International Review of Economics and Finance 65 (2020) 69–83

Contents lists available at ScienceDirect

International Review of Economics and Finance

journal homepage: www.elsevier.com/locate/iref

Corporate future investments and stock liquidity: Evidence from emerging markets

Abdulrahman Alhassan [a,*], Atsuyuki Naka [b]

[a] Finance Department, College of Business Administration, King Saud University, King Khalid Rd, Riyadh, Saudi Arabia
[b] Department of Economics and Finance, University of New Orleans, New Orleans, LA, 70148, USA

ARTICLE INFO

JEL classification:
G12
G15
G31

Keywords:
Corporate investment
Stock liquidity
Financial constraints
Financial development
Emerging markets

ABSTRACT

This paper studies the impact of stock liquidity on future investments in emerging markets. Since stock liquidity is an important determinant of the cost of equity, we expect a positive relation between future investments and stock liquidity. We conjecture that this relation is more pronounced in financially constrained firms due to their limited access to external capital and less pronounced in weaker financially developed markets due to their lack of ability to mobilize capital. We find robust evidence of this relation, and the findings suggest that the relation is influenced by financial constraints and the degree of financial market development.

1. Introduction

The linkage between stock market liquidity and corporate decisions regarding payouts and reinvestments is an ongoing concern in the corporate finance literature. It could be argued that because the cost of equity is a factor in discounting future cash flows, it is reasonable to expect that a reduction in the cost of equity caused by an increase in stock liquidity would eventually cause growth in future investments. In this paper, we study the impact of stock liquidity on future investments made by firms operating in emerging markets. Because firms operating in emerging markets are expected to suffer more from financial constraints, we additionally investigate whether or not such a stock liquidity effect varies across firms with different levels of constraints. A firm that is financially constrained by limited access to external capital could, therefore, be expected to be more sensitive to a reduced cost of equity by higher liquidity. Further, we look at whether or not the degree of financial development in the region hinders investments. In this analysis, we explore the heterogeneities in the association between stock liquidity and firm growth across the countries in our sample with a factor that has been evident to play a role in capital market growth. The lack of development of financial systems may hinder their critical role of mobilizing capital from various agents to profitable investments (Levine, 1997). Thus, we argue that a sufficiently developed financial system is a prerequisite for the corporate investment growth that results from increases in stock liquidity.

Our research contributes to the existing literature in two ways: first, this is a comprehensive investigation of a large number of firms representing 21 emerging markets from widely diverse regions that exhibit a range of financial constraints across firms. Second, the study examines how stock liquidity interacts with both financial constraints and financial development among these firms. Many existing studies that have examined the relationship between liquidity and investment are based on samples drawn from developed

* Corresponding author.
E-mail addresses: alabdulrahman@ksu.edu.sa (A. Alhassan), anaka@uno.edu (A. Naka).

https://doi.org/10.1016/j.iref.2019.10.002
Received 8 October 2018; Received in revised form 15 September 2019; Accepted 4 October 2019
Available online 9 October 2019

markets. In such cases, liquidity would be potentially less significant than in emerging markets.[1] In addition, the number of firms included in these previous studies is relatively small and the samples tend to be drawn from a single market or region, which may not allow one to control for country effects. For example, Muñoz (2013), who studied a similar research question in emerging markets, employed only 450 firms from four Latin American countries and did not investigate the effects of financial constraints. The sample in this study covers almost 7000 firms from different countries, which allows us to exhibit more variation in financial constraints and financial development.

Using a sample of 6969 firms from 21 emerging markets located in different regions and data spanning the period 2000–2015, we find supportive and robust evidence of a positive association between stock liquidity and future investments. Consistent with the findings in previous studies, we show that future investments are positively affected by free cash flow, sales, cash holdings, and future opportunities, and are negatively affected by leverage ratios. Interestingly, our findings strongly suggest that the liquidity effect on corporate investments is highly influenced by the level of financial constraint, using three different categories of financial constraint, and by the country-level of financial development. These results are robust to other future investment determinants as suggested in the previous literature, and to country and time effects. In addition, the results are consistent with the use of alternative measures for corporate investment and stock liquidity, and alternative model specifications. Because stock liquidity is crucial in emerging markets, this has vital implications for managers and policymakers as it will enable them to understand more about the importance of stock market liquidity and when it is most important for the growth of a firm.

2. Review of literature and hypotheses

The liquidity effect is one of the major price factors used to explain stock returns and has been extensively examined in the literature. In an early study, Amihud and Mendelson (1986) show that liquidity has a positive effect on market capitalization and argue that when liquidity is high the cost of capital will decrease, resulting in a lower rate being used to discount new investments. In examining payout policies, Banerjee, Gatchev, and Spindt (2007) find that less liquid stocks are more likely to pay cash dividends to their shareholders. Their results suggest that the declining propensity of firms to pay dividends over time is related to changes in the liquidity of the U.S. stock markets. Brockman, Howe, and Mortal (2008) show that firms with higher liquidity are motivated more toward the use of repurchases rather than cash dividends. Lins, Strickland, and Zenner (2005) and Hail and Leuz (2009) utilize U.S. cross-listings to determine how the level of financial constraint can affect the amount of benefits a firm can gain from an increase in liquidity. Lipson and Mortal (2009) argue that a reduction in the cost of equity encourages managers to use equity more than debt and show a significant negative association between a firm's leverage and stock liquidity. Bai and Qin (2015) examine 18 emerging markets and conclude that systematic volatility affects individual firms' liquidity more than its idiosyncratic volatility. Jiang, Ma, and Shi (2017) examine the relationship between stock liquidity and payouts from an informational perspective and find that payouts increase with stock liquidity due to the decreased cost of information asymmetry.

Becker-Blease and Paul (2006) show that stocks that are added to the S&P500 index experience an increase in future investments and that this increase is partially explained by the increase in stock liquidity. However, Gregoriou and Nguyen (2010) find no effect of liquidity on future investments in a sample of U.K. firms deleted from the FTSE100 index and conclude that firms should still be able to borrow at the same cost of capital even after a negative liquidity shock. Similarly, Mazouz, Daya, and Yin (2014) show that the addition of a firm to the FTSE100 index lowers the liquidity risk and reduces the cost of equity; however, index deletions have no significant impact on liquidity risk or the cost of equity. Orihara (2017) uses legal reforms in Japanese corporate law to study the impact of stock market listings on corporate decisions. In particular, the paper shows that an increase in stock liquidity caused by legal reforms increases capital expenditures. Using a sample from four Latin American countries (Argentina, Brazil, Chile, and Mexico), Muñoz (2013) finds that liquidity positively affects future investments and that this effect is less pronounced in large firms and higher book-to-market firms, and more pronounced for share-issuing firms.

We propose the following three main hypotheses in this paper:

H1. *Holding other factors constant, a firm's stock liquidity affects positively its future investments due to the reduction in the cost of equity.*

H2. *Holding other factors constant, the effect of stock liquidity on future investments is more pronounced in more financially constrained firms due to limited access to other external capital.*

H3. *Holding other factors constant, the effect of stock liquidity on future investments is less pronounced in firms that operate in a less financially developed market.*

The remaining sections of the paper are organized as follows: Section 3 presents the baseline corporate investment model, the variables used, and estimation strategy; Section 4 describes the data; Section 5 presents the main results based on the two-stage panel regressions; Section 6 introduces the role of financial constraints on corporate investment decisions and shows their results; Section 7 presents the findings of the role of financial development; and Section 8 concludes the paper.

[1] Bai and Qin (2015) point out the importance of examining the commonality in liquidity for emerging equity markets.

3. Corporate investment model and variables

3.1. Baseline regression model

To examine the effect of future corporate investments to stock liquidity, we use the well-known corporate investment equation and modify it for our empirical study.[2] In particular, we first estimate the following baseline regression model:

$$\frac{I_{i,t+j}}{K_{i,t}} = \alpha_i + \beta_1\ Liquidity_{i,t} + \beta_2\ \frac{FCF_{i,t+j}}{TA_{i,t}} + \beta_3\ Leverage_{i,t} + \beta_4\ Sales_{i,t} + \beta_5\ Cash_{i,t} + \beta_6\ q_{i,t} + \varepsilon_{i,t}. \tag{1}$$

The dependent variable (*I/K*) is the firm's capital expenditure (CAPX) at time $t+j$ scaled by beginning period capital (*K*). Following Love (2003), capital (*K*) is defined as the sum of net property, depreciation, and plant and equipment minus capital expenditure. We use different future periods ($j = 1, 2$) because the investment may not be carried out immediately. Lins et al. (2005) note that international firms are more likely to be consistent in reporting total assets than capital. Therefore, we also use total assets (TA) to scale the investment variable for robustness. Because the dependent variable is almost always between 0 and 1 to make it more suitable for a regression framework, we use the logistic transformation $\ln[y/(1-y)]$, where y is the dependent variable (Karolyi, Lee, & Van Dijk, 2012; Morck, Yeung, & Yu, 2000).[3] We present each explanatory variable and the expected sign of the coefficient in detail in the next subsection.

3.2. Discussion of explanatory variables

Our key explanatory variable is *Liquidity*, which is a proxy for a firm's stock liquidity. We use two proxies of liquidity that only require daily frequencies, namely, *Amihud* and *Turnover*; these have also been used by previous studies that investigate international data (e.g., Amihud, 2002; Amihud, Hameed, Kang, & Zhang, 2015; Bai & Qin, 2015; Karolyi et al., 2012). The coefficient β_1 is expected to be positive in accordance with our first hypothesis that expects stock liquidity to increase future investments. We multiply by negative one to convert the original *Amihud*'s illiquidity measure to a liquidity measure, obtained as[4]:

$$Amihud_{i,d} = -\log\left(1 + \frac{|R_{i,d}|}{P_{i,d} VO_{i,d}}\right),$$

where *R* is the daily return in U.S. dollars, *P* is the daily price converted to U.S. dollars, and *VO* is the daily volume. By multiplying the outcome by -1, the measure increases in liquidity, thus making it comparable with *Turnover*. *Turnover* is defined as:

$$Turnover_{i,d} = \log\left(1 + \frac{VO_{i,d}}{Shares_{i,y}}\right),$$

where *Shares* is the annual number of shares outstanding.

To avoid an omitted variable bias, we identify several control variables that have appeared in previous studies to capture some of the corporate investment variations across firms and over time. One of the most important variables studied is free cash flow (*FCF*). *FCF* is defined as the sum of earnings before interest and tax and deprecation minus dividends at time $t+1$ or $t+2$, and is divided by the beginning period TA. Fazzari et al. (1988)'s argue that firms' corporate investments are positively related to their internal financing capability because external financing is costly.[5] We expect the coefficient β_2 to be positive, which is consistent with the investment–cash sensitivity hypothesis.

Leverage is defined as total debt divided by TA. The higher the leverage, the lower the debt capacity or the lower the ability to raise capital when needed. Lang, Ofek, and Stulz (1996) and Hovakimian (2009) show a negative relationship between leverage and future investments. Therefore, we expect β_3 to be negative.

Sales are defined as revenue divided by TA. Hoshi, Kashyap, and Scharfstein (1991) and Lins et al. (2005), among others, include sales in the corporate investment equation as a proxy for productivity, where sales could possibly have an accelerator effect on corporate investments. Firms are likely to invest more when their productivity increases strongly and we expect β_4 to be positive.

Cash is defined as cash holdings divided by TA. Cash holdings account for a firm's financial slack. Myers and Majluf's (1984) model predicts that under information asymmetry, firms with more financial slack are more likely to be able to undertake positive NPV projects. Love (2003) and Lins et al. (2005), among others, show results that are consistent with this prediction. Accordingly, we expect β_5 to be positive.

Tobin's *q* is defined as the sum of the market value of equity and the book value of debt, divided by TA. To account for the variations in growth opportunities, we include Tobin's *q* in the regression equation. The higher the Tobin's *q*, the more growth opportunities a firm has. Other studies have found a positive association between Tobin's *q* and future investments and we expect β_6 to be positive.

Following Malmendier and Tate (2005), we take the natural logarithm of the variable and add a constant of one for all variables to

[2] See Fazzari et al. (1988), Hoshi et al. (1991), Lang et al. (1996), Lins et al. (2005), and Muñoz (2013), among others.

[3] For robustness, we also use the actual value for the dependent variable and find that the results are basically the same and these are not reported.

[4] Karolyi et al. (2012) use the same liquidity measure.

[5] Many studies, including Hoshi et al. (1991), Lang et al. (1996), Lins et al. (2005), and others have found supportive evidence of this prediction.

avoid outliers instead of following other approaches (e.g., winsorizing or trimming) without discarding information. In addition, following Lins et al. (2005), we convert all values to U.S. dollars to avoid biases triggered by inflationary effects.

3.3. Estimation strategy

We estimate the proposed model using two-stage panel regressions to address the potential endogeneity problem that arises from the inclusion of Tobin's q in the corporate investment equation. Bond and Van Reenen (2008) and Almeida, Campello, and Galvao (2010) show that when Tobin's q is included in the corporate investment equation, an endogeneity problem could be present due to measurement errors. Almeida et al. (2010) demonstrate that a two-stage least squares method outperforms other more complicated methods. In particular, they recommend that the investment equation should be estimated in a two-stage process where the variable q is instrumented with two lags of its first difference.[6]

In this paper, we perform two instrumental variable tests, namely, the Kleibergan–Paap test and Hansen's J, to ensure the validity of the instrumental variables used.[7] To account for serial dependency and heteroscedasticity in the residuals, we use standard errors that are Huber–White-corrected and clustered at firm level. Furthermore, we include year dummies to account for business cycle effects (Lang et al., 1996). It is highly likely that both corporate investments and stock liquidity are influenced by certain economic state variables (e.g., gross domestic product growth, inflation, interest rates, etc.), which could impose an omitted variable bias if they are not controlled for. In fact, in a later section, we investigate how investments and liquidity were both significantly affected by the 2008 credit crisis. If the years surrounding the 2008 credit crisis are not controlled for, then any evidence supporting our hypotheses may be attributed to an omitted variable bias. Finally, we use firm fixed-effects to capture heterogeneity across the firms in our sample.

4. Data description

We use a sample of firms drawn from 21 emerging markets: Brazil, Chile, China, Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Malaysia, Mexico, Morocco, Peru, the Philippines, Poland, Russia, South Africa, Taiwan, Thailand, and Turkey. The sample period is from 2000 to 2015. Our main source of daily security data as well as annual accounting data is Compustat Global.

We begin by processing the daily security data for each firm to construct the firms' annual liquidity measures. Specifically, we compute the daily *Amihud* measure, using U.S. dollar returns and volume, and the daily *Turnover* measure. Annual currency exchange rates for each country relative to the U.S. are obtained from the Federal Reserve Economic Data and the World Bank. Following previous studies that deal with large international data (e.g., Karolyi et al., 2012), we apply similar filtering criteria to the daily price data: we drop observations that are reported in a currency other than the country's local currency and only keep observations for common stocks. We also exclude observations that are missing the closing price variable, those that are missing the trading volume variable, days with 90% or more of the stocks with a return of zero in a given year (non-trading days), and stocks with zero daily returns for more than 80% of the time in a given year (non-traded stocks).

The accounting variables for each firm are obtained from the Fundamentals Annual database of Compustat Global and all variables are converted to U.S. dollars. We exclude financial firms (SIC 60–67) due to differences in their nature compared with other industries. We then merge the file that contains the annual liquidity measure previously constructed from the daily data with the annual fundamental data file. This requires annual observations to have data available for the following key variables: *Amihud*, *Turnover*, earnings before income and tax, depreciation, dividends, TA, total debt, total revenue, and cash. After taking account of these restrictions, our final sample consists of 6969 firms with 45,553 annual observations in total.

Table 1 presents the summary statistics of the data. In Panel A, we report the means, medians, standard deviations, and both the bottom and top 1 percentile of the investment measures, along with liquidity measures and other firm characteristics. The average and median CAPX scaled by K (*CAPX/K*) are 0.20 and 0.14, respectively, whereas the average and median CAPX scaled by TA (*CAPX/TA*) are 0.06 and 0.04, respectively. Our sample means for the cash flow to TA ratio, the leverage ratio, the sales to TA ratio, the cash to TA ratio and q are 0.07, 0.38, 0.60, 0.11, and 0.96, respectively.

Panel B shows the pairwise correlations between the key variables. For example, the correlation between the two investment measures is 0.55 and is statistically significant at the 1% level. Furthermore, the correlation between the two liquidity measures is 0.70 and is statistically significant at the 1% level. For the correlation between future investments and current liquidity, all coefficients are positive, which are also statistically significant at the 1% level. These findings are consistent with the existing literature.

Table 2 shows the summary statistics of the key variables reported for each country in our sample. For each country, we report the starting and ending year, the number of firms and observations, and the means of the investment measures and liquidity measures. Except for Colombia, Morocco, Russia, and Turkey, the data for all countries in our sample start in 2000 and end in 2015.[8] We observe that the largest number of firms comes from China, with 1849 (26.5% of all firms) followed by Taiwan with 1370 firms (19.7% of all firms). Colombia, Czech Republic, Hungary, and Morocco have only 74 firms combined (about 1% of all firms).

[6] For a detailed discussion regarding this issue, refer to Almeida et al. (2010).

[7] The under-identification test (Kleibergan–Paap) tests the null hypothesis that the correlation between the endogenous variable (q) and the instruments is zero. The over-identification test (Hansen's J) tests the null hypothesis that the correlation between the instruments and the error terms is zero. The validity of our estimation procedure requires the former to be statistically significant and the latter to be statistically insignificant. These two requirements hold for all results.

[8] The reason those four countries' starting years range from 2002 to 2005 is because we do not have sufficient data for prior years.

Table 1

Descriptive and preliminary analysis.

Panel A presents the means, medians, standard deviations and the 1st and 99th percentiles for each variable included in the study. $CAPX_{t+j}/K_t$ is defined as the capital expenditures in period $t+j$, where j is one or two, divided by K in period t, which is defined as net property plant and equipment minus capital expenditure plus depreciation. $CAPX_{t+j}/TA_t$ is defined as the capital expenditure in $t+j$, where j is one or two, divided by total assets (TA) in t. *Amihud* is the annual average of the daily Amihud measure. The daily Amihud measure is defined as the absolute daily returns divided by the U.S. dollar volume. We take the log of the Amihud measure plus one to avoid outliers and multiply it by −1 to convert it to a liquidity measure. *Turnover* is the annual average of the daily Turnover measure. The Turnover measure is defined as the daily volume divided by shares outstanding. Likewise, we take the log of the Turnover measure plus one to avoid outliers. *FCF* is defined as the sum of earnings before interest and tax and deprecation minus dividends scaled by the beginning period's TA. *Leverage* is defined as total debt divided by TA. *Sales* is defined as revenue scaled by TA. Tobin's q is computed as the sum of the market value of equity and the book value of debt divided by TA. Panel B shows the pairwise Pearson's correlations between the variables included in the study. All correlation coefficients are statistically significant at 1% level except when denoted by the superscripts^{n}.

Panel A: Summary statistics

Variable	Mean	Median	Standard Deviation	Percentiles	
				1st	99th
Investment					
$CAPX_{t+1}/K_t$	0.203	0.135	0.273	0.001	1.199
$CAPX_{t+2}/K_t$	0.219	0.140	0.303	0.001	1.327
$CAPX_{t+1}/TA_t$	0.059	0.040	0.067	0.000	0.312
$CAPX_{t+2}/TA_t$	0.068	0.041	0.096	0.000	0.398
Liquidity					
Amihud	−0.065	0.000	2.334	−0.979	0.000
Turnover	0.007	0.003	0.010	0.000	0.042
Controls					
FCF	0.072	0.066	0.095	−0.165	0.312
Leverage	0.378	0.386	0.158	0.061	0.681
Sales	0.596	0.566	0.291	0.067	1.456
Cash	0.112	0.086	0.100	0.001	0.442
Tobin's q	0.960	0.812	0.682	0.387	4.535

Panel B: Pairwise Correlation Matrix

	CAPX/K	CAPX/TA	Amihud	Turnover	Cash Flow	Leverage	Sales	Cash	Tobin's q
CAPX/K	1.00								
CAPX/TA	0.55	1.00							
Amihud	0.07	0.08	1.00						
Turnover	0.05	0.01	0.70	1.00					
Cash Flow	0.18	0.33	−0.06	−0.17	1.00				
Leverage	−0.01	0.02	0.06	0.10	−0.06	1.00			
Sales	0.05	−0.01	−0.14	−0.11	0.18	0.10	1.00		
Cash	0.13	−0.05	0.23	0.23	−0.04	−0.27	0.04	1.00	
Tobin's q	0.07	0.08	0.20	0.02	0.12	0.04	0.01^{n}	0.08	1.00

5. Regression results

5.1. Main results

Table 3 reports the estimation results of Equation (1) from the two-stage panel regressions, where the dependent variable is the firm's capital expenditure at time $t+1$ or $t+2$ scaled by capital at time t. We use firm fixed-effects to capture heterogeneity across firms, year dummies to account for possible time and business cycle effects, and instrument variables with two lags of q's first difference to mitigate the endogeneity issue discussed earlier. We perform two tests to check the validity of the instrument variables, namely, the Kleibergan–Paap and Hansen's J tests. The Kleibergan–Paap tests the null hypothesis that the correlation between the endogenous variable (q) and the instruments is zero (under-identification), whereas Hansen's J, tests whether the correlation between the instruments and the error terms is zero (over-identification). The validity of our instrument variable estimation procedure requires the former to be statistically significant and the latter to be statistically insignificant. These two requirements appear to hold for all the results.

Table 3 presents the estimation results of the panel regressions, where the dependent variable is the firm's capital expenditure at time $t+1$ ($j=1$) or $t+2$ ($j=2$) scaled by capital at time t. In Table 3, the coefficients of all control variables have the expected signs and are statistically significant at the 1% level. Although all coefficients with liquidity measures are positive and statistically significant, the magnitudes of the estimated coefficients regarding $j=1$ and $j=2$ depend on the liquidity measure used. For example, the coefficients are 0.069 for $j=1$ and 0.034 for $j=2$ with Amihud measure, but 0.036 for $j=1$ and 0.047 with Turnover measure. The results indicate that future investment increases with stock liquidity. This is consistent whether the *Amihud* or *Turnover* liquidity measure is used, and

Table 2
Summary statistics by country.
This table reports key statistics for all countries in the sample. For each country, it reports the start year, end year, the number of firms, the percentage of total firms, the number of annual observations, the percentage of total annual observations, and the means of investments measures and liquidity measures. Full definitions of the investment and liquidity measures are provided in Table 1.

Countries	Start Year	End Year	No. Firms	% Firms	No. Obs.	% Obs.	Investment Measures				Liquidity Measures	
							$CAPX_{t+j}/K_t$		$CAPX_{t+j}/TA_t$		Amihud	Turnover
							j = 1	j = 2	j = 1	j = 2		
Brazil	2000	2015	167	2.4	1023	2.2	0.223	0.238	0.060	0.068	−0.037	0.002
Chile	2000	2015	120	1.7	949	2.1	0.147	0.175	0.061	0.074	−0.522	0.001
China	2000	2015	1849	26.5	13894	30.5	0.213	0.241	0.063	0.078	0.000	0.015
Colombia	2002	2015	16	0.2	106	0.2	0.176	0.208	0.052	0.057	0.000	0.001
Czech Republic	2000	2015	10	0.1	68	0.1	0.119	0.129	0.066	0.071	−0.107	0.001
Egypt	2000	2015	60	0.9	268	0.6	0.141	0.149	0.053	0.054	−0.002	0.002
Greece	2000	2015	163	2.3	902	2.0	0.145	0.140	0.043	0.044	−0.368	0.002
Hungary	2000	2015	12	0.2	77	0.2	0.180	0.177	0.082	0.081	−0.003	0.002
Indonesia	2000	2015	206	3.0	1321	2.9	0.225	0.245	0.070	0.079	−0.293	0.002
India	2000	2015	1124	16.1	6083	13.4	0.268	0.281	0.079	0.086	−0.140	0.003
Malaysia	2000	2015	712	10.2	4522	9.9	0.156	0.168	0.045	0.050	−0.039	0.002
Mexico	2000	2015	59	0.8	434	1.0	0.162	0.174	0.061	0.066	−0.020	0.001
Morocco	2003	2015	36	0.5	168	0.4	0.203	0.217	0.069	0.076	−0.035	0.001
Peru	2000	2015	51	0.7	363	0.8	0.160	0.171	0.061	0.070	−0.006	0.001
Philippines	2000	2015	110	1.6	702	1.5	0.226	0.273	0.059	0.072	−0.120	0.001
Poland	2000	2015	172	2.5	773	1.7	0.227	0.247	0.058	0.066	−0.070	0.002
Russia	2002	2015	69	1.0	287	0.6	0.194	0.303	0.101	0.175	−0.163	0.000
S. Africa	2000	2015	188	2.7	1362	3.0	0.281	0.286	0.066	0.071	−0.178	0.002
Taiwan	2000	2015	1370	19.7	9225	20.3	0.169	0.174	0.044	0.047	−0.007	0.008
Thailand	2000	2015	376	5.4	2571	5.6	0.187	0.203	0.064	0.072	−0.067	0.004
Turkey	2005	2015	99	1.4	455	1.0	0.217	0.228	0.052	0.057	0.000	0.007
All	**2000**	**2015**	**6969**	**100**	**45553**	**100**	**0.191**	**0.211**	**0.062**	**0.072**	**−0.104**	**0.003**

whether a 1-year or 2-year investment lead is used.

The finding supports our first hypothesis, which states that stock liquidity reduces the cost of equity and, therefore, increases future investments. *FCF* appears to positively affect future investments with 1-year and 2-year leads, where the coefficients are all statistically significant at the 1% level. This is expected because in emerging markets, firms' investments are more likely to be sensitive to their free cash flows as they have less access to external capital. The result is consistent with previous findings on investment–cash sensitivity (e.g., Lins et al., 2005; Love, 2003). On the other hand, we find *Leverage* to be negatively associated with future investments with statistically significant coefficients at the 1% level in all models. The findings of the negative sign support the conjecture that firms with a high level of leverage have lower ability (due to less debt capacity) to raise additional capital (Hovakimian, 2009; Lang et al., 1996). The coefficient of *Sales* is positive and statistically significant at the 1% level across all models, which is consistent with the hypothesis that sales have an accelerator effect on corporate investments (Hoshi et al., 1991; Lins et al., 2005). Similarly, the coefficient of *Cash* has the expected positive sign in all models and is statistically significant at the 1% level, which supports the argument that firms with more financial slack are more likely to undertake positive NPV projects (e.g., Love, 2003; Lins et al., 2005; among others). As expected, we observe that q appears to have a positive sign and a statistically significant coefficient in all models.

5.2. Robustness checks and additional results

In this section, we perform additional analyses and conduct robustness checks. For a robustness check, we re-estimate the two-stage panel regressions of Equation (1), where the dependent variable is now the firm's capital expenditure at time $t+1$ or $t+2$ scaled by TA at time *t*. As mentioned earlier, international firms are more likely to report total assets accurately as opposed to capital employed (Lins et al., 2005). Therefore, as a robustness check for our findings, it is useful to consider investments relative to TA rather than relative to the capital employed. Table 4 shows similar results to those reported in Table 3 and delivers consistent conclusions. In particular, the coefficients of stock liquidity, although slightly smaller than the results in Table 4, remain statistically significant across all models. In addition, other control variables exhibit quantitatively similar results for their associations with future corporate investments.

Although the estimation strategy employed thus far minimizes the biases from the potential endogeneity issue discussed earlier, it requires a minimum number of annual observations for a firm to be included in the sample. As a result, our findings could suffer from possible survivorship bias because firms that fail shortly are excluded. Therefore, we employ an alternative estimation strategy where we estimate cross-sectional regressions and report the averages of the coefficients and statistics across the years. We include country dummies to control for country effects and apply Huber–White standard errors to account for the possible presence of heteroscedasticity. The results are consistent with the earlier findings and reported in Appendix A (Tables A1 and A2).

Table 5 reports the results from estimating Equation (1) with two-stage panel regressions with firm fixed-effects and year dummies. The variable q is instrumented with two lags of q's first difference. Here, we perform a robustness check on our results to address the

Table 3
Two-stage panel regressions of future investments scaled by capital.
This table reports the results from estimating Equation (1) with two-stage panel regressions with firm fixed effects and year dummies. The dependent variable is the firm's capital expenditure at time *t*+1 or *t*+2 scaled by capital at time *t*. The variable *q* is instrumented with two lags of *q*'s first difference. The standard errors are Huber–White corrected for heteroscedasticity and clustered at the firm level. *P*-values of the zero coefficient hypothesis are reported in parentheses for each independent variable. The last two rows report two instrumental variable (IV) tests. The under-identification test (Kleibergan–Paap) tests the null hypothesis that the correlation between the endogenous variable (*q*) and the instruments is zero. The over-identification test (Hansen's J) tests the null hypothesis that the correlation between the instruments and the error terms is zero. The superscripts *, **, *** and ^ refer to the 1%, 5%, 10% and one-tailed statistical significance level..

Dependent Variable		$CAPX_{t+j}/K_t$			
	E[sign]	Amihud		Turnover	
		j = 1	j = 2	j = 1	j = 2
$Liquidity_t$	+	0.069***	0.034***	0.036***	0.047***
		(0.000)	(0.000)	(0.000)	(0.000)
FCF_{t+j}	+	2.532***	3.046***	2.496***	3.009***
		(0.000)	(0.000)	(0.000)	(0.000)
$Leverage_t$	–	−1.453***	−1.732***	−1.554***	−1.781***
		(0.000)	(0.000)	(0.000)	(0.000)
$Sales_t$	+	0.409***	0.609***	0.429***	0.609***
		(0.000)	(0.000)	(0.000)	(0.000)
$Cash_t$	+	2.338***	2.401***	2.364***	2.417***
		(0.000)	(0.000)	(0.000)	(0.000)
q_t	+	0.292***	0.343***	0.355***	0.367***
		(0.000)	(0.000)	(0.000)	(0.000)
Firm FE		Yes	Yes	Yes	Yes
Year Dummies		Yes	Yes	Yes	Yes
R^2		0.087	0.1159	0.081	0.1157
# Firms		6835	5714	6835	5714
# Observations		44073	34984	44073	34984
IV tests					
Kleibergan-Paap		(0.000)	(0.000)	(0.000)	(0.000)
Hansen J		(0.447)	(0.3717)	(0.6339)	(0.3036)

possibility that the findings are influenced by the inclusion of a large number of firms and observations from a single or two markets. In fact, about half the number of firms and observations come from China and Taiwan, which are in the top ten percentile in terms of representation in the sample (for both number of firms and observations). Therefore, we introduce interaction terms to allow the coefficients of stock liquidity for Chinese firms, Taiwanese firms, and the rest to vary. Particularly, we define two dummy variables, one for Chinese firms and the other for Taiwanese firms, while the rest are considered the base group. Then, we include an interaction term that equals the dummy variable multiplied by stock liquidity. The results in Table 5 show that the coefficients of stock liquidity remain positive and statistically significant after the exclusion of Chinese and Taiwanese firms. The difference between Chinese firms and the rest in terms of the relationship between their future investments and stock liquidity is only statistically significant in some model specifications. On the other hand, the difference between Taiwanese firms and the rest is statistically significant across all model specifications.

Finally, we allow the coefficients to vary across four different sub-periods to explore variations in the relationship between future investments and stock liquidity over time. We estimate Equation (1) with two-stage panel regressions with firm fixed-effects and year dummy. The variable *q* is instrumented with two lags of *q*'s first difference. We create four sub-periods (2000–2003; 2004–2007; 2008–2011; 2012–2015) that allow the intercept to vary over each period. Table 6 presents the results of the sub-periods analysis. Unsurprisingly, the findings document that the relationship between future investments and stock liquidity was especially important during the financial crisis period (2008–2011), which persists across all model specifications.

6. The role of financial constraints

This section examines the validity of our second hypothesis. We identify several determinants of financial constraints at the firm level while controlling for country effects. We expect more financially constrained firms to exhibit a more pronounced effect of stock liquidity

Table 4
Two-stage panel regressions of future investments scaled by total assets.
This table is similar to Table 5. The dependent variable is, however, the firm's capital expenditure at time *t*+1 or *t*+2 scaled by total assets (TA) at time *t*.

Dependent Variable		$CAPX_{t+j}/TA_t$			
	E[sign]	Amihud		Turnover	
		j = 1	j = 2	j = 1	j = 2
$Liquidity_t$	+	0.043***	0.009	0.020**	0.025***
		(0.000)	(0.196)	(0.014)	(0.010)
FCF_{t+j}	+	2.727***	3.166***	2.698***	3.157***
		(0.000)	(0.000)	(0.000)	(0.000)
$Leverage_t$	–	−1.094***	−1.439***	−1.155***	−1.452***
		(0.000)	(0.000)	(0.000)	(0.000)
$Sales_t$	+	0.538***	0.708***	0.552***	0.704***
		(0.000)	(0.000)	(0.000)	(0.000)
$Cash_t$	+	1.205***	1.064***	1.220***	1.069***
		(0.000)	(0.000)	(0.000)	(0.000)
q_t	+	0.249***	0.309***	0.289***	0.311***
		(0.000)	(0.000)	(0.000)	(0.000)
Firm FE		Yes	Yes	Yes	Yes
Year Dummies		Yes	Yes	Yes	Yes
R^2		0.1087	0.1522	0.1057	0.1524
# Firms		6969	5821	6969	5821
# Observations		45553	36251	45553	36251
IV tests					
Kleibergan-Paap		(0.000)	(0.000)	(0.000)	(0.000)
Hansen J		(0.3784)	(0.7813)	(0.5195)	(0.7993)

on their investment due to their limited access to other external financing.

6.1. Data description

To investigate the hypothesis, we introduce different determinants of financial constraints such as firm leverage, firm payout ratio, and Kaplan and Zingales's (1997) index (the KZ index, hereafter). These different financial constraints are used to ensure that our results are not sensitive to the choice of a single determinant. Because the data cover a large number of firms from a broad set of different countries in emerging markets, it is possible to separate the firm-level effect from the country effect. It is reasonable to expect that financially constrained firms could be concentrated in less financially developed countries. To capture the country effect, we sort firms based on the financial determinants within each country. That is, firms are ranked into four quartiles every year using different break points for each country. These financial constraints are discussed below.

Firm Leverage Ratio is also another proxy for financial constraints (e.g., Greenaway, Guariglia, & Kneller, 2007). We define the leverage ratio as long-term debt divided by TA. Intuitively, we expect firms with high leverage to have a lower debt capacity or ability to raise additional capital to finance new investments. We follow the industry adjustment approach employed by Lang et al. (1996) to control for industry heterogeneities across industries.[9] Annually, we rank firms within each country–industry by the leverage ratio into four quartiles and construct a dummy variable (*High Leverage*) that takes the value 1 if the firm is assigned in the top leverage ratio quartile (i.e., most financially constrained firms) and zero otherwise.

Payout Ratio is one of the most commonly used variables to proxy for financial constraints.[10] We define the payout ratio as the sum of cash dividends and stock repurchases divided by income before extraordinary items. The intuition is that low-dividend firms have less internal financing capacity, which makes them more in need of external capital to finance new investments (Hennessy & Whited, 2007). Fazzari, Hubbard, Petersen, Blinder, and Poterba (1988) predicted that financially unconstrained firms are more likely to have higher

[9] Although not reported, unadjusted leverage effects yield very similar results.
[10] See Fazzari et al. (1988), Lamont, Polk, and Saaá-Requejo (2001), Almeida, Campello, and Weisbach (2004), Acharya, Almeida, and Campello (2007), and Denis and Sibilkov (2010).

Table 5
The investment-liquidity sensitivity excluding China and Taiwan.
This table reports the results from estimating Equation (1) with two-stage panel regressions with firm fixed effects and year dummies. The variable *q* is instrumented with two lags of *q*'s first difference. In the second column, the table states the expected sign for each independent variable. Two interaction terms, *Liquidity* × *China* and *Liquidity* × *Taiwan*, are included in the estimated equation. China is a dummy variable that takes one if the firm is a Chinese firm and zero otherwise. Similarly, Taiwan is a dummy variable that takes one if the firm is a Taiwanese firm and zero otherwise. Full definitions of the variables appearing in the equation are provided in Table 1. The standard errors are Huber–White corrected for heteroscedasticity and clustered at the firm level. *P*-values of the zero coefficient hypothesis are reported in parentheses for each independent variable. The last two rows report two instrumental variable (IV) tests. The under-identification test (Kleibergan–Paap) tests the null hypothesis that the correlation between the endogenous variable (*q*) and the instruments is zero. The over-identification test (Hansen's J) tests the null hypothesis that the correlation between the instruments and the error terms is zero. The subscripts ***, **, * and ^ refer to the 1%, 5%, 10% and one-sided statistical significance levels, respectively.

Dependent Variable		$CAPX_{t+1}/K_t$		$CAPX_{t+1}/TA_t$	
	E[sign]	Amihud	Turnover	Amihud	Turnover
$Liquidity_t$	+	0.046***	0.026**	0.036***	0.016*
		(0.000)	(0.024)	(0.000)	(0.09)
$Liquidity_t$ x China	?	0.086***	−0.038^	0.017	−0.034^
		(0.000)	(0.125)	(0.222)	(0.116)
Liquidity x Taiwan	?	0.071***	0.095***	0.031**	0.056***
		(0.000)	(0.000)	(0.018)	(0.007)
FCF_{t+1}	+	2.537***	2.505***	2.733***	2.704***
		(0.000)	(0.000)	(0.000)	(0.000)
$Leverage_t$	−	−1.435***	−1.542***	−1.090***	−1.148***
		(0.000)	(0.000)	(0.000)	(0.000)
$Sales_t$	+	0.389***	0.419***	0.531***	0.545***
		(0.000)	(0.000)	(0.000)	(0.000)
$Cash_t$	+	2.374***	2.347***	1.209***	1.206***
		(0.000)	(0.000)	(0.000)	(0.000)
q_t	+	0.282***	0.357***	0.245***	0.292***
		(0.000)	(0.000)	(0.000)	(0.000)
Firm FE		Yes	Yes	Yes	Yes
Year Dummies		Yes	Yes	Yes	Yes
R^2		0.0896	0.0819	0.1065	0.1061
# Firms		6835	6835	6969	6969
# Observations		44073	44073	45553	45553
IV tests					
Kleibergan-Paap		(0.000)	(0.000)	(0.000)	(0.000)
Hansen J		(0.301)	(0.706)	(0.336)	(0.567)

payout ratios. For each year, we rank firms within each country by all positive payout ratios into four quartiles. We define a dummy variable *(High Payout)* that takes one if the firm is in the top payout ratio quartile (i.e., least financially constrained firms) or has a negative payout ratio,[11] and zero otherwise.

The KZ index was introduced by Kaplan and Zingales (1997) and has been used to proxy for financial constraints in related studies.[12] They use the annual reports of constrained firms and construct a scale variable that ranks firms by their financial constraints. They then estimate an ordered logit regression of this scale variable on several firm characteristics.[13] We define a dummy variable *(High KZ)* that takes the value 1 if the firm is in the top KZ index quartile (i.e., the most financially constrained firms) and zero otherwise.

In this section, Equation (1) is modified to include an interaction variable that allows the slope of *Liquidity* to vary across the level of financial constraints. Specifically, the following panel equation is estimated:

$$\frac{I_{i,t+1}}{K_{i,t}} = \alpha_i + \alpha_t + \beta_1\ Liquidity_{i,t} + \ \beta_2\ FC_{i,t} + \ \beta_3\ Liquidity_{i,t} \times FC_{i,t} + \ \beta_4\ \frac{FCF_{i,t+1}}{TA_{i,t}} + \beta_5\ Leverage_{i,t} + \beta_6\ Sales_{i,t} + \ \beta_7\ Cash_{i,t} + \ \beta_8\ q_{i,t} + \varepsilon_{i,t}. \tag{2}$$

FC is the financial constraint indicator that can be *Large Size*, *High Leverage*, *High Payout*, or *High KZ Index*. *FC* is included in this equation as the interaction term ($Liquidity_{i,t} \times FC_{i,t}$) because our financial constraint determinants are potentially time-variant (assigned on an annual basis). Equation (2) is estimated via a two-stage regression with firm and year fixed-effects, and standard errors are made robust by using Huber–White correction and clustering at the firm level. The key estimate is β_3 to test for our second hypothesis. We expect β_3 to be negative for *Large Size* and *High Payout*. This implies that the effect of stock liquidity on future investments is lower in the least financially constrained firms. For *High Leverage* and *High KZ Index*, we expect β_3 to be positive. This, on the other hand, implies that the effect of stock liquidity on future investment is more pronounced in the most financially constrained firms.

[11] A negative payout ratio indicates that the firm pays dividends or repurchases stocks while reporting negative income before extraordinary items.
[12] Lamont et al. (2001), Almeida et al. (2004), and Hennessy and Whited (2007).
[13] Refer to Kaplan and Zingales (1997) for a detailed discussion and the estimated equation.

Table 6
Sub-periods results of the investment-liquidity sensitivity.
This table reports the results from estimating Equation (1) with two-stage panel regressions with firm fixed effects and year dummies. The variable q is instrumented with two lags of q's first difference. In the second column, the table states the expected sign for each independent variable. The intercept, α, is allowed to vary every three years (i.e. four sub-periods). Full definitions of the variables appearing in the equation are provided in Table 1. The standard errors are Huber–White corrected for heteroscedasticity and clustered at the firm level. *P*-values of the zero coefficient hypothesis are reported in parentheses for each independent variable. The last two rows report two instrumental variable (IV) tests. The under-identification test (Kleibergan–Paap) tests the null hypothesis that the correlation between the endogenous variable (q) and the instruments is zero. The over-identification test (Hansen's J) tests the null hypothesis that the correlation between the instruments and the error terms is zero. The subscripts ***, **, * and ^ refer to the 1%, 5%, 10% and one-sided statistical significance levels, respectively.

Dependent Variable		$CAPX_{t+1}/K_t$		$CAPX_{t+1}/TA_t$	
	E[sign]	Amihud	Turnover	Amihud	Turnover
$Liquidity_t$					
(2000–2003)	+	0.062***	0.026	0.032***	0.008
		(0.000)	(0.218)	(0.002)	(0.683)
(2004–2007)	+	0.068***	0.014	0.043***	0.009
		(0.000)	(0.262)	(0.000)	(0.433)
(2008–2011)	+	0.074***	0.050***	0.049***	0.036***
		(0.000)	(0.000)	(0.000)	(0.000)
(2012–2015)	+	0.066***	0.032***	0.039***	0.008
		(0.000)	(0.006)	(0.000)	(0.442)
FCF_{t+1}	+	2.540***	2.508***	2.739***	2.716***
		(0.000)	(0.000)	(0.000)	(0.000)
$Leverage_t$	–	−1.452***	−1.547***	−1.093***	−1.148***
		(0.000)	(0.000)	(0.000)	(0.000)
$Sales_t$	+	0.408***	0.428***	0.537***	0.551***
		(0.000)	(0.000)	(0.000)	(0.000)
$Cash_t$	+	2.337***	2.377***	1.204***	1.228***
		(0.000)	(0.000)	(0.000)	(0.000)
q_t	+	0.283***	0.338***	0.236***	0.268***
		(0.000)	(0.000)	(0.000)	(0.000)
Firm FE		Yes	Yes	Yes	Yes
Year Dummies		Yes	Yes	Yes	Yes
R^2		0.0877	0.0819	0.1091	0.1065
# Firms		6835	6835	6969	6969
# Observations		44073	44073	45553	45553
IV tests					
Kleibergan-Paap		(0.000)	(0.000)	(0.000)	(0.000)
Hansen J		(0.383)	(0.483)	(0.294)	(0.350)

6.2. Results with financial constraints

Table 7 presents the estimation results of Equation (2) based on the two-stage panel regressions with firm fixed-effects, where we include the variable that represents the interaction between liquidity and dummy variables of financial constraint indicators. The variable q is instrumented with two lags of q's first difference. *High Leverage*, *High Payout,* and *High KZ Index* are financial constraint dummies that take the value 1 if the firm is assigned in the top quartile within its country and zero otherwise. The financial constraint index rank is conducted on an annual basis. We include year dummies and dummies for each financial constraint indicator in the regressions to control for the time-variant effects on future investments.

Consistent with the second hypothesis, the coefficient of the interaction term is positive and statistically significant for the highly leveraged firms and firms with high KZ index and negative and statistically significant for firms with high payout ratios. That is, the future investments of highly leveraged firms and firms with high KZ index are more affected by stock liquidity, whereas the future investments of firms with high payout ratios are less affected by stock liquidity. These results provide evidence to the hypothesis that less financially constrained firms have more access to capital and, therefore, their future investments are more likely to depend less on how liquid their stocks are, whereas the effect of stock liquidity on future investments is more prominent in more financially constrained firms.

7. The role of financial development

Although the findings thus far suggest that increases in stock liquidity stimulate firm growth, the country's level of financial development could facilitate or impede the growth process. Following previous studies, we define the financial development indicator as the ratio of the sum of stock market capitalization and total domestic credit to GDP. We obtain data on stock market capitalization, total domestic credit, and GDP from the World Bank. Based on this ratio, we rank countries into three quantiles: Least Developed, Medium Developed, and Most Developed. The ratios range from roughly 55%–777%, where Russia, Peru, and Egypt are considered in the bottom decile and Malaysia, South Africa, and Taiwan are in the top decile.

Table 7

Financial constraints and the investment-liquidity sensitivity.

This table reports the results from estimating Equation (2) with two-stage panel regressions with firm fixed effects and year dummies. The variable *q* is instrumented with two lags of *q*'s first difference. In the second column, the table states the expected sign for each independent variable. *High-level*, *High_Payout,* and *High_KZ* are financial constraint dummies that take one if the firm is assigned in the top quartile within its country and zero otherwise. The financial constraint index rank is conducted on an annual basis. Full definitions of the variables appearing in the equation above are provided in Table 1. Standard errors used are Huber-white corrected for heteroscedasticity and clustered at the firm level. P-values of the zero coefficient hypothesis are reported in parentheses for each independent variable. The last two rows report two instrumental variable (IV) tests. The under-identification test (Kleibergan–Paap) tests the null hypothesis that the correlation between the endogenous variable (*q*) and the instruments is zero. The over-identification test (Hansen's J) tests the null hypothesis that the correlation between the instruments and the error terms is zero. The subscripts ***, **, * and ˆ refer to the 1%, 5%, 10% and one-sided statistical significance levels, respectively.

Dep. Variable		$CAPX_{t+1}/K_t$						$CAPX_{t+1}/TA_t$					
	E[S]	Amihud			Turnover			Amihud			Turnover		
$Liquidity_t$	+	0.067***	0.070***	0.063***	0.032***	0.044***	0.028***	0.040***	0.044***	0.037***	0.017***	0.026***	0.012ˆ
		(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.006)	(0.000)	(0.000)	(0.000)	(0.049)	(0.002)	(0.167)
$Liquidity_t$ x $High\_Lev_t$	+	0.011*			0.023*			0.012**			0.019*		
		(0.075)			(0.054)			(0.025)			(0.076)		
$Liquidity_t$ x $High\_Payout_t$	–		−0.011**			−0.047***			−0.007*			−0.031***	
			(0.018)			(0.000)			(0.098)			(0.000)	
$Liquidity_t$ x $High\_KZ_t$	+			0.013**			0.029**			0.015***			0.030***
				(0.018)			(0.017)			(0.002)			(0.004)
Controls		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dums		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2		0.0876	0.0924	0.0882	0.0813	0.0869	0.0821	0.1091	0.111	0.11	0.1061	0.1086	0.1072
# Firms		6834	6834	6834	6834	6834	6834	6969	6969	6969	6969	6969	6969
# Obs		44070	44070	44070	44070	44070	44070	45550	45550	45550	45550	45550	45550
IV tests													
Kleibergan-Paap		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Hansen J		(0.436)	(0.590)	(0.439)	(0.607)	(0.812)	(0.597)	(0.363)	(0.469)	(0.184)	(0.490)	(0.641)	(0.256)

To examine our third hypothesis, we modify Equation (1) to include an interaction variable that allows the slope of *Liquidity* to vary across the level of financial development. The phases of financial developments within these emerging markets are categorized as least developed, medium developed, and most developed. Specifically, the following panel regression is estimated:

$$\frac{I_{i,t+1}}{K_{i,t}} = \alpha_i + \alpha_t + \beta_1 \ Liquidity_{i,t} + \ \beta_2 \ Liquidity_{i,t} \times Bot_{FD_c} + \beta_3 \ Liquidity_{i,t} \times Top_{FD_c} + \ \beta_4 \ \frac{FCF_{i,t+1}}{TA_{i,t}} + \beta_5 \ Leverage_{i,t} + \beta_6 \ Sales_{i,t} + \ \beta_7 \ Cash_{i,t} + \ \beta_8 \ q_{i,t} + \varepsilon_{i,t}. \tag{3}$$

Bot_FD is a dummy variable at the country-level that takes the value 1 if the firm is operating in a country that is in the Least Developed rank and zero otherwise. Similarly, *Top_FD* is a dummy variable at the country-level that takes the value 1 if the firm is operating in a country that is in the Most Developed rank and zero otherwise. We obtain the slopes for each rank as follows:

- Least Developed = $\beta_1 + \beta_2$
- Medium Developed = β_1
- Most Developed = $\beta_1 + \beta_3$

Table 8 shows the results from the estimation of Equation (3) with two-stage panel regressions with firm fixed-effects and year dummies. The variable *q* is instrumented with two lags of *q*'s first difference. The financial development indicator is defined as the ratio of the sum of stock market capitalization and total domestic credit to GDP. The *p*-values of the jointly estimated coefficient of *Liquidity* for each rank are reported. The difference between the coefficients of *Liquidity* for the Most Developed and Least Developed ranks is reported with the *p*-values of the zero-difference null hypothesis. We find that the difference is statistically significant for all estimation

Table 8
The investment-liquidity sensitivity and financial market development.
This table reports the results from estimating Equation (3) with two-stage panel regressions with firm fixed effects and year dummies. The variable q is instrumented with two lags of q's first difference. In the second column, the table states the expected sign for each independent variable. Based on the financial development indicator, countries are ranked into three quantiles, Least Developed, Medium Developed, and Most Developed. The financial development indicator is defined as the ratio of the sum of stock market capitalization and total domestic credit to GDP. For each rank, the jointly estimated coefficient of $Liquidity_t$ and its p-value are reported. The difference between the coefficients of $Liquidity_t$ for the Most Developed rank and the Least Developed rank is reported with the p-values of the zero-difference null hypothesis. Full definitions of the variables appearing in the equation are provided in Table 1. The standard errors are Huber–White corrected for heteroscedasticity and clustered at the firm level. P-values of the zero coefficient hypothesis are reported in parentheses for each independent variable. The last two rows report two instrumental variable (IV) tests. The under-identification test (Kleibergan–Paap) tests the null hypothesis that the correlation between the endogenous variable (q) and the instruments is zero. The over-identification test (Hansen's J) tests the null hypothesis that the correlation between the instruments and the error terms is zero. The subscripts ***, **, * and ^ refer to the 1%, 5%, 10% and one-sided statistical significance levels, respectively..

Dependent Variable		$CAPX_{t+1}/K_t$		$CAPX_{t+1}/TA_t$	
	E[sign]	Amihud	Turnover	Amihud	Turnover
$Liquidity_t$					
Least Developed	+	0.039**	−0.029	0.032**	−0.040*
		(0.028)	(0.238)	(0.022)	(0.052)
Med. Developed	+	0.029**	0.029^	0.036***	0.033**
		(0.017)	(0.133)	(0.001)	(0.049)
Most Developed	+	0.090***	0.050***	0.048***	0.027***
		(0.000)	(0.000)	(0.000)	(0.008)
Most *minus* Least	+	0.051***	0.079***	0.016	0.067***
		(0.007)	(0.004)	(0.271)	(0.004)
FCF_{t+1}	+	2.532***	2.531***	2.727***	2.700***
		(0.000)	(0.000)	(0.000)	(0.000)
$Leverage_t$	–	−1.452***	−1.506***	−1.094***	−1.154***
		(0.000)	(0.000)	(0.000)	(0.000)
$Sales_t$	+	0.402***	0.424***	0.537***	0.550***
		(0.000)	(0.000)	(0.000)	(0.000)
$Cash_t$	+	2.345***	2.381***	1.208***	1.226***
		(0.000)	(0.000)	(0.000)	(0.000)
q_t	+	0.292***	0.348***	0.248***	0.285***
		(0.000)	(0.000)	(0.000)	(0.000)
Firm FE		Yes	Yes	Yes	Yes
Year Dummies		Yes	Yes	Yes	Yes
R^2		0.0885	0.0815	0.1087	0.1039
# Firms		6835	6835	6969	6948
# Observations		44073	44073	45553	45337
IV tests					
Kleibergan-Paap		(0.000)	(0.000)	(0.000)	(0.000)
Hansen J		(0.329)	(0.624)	(0.347)	(0.637)

methods and conclude that it is consistent with our third hypothesis: the effect of stock liquidity on corporate investments is influenced by the level of financial development. That is, as we move from the least developed financial systems in these emerging markets to the most developed financial systems, the coefficient of stock liquidity increases and, hence, potential future investment is enhanced.

8. Conclusion

In this study, we investigate the relationship between stock liquidity and future investment decisions. We hypothesize that investment growth is influenced by the potential reduction in the cost of equity as a result of increases in stock liquidity. In addition, we shed light on the impact of financial constraints and the country-level of financial development on the liquidity–future investment relationship. We argue that the effect of stock liquidity on future investments is more pronounced in more financially constrained firms due to their limited access to other external capital. In addition, we argue that weaker financial development may impede the ability to mobilize capital from various agents to profitable investments and, hence, will undermine the effect of stock liquidity on future investments.

Using a sample of a large number of firms from 21 emerging markets for the period 2000–2015, we find robust evidence supporting our three hypotheses. Our findings are robust when using alternative measures of investments and liquidity, alternative model specifications, and controlling for time and country effects. In addition to finding a positive relationship between stock liquidity and future investments, our findings strongly suggest that the liquidity effect on future investments is more prominent in more financially constrained firms, even when using the leverage ratio, the payout ratio, and the KZ index as alternative determinants of financial constraints. Finally, we show that firms operating in countries with stronger financial development tend to be more sensitive to changes in stock liquidity.

These findings have implications for both managers and policymakers. For managers seeking growth, our findings indicate how important it is to boost liquidity through strategies such as splits, cross-listing, meeting index criteria, etc. In addition, our findings suggest that more financially constrained stocks benefit more from stock liquidity increases; thus, firms with more financial constraints should be encouraged to find ways to boost their stock liquidity to achieve growth objectives. Similarly, policymakers in relatively less liquid markets, including emerging markets, should realize the importance of finding ways to enhance the aggregate liquidity to help stimulate growth in the capital market, especially for low-growth firms whose growth is essentially constrained by limited access to capital. Policymakers could pursue liquidity-enhancing strategies to achieve policy objectives such as liberalization or an open capital market for foreign investors, and relaxing regulations for market entry.

Acknowledgment

The authors extend their appreciation to the Deanship of Scientific Research at King Saud University, Saudi Arabia for funding this work through Thesis Publication Fund No. TPF-004.

Appendix A

Table A1
Cross sectional regressions of future investments scaled by capital.
This table reports the average estimates along with the means and medians of R^2 across years from annual cross-sectional regressions of Equation (1). The dependent variable is a firm's capital expenditure at time t+1 or t+2 scaled by capital at time t. For each model, the table reports the minimum, maximum, and unique number of firms included in the estimation. In the second column, the table states the expected sign for each independent variable. In addition, it reports the number of statistically significant (in parentheses) coefficients and their expected signs across equations for each independent variable. Full definitions of the variables appearing in the equation above are provided in Table 1 Panel A. Country dummies are also included in each of the cross-sectional regressions. The p-values of the zero mean t-test are reported in parentheses. The subscripts *, ** and *** refer to the 1%, 5% and 10% statistical significance levels, respectively.

Dependent Variable		$CAPX_{t+j}/K_t$			
	E[sign]	Amihud		Turnover	
		j = 1	j = 2	j = 1	j = 2
$Liquidity_t$	+	0.075***	0.073***	0.085***	0.077***
		(0.000)	(0.000)	(0.000)	(0.000)
# >0 (# sig)		15(15)	14(14)	15(15)	14(13)
FCF_{t+j}	+	3.757***	4.171***	4.006***	4.319***
		(0.000)	(0.000)	(0.000)	(0.000)
# >0 (# sig)		15(15)	14(14)	15(15)	14(14)
$Leverage_t$	−	−0.602***	−0.674***	−0.661***	−0.732***
		(0.000)	(0.000)	(0.000)	(0.000)
# <0 (# sig)		15(12)	14(10)	15(9)	14(10)
$Sales_t$	+	0.797***	0.872***	0.756***	0.837***
		(0.000)	(0.000)	(0.000)	(0.000)
# >0 (# sig)		15(15)	14(14)	15(15)	14(14)
$Cash_t$	+	3.188***	3.146***	3.220***	3.171***

(continued on next page)

Table A1 (*continued*)

Dependent Variable		$CAPX_{t+j}/K_t$			
	E[sign]	Amihud		Turnover	
		j = 1	j = 2	j = 1	j = 2
		(0.000)	(0.000)	(0.000)	(0.000)
# >0 (# sig)		15(15)	14(14)	15(15)	14(14)
q_t	+	−0.018	−0.011	0.045***	0.053***
		(0.192)	(0.484)	(0.000)	(0.000)
# >0 (# sig)		5(4)	7(3)	14(5)	13(6)
Country Dummies		Yes	Yes	Yes	Yes
R^2	*Mean*	0.223	0.238	0.214	0.229
	Median	0.231	0.241	0.217	0.230
# Years (Eqs)		15	14	15	14
# Firms	*Min*	1527	1516	1534	1522
	Max	6055	5651	6059	5652
	Unique	9721	9131	9731	9138

Table A2
Cross sectional regressions of future investments scaled by total assets.
This table is similar to Table 3. The dependent variable (*I*) is now the firm's capital expenditure at time *t*+1 or *t*+2 scaled by total assets (TA) at time *t*.

Dependent Variable		$CAPX_{t+j}/TA_t$			
	E[sign]	Amihud		Turnover	
		j = 1	j = 2	j = 1	j = 2
$Liquidity_t$	+	0.067***	0.068***	0.032***	0.027***
		(0.000)	(0.000)	(0.000)	(0.002)
# >0 (# sig)		15(15)	14(14)	15(8)	12(6)
FCF_{t+j}	+	4.897***	4.890***	5.102***	5.005***
		(0.000)	(0.000)	(0.000)	(0.000)
# >0 (# sig)		15(15)	14(14)	15(15)	14(14)
$Leverage_t$	–	−0.693***	−0.772***	−0.707***	−0.785***
		(0.000)	(0.000)	(0.000)	(0.000)
# <0 (# sig)		15(14)	14(14)	15(13)	14(14)
$Sales_t$	+	0.255**	0.331***	0.211*	0.294***
		(0.022)	(0.003)	(0.051)	(0.008)
# >0 (# sig)		12(8)	12(9)	8(8)	11(9)
$Cash_t$	+	0.052	0.021	0.119	0.092
		(0.807)	(0.912)	(0.594)	(0.638)
# >0 (# sig)		5(6)	4(7)	5(6)	5(5)
q_t	+	−0.032**	−0.019	0.021*	0.038***
		(0.027)	(0.217)	(0.070)	(0.002)
# >0 (# sig)		4(6)	5(2)	11(3)	13(5)
Country Dummies		Yes	Yes	Yes	Yes
R^2	*Mean*	0.209	0.231	0.197	0.220
	Median	0.221	0.254	0.203	0.235
# Years (Eqs)		15	14	15	14
# Firms	*Min*	1587	1628	1594	1635
	Max	6460	5885	6464	5886
	Unique	9898	9341	9909	9349

References

Acharya, V. V., Almeida, H., & Campello, M. (2007). Is cash negative debt? A hedging perspective on corporate financial policies. *Journal of Financial Intermediation, 16*(4), 515–554.

Almeida, H., Campello, M., & Galvao, A. F. (2010). Measurement errors in investment equations. *Review of Financial Studies, 23*, 3279–3328.

Almeida, H., Campello, M., & Weisbach, M. S. (2004). The cash flow sensitivity of cash. *The Journal of Finance, 59*, 1777–1804.

Amihud, Y. (2002). Illiquidity and stock returns: Cross-section and time-series effects. *Journal of Financial Markets, 5*, 31–56.

Amihud, Y., Hameed, A., Kang, W., & Zhang, H. (2015). The illiquidity premium: International evidence. *Journal of Financial Economics, 117*, 350–368.

Amihud, Y., & Mendelson, H. (1986). Asset pricing and the bid–ask spread. *Journal of Financial Economics, 17*, 223–249.

Bai, M., & Qin, Y. (2015). Commonality in liquidity in emerging markets: Another supply-side explanation. *International Review of Economics & Finance, 39*, 90–106.

Banerjee, S., Gatchev, V. A., & Spindt, P. A. (2007). Stock market liquidity and firm dividend policy. *Journal of Financial and Quantitative Analysis, 42*, 369–397.
Becker-Blease, J. R., & Paul, D. L. (2006). Stock liquidity and investment opportunities: Evidence from index additions. *Financial Management, 35*, 35–51.
Bond, S., & Van Reenen, J. (2008). Microeconometrics models of investment and employment. In *Chapter 65 in handbook of econometrics, 6A* pp. 4417–4498). Amsterdam: Elsevier.
Brockman, P., Howe, J. S., & Mortal, S. (2008). Stock market liquidity and the decision to repurchase. *Journal of Corporate Finance, 14*, 446–459.
Denis, D. J., & Sibilkov, V. (2010). Financial constraints, investment, and the value of cash holdings. *Review of Financial Studies, 23*, 247–269.
Fazzari, S. M., Hubbard, R. G., Petersen, B. C., Blinder, A. S., & Poterba, J. M. (1988). Financing constraints and corporate investment. *Brookings Papers on Economic Activity*, 141–206.
Greenaway, D., Guariglia, A., & Kneller, R. (2007). Financial factors and exporting decisions. *Journal of International Economics, 73*, 377–395.
Gregoriou, A., & Nguyen, N. D. (2010). Stock liquidity and investment opportunities: New evidence from FTSE 100 index deletions. *Journal of International Financial Markets, Institutions and Money, 20*, 267–274.
Hail, L., & Leuz, C. (2009). Cost of capital effects and changes in growth expectations around US cross-listings. *Journal of Financial Economics, 93*, 428–454.
Hennessy, C. A., & Whited, T. M. (2007). How costly is external financing? Evidence from a structural estimation. *The Journal of Finance, 62*, 1705–1745.
Hoshi, T., Kashyap, A., & Scharfstein, D. (1991). Corporate structure, liquidity, and investment: Evidence from Japanese industrial groups. *Quarterly Journal of Economics, 106*(1), 33–60.
Hovakimian, G. (2009). Determinants of investment cash flow sensitivity. *Financial Management, 38*, 161–183.
Jiang, F., Ma, Y., & Shi, B. (2017). Stock liquidity and dividend payouts. *Journal of Corporate Finance, 42*, 295–314.
Kaplan, S. N., & Zingales, L. (1997). Do investment–cash flow sensitivities provide useful measures of financing constraints? *Quarterly Journal of Economics, 112*(1), 169–215.
Karolyi, G. A., Lee, K. H., & Van Dijk, M. A. (2012). Understanding commonality in liquidity around the world. *Journal of Financial Economics, 105*, 82–112.
Lamont, O., Polk, C., & Saaá-Requejo, J. (2001). Financial constraints and stock returns. *Review of Financial Studies, 14*, 529–554.
Lang, L., Ofek, E., & Stulz, R. M. (1996). Leverage, investment, and firm growth. *Journal of Financial Economics, 40*, 3–29.
Levine, R. (1997). Financial development and economic growth: Views and agenda ". *Journal of Economic Literature, 35*.
Lins, K. V., Strickland, D., & Zenner, M. (2005). Do non-US firms issue equity on US stock exchanges to relax capital constraints? *Journal of Financial and Quantitative Analysis, 40*, 109–133.
Lipson, M. L., & Mortal, S. (2009). Liquidity and capital structure. *Journal of Financial Markets, 12*, 611–644.
Love, I. (2003). Financial development and financing constraints: International evidence from the structural investment model. *Review of Financial Studies, 16*, 765–791.
Malmendier, U., & Tate, G. (2005). CEO overconfidence and corporate investment. *The Journal of Finance, 60*, 2661–2700.
Mazouz, K., Daya, W., & Yin, S. (2014). Index revisions, systematic liquidity risk and the cost of equity capital. *Journal of International Financial Markets, Institutions and Money, 33*, 283–298.
Morck, R., Yeung, B., & Yu, W. (2000). The information content of stock markets: Why do emerging markets have synchronous stock price movements? *Journal of Financial Economics, 58*(1), 215–260.
Muñoz, F. (2013). Liquidity and firm investment: Evidence for Latin America. *Journal of Empirical Finance, 20*, 18–29.
Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics, 13*(2), 187–221.
Orihara, M. (2017). Stock market listing and corporate policy: Evidence from reforms to Japanese corporate law. *Pacific-Basin Finance Journal, 43*, 15–36.