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The equity-financing channel, the catering channel, and corporate investment: International evidence*

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Abstract

We examine how equity mispricing affects corporate investment in an international setting. We find that investment is more sensitive to stock prices for equity-dependent firms than for non-equity-dependent firms in our international sample. Investment is also more sensitive to stock prices for firms located in countries with more developed capital markets (i.e., lower costs of raising capital), higher share turnover (i.e., shorter shareholder horizons), and higher R&D intensity (i.e., more opaque assets). More importantly, the positive relation between equity dependence and the sensitivity of investment to stock prices is more pronounced for firms located in these same countries. These findings are consistent with the equity-financing hypothesis and the catering hypothesis on corporate investment proposed by Baker et al. (2003) and Polk and Sapienza (2009), respectively.

JEL classifications: G32; G34

Keywords: Equity-financing channel; Catering channel; Corporate investment

1. Introduction

The existing literature has documented ample evidence of a positive relation between corporate investment and stock prices. The traditional explanation for this observed positive association is the "*q*-theory of investment" (Tobin, 1969). In an efficient market, stock prices (measured by Tobin's *Q*) reflect the market's information about a firm's investment opportunities or its marginal rate of return on capital. However, studies in behavioral finance have offered alternative explanations. For example, Keynes (1936) points out that stock market mispricing has an effect on the cost of equity, while Bernanke and Gertler (1995) and others argue that mispricing can also affect the cost of debt through its effect on perceived collateral values. Since the non-fundamental component of stock prices (mispricing) causes the effective cost of external equity to deviate from the cost of other forms of capital, this divergence affects a firm's equity financing and, consequently, corporate investment.

Based on Stein (1996), Baker et al. (2003) derive and test a simple model that suggests that corporate investment is more sensitive to stock prices for equity-dependent firms than for non-equity-dependent firms. The intuition is that managers of equity-dependent firms have incentives to issue equity in more attractive terms to finance investment when their stock prices are overvalued; but they would rather forgo their investment opportunities when their stock prices are undervalued. Using a modified *KZ* index first constructed by Kaplan and Zingales (1997) as a measure of equity dependence, Baker et al. (2003) find support for the equity-financing channel argument for U.S. firms.

Also based on Stein (1996), Polk and Sapienza (2009) develop and test a catering theory of investment, through which stock market mispricing affects corporate investment decisions. Using discretionary accruals as a proxy for mispricing, their empirical results from U.S. firms are consistent with the predictions of the catering theory--overvalued firms invest more while undervalued firms invest less. In addition, this catering effect is more pronounced for firms with shorter shareholder horizons (proxied by higher share turnover) and longer expected durations of mispricing (proxied by higher R&D intensity).

Despite these findings, very little is known about the relation between the roles of the equity-financing channel and the catering channel in corporate investment outside the United States. One important motivation of using international data is to allow us to test whether the effect of mispricing on corporate investment can be extended into an international sample. The difference in the cost of raising external equity capital across countries (which is larger than the difference across U.S. firms) implies that there could be cross-sectional variations in the results for firms located in different countries. Moreover, it is also worthwhile to examine whether there is any incremental interactive effect between the equity-financing channel and the catering channel, which will provide more insights into the relation between mispricing and corporate investment.

The equity-financing hypothesis predicts that the degree of equity dependence is positively related to the effect of stock prices on corporate investment. In this study, we focus on the effect of the equity-financing channel on corporate investment at the firm level. The extended catering hypothesis suggests that corporate investment is more sensitive to stock prices for firms located in countries with a lower cost of raising external equity capital. The original catering theory of Polk and Sapienza (2009) also predicts that corporate investment is more sensitive to stock prices for firms whose shareholders have shorter horizons and whose assets are more difficult to value. In this study, we focus on the effects of the catering channel on corporate investment at the country level. The third hypothesis examines the joint interactive effect between the equity-financing channel and the catering channel.

To test our hypotheses, we use the financial flexibility index as an inverse measure of firm-level equity dependence. Our first main result confirms the role of the equity-financing channel in corporate investment decisions in the broader cross-country sample. More specifically, the sensitivity of investment to stock prices monotonically increases with the degree of equity dependence. We recognize that there may be alternative explanations for our result and potential measurement problems concerning several of our explanatory variables in the regressions. We attempt to address these concerns by performing a series of robustness tests. Our result survives these robustness tests.

To test the catering theory, we use the extent of capital market development to measure the cost of raising external capital. Capital market development is measured at the country level by: the ease of access to equity markets and whether the market is developed or emerging. In addition, we use country-level share turnover and R&D intensity to measure average shareholder horizon and the opaqueness of average firm assets, respectively. Consistent with the predictions of the extended catering theory, we find that corporate investment is more sensitive to stock prices for firms located in countries with more developed capital markets, higher share turnover, and higher R&D intensity. More importantly, the role of the equity-financing channel in the sensitivity of investment to stock prices is more pronounced for firms located in these same countries. These results suggest that there is an incremental interactive effect between the equity-financing and catering channels in influencing international firms' corporate investment decisions.

The studies that are closest to ours are the ones by Baker et al. (2003) and Polk and Sapienza (2009). Baker et al. (2003) and Polk and Sapienza (2009) emphasize solely the roles of equity dependence and the catering channel, respectively, at the firm level. By contrast, our international sample allows us to focus on both the roles of firm-level equity dependence and country-level institutions or characteristics associated with the catering channel as well as their joint effects. To the best of our knowledge, no previous empirical study has attempted to examine these issues jointly.

The findings from our study also complement the literature on the effect of stock prices on corporate investment. Earlier studies by Morck et al. (1990) and Blanchard et al. (1993) find little evidence that the stock market affects corporate investment. However, the evidence from recent studies by Baker et al. (2003), Chen et al. (2007), Polk and Sapienza (2009), Ovtchinnikov and McConnell (2009), Campello and Graham (2013), and Hau and Lai (2013) suggests otherwise.[1] The evidence from our international sample further confirms that financial markets are not just a sideshow; they also affect corporate investment decisions.[2]

The remainder of this paper is organized as follows. Section 2 reviews the related literatures and develops our hypotheses. Section 3 describes the sources of our data. Section 4 presents the test results about the role of the equity-financing channel in corporate investment. Section 5 presents the test results about the role of the catering channel. Section 6 reports the results about joint effects of the two channels. Section 7 discusses the q-theory with investment frictions as an alternative explanation for some of our results. Section 8 concludes the paper.

2. Related literatures and hypothesis development

2.1 The role of the equity-financing channel in corporate investment

[1] A recent paper by Bai et al. (2016) documents that financial markets have become more informative over the longer horizon. More relevantly, prices have also been found to be important in influencing firms' investment behavior. In addition, Kadyrzhanova and Rhodes-Kropf (2014) contend that stock price overvaluation may affect the relation between corporate governance and firm performance. Dong et al. (2016) further demonstrate that R&D spending is positively associated with stock price overvaluation.

[2] There are also related papers such as Hsu et al. (2015) and Sun (2016) which have examined the role of accounting standards and internal control weakness on firms' investment.

Baker et al. (2003) extend the model of Stein (1996) and derive the implications of stock market mispricing for the role of the equity-financing channel in corporate investment. They define a firm as equity dependent if its stock price is undervalued and its available capital is so low that it has to issue undervalued equity to achieve the first-best level of investment. They argue that stock market irrationality is unlikely to affect the investment decisions of non-equity-dependent firms (those with sufficient liquidity and no debt), since they do not rely on external financing. By contrast, equity-dependent firms will not want to issue equity in the external market when their stocks are undervalued, even if they need to raise funds for investment. The opposite is true in the case of overvaluation--equity-dependent firms are willing to issue equity to finance their investment when their stocks are overvalued. Therefore, equity-dependent firms have their investments that are more sensitive to the variation in the non-fundamental component of stock prices than non-equity-dependent firms.

Our first hypothesis on the role of the equity-financing channel in corporate investment follows that of Baker et al. (2003). Specifically, we hypothesize that:

H1: *Under the equity-financing channel, investment is more sensitive to stock prices for equity-dependent firms than for non-equity dependent firms in our international sample*.

2.2 The role of the catering channel in corporate investment

Polk and Sapienza (2009) extend the model of Stein (1996) and derive the testable implications of stock market mispricing for the role of the catering channel in corporate investment. We further extend their model to an international setting by allowing for the cross-country difference in the cost of raising capital. Following Polk and Sapienza (2009) closely with the same notations, we assume that K is the capital at time 0 used by a firm to produce output and K_0 is the initial capital right before time 0. The new investment, $(K-K_0)$, has a unit cost of c, if there is no market frictions. With market frictions, the cost of capital is $c(1+f)$, where $f>0$, and can be interpreted as a measure of how difficult and costly it is for a firm to raise external capital. Therefore, f should be lower for firms located in more developed capital markets or in countries with easier access to equity markets or stronger legal protection.

Due to investor irrationality or sentiment (Baker and Wurgler, 2006), a firm's stock price may be overvalued or undervalued from time to time. Hence, we assume that the true value of the firm is $V(K)$, while its market value is $V^{mkt}(K)=(1+\alpha_t)V(K)$, where α_t measures the degree of mispricing. The level of initial mispricing is α, which decays over time at a rate of p. That is, $\alpha_t=\alpha e^{-pt}$. A higher p value indicates a shorter duration, and therefore, faster disappearance of mispricing. A representative shareholder will have a liquidity need at some point in time. The arrival of this liquidity shock follows a Poison process with a mean arrival rate of $q\in(0,\infty)$. A larger q indicates that the shareholder horizon is shorter. The representative shareholder's level of income (Y_t) is the weighted average of the firm value before and after the true value of the firm is revealed. That is,

$$Y_0=\int_{t=0}^{\infty}(1+\alpha e^{-pt})qe^{-qt}V(K)dt-(K-K_0)c(1+f).$$

The first-order condition is

$$V'(K)=\frac{c}{\gamma}, \tag{1}$$

where $\gamma\equiv\left(\frac{1}{1+f}\right)\left(1+\frac{\alpha q}{q+p}\right)$.[3]

[3] Following Polk and Sapienza (2009), we assume that $(q+p+\alpha q)>0$.

Assume that the optimal investment level is K^*, which is the case where there is no mispricing (i.e., $\alpha = 0$) and no market frictions (i.e., f = 0). In this case, $V'(K^*) = c$. The implication of equation (1) is that if managers cater to this short-term representative investor, they will overinvest when their stocks are overvalued (i.e., $\alpha > 0$) and underinvest when they are undervalued (i.e., $\alpha < 0$). Polk and Sapienza (2009) also argue that the catering effect is stronger for firms with more short-term investors (i.e., larger q) and for firms whose assets are more difficult to evaluate (i.e., smaller p or longer durations of mispricing). In addition, our extended model suggests that the catering effect should also be more pronounced for firms located in countries with a lower cost of raising equity capital (i.e., smaller f). If we further assume that $V(K) = K^{\beta}$, where $\beta < 1$ (i.e., decreasing returns to scale), the above arguments can be presented mathematically as follows:

$$\frac{dK}{d\alpha} = \frac{\beta q K^{\beta}}{c(1-\beta)(p+q)(1+f)} > 0, \tag{2}$$

$$\frac{d^2K}{d\alpha df} = \frac{\beta q K^{\beta}}{c(1-\beta)(\beta-1)(p+q)(1+f)^2} < 0, \tag{3}$$

$$\frac{d^2K}{d\alpha dq} = \frac{\beta p K^{\beta}}{c(1-\beta)(1+f)(p+q)^2}\left(1+\frac{\beta}{(1-\beta)}\times\frac{\alpha q}{(p+q+\alpha q)}\right) > 0, \text{ if } \alpha > 0, \text{ or in the case of } \alpha < 0, |\alpha| < (1-\beta)(1+\frac{p}{q}), \tag{4}$$

$$\frac{d^2K}{d\alpha dp} = -\frac{\beta q K^{\beta}}{c(1-\beta)(1+f)(p+q)^2}\left(1+\frac{\beta}{(1-\beta)}\times\frac{\alpha q}{(p+q+\alpha q)}\right) < 0, \text{ if } \alpha > 0, \text{ or in the case of } \alpha < 0, |\alpha| < (1-\beta)(1+\frac{p}{q}). \tag{5}$$

There is no ambiguity in the signs in equations (2) and (3). Although the signs in equations (4) and (5) are somewhat ambiguous, the results that $d^2K/d\alpha dq > 0$ and $d^2K/d\alpha dp < 0$ hold true if $\alpha > 0$. But even if $\alpha < 0$, the two results hold as long as $|\alpha| < (1-\beta)(1+\frac{p}{q})$.

The catering theory suggests that investment is positively associated with the extent of stock market mispricing (equation (2)). We follow Baker et al. (2003) and use Tobin's *Q* as our empirical proxy for α, the non-fundamental component of the stock price. Equation (3) suggests that the positive sensitivity of investment to stock prices is more pronounced for firms located in countries with smaller market frictions (i.e. more developed capital markets) than for firms located in countries with larger market frictions (i.e. less developed capital markets). One reason is that in more developed capital markets where costs of capital are lower, managers have more opportunities to exploit the mispricing in stock prices (McLean et al., 2010). Hence, the tendency for firms to overinvest when their stocks are overvalued will be more evident for firms in more developed capital markets, leading to a higher investment-stock price sensitivity for these firms, compared to firms located in less developed capital markets.[4]

In addition, if we average over the overvaluation and undervaluation regions, equations (4) to (5) suggest that, in most cases, firms located in countries with shorter shareholder horizons (i.e., larger *q*) or longer durations of mispricing (i.e., smaller *p*) make investments that are more sensitive to stock prices than firms located in countries with longer shareholder horizons or faster disappearance of mispricing. As mentioned at the outset, we focus on the country-level proxies for *f*, *q*, and *p* to test the cross-country implications of the catering channel. In particular, we measure

[4] Brown et al. (2013) find that firms located in countries with better access to equity financing have higher rates of R&D investment. Meanwhile, a recent paper by Chen et al. (2017) also find that the positive effect of the initial enforcement of insider trading laws on the sensitivity of investment growth to return is only significant for firms in the developed markets.

market frictions by the extent of capital market development. Following Polk and Sapienza (2009), we measure shareholder horizons inversely by share turnover and durations of mispricing by R&D intensity. The above discussion leads to our second hypothesis:

H2: *Under the catering channel, investment is more sensitive to stock prices for firms located in countries with more developed capital markets, higher share turnover, or higher R&D intensity than for firms located in countries with less developed capital markets, lower share turnover, or lower R&D intensity*.

2.3 The joint effects of the equity-financing channel and the catering channel on corporate investment

We next examine how the effect of the equity-financing channel on corporate investment decisions of international firms is influenced by country-level institutions associated with the catering channel. In particular, we focus on the incremental interactive effect and argue that managers of equity-dependent firms will invest more in response to an increase in their stock price when the associated costs of raising external equity are lower, which is the case in countries with more developed capital markets. In addition, the same effect will also be observed for firms in countries with longer shareholder horizons (measured by higher share turnover) or faster disappearance of mispricing (measured by higher R&D intensity) implied from the catering channel.

From the above discussion, we can state our third hypothesis as follows:

H3: *The effect of the equity-financing channel on the sensitivity of corporate investment to stock prices is more pronounced for firms located in countries with more developed capital markets, higher share turnover, or higher R&D intensity than for firms located in countries with less developed capital markets, lower share turnover, or lower R&D intensity.*

3. Data and variables

We collect two sets of data. The first set consists of firm-level financial data available from Worldscope and Datastream, both of which are provided by Thomson Financial. After eliminating countries with less than 100 firm-year observations, we manage to retrieve firm-level data for 44 countries. For each firm, we collect financial variables that include capital expenditures (including property, plant, and equipment; research and development; and acquisitions), cash flow, cash balances, cash dividends, total debt, total assets, and the book value of equity from Worldscope; and the market value of equity and stock returns from Datastream.

We exclude firms with missing firm-year observations, firms operating in the financial industry (i.e., firms with SIC codes between 6000 and 6999), and firms with a book value of total assets of less than US$10 million.[5] Overall, our filtering process yields an unbalanced panel of 239,307 firm-year observations from 44 countries. The sample period is from 1982 to 2008. Table 1 presents the sample distribution in terms of the country-level institutional variables. The second column of Table 1 reports the total number of firm-year observations for each country in the final sample. Japan, the United Kingdom, and the United States dominate the sample, each with more than 20,000 firm-year observations.

[Insert Table 1 here]

3.1 Country-level variables

Our second dataset includes data on three country-level institutional variables and two country characteristics. To test equation (3), we need to proxy for the cross-country difference in the cost of raising external equity capital. Recent studies have found that the cost of equity capital tends to be lower in countries with more developed financial markets and better corporate governance (Hail

[5] We use the exchange rates from Datastream to convert the book value of total assets from local currencies to US dollars.

and Leuz, 2006; Chen et al., 2009).[6] Therefore, our first variable is the access-to-equity market index (*ACCESS*) obtained from La Porta et al. (2006). This variable measures the extent of access to the equity market. A higher score on this index indicates that a firm can more easily access the equity market, and so the cost associated with raising external equity is lower. Our second country-level variable represents whether a country belongs to the developed market or not. We follow International Monetary Fund (IMF) to classify the countries in our sample into 23 developed markets and 21 emerging markets. We construct a dummy variable, *DEV*, which is equal to 1 for firms in the developed markets and 0 for firms in the emerging markets.

We employ the country-level share turnover (*TURNOVER*) index to proxy for average shareholder horizons. This index is obtained from the Standard and Poor's Emerging Markets Database and is calculated as the annual average of the total value of stocks traded as a fraction the total value of shares outstanding (%) for the period from 1996 to 2005. A higher *TURNOVER* index indicates a shorter shareholder horizon. Finally, we create a country-level R&D intensity (*RD*) index to proxy for the average opacity of a firm's assets. This index is calculated by taking the average of the firm-level research and development expenditures (R&D) divided by total sales for all firms with a positive value of R&D expenditures.[7] A higher *RD* index indicates that the average assets of a firm are more opaque and more difficult to value.

The third to the sixth columns of Table 1 present the scores of *ACCESS*, *TURNOVER*, and *RD* in each country. *ACCESS* ranges from 2.78 (Columbia) to 6.74 (United States); *TURNOVER* ranges from 6.02% (Columbia) to 280.5% (Pakistan); and *RD* ranges from 0 (e.g. Argentina, Chile

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[6] In addition, several recent studies have documented that country-level institutions are important determinants of corporate investment decisions (Wurgler, 2000; McLean et al., 2012). In the context of our study, these institutional variables will influence managers' abilities to exploit the mispricing to raise external equity to finance investment needs (McLean et al., 2010).

[7] We follow the previous studies to assign a value of 0 if the value of R&D expenditures is missing.

and Columbia) to 8.6% (Israel). Panels A and B of Table 1 also report the means and standard deviations of the four country-level variables for the developed and emerging markets, respectively. We observe that developed countries have easier access to capital markets, stronger legal protection, and higher R&D intensity. The overall means (standard deviations) of *ACCESS*, *TURNOVER*, and *RD* are 5.18 (0.91), 74.73% (64.12%), and 1.1% (1.6%), respectively.

3.2 Firm-level measures of financial variables

We use three measures of corporate investment. The first measure is capital investment (*CAPX*) calculated as capital expenditures in year *t* divided by total assets at the end of year *t*-1. The second measure, *CAPXRD*, is defined as the sum of capital expenditures and research and development expenditures in year *t* divided by total assets at the end of year *t*-1. The third measure, *CAPXRDA*, is defined as the sum of capital expenditures, research and development expenditures, and acquisitions in year *t* divided by total assets at the end of year *t*-1.

Cash flow (*CF*) is calculated as income before extraordinary items plus depreciation and amortization in year *t* divided by total assets at the end of year *t*-1. Similar to Baker et al. (2003), we use the natural logarithm of Tobin's *Q* (*Q*) as our main measure of the non-fundamental component of the stock price. Tobin's *Q* is calculated as the market value of equity (i.e., the stock price multiplied by the number of shares outstanding) plus total assets minus the book value of equity divided by total assets at the end of year *t*-1. In our robustness tests, we also use returns (*RET*) as an alternative measure. *RET* is calculated as the change in stock price from the end of year *t*-2 to the end of year *t*-1.[8] We winsorize all financial variables at the 1^{st} and 99^{th} percentile levels to minimize the outlier problem.

[8] In our untabulated tests, we repeat all the empirical analyses using *RET* as an alternative measure of stock prices and obtain results that are similar to those when Tobin's *Q* is used.

3.3 Firm-level measures of equity dependence

Our main measure of equity dependence is the financial flexibility (*FF*) index. Following Doidge et al. (2009), we first compute the 75th percentile of cash balance (*CASH*) and dividend payout ratios (*DIV*), as well as the 25th percentile of CAPX for each country. A firm is considered financially flexible if it has high values of *CASH* and *DIV* and a low value of *CAPX*. More specifically, it will be assigned a value of 1 if its *CASH* value or *DIV* value is greater than the 75th percentile or its *CAPX* value is below the 25th percentile. In this respect, the *FF* score ranges from 0 to 3. Firms with lower *FF* scores are considered less financially flexible and therefore more equity dependent. In our robustness tests, we also use the adjusted *KZ* index originally constructed by Kaplan and Zingales (1997) based on a sample of 49 low-dividend manufacturing firms in the United States as an alternative measure of equity dependence.

Panel A of Table 2 presents the summary statistics of the financial variables. The mean (median) value of *CAPX* across the 44 sample countries is 7.4% (4.6%). This is slightly lower than the mean (median) of 8.2% (6.0%) reported by Baker et al. (2003) for the sample of U.S. firms. In addition, the mean (median) values of *CAPXRD* and *CAPXRDA* are 9.5% (6.1%) and 11.5% (6.9%), respectively. The mean (median) value of *CF* is 11.5% (12%), while the mean (median) value of the logarithm of *Q* is 0.3 (0.2). The mean (median) value of the *FF* index is 1.2 (1.0).

[Insert Table 2 here]

Additionally, we present the correlations among the firm-level variables and among the country-level institutional variables in Panels B and C of Table 2, respectively.[9] All three measures of corporate investment (*CAPX*, *CAPXRD*, and *CAPXRDA*) are positively correlated with *Q* and

[9] The country median values of financial variables are used to compute the correlation coefficients.

CF. These preliminary findings are consistent with the evidence reported in the literature in the United States (e.g., Baker et al., 2003). The correlations among the country-level variables are all in the expected signs (i.e., positive) for most of the variables, with the magnitudes ranging from -0.02 to 0.61.

4. The role of the equity-financing channel in corporate investment

In this section, we first investigate if the empirical evidence found in U.S. firms for the role of the equity-financing channel in corporate investment (Baker et al., 2003) can be extended to our international sample. Following Fazzari et al. (1988) and Baker et al. (2003), we first estimate the following baseline investment equation:

$$CAPX_{it} = a_o + bQ_{it-1} + cCF_{it} + u_{it}\,, \tag{6}$$

where $CAPX_{it}$ is the corporate investment of firm i in year t, $Q_{it\text{-}1}$ is firm i's natural logarithm of Tobin's Q in year t-1, and CF_{it} is its cash flow in year t. All these variables are scaled by total assets. The regression coefficient b measures the sensitivity of corporate investment to the stock price (as proxied by Q) and the regression coefficient c measures the sensitivity of investment to cash flow. We use the panel regression model with country fixed effects to estimate equation (6) for the pooled sample.[10] u_{it} is the error term which is assumed to be independent of the explanatory variables. To mitigate the problems of within-firm serial correlation and heteroskedasticity, we conduct our tests by estimating White's (1980) heteroskedasticity-corrected standard errors, clustered by country.

4.1 Baseline results

[10] We also estimate all our regressions using firm fixed effects and country random effects models and obtain similar results. The results are available upon request.

Our first task is to test the role of the equity-financing channel in corporate investment in the international setting. As elaborated earlier, we use the financial flexibility index (*FF*) as our inverse measure of equity dependence to test H1. It is noted that the degree of equity dependence decreases with the *FF* score. We first assign firms to quartile portfolios according to their *FF* scores, where the top quartile (*FF* = 0) represents the portfolio of firms with the *FF* score of 0 and are the most equity dependent; and the bottom quartile (*FF* = 3) represents the portfolio of firms with the *FF* score of 3 and are the least equity dependent. Following Baker et al. (2003), the assignment of firms is based on the firm's median *FF* scores over the whole sample period.

We then estimate the baseline investment equation (6) separately for each *FF* quartile portfolio using the country fixed effects model with year and industry dummies. We follow Fama and French (1997) in defining the industry classification of our firms. H1 predicts that the sensitivity of corporate investment to stock prices should decrease (increase) with the degree of financial flexibility (equity dependence). That is, *b* should decrease with *FF* quartiles.

Panel A of Table 3 presents the estimation results of equation (6) for portfolios formed using *FF* and with *CAPX* as the dependent variable. We observe that the coefficient on *Q* (i.e., *b*) decreases from 5.194 in the bottom *FF* quartile to 0.075 in the top *FF* quartile. We also compute the *p*-value of the *F*-statistic which essentially tests the hypothesis that the difference in the *b* coefficient between the top and bottom quartile portfolios is zero. We find that the *p*-value is smaller than 0.01. Our evidence indicates that corporate investment is significantly more sensitive to stock prices for less financially flexible (or equity-dependent) firms than for more financially flexible (or non-equity-dependent) firms in our international sample.

[Insert Table 3 here]

Similarly, Panels B and C of Table 3 present the regression results when the dependent variable is replaced by *CAPXRD* and *CAPXRDA*, respectively. All the results are consistent with the findings reported in Panel A of Table 3. That is, the sensitivity of investment to stock prices in general declines with the degree of financial flexibility. More specifically, when *CAPXRD* is the measure of corporate investment, the regression coefficient on Q is 7.076 for the top quartile and 2.018 for the bottom quartile of equity dependence. The difference in the b coefficient between the top and bottom quartile portfolios of equity dependence is significantly positive at the 1% level. When *CAPXRDA* is the measure of corporate investment, the results are even stronger. The regression coefficient on Q is 9.642 for the top quartile but only 2.992 for the bottom quartile of equity dependence. The difference in the b coefficient between the two extreme quartiles is also statistically significant at the 1% level.

As an alternative specification to test H1, we estimate the following regression for the pooled sample:

$$CAPX_{it} = a_o + bQ_{it-1} + b_1(Q_{it-1} \times FF_{it}) + cCF_{it} + dFF_{it} + + u_{it}, \qquad (7)$$

where *FF* is the financial flexibility index. The other variables are defined previously. We include the interaction term between Q and *FF* as an additional explanatory variable. The coefficient of interest in this case is b_1 and we expect the interaction coefficient to be negative (i.e., $b_1 < 0$). That is, corporate investment is less sensitive to the stock price for financially flexible firms than for financially inflexible firms. Panel D of Table 3 reports the estimation results of equation (7). We find that the coefficient of the interaction term, b_1, is negative and highly significant for all three measures of corporate investment at the 1% level. More specifically, b_1 is -2.148, -1.922, and -2.792, when the dependent variable is *CAPX*, *CAPXRD*, and *CAPXRDA*, respectively.

In summary, the empirical results in Table 3 are consistent with H1 and extend the findings of Baker et al. (2003) to our international sample. We conclude that the equity-financing channel at the firm level explains for the positive relation between corporate investment and stock prices among firms in our international sample.[11]

4.2 Inclusion of alternative measures of growth opportunities

Our regression specifications might suffer from potential problems related to Tobin's *Q* which we use in this study as a proxy for the non-fundamental component of stock prices. In particular, one alternative explanation for our finding is that corporate investment is simply responding to investment opportunities. Past studies have also used Tobin's *Q* as a measure of growth opportunities. To test the robustness of our results, we include two alternative measures of growth opportunities (*TAG* or *SG*) separately in the estimation of equation (6) as an additional control variable. *TAG* is total assets growth and is calculated as the change in total assets from the end of year *t*-1 to the end of year *t*, divided by total assets at the end of year *t*-1. *SG* is sales growth and is calculated as the change in total sales from year *t*-1 to year *t*, divided by total sales in year *t*-1.

The results are presented in Panels A and B of Table 4. Our finding of a monotonic decline in the magnitude of the regression coefficient on *Q* from the least financially flexible firms (*FF* = 0) to the most financially flexible firms (*FF* = 3) persists, regardless of which additional measure of growth opportunities is included in the regression. More specifically, the regression coefficient on *Q* decreases monotonically from 3.653 (3.980) in the least financially flexible firms to 0.075 (0.071) in most financially flexible firms, when *TAG* (SG) is included in the regression to proxy for investment opportunities. The difference in the coefficient between the two extreme groups is

[11] To save space, the dependent variable that we use in the subsequent analysis is *CAPX*. We continue to obtain robust results for the other two alternative measures of *CAPX*. These results are available upon request.

significant at the 1% level in both cases. We further include *TAG* (or *SG*) and the interaction term between *TAG* (or *SG*) and *FF* in the estimation of equation (7) for the pooled sample. The result from Panel C of Table 4 shows that the coefficient on $Q \times FF$ continues to be negative with a value of -1.528 (-1.567), when *TAG* (*SG*) and its interaction with *FF* are also included in the regression. Both coefficients are highly significant at the 1% level. Therefore, our results are not sensitive to the inclusion of other measures of growth opportunities.

[Insert Table 4 here]

4.3 Results from country-by-country analysis

We next examine whether the role of the equity-financing channel in corporate investment as documented in Table 3 is stronger in some countries than in others. Moreover, we acknowledge that the measurements of *CAPX*, *Q*, and *CF* are affected by differences in accounting methods and reporting incentives across countries. In order to mitigate this concern, we estimate equation (7) for each of the countries in our international sample. Table 5 presents the results for the country-by-country analysis. For the sake of brevity, we only present the regression coefficient and standard error of $Q \times FF$. The regressions yield negative interaction coefficients in 36 out of the 44 countries in our international sample. In addition, among those negative coefficients, 14 are significant at the 10% level or better. Therefore, the results in Table 5 illustrate that the equity-financing channel affects corporate investment in most countries in our sample, albeit to different degrees in different countries.

[Insert Table 5 here]

4.4 Robustness checks

In this section, we perform a series of robustness checks to examine if our results are sensitive to alternative specifications and sub-samples. First, we re-estimate equation (7) using the Fama and MacBeth (1973) methodology. The result is reported in Column (1) of Table 6. The coefficient on $Q \times FF$ remains negative and highly significant with a value of -2.016. The estimated coefficient is very close to that estimated using the industry- and year-fixed effect ordinary least squares (OLS) method reported in Panel D of Table 3. However, the standard error is reduced substantially from 0.495 to 0.127. There is a great variation in the number of firm-year observations among the 44 countries in our sample. To mitigate the concern that our results might be driven by a large number of observations from the larger countries, we re-estimate equation (7) using the weighted least squares (WLS) methodology, where the weight is the inverse of the number of firms in each country in each year. The result is presented in Column (2) of Table 6. The coefficient on $Q \times FF$ is slightly reduced to -1.796, which is still highly significant; the standard error of 0.482 remains very close to the 0.495 reported in Panel D of Table 3.

[Insert Table 6 here]

We then exclude Japan, the United Kingdom, and the United States from our sample to check if our results would still hold because these three countries dominate our sample observations. The result is presented in Column (3) of Table 6. We also test our results for the sample of manufacturing firms only (SIC codes 2000 to 3999). The finding is reported in Column (4) of Table 6. The results in both Columns (3) and (4) are similar to the results from the overall sample—the coefficient on $Q \times FF$ is negative and highly significant in both cases.[12]

We next replace the dependent variable by total assets growth (*TAG*) or the change in investment (i.e., $\Delta CAPX$, calculated as the change in capital investment from time *t*-1 to *t*, divided by total assets at the end of year *t*-1). The results are reported in Columns (5) and (6) of Table 6.

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[12] In addition, our results (unreported) remain robust even after excluding the periods of financial crises (1987, 1998 to 2000, and 2008) and in the different sub-periods (pre-1990, 1990 to 2000, and post-2000).

We also replace Tobin's *Q* by annual stock returns in the previous year (i.e., *RET*, calculated as the change in stock prices from the end of year *t*-2 to the end of year *t*-1). The result is presented in Column (7) of Table 6. We then replace the *FF* index with the *KZ* index (i.e., the adjusted Kaplan-Zingales (1997) index) as our measure of equity dependence.[13] The result is shown in Column (8) of Table 6. Since the *KZ* index is a direct measure of equity dependence, we expect the interaction coefficient on $Q \times KZ$ to be positive. We also include the interaction term between *CF* and *FF* $(CF \times FF)$ in the regression. The result is reported in Column (9) of Table 6. Finally, we include contemporaneous *Q* (denoted as Q_t) and lagged investment (denoted as *LCAPX*) in our regression specification. The reason for including *LCAPX* is because a firm's actual investment occurs with a lag (Lamont, 2000). The result is presented in Column (10) of Table 6. The results in Columns (5)-(10), except Column (8), show that the regression coefficients on the interaction term $(Q \times FF)$ are all negative and highly significant, while the interaction coefficient on $(Q \times KZ)$ reported in Column (8) is positive and highly significant.[14]

In summary, our sensitivity tests show that our main finding of a positive effect of equity dependence or a negative effect of financial flexibility on the sensitivity of investment to stock prices in our international sample survives all robustness checks. This suggests that the role of the equity-financing channel in corporate investment decisions is robust.

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[13] Baker et al. (2003) use the *KZ*-index as their main measure of equity dependence and find similar results for U.S. firms. The *KZ* score is estimated for each firm-year observation using an equation that comprises five components. The estimated coefficients of cash flow (*CF*), dividend payout ratios (*DIV*), and cash balance (*CASH*) are negatively associated with the *KZ* index, while leverage (*LEV*) and Tobin's *Q* are positively associated with the *KZ* index. Therefore, firms with a higher *KZ* score are considered more equity dependent or more reliant on external equity financing for their investment projects.

[14] We also use firm size, which is computed as the natural logarithm of total assets, as another alternative measure of equity dependence. The smaller the firm is, the more equity dependent it should be. Our results remain unchanged.

5. The role of the catering channel in corporate investment

In this section, we formally examine whether the catering channel also plays an important role in corporate investment. In particular, H2 posits that the sensitivity of investment to stock prices should be higher for firms located in countries where the costs associated with raising external equity capital for investment needs are lower, or for firms whose shareholders have shorter investment horizons, or for firms whose assets are more difficult to value. To test this hypothesis, we first partition our whole sample into two sub-samples according to the median value of *ACCESS*, *TURNOVER*, or *RD*, or whether the dummy variable *DEV* is 0 or 1. We then estimate equation (6) for each of the two sub-samples. The prediction from the first part of H2 is that the sensitivity of corporate investment to stock prices is higher in countries where the cost of raising external equity is lower and is lower in countries where the financing cost is higher.

Panel A of Table 7 present the estimation results of equation (6) for the two sub-samples based on the above two country-level institutional variables (*ACCESS* and *DEV*). Consistent with the prediction of H2, we find that sensitivities of investment to stock prices (as measured by the coefficient of b in equation (6)) are higher for the sub-sample of firms located in countries with a high score on *ACCESS*, and for firms in developed markets than for firms in the other sub-samples. For example, when *ACCESS* is used as a measure of external-financing costs, the estimated coefficient of b increases from 1.456 in the low sub-sample to 4.291 in the high sub-sample. Both coefficients are statistically significant at the 1% level. We also conduct the F-test which essentially tests the hypothesis that the difference in the coefficient of b between the high and low sub-samples is zero. As expected, the F-statistic is highly significant at the 1% level or better. Investment is also significantly more sensitive to stock prices for firms in developed markets (with b = 4.056) than for firms in emerging markets (b = 1.602).

[Insert Table 7 here]

The second part of H2 predicts that corporate investment is also more sensitive to stock prices for firms located in countries where shareholders have shorter horizons and for firms whose average assets are more opaque. We find the results to be consistent with the predictions of the catering theory (Panel A of Table 7) when we use *TURNOVER* as an inverse measure of average shareholder horizons and *RD* as a direct measure of asset opacity. For example, when *TURNOVER* is the partitioning variable, the sensitivity of investment to stock prices is 3.948 for the high *TURNOVER* sub-sample firms and 1.942 for the low *TURNOVER* sub-sample firms. When *RD* is the partitioning variable, the sensitivity of investment to stock prices is 3.933 for the high *RD* sub-sample firms and 1.843 for the low *RD* sub-sample firms. The difference in the regression coefficient of *Q* between the high and low sub-samples is significant at the 10% level or better in both cases.

As an alternative specification to test H2, we estimate the following regression for the pooled sample using the random effects model:

$$CAPX_{it} = a_o + bQ_{it-1} + b_1 COUNTRY_i + b_2 (Q_{it-1} \times COUNTRY_i) + cCF_{it} + u_t, \tag{8}$$

where *COUNTRY* is a dummy variable that equals 1 for countries with a high score on *ACCESS*, *TURNOVER*, or *RD*, and for developed countries; and 0 otherwise. The coefficient of interest in this case is the coefficient on the interaction term between *Q* and *COUNTRY*, b_2. H2 predicts that the coefficient of b_2 should be positive. We estimate equation (8) by including the interaction of each of the four country-level variables with Tobin's *Q* as an additional regressor. Panel B of Table 7 presents the estimation results for the pooled sample. Consistent with the findings in Panel A of

Table 7, we find that the coefficients of the interaction term (i.e., b_2) are all positive and significant at the 1% level. The results again appear to support H2.[15]

Our findings in this section highlight the important roles that the various country-level variables which proxy for the costs of raising external capital, average shareholder horizons, and opacity of assets, play an important role in the relation between corporate investment and stock prices. In general, our results suggest that the non-fundamental component of stock prices is a better predictor of investment for firms in countries where the costs of raising external equity are lower, or where average shareholder horizons are shorter, or for firms whose assets are more difficult to evaluate. The results support the catering theory of investment proposed by Polk and Sapienza (2009).

6. The joint roles of the equity-financing and catering channels in corporate investment

In this section, we explore the joint effects of the equity-financing and catering channels on corporate investment behavior in our international sample. Specifically, we test whether the ability of managers to exploit the mispricing in stock prices is attenuated or intensified in countries with a lower external equity-financing cost.

We continue to use the partitioned samples based on each of the country-level variables used in the previous section and re-estimate equation (7) for each of them. The investment regressions are estimated using the country fixed effects model, with year and industry dummies and White's heteroskedasticity-corrected clustered standard errors. The results are reported in Panel A of Table 8. When *ACCESS* is used as the country-level partitioning variable, we find that the coefficient on the interaction term between *Q* and *FF* is more negative in the high *ACCESS* sub-sample (-2.070)

[15] In our unreported results, we find that the coefficient of the interaction term between our country-level variables and *CF* is negative and significant at the 1% level for all four country-level variables.

than in the low *ACCESS* sub-sample (-1.329). This is consistent with our hypothesis that the role of the equity-financing channel is more pronounced in countries with easier access to equity markets. Moreover, the *F*-statistic that tests the difference in the coefficient on $Q \times FF$ between the two sub-samples is highly significant with a *p*-value of less than 0.01.

[Insert Table 8 here]

We also find that the effect of the equity-financing channel is significantly stronger (with a *p*-value of less than 0.05) for firms in developed markets (coefficient of $Q\times FF$ = -2.242) than for firms in emerging markets (coefficient of $Q\times FF$ = -1.533). The same pattern is also found for firms split by *TURNOVER* or *RD*. The coefficient of $Q\times FF$ is -2.179 (-2.215) for firms from the high *TURNOVER* (*RD*) sub-sample and -1.672 (-1.532) for firms from the low *TURNOVER* (*RD*) sub-sample. The differences in the estimated coefficients of $Q\times FF$ between the two sub-samples are significant at the 10% level or better with the correct signs in both cases.

As an alternative specification to test H3, we estimate the following regression for the pooled sample using the random effects model:

$$\begin{aligned} CAPX_{it} &= a_o + bQ_{it-1} + b_1(Q_{it-1} \times FF_{it}) + b_2(Q_{it-1} \times COUNTRY_i) \\ &+ b_3(Q_{it-1} \times FF_{it} \times COUNTRY_i) + cCF_{it} + dFF_{it} + eCOUNTRY_i + u_{it}, \end{aligned} \quad (9)$$

where all variables are defined previously. We include three interaction terms, $Q\times FF$, $Q\times COUNTRY$, and $Q\times FF\times COUNTRY$, as additional explanatory variables. The coefficient of interest in this case is b_3 and we expect this coefficient to be negative. That is, corporate investment is more sensitive to stock prices for non-financially flexible (i.e., equity-dependent) firms than for financially flexible (i.e., non-equity-dependent) firms and the effect of this equity-financing channel should be stronger in countries where the external financing costs are lower, or where shareholders have shorter horizons, or for firms whose assets are more difficult to value.

Panel B of Table 8 presents the estimation results of equation (9). In all specifications, we find that the coefficient of the interaction term $Q \times FF \times COUNTRY$ is negative with a value ranging from -1.035 to -1.693 and is highly significant at the 1% level. These findings are consistent with the argument that managers of equity-dependent firms will invest more in response to an increase in their stock price when the associated costs of raising external equity are lower, which is the case in countries with more developed institutions. Therefore, more developed institutions allow managers who are adept at timing the market to exploit the mispricing in stock prices (McLean, Pontiff, and Watanabe (2010)). In addition, consistent with the evidence in Panel B of Table 7, we find that the coefficient of $Q \times COUNTRY$ continues to be positive for all specifications at the 1% level. Furthermore, consistent with the evidence in Panel D of Table 3 and Panel C of Table 4, the coefficient of $Q \times FF$ continues to be negative and significant at the 1% level for all four specifications.

Finally, we also include two interaction terms, $Q \times COUNTRY$ and $Q \times FF \times COUNTRY$, and repeat the robustness tests in Section 4.4. Our findings (unreported) are unchanged. That is, the interaction coefficient on $Q \times COUNTRY$ retains its expected positive sign, while the coefficients on $Q \times FF$ and on $Q \times FF \times COUNTRY$ remain negative and significant at least at the conventional levels. On the whole, our results suggest that the equity-financing channel and the catering channel work together in driving managers' investment decisions for our international sample

7. An alternative interpretation of some of our results: the q-theory

Equation (3) states that the positive relation between corporate investment and stock mispricing is stronger for firms in countries with low market frictions than for firms in countries with high market frictions. This relation is also consistent with the *q*-theory with investment frictions or adjustment costs proposed by Cochrane (1991, 1996) and Li and Zhang (2010), among others. The *q*-theory with investment frictions proposed by Li and Zhang (2010) suggests that corporate investment is more responsive to the change in the cost of capital for firms in countries with low investment frictions than for firms in countries with high investment frictions. The measures of investment frictions would be empirically indistinguishable from the measures of market frictions. Therefore, if the change in the cost of capital reflects the change in mispricing, our results in Tables 7 and 8 are also supportive of the *q*-theory with investment frictions when *ACCESS*, *DEV*, and *ANTISELF* are used as the inverse measures of market frictions.[16]

Although the predictions from the *q*-theory and the catering theory are the same, the underlying intuitions and assumptions are different. The *q*-theory assumes that the stock market is always rational, but the cost of capital may change from time to time and across firms due to the change in investor risk aversion. Managers of firms will invest more when the expected cost of capital is lower and invest less when the expected cost of capital is higher. On the other hand, the catering theory assumes that due to investor irrationality, stock markets may be overvalued or undervalued from time to time and across firms. If mangers are assumed to cater to short-term shareholders, they will invest more when their shares are overvalued and invest less when their shares are undervalued.

8. Conclusions

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[16] Li and Zhang (2010) have shown that $\frac{d}{d\lambda}\left|\frac{dK}{dR}\right| < 0,$ where $\lambda > 0$ is a cost parameter (i.e., a measure of investment frictions) and R is the gross discount rate. Since the market value of a firm (V^{mkt}) and its expected cost of capital (R) are negatively correlated (i.e., $\frac{dV^{mkt}}{dR} < 0$), it is easy to show that $\frac{d^2K}{d\lambda dV^{mkt}} < 0.$ Since λ is analogous to our measure of market frictions (f) and V^{mk} is positively associated with our measure of mispricing (α), our equation (3) is equivalent to Li and Zhang's equation (6).

We have investigated how equity mispricing affects corporate investment decisions through the equity-financing channel proposed by Baker et al. (2003) and the catering channel suggested by Polk and Sapienza (2009) using an international sample covering 44 countries. Our first main result is that the previous finding that the equity-financing channel affects the sensitivity of corporate investment to stock prices extends to our international sample. We have then shown that corporate investment is more sensitive to stock prices for firms in countries with more developed capital markets, higher share turnover, and higher R&D intensity. Since the degree of capital market development proxies for the cost of raising external capital, the result is consistent with the prediction of the extended catering theory of investment. In addition, by examining the interaction between firm-level equity dependence and country-level institutions, we have found that the sensitivity of investment to stock prices is most pronounced for equity-dependent firms in countries with more developed capital markets, higher share turnover, and higher R&D intensity. The analysis based on capital market development suggests that managers of equity-dependent firms are better able to engage in market timing in countries where the costs of raising external equity are relatively lower.

As an aside, we have provided corroborating evidence that helps to explain the cross-country difference in the determinants of corporate investment decisions. In addition, by using the sensitivity of investment to stock prices as a measure of the efficiency of capital allocation as Baker et al. (2003) have done, we have shown that the presence of strong institutions enables equity-dependent firms to allocate capital to investment projects more efficiently, through the equity-financing channel and the catering channel.

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Appendix A. Variable definitions

Variable name	Definition	Source
Country-level variables		
ACCESS	Access to external equity index.	La Porta et al. (2006)
DEV	A dummy variable which equals 1 for developed countries and 0 for emerging countries.	IMF
TURNOVER	Share turnover index, calculated as the average percentage of total value of stocks traded to average real market capitalization for the period 1996-2005.	Standard and Poor's Emerging Market Database
RD	R&D intensity, calculated as the average of firm-level research and development expenditures divided by total sales.	Worldscope
Firm-Level Variables		
CAPX	Capital investment, calculated as capital expenditures in year *t* divided by total assets at the end of year *t*-1.	Worldscope
CAPXRD	Alternative measure of capital investment, calculated as capital expenditures plus research and development expenditures in year *t* divided by total assets at the end of year *t*-1.	Worldscope
CAPXRDA	Alternative measure of capital investment, calculated as capital expenditures plus research and development expenditures plus acquisitions in year *t* divided by total assets at the end of year *t*-1.	Worldscope
FF	Financial flexibility index	Doidge et al. (2009)
Q	The natural logarithm of Tobin's *Q*, calculated as market value of equity plus total assets minus total equity in year *t*-1divided by total assets at the end of year *t*-1.	Worldscope
CF	Cash flow, calculated as income before extraordinary items plus depreciation and amortization in year *t* divided by total assets at the end of year *t*-1.	Worldscope

Table 1
Country-level variables.
This table presents the country-level variables for our sample. *ACCESS* is a country-level measure of ease of access to external equity markets. *TURNOVER* is the share-turnover index. *RD* is the R&D intensity index. The detailed definitions of these variables are provided in the Appendix. The sample consists of 44 countries and covers the period from 1982 to 2008.

Panel A: Developed markets				
Country	Firm-year observations	*ACCESS*	*TURNOVER*	*RD*
Australia	6,846	6.00	63.70	0.018
Austria	1,122	4.89	35.13	0.011
Belgium	1,492	5.70	22.42	0.013
Canada	10,648	6.39	61.95	0.029
Denmark	2,072	5.87	66.43	0.021
Finland	1,699	6.37	79.13	0.022
France	8,726	5.75	73.86	0.013
Germany	8,289	5.93	105.56	0.018
Greece	1,253	5.28	57.58	0.003
Hong Kong	5,932	5.50	57.02	0.004
Ireland	932	5.29	47.24	0.010
Italy	2,976	4.41	94.14	0.009
Japan	34,950	4.92	67.66	0.014
Netherlands	2,708	6.43	102.65	0.012
New Zealand	901	5.82	38.30	0.004
Norway	1,851	5.57	87.61	0.015
Portugal	696	4.50	58.36	0.000
Singapore	4,076	5.50	51.90	0.003
Spain	1,969	5.09	170.35	0.003
Sweden	3,128	6.15	94.59	0.032
Switzerland	2,787	6.07	89.96	0.027
United Kingdom	20,758	6.26	84.79	0.020
United States	68,482	6.74	140.19	0.047
Mean		5.67	76.11	0.015
Std dev		0.62	33.43	0.011

Table 1 - Continued

Panel B: Emerging markets				
Country	Firm-year observations	*ACCESS*	*TURNOVER*	*RD*
Argentina	539	3.23	20.14	0.000
Brazil	2,104	4.05	46.84	0.001
Chile	1,418	4.80	9.65	0.000
Colombia	209	2.78	6.02	0.000
Egypt	139	5.20	21.66	0.000
India	5,228	5.30	136.28	0.004
Indonesia	1,862	4.53	49.99	0.000
Israel	895	5.35	47.32	0.086
Korea (South)	6,992	5.02	240.85	0.009
Malaysia	6,632	5.11	39.79	0.001
Mexico	1,080	3.90	30.66	0.000
Pakistan	935	.	280.50	0.000
Peru	511	3.84	14.44	0.002
Philippines	1,008	4.62	22.08	0.001
South Africa	3,271	5.94	36.54	0.002
Sri Lanka	159	.	16.61	0.000
Taiwan	7,825	5.54	255.00	0.024
Thailand	3,165	4.24	81.74	0.000
Turkey	1,368	5.03	156.94	0.003
Venezuela	148	3.51	11.18	0.000
Zimbabwe	126	4.93	13.35	0.003
Mean		4.57	73.22	0.006
Std dev		0.84	87.20	0.019
Overall mean		5.18	74.73	0.011
Overall Std dev		0.91	64.12	0.016

Table 2
Summary statistics.
Panel A of this table presents the summary statistics of the financial variables. *CAPX* is a measure of capital investment. *CAPXRD* is a measure of *CAPX* plus R&D expenditures. *CAPXRDA* is a measure of *CAPXRD* plus acquisitions. *Q* is the natural logarithm of Tobin's *Q*. *CF* is cash flow. *FF* is the financial flexibility index. Panel B presents the correlations among the firm-level financial variables. Panel C presents the Pearson correlations among the country-level variables. *ACCESS* is a country-level measure of ease of access to external equity. *DEV* is a dummy variable that equals one for developed countries and zero for emerging countries. *TURNOVER* is the share turnover index. *RND* is the R&D intensity index. The detailed definitions of these variables are provided in the Appendix. The sample period is from 1982 to 2008.

Panel A: Summary statistics

Variable	N	Mean	Median	Std dev	Min	Max	1st Quartile	3rd Quartile
CAPX (%)	239,907	7.389	4.581	10.022	0.000	88.686	2.057	8.799
CAPXRD (%)	239,907	9.480	6.061	12.421	0.000	130.359	2.745	11.558
CAPXRDA (%)	239,907	11.524	6.860	16.723	0.000	165.624	3.049	13.453
)	239,907	0.300	0.191	0.524	-0.736	3.483	-0.032	0.532
CF (%)	239,907	11.459	12.007	20.114	-443.100	75.238	5.851	18.785
FF	239,907	1.155	1.000	0.715	0.000	3.000	1.000	2.000

Panel B: Correlations among firm-level variables

Variable	*CAPX*	*CAPXRD*	*CAPXRDA*	Ln(*Q*)	*CF*
CAPXRD	0.859				
CAPXRDA	0.687	0.800			
Q	0.203	0.333	0.333		
CF	0.124	-0.030	-0.003	0.072	
FF	-0.211	-0.156	-0.135	0.052	0.034tab1

Panel C: Correlations among country-level institutional variables

	ACCESS	*DEV*	*TURNOVER*
DEV	0.608		
TURNOVER	0.353	0.023	
RD	0.501	0.274	0.158

Table 3
Financial flexibility and corporate investment.
Panels A to C of this table present the coefficients of investment regressions based on equation (6) in the main text for each portfolio formed according to the measures of financial flexibility. The dependent variables are *CAPX*, *CAPXRD*, and *CAPXRDA*, respectively. *CAPX* is a measure of capital investment. *CAPXRD* is a measure of *CAPX* plus R&D expenditures. *CAPXRDA* is a measure of *CAPXRD* plus acquisitions. *Q* is Tobin's *Q*. *CF* is cash flow. *FF* is the financial flexibility index that ranges from 0 (most equity dependent firms) to 3 (least equity dependent firms). The detailed definitions of these variables are provided in the Appendix. Panel D presents the results for the pooled sample obtained by including the interaction term, $Q \times FF$. Standard errors are reported in parentheses, clustered by country and robust to heteroskedasticity. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1) *FF* = 0 (Most equity dependent)	(2) *FF* = 1	(3) *FF* = 2	(4) *FF* = 3 (Least equity dependent)
Panel A: *CAPX* is the dependent variable				
Q	5.194^{***}	5.085^{***}	2.359^{***}	0.075^{***}
	(0.897)	(0.630)	(0.260)	(0.027)
CF	0.073^{***}	0.016	0.089^{**}	0.003^{***}
	(0.012)	(0.018)	(0.031)	(0.001)
Industry and year fixed effects	Yes	Yes	Yes	Yes
N	37,222	136,549	57,807	8,329
Adj. *R*-Squared	0.251	0.144	0.184	0.368
Panel B: *CAPXRD* is the dependent variable				
Q	7.076^{***}	8.505^{***}	5.733^{***}	2.018^{***}
	(0.892)	(0.959)	(0.965)	(0.726)
CF	0.038^{***}	-0.054^{*}	-0.034	-0.076^{**}
	(0.018)	(0.027)	(0.059)	(0.033)
Industry and year fixed effects	Yes	Yes	Yes	Yes
N	37,222	136,549	57,807	8,329
Adj. *R*-Squared	0.228	0.190	0.179	0.262
Panel C: *CAPXRDA* is the dependent variable				
Q	9.642^{***}	10.770^{***}	7.029^{***}	2.992^{***}
	(0.949)	(1.052)	(1.108)	(0.947)
CF	0.089^{***}	-0.050^{*}	-0.006	-0.057
	(0.018)	(0.027)	(0.013)	(0.039)
Industry and year fixed effects	Yes	Yes	Yes	Yes
N	37,222	136,549	57,807	8,329
Adj. *R*-Squared	0.205	0.179	0.147	0.124

Table 3 - Continued

Panel D: Pooled sample regressions			
	(1) *CAPX*	(2) *CAPXRD*	(3) *CAPXRDA*
Q	6.868***	9.703***	12.762***
	(1.060)	(0.881)	(0.991)
CF	0.043**	-0.038	-0.020
	(0.017)	(0.034)	(0.034)
FF	-2.371***	-2.127***	-2.243***
	(0.182)	(0.175)	(0.251)
$Q \times FF$	-2.148***	-1.922***	-2.792***
	(0.495)	(0.578)	(0.465)
Industry and year fixed effects	Yes	Yes	Yes
N	239,907	239,907	239,907
Adj. *R*-Squared	0.191	0.199	0.181

Table 4
Financial flexibility and corporate investment controlling for growth opportunities.
Panels A and B of this table present the investment regression coefficients based on equation (7) for each portfolio formed according to the measures of financial flexibility (*FF*). The dependent variable is *CAPX*. *CAPX* is a measure of capital investment. *Q* is Tobin's *Q*. *CF* is cash flow. *FF* is the financial flexibility index that ranges from 0 (most equity dependent firms) to 3 (least equity dependent firms). The detailed definitions of these variables are provided in the Appendix. *TAG* is total assets growth and *SG* is sales growth. Panel C presents the results for the pooled sample. Standard errors are reported in parentheses, clustered by country and robust to heteroskedasticity. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1) *FF* = 0 (Most equity dependent)	(2) *FF* = 1	(3) *FF* = 2	(4) *FF* = 3 (Least equity dependent)
Panel A: *TAG* as the measure of growth opportunities				
Q	3.653***	2.579***	1.211***	0.075***
	(0.717)	(0.359)	(0.144)	(0.028)
TAG	0.067***	0.060***	0.044***	-0.000
	(0.009)	(0.006)	(0.005)	(0.000)
CF	0.047***	0.042***	0.080***	0.003***
	(0.012)	(0.013)	(0.020)	(0.001)
Industry and year fixed effects	Yes	Yes	Yes	Yes
N	37,222	136,549	57,807	8,329
Adj. *R*-Squared	0.323	0.273	0.304	0.368
Panel B: *SG* as the measure of growth opportunities				
Q	3.980***	3.402***	1.797***	0.071***
	(0.564)	(0.378)	(0.298)	(0.026)
SG	0.044***	0.047***	0.040***	0.001*
	(0.006)	(0.005)	(0.010)	(0.000)
CF	0.082***	0.050***	0.087***	0.003***
	(0.010)	(0.016)	(0.027)	(0.001)
Industry and year fixed effects	Yes	Yes	Yes	Yes
N	36,705	135,120	57,029	8,297
Adj. *R*-Squared	0.278	0.175	0.232	0.372

Table 4 – Continued

Panel C: Pooled sample		
	(1)	(2)
Q	4.157***	4.853***
	(0.717)	(0.544)
TAG	0.074***	
	(0.010)	
SG		0.053***
		(0.006)
CF	0.053***	0.066***
	(0.012)	(0.017)
FF	-2.319***	-2.227***
	(0.131)	(0.135)
Q × *FF*	-1.528***	-1.567***
	(0.371)	(0.299)
TAG × *FF*	-0.015***	
	(0.005)	
SG × *FF*		-0.744
		(0.470)
Industry and year fixed effects	Yes	Yes
N	239,907	237,151
Adj. *R*-Squared	0.305	0.229

Table 5

Country-by-country regressions.

This table presents the coefficients of the interaction term between Tobin's *Q* and the measure of financial flexibility (*FF*) obtained from the following investment regression for each country in our sample:

$$CAPX_{it} = a_o + bQ_{it-1} + b_1(Q_{it-1} \times FF_{it}) + cCF_{it} + dFF_{it} + +u_{it},$$

where *CAPX* is capital investment. *Q* is Tobin's *Q*. *CF* is cash flow. *FF* is the financial flexibility index. The detailed definitions of these variables are provided in the Appendix. Standard errors are reported in parentheses, clustered by country and robust to heteroskedasticity. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5 – Continued

Country	Coefficients on $Q \times FF$	Standard errors
Argentina	-0.704	(0.993)
Australia	-3.696***	(0.693)
Austria	-2.357	(2.319)
Belgium	-2.306**	(1.015)
Brazil	0.263	(1.084)
Canada	-3.386***	(0.515)
Chile	-1.907	(1.361)
Colombia	-1.976	(2.211)
Denmark	-0.761	(0.613)
Egypt	-0.042	(4.010)
Finland	-0.627	(0.855)
France	-0.863**	(0.424)
Germany	-1.199***	(0.418)
Greece	-0.978	(0.970)
Hong Kong	-0.625	(0.421)
India	-0.020	(0.604)
Indonesia	0.178	(0.892)
Ireland	-0.360	(0.949)
Israel	-0.597	(0.504)
Italy	-1.442*	(0.776)
Japan	-0.649***	(0.173)
Korea	-0.854	(0.546)
Malaysia	-1.096***	(0.406)
Mexico	0.659	(0.813)
Netherlands	-0.997*	(0.540)
New Zealand	-0.656	(0.907)
Norway	-0.955	(1.240)
Pakistan	-0.912	(2.873)
Peru	0.663	(0.999)
Philippines	-0.197	(0.933)
Portugal	0.033	(1.623)
Singapore	-0.202	(0.703)
South Africa	-1.614*	(0.903)
Spain	-0.308	(0.838)
Sri Lanka	-1.740	(3.063)
Sweden	-1.169**	(0.461)
Switzerland	-0.470	(0.513)
Taiwan	-1.457***	(0.404)
Thailand	-0.738	(0.708)
Turkey	2.224	(1.566)
United Kingdom	-1.485***	(0.300)
United States	-1.331***	(0.132)
Venezuela	0.060	(1.912)
Zimbabwe	5.146	(3.262)

Table 6

Robustness tests.

This table presents the coefficients from the investment regression for the pooled sample based on different model specifications, estimation methods, and sub-samples. The dependent variable is *CAPX*, which is a measure of capital investment. *Q* is Tobin's *Q*. *CF* is cash flow. *FF* is the financial flexibility index. The detailed definitions of these variables are provided in the Appendix. *TAG* is total assets growth. *RET* is the annual stock return during year *t*-1. *KZ* is the adjusted Kaplan-Zingales (1997) index. *LCAPX* is the lagged one-period *CAPX*. Q_t is the contemporaneous *Q*. Δ*CAPX* is the change in *CAPX* between year *t* and year *t*-1. Column (1) reports the result from the Fama-MacBeth (1973) regression procedure. Column (2) reports the result based on the weighted least squares (WLS), where the weight is the inverse of the number of firms in each country in each month. Column (3) reports the result of excluding firms from Japan, the U.K., and the U.S. Column (4) reports the result of including manufacturing firms only. Column (5) reports the result of including *TAG* as a control for investment opportunities. Column (6) reports the result of replacing *CAPX* with Δ*CAPX*. Column (7) reports the result of replacing *Q* with *RET*. Column (8) reports the result of replacing *FF* with the *KZ* index. Column (9) reports the result of including the interaction term, *FF*×*CF*, as an additional control. Column (10) reports the result of including two additional controls, *LCAPX* and Q_t. Standard errors are reported in parentheses, clustered by country and robust to heteroskedasticity. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 6 – Continued

Variables	(1) FM	(2) WLS	(3) Excluding Japan/UK/US	(4) Manufacturing firms	(5) TAG	(6) ΔCAPX	(7) RET	(8) KZ	(9) Including CF × FF	(10) Including LCAPX and Q_t
Q	5.724***	6.319***	8.414***	5.034***	40.857***	0.966***		4.994***	6.933***	4.396***
	(0.897)	(0.931)	(1.819)	(0.296)	(3.280)	(0.159)		(0.504)	(1.110)	(0.573)
RET							3.206***			
							(0.574)			
CF	0.127***	0.124***	0.060*	0.051*	-0.157	0.005	0.041**	0.070***	0.027	0.026**
	(0.018)	(0.030)	(0.034)	(0.029)	(0.126)	(0.007)	(0.019)	(0.017)	(0.022)	(0.013)
Q_t										-0.072
										(0.050)
LCAPX										0.438***
										(0.017)
FF	-2.421***	-2.350***	-2.408***	-1.628***	1.433	-0.037	-2.804***		-2.500***	-1.358***
	(0.037)	(0.122)	(0.175)	(0.132)	(1.149)	(0.053)	(0.243)		(0.222)	(0.090)
Q × *FF*	-2.016***	-1.796***	-2.896***	-1.447***	-5.062***	-0.127**			-2.218***	-1.251***
	(0.127)	(0.482)	(0.723)	(0.138)	(1.329)	(0.060)			(0.566)	(0.286)
RET × *FF*							-0.648***			
							(0.251)			
CF × *FF*									0.014	
									(0.016)	
KZ								0.254***		
								(0.087)		
Q × *KZ*								0.597***		
								(0.075)		
Industry and year fixed-effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N		239,907	115,717	121,397	239,907	235,134	239,907	229,870	239,907	235,134
Adj. *R*-Squared		0.232	0.175	0.147	0.120	0.006	0.161	0.158	0.191	0.381

Table 7

The catering channel and corporate investment.

Panel A of this table presents the coefficients from the investment regressions based on equation (6) in the main text. All firms are split into two groups (High and Low) based on the scores of *ACCESS* (Columns (1) and (2)), *TURNOVER* (Columns (5) and (6)), or *RD* (Columns (7) and (8)). All firms are also split into the emerging market group (Column (3) and the developed market group (Column (4)). The dependent variable is *CAPX*, which is a measure of capital investment. *Q* is Tobin's *Q*. *CF* is cash flow. *FF* is the financial flexibility index. *ACCESS* is a country-level measure of ease of access to external equity markets. *DEV* is a dummy variable that equals one for developed countries and zero for emerging countries. *TURNOVER* is the share turnover index. *RD* is the R&D intensity index. *COUNTRY* is a dummy variable that equals one for countries in developed markets or countries with high values of *ACCESS*, *TURNOVER*, or *RD*; and 0 otherwise. The detailed definitions of these variables are provided in the Appendix. The F-test is the test of the difference in coefficients of *Q* between the two sub-samples. Panel B reports the results from pooled regressions that include an interaction term, $Q \times COUNTRY$. Standard errors are reported in parentheses, clustered by country and robust to heteroskedasticity. ***, **, * denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Split-sample regressions

Variables	(1) Low *ACCESS*	(2) High *ACCESS*	(3) *Emerging* Markets	(4) *Developed* Markets	(5) Low *TURNOVER*	(6) High *TURNOVER*	(7) Low *RD*	(8) High *RD*
Q	1.456^{**}	4.291^{***}	1.602^{*}	4.056^{***}	1.942^{*}	3.948^{***}	1.843^{**}	3.933^{***}
	(0.629)	(0.549)	(0.820)	(0.583)	(0.936)	(0.554)	(0.879)	(0.557)
CF	0.158^{***}	0.023^{**}	0.161^{***}	0.024^{*}	0.169^{***}	0.028^{**}	0.191^{***}	0.026^{*}
	(0.041)	(0.013)	(0.043)	(0.013)	(0.045)	(0.014)	(0.042)	(0.013)
F-test								
p-value	(0.00)		(0.01)		(0.06)		(0.04)	
Industry and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	71,199	168,708	45,614	194,293	28,624	211,283	33,569	206,338
Adj. *R*-Squared	0.173	0.143	0.159	0.158	0.169	0.149	0.167	0.153

Table 7 – Continued

Panel B: Pooled-sample regressions				
	(1) *ACCESS*	(2) *DEV*	(3) *TURNOVER*	(4) *RD*
Q	2.534***	3.339***	3.330***	3.569***
	(0.081)	(0.091)	(0.114)	(0.107)
CF	0.040***	0.039***	0.039***	0.039***
	(0.001)	(0.001)	(0.001)	(0.001)
COUNTRY	-0.601***	-1.616***	-0.502***	-0. 930***
	(0.209)	(0.205)	(0.193)	(0.197)
Q × *COUNTRY*	1.687***	0.611***	0.568***	0.308***
	(0.091)	(0.099)	(0.121)	(0.114)
Industry and year fixed effects	Yes	Yes	Yes	Yes
N	239,907	239,907	239,907	239,907
Adj. *R*-Squared	0.116	0.120	0.116	0.116

Table 8

The joint effects of the equity-financing channel and the catering channel on corporate investment.

Panel A of this table presents the coefficients of *Q* from the investment regressions based on equation (7) in the main text. All firms are split into two groups (High and Low) based on the scores of *ACCESS* (Columns (1) and (2)), *TURNOVER* (Columns (5) and (6)), or *RD* (Columns (7) and (8)). All firms are also split into the emerging market group (Column (3) and the developed market group (Column (4)). The dependent variable is *CAPX*, which is a measure of capital investment. *Q* is Tobin's *Q*. *FF* is the financial flexibility index. *ACCESS* is a country-level measure of ease of access to external equity markets. *DEV* is a dummy variable that equals one for developed countries and zero for emerging countries. *TURNOOVER* is the share turnover index. *RD* is the R&D intensity index. *COUNTRY* is a dummy variable that equals one for countries in developed markets or countries with high values of *ACCESS*, *TURNOVER*, or *RD*; and 0 otherwise. The detailed definitions of these variables are provided in the Appendix. The *F*-test is the test of the difference in coefficients of $Q \times FF$ between the two sub-samples. Panel B reports the results from pooled regressions that include two additional interaction terms, $Q \times COUNTRY$ and $Q \times FF \times COUNTRY$. Standard errors are reported in parentheses, clustered by country and robust to heteroskedasticity. ***, **, * denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Split-sample regressions								
Variables	(1) Low *ACCESS*	(2) High *ACCESS*	(3) Emerging Markets	(4) Developed Markets	(5) Low *TURNOOVER*	(6) High *TURNOOVER*	(7) Low *RD*	(8) High *RD*
Q	3.486***	7.167***	3.892***	7.159***	4.396***	7.003***	4.083***	7.025***
	(0.610)	(1.283)	(0.907)	(1.248)	(1.099)	(1.159)	(0.977)	(1.176)
CF	0.174***	0.026***	0.181***	0.027*	0.184***	0.032**	0.210***	0.029**
	(0.042)	(0.013)	(0.045)	(0.013)	(0.046)	(0.014)	(0.043)	(0.014)
FF	-1.888***	-2.712***	-2.286***	-2.429***	-2.282***	-2.414***	-2.316***	-2.424***
	(0.112)	(0.157)	(0.230)	(0.231)	(0.167)	(0.215)	(0.149)	(0.221)
$Q \times FF$	-1.329***	-2.070***	-1.533***	-2.242***	-1.672***	-2.179***	-1.532***	-2.215***
	(0.129)	(0.585)	(0.308)	(0.593)	(0.337)	(0.543)	(0.309)	(0.558)
F-test (*p*-value)	(0.00)		(0.03)		(0.10)		(0.05)	
Industry and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	71,199	168,708	45,614	194,293	28,624	211,283	33,569	206,338
Adj. *R*-Squared	0.205	0.198	0.189	0.213	0.200	0.201	0.196	0.207

Table 8 – Continued

Panel B: Pooled-sample regressions				
	(1) *ACCESS*	(2) *DEV*	(3) *TURNOOVER*	(4) *RD*
Q	3.850***	5.087***	5.279***	5.030***
	(0.165)	(0.175)	(0.224)	(0.208)
CF	0.044***	0.043***	0.044***	0.048***
	(0.001)	(0.001)	(0.001)	(0.001)
COUNTRY	-0.823***	-1.752***	-0.730***	-1.138***
	(0.327)	(0.343)	(0.292)	(0.059)
FF	-2.351***	-2.348***	-2.362***	-2.313***
	(0.030)	(0.030)	(0.030)	(0.030)
Q × *COUNTRY*	3.622***	2.100***	1.744***	1.859***
	(0.179)	(0.189)	(0.233)	(0.218)
Q × *FF*	-0.725***	-1.038***	-1.205***	-0.961***
	(0.099)	(0.111)	(0.145)	(0.134)
Q × *FF* × *COUNTRY*	-1.693***	-1.319***	-1.035***	-1.232***
	(0.110)	(0.120)	(0.151)	(0.141)
Industry and year fixed effects	Yes	Yes	Yes	Yes
N	239,907	239,907	239,907	239,907
Adj. *R*-Squared	0.163	0.168	0.164	0.166