and Size denotes the natural logarithm of firm size. The market to book ratio is a proxy for investment opportunities and growth, while size variable controls for potential market imperfections related to firm size. Our main interest in equation (1) centers on β_1. This coefficient represents the investment-cash flow sensitivity (cash flow coefficient). If our results suggest that corporate investment is less sensitive to internal funds for companies originating from countries

with strong securities laws; we will conclude that unconstrained firms' exhibit lower investment-cash flow sensitivity. Such results will be consistent with Fazzari et al. (1988) findings.

To further examine the impact of firm's financing constraints on the investment-cash flow sensitivity, we also propose to sort our sample according to an intuitive measure of stock price informativeness before comparing the investment-cash flow sensitivity across our two different groups. We consider firms with more informative stock prices as unconstrained because high stock price informativeness can lower the information risk borne by investors, and in turn, reduce firm's cost of capital. Further, informative stock prices should help providers of external capital to better assess firm's investment opportunities. Following this argument, firms with informative stock prices should exhibit low costs of capital because such costs are function of the estimation risk (Barry and Brown, 1985). The proxy of stock price informativeness we propose is based on Collins et al. (1994). It measures how much current stock prices contain information about future earnings (informative prices should reflect more information about future earnings). Therefore, in this research, we regress current returns against both current and future earnings to estimate price informativeness:

$$R_t = \beta_0 + \beta_1 uce_t + \sum_{j=1}^{\infty} \beta_{2j} \Delta E_t(fe_{t+j}) + \varepsilon_t \qquad (2)$$

Where

R_t current stock return (period *t*)

uce_t unexpected current earnings (period *t*)

$\Delta E_t(fe_{t+j})$ change in expectations about future earnings

ε_t error term

The explanatory variables in regression (2) being unobservable, similar proxies are used in the literature. For instance, Lundholm and Myers (2002), and Durnev et al. (2003) use earnings at periods (t) and (t-1) to proxy for the unexpected current earnings in period t. Lundholm and Myers (2002) consider that including past year earnings (e_{t-1}) in equation (2) allows the regression to dictate the best representation of the prior expectation for current earnings. According to Lundholm and Myers (2002): "if earnings are treated by the market as a random walk process, then the coefficient on e_{t-1} and e_t are of similar magnitude but opposite signs. In contrast, if the coefficient on e_{t-1} is approximately zero then earnings are treated as a white noise process".

Furthermore, to proxy for the changes in the expected future earnings, we follow the standard practice in the literature and use the realized future earnings (e_{t+j}) and future returns (R_{t+j}) as proxies. Note that Beaver et al. (1980) and Warfield and Wild (1992) proxy for $\Delta E_t(fe_{t+j})$ by using only realized future earnings. However, Collins et al. (1994) recommend including future stock returns as an additional control variable because the omission of this variable introduces an error in variables (realized future earnings have expected and unexpected components). In order to control for the unexpected component, an instrument (future returns) is needed that correlates with the measurement error but not with the dependent variable. The

underlying intuition being that an unexpected shock to future earnings (t+j) should have an impact on future returns (R_{t+j}).
Hence, the regression we estimate to proxy for stock price informativeness goes as follows:

$$R_t = b_0 + b_1 e_{t-1} + b_2 e_t + \sum_{j=1}^{3} (b_{3j} e_{t+j} + b_{4j} R_{t+j}) + \varepsilon_t \qquad (3)$$

We use only three years of future earnings (e_{t+1}, e_{t+2} and e_{t+3}) and corresponding returns (R_{t+1}, R_{t+2} and R_{t+3}) because prior research has shown that amounts further out in time add little explanatory power (Collins et al. 1994). The aggregated coefficients on the future earnings (Sum of b_{3j}) measure the association between current return and realized future earnings. The more current return, R_t, contains information about future earnings, the higher the coefficients are expected to be. It is worth mentioning that when we measure the Pearson correlations between current earnings, future earnings and future returns, multicollinearity is not an issue in equation (3). We also use the variance inflation factor and find no evidence of multicollinarity.

R_t are the buy-and-hold returns for the 12 months period starting at the fiscal-year-end1. Earnings e_t equates with income before interest, taxes, depreciation and amortization (EBITDA), recorded at the end of fiscal year (t) divided by the initial market value of equity recorded at (t-1). Durnev et al. (2003) argue that depreciation and amortization are quite sensitive to differences in discretionary accounting rules. Therefore, knowing that such differences in accounting practices are country-or industry-specific, the advantage of relying on EBITDA is increasing with trans-industry and transnational sampling. Furthermore, the country or the industry fixed effects in our regressions models are likely to pick up any potential differences in accounting rules (see, Hail and Leuz, 2006, 2009 for a discussion).

In our tests, we consider the sum of the coefficients on future earnings as the variable that measures stock price informativeness:

$$PI = \sum_{j=1}^{3} b_{3j} \qquad (4)$$

This variable cumulates the sensitivities of current prices to future earnings. Thus, transparent firms should have higher measures of PI because informative stock prices contain more information about future earnings. We obtain the estimates of PI for either a firm or a group of firms on an industry level. For the firm-by-firm approach, we pool many years of data for each firm (from 1995 to 2007) to estimate its PI based on equation (4). Then, we calculate the PI sample median. We consider firms with PI estimates above the sample median as unconstrained because such firms face low asymmetric information problems.

On the other hand, pooling years of data to calculate PI for each firm may be problematic for two main reasons. First, we use few observations for our estimation purpose (maximum 13 observations for each firm). The result could be unreliable measures for PI. Second, as stressed by Durnev et al. (2003), changes in macroeconomic environment, industry conditions, accounting rules and financial regulations can cause intertemporal changes in our future earnings

1 The fiscal-year-end adjusted share price, plus the adjusted dividends, all divided by the adjusted price at the end of the previous fiscal year (t-1). The adjustment factor reflects stocks splits that occurred during the fiscal year.

coefficients. To avoid these limitations, we follow Durnev et al. (2003) and use a cross-section of similar firms (industry level approach). This approach requires pooling firms in two-digit SIC industries before running regression (3). Hence, to investigate whether greater stock price informativeness is linked to higher or lower investment-cash flow sensitivity, based on our industry-level method, we run the following regression:

$$CFC_{i,t} = \alpha_0 + \alpha_1 PI_{i,t} + \alpha_2 (controls)_{i,t} + \varepsilon_{i,t} \qquad (5)$$

Note that in equation (5), i indexes two-digit SIC industries and t indexes years (in equation 1, i indexes firms and t indexes years). The two-digit SIC industry approach consists of pooling firms in a two-digit code industry before calculating the corresponding variables. Therefore, in equation (5), we regress our industry cash flow coefficients on industry price informativeness estimates and industry average estimates of our control variables (leverage and lagged values of cash). Adding leverage in equation (5) allows us to consider the riskiness of debt. We argue that it's important to control for potential differences in CFC between high and low leverage firms because higher degrees of leverage are associated with risky debt (binding financing constraints). Leverage is the ratio of long term debt to total assets. In addition, lagged values of cash may have explanatory power for firm's financing constraints because some firms tend to accumulate and use liquidity as a buffer against these constraints (Cleary and Booth, 2008). Cash is cash and marketable securities. Finally, to control further for differences among industries in equation (5), we use a one-digit industry-fixed effects model (we do not use two-digit industry dummies to conserve degrees of freedom). If α_1 is negative and significant, we can infer that firms with more informative stock prices (unconstrained firms) exhibit lower investment-cash flow coefficients.

Empirical Results

We compile our country-level data and firms characteristics from a variety of sources. A description of country-level data is given in Appendix A. Common law or civil law describes the legal origin system and anti-director rights scores are obtained from Djankov et al. (2008). In this paper, we use international data from 44 countries over the 1995-2007 period. Information on firm-level data is drawn from Datastream and Worldscope. To be consistent with prior research, commercial banks, insurance companies, diversified financial services and brokerage houses were deleted from the sample. In addition, to avoid drawing spurious inferences from extreme values, regression results are robust to outliers (observations are winsorised at 1%).

Primary results

Table 1 presents the primary empirical results of equation (1) for constrained and unconstrained firms. The equations were estimated with fixed country, industry and year effects (for robustness, we also estimate our regressions using fixed firm and year effects)2. Further, in all specifications, standard errors are adjusted for heteroskedasticity and clustering at the firm level.

Table 1: The impact of firm's financing constraints on investment-cash flow sensitivity: Primary results

Independent variables	Legal origin approach		Investors' protection approach		Price informativeness approach	
	Common law firms	Civil law firms	Firms with high scores	Firms with low scores	Firms with high PI	Firms with low PI
Intercept	-0.045	-1.183	-0.753	0.017	-1.633	0.392
	(0.001)***	(0.221)	(0.225)	(0.983)	**(0.001)*****	(0.552)
Cash flow	0.452	0.713	0.591	0.810	0.654	0.747
	(0.001)***	**(0.001)*****	**(0.001)*****	**(0.001)*****	**(0.001)*****	**(0.001)*****
Market-to-Book	-0.000	-0.000	-0.000	-0.000	-0.003	0.000
	(0.567)	(0.839)	(0.965)	(0.936)	(0.611)	(0.957)
Size	0.004	0.140	0.054	0.054	0.171	0.092
	(0.001)***	**(0.001)*****	**(0.004)*****	**(0.004)*****	**(0.001)*****	(0.690)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes

2 Introducing fixed firm effects estimation should mitigate concerns about correlated omitted variables and selection bias based on unobservable time-invariant firm characteristics. Further, fixed time effects are included to capture aggregate business-cycle influences. Firm fixed effects estimates are obtained by demeaning the observations with respect to the firm average for each variable. Year dummies are included in our analysis. Our conclusions are not affected when we estimate our regressions based on fixed firm and year effects instead of fixed country, industry and year effects.

Independent variables	Legal origin approach		Investors' protection approach		Price informativeness approach	
	Common law firms	Civil law firms	Firms with high scores	Firms with low scores	Firms with high PI	Firms with low PI
R^2	0.063	0.076	0.069	0.082	0.070	0.079
N	40 370	66 460	50 268	56 562	62 447	44 383

Where *i* indexes firms and *t* indexes years. In our first approach, we classify firms according to legal origin before estimating investment cash-flow sensitivity. In the second approach, we sort firms based on scores of the anti-director rights index. Finally, in the third approach, we classify firms according to an intuitive measure of stock price informativeness before estimating investment cash-flow sensitivity. Financial firms were deleted from our sample. Country, industry and year dummies are included but not reported. P-values for two-tailed tests are in parentheses. One, two or three asterisks denote significance at the 10, 5 and 1% levels, respectively.

Our findings suggest that the coefficients for cash flow are all positive and significant, which is consistent with the existence of a financial hierarchy. More important, the cash flow coefficient is greater for civil law firms (0.713) in comparison to common law firms (0.452). We also perform tests for the difference between our two regressions coefficients and find that this difference (0.713-0.452) is significant at 1% level. Table 1 also reports results for the groups formed according to investors' protection scores. As suggested earlier, we assume that firms with high scores (above the median) face lower binding financing constraints. We find that such companies' exhibit low investment-cash flow sensitivity (0.591) compared to companies with scores below the median (0.810). We also computed the statistical difference between the two coefficients and find that it's significant at 1% level. So far, our evidence suggests that financially constrained firms are more investment-cash flow sensitive than unconstrained firms. Our third measure of financial constraints is based on stock price informativeness. In Table 1, we consider firms with PI coefficients above the median sample as unconstrained (transparent firms), and firms with PI coefficients below the median as constrained (opaque firms). PI is estimated using a firm-by-firm approach. The latter is conducted by pooling many years of data for each firm to estimate its PI. Then, the median we use to distinguish between our two firms' classes is calculated as the median across all firms. Again, our findings (PI approach in Table 1) show large estimated cash flow coefficients for constrained firms (opaque firms with low PI). Further, the difference in estimated coefficients (0.747 – 0.654) across the two classes remains statistically significant at very high confidence levels.

We now turn to investigate the relation between our proxy of stock price informativeness and the cash flow coefficients according to equation (5). In this regression, PI is estimated using two digit code cross-industry approach.

Table 2: Stock price informativeness and cash flow coefficients

Independent variables		
	Coefficient	p-value
Intercept	0.505	0.001***
Price informativeness	-0.204	0.056*
Leverage	0.104	0.343
Lagged cash	0.070	0.056*
Industry dummies	Yes	
Year dummies	Yes	
R^2	0.063	
N	266	

Where *i* indexes two-digit SIC industries and *t* indexes years. The two-digit SIC industry approach consists of pooling all firms in a two-digit code industry and calculate the corresponding variables. Industry and year dummy variables are included but not reported. One, two or three asterisks denote significance at the 10, 5 and 1% levels, respectively.

Table 2 shows that the PI coefficient is negative (-0.204) and significant (at 10% level), suggesting that greater stock price informativeness is linked to lower cash flow coefficients. This additional result provides further support for the fact that unconstrained firms are less cash flow sensitive, which is consistent with Fazzari et al. (1988) findings.

Robustness checks

In this section, we conduct extensive robustness tests to validate our primary findings. First, we run pooled regressions (unconstrained and constrained firms together) and use a dummy variable to distinguish between the two groups. Second, we drop firms with US exchange cross-listings from our sample because relaxation of firm's financial constraints can be an important outcome

of the US cross-listing decision (Errunza and Miller, 2000; Lins et al. 2005; and Hail and Leuz, 2009). This additional test will allow us to isolate the effect of companies that cross-list on US exchanges in order to improve their corporate governance practices and overcome their weak domestic markets laws. Finally, we propose to classify firms according to both firm-level and institutional features, before estimating investment-cash flow sensitivity.

Joint analysis: Instead of classifying firms into two groups, we conduct a joint analysis by using the entire data set in one regression and adding a dummy variable to distinguish between unconstrained and constrained firms. The following model is used:

$$(I/K)_{i,t} = \beta_0 + \beta_1(CF/K)_{i,t} + \beta_2(M/B)_{i,t} + \beta_3(Size)_{i,t} + \theta_0 D_{i,t} + \theta_1 D_{i,t} \times (CF/K)_{i,t} + \varepsilon_{i,t} \quad (6)$$

Where $D_{i,t}$ is a dummy variable that takes the value 1 if the firm is unconstrained and 0 otherwise. In fact, we will estimate three different models based on equation (6). In the first model, $D_{i,t}$ is equal to 1 for common law firms and 0 otherwise. In the second model, $D_{i,t}$ takes the value of 1 for firms with high investors' protection scores and 0 otherwise. Finally, in the third model, $D_{i,t}$ takes the value of 1 for firms with greater stock price informativeness and 0 otherwise. The interaction term $D_{i,t} \times (CF/K)_{i,t}$ proxies for the interaction effect between being an unconstrained firm and the cash flow coefficient. Given that β_1 represents the cash flow coefficient for constrained firms, the cash flow coefficient for unconstrained firms becomes $\beta_1+\theta_1$. If θ_1 is negative and significant, investment decisions of unconstrained firms can be considered as less liquidity sensitive. On the other hand, if θ_1 is positive and significant, we can infer that unconstrained firms are more investment-cash flow sensitive. The findings (not tabulated) show that unconstrained firms exhibit lower investment cash flow sensitivity (θ_1 is negative and significant in all models).

In additional checks, we also calculate our estimates of CFC (cross-industry method) without using Market-to-Book and size as controls variables in equation (1). Instead, we propose to add these variables in equation (5). We confirm again our primary results suggesting the presence of a negative and significant (10% level) association between our proxy of price informativeness and cash flow coefficients.

Additional Robustness checks: In other tests, firms with US exchange cross-listings are dropped from our sample before estimating equation (1). In fact, if cross-listing in the US alleviates firm's financing constraints as stressed in many papers in the literature (Errunza and Miller, 2000; Lins et al. 2005; and Hail and Leuz, 2009), it's possible that any differences in the estimated cash flow coefficients may be driven by US cross-listed firms. On the other hand, it's worth mentioning that we find US cross-listed companies across all firms' classes (constrained and unconstrained companies). This additional test yields similar results (not tabulated) to those found in our primary analysis. Finally, we propose to sort firms based on both firm-level and institutional characteristics before estimating the cash flow sensitivity. In this case, firms are categorized, first, according to the level of investors' protection and, second, based on their dividend payout ratios (dividends/EBIT). For instance, we will choose among a group of firms with high investors' protection scores only those with high dividend payout ratios. This subsample will be considered as facing lower financing constraints. On the other hand, firms with lower investors' protection scores and low dividend payout ratios are considered as financially constrained. Model (1) and (2) in Table 3 report results of estimations based on our combined classification scheme. Consistent with Fazzari et al. (1988), we find that investment-cash flow coefficient is greatest for constrained firms (1.181) while unconstrained firms' exhibit a lower cash flow coefficient (0.344).

Table 3: The impact of firm's financing constraints on investment-cash flow sensitivity: Combination of country-level and firm-level data for firms' classification

Independent variables	Institutional and firm-level classification	
	Model (1) Unconstrained firms	Model (2) Constrained firms
Intercept	-1.729	0.046
	(0.025)**	(0.980)
Cash flow	0.344	1.181
	(0.001)***	**(0.001)*****
Market-to-Book	-0.081	-0.000
	(0.153)	(0.916)
Size	1.146	0.005
	(0.001)***	(0.724)
Country dummies	Yes	Yes
Industry dummies	Yes	Yes
Year dummies	Yes	Yes
R^2	0.165	0.096
N	2835	4376

Where *i* indexes firms and *t* indexes years. In table 3, we classify firms according to both firm-level and institutional characteristics. Firms with high investors' protection scores and dividend payout ratios are considered as financially unconstrained. On the other hand, firms with lower investors' protection scores and low dividend payout ratios are

considered as financially constrained. Financial firms were deleted from our sample. Country, industry and year dummies are included but not reported. P-values for two-tailed tests are in parentheses. One, two or three asterisks denote significance at the 10, 5 and 1% levels, respectively.

Conclusion

In this paper, the investment-cash flow sensitivity controversy is examined using a sample of 44 countries. Investment decisions of constrained firms are shown to be highly sensitive to the availability of internal funds. This large sample evidence is based on a different sorting approach that classifies firms according to a variety of country-level variables instead of firm-level variables. We argue that relying on institutional features for firms' classification will mitigate some concerns about the potential endogeneity of firm-level classification methodology. In addition, we also propose an intuitive measure of stock price informativeness and examine its relation with the investment-cash flow coefficients. Our findings support the results of Fazzari et al. (1988) who argue that higher investment-cash flow sensitivity can be interpreted as evidence that firms are more financially constrained.

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Appendix A

Country-level variables description

This table summarizes variables for legal origin and shareholder protection. The common law variable represents a dummy set equal to 1 for countries falling into the common law legal system and 0 for civil law countries. The Anti-director rights variable is taken for Djankov et al. (2008). It represents an index that measures the level of protection for minority investors.

	Common law dummy	***Anti-director rights***
Panel A : Developed markets		
Australia	1	0.79
Austria	0	0.21
Belgium	0	0.54
Canada	1	0.65
Denmark	0	0.47
Finland	0	0.46
France	0	0.38
Germany	0	0.28
Hong Kong	1	0.96
Ireland	1	0.79
Italy	0	0.39
Japan	0	0.48
Netherlands	0	0.21
New Zealand	1	0.95
Norway	0	0.44
Portugal	0	0.3
Singapore	1	1
Spain	0	0.37
Sweden	0	0.34
Switzerland	0	0.27
UK	1	0.93

Panel B : Emerging markets		
Argentina	0	0.44
Brazil	0	0.29
Chile	0	0.63
China	0	0.78
Colombia	0	0.58
Czech Republic	0	0.34
Greece	0	0.23
Hungary	0	0.2
India	1	0.55
Indonesia	0	0.68
Israel	1	0.71
Korea (South)	0	0.46
Malaysia	1	0.95
Mexico	0	0.18
Pakistan	1	0.41
Peru	0	0.41
Philippines	0	0.24
Poland	0	0.3
Russia	0	0.48
South Africa	1	0.81
Taiwan	0	0.56
Thailand	1	0.85
Turkey	0	0.43