Full Title: **Stock Liquidity and Firm Value: Nonlinearity, Corporate Political Connections and Investor Heterogeneity**

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JEL Classifications: G10; G32; G38

Keywords: Stock liquidity; Firm value; Nonlinearity; Political connections; Investor heterogeneity; Malaysia

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Abstract

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1. Introduction

In a series of papers, Amihud and Mendelson (1988, 1991, 2000, 2008) advocate that firms can and should actively pursue corporate policies aimed at increasing the liquidity of their publicly traded shares. The incentive is that improved liquidity leads to lower cost of equity capital and higher stock price, hence increasing the market value of the firm. Additional benefits of liquidity enhancement have been reported in the academic literature, such as better corporate governance (Edmans *et al*., 2013; Norli *et al*., 2015), more informative stock prices (Chordia *et al*., 2008; Chung and Hrazdil, 2010), higher managerial pay-for-performance sensitivity to stock prices (Jayaraman and Milbourn, 2012) and lower corporate bankruptcy risk (Brogaard *et al*., 2017). Contrary to the popular view that firms care less about liquidity after their public listings and leave the task to stock exchange regulators, Dass *et al*. (2013) find that innovative firms do take specific steps to make their stocks more liquid, such as providing more frequent managerial guidance for future earnings, conducting stock splits, and making seasoned equity offerings. Amidst widespread analyst coverage terminations, Balakrishman *et al*. (2014) report that corporate managers deliberately seek to boost liquidity through the alternative means of voluntarily disclosing more information than mandated by legislation. The literature also documents that significant amounts of managerial time have been devoted to managing investor relations with the objective of increasing firms' visibility and liquidity (Brennan and Tamarowski, 2000; Bushee and Miller, 2012; Karolyi and Liao, 2017).

Despite theoretical predictions and the repeated calls for liquidity management, the first evidence supporting the firm value benefit of stock liquidity is only provided by the pioneering empirical work of Fang *et al*. (2009). Using U.S. stocks, these authors establish the positive causal effect of stock liquidity on Tobin's *Q*. Subsequent delineation analyses show that it operates through the channels of informative stock prices and stock-based managerial compensation. Sampling international firms from 41 countries over the period 1996-2010, Huang *et al*. (2014) confirm the positive relationship between stock liquidity and firm value across countries in their pooled analysis and within 36-40 countries in country-specific regressions. The value gains from improved stock liquidity are greater in countries with stronger investor protection, operating through its effect on the future growth of operating earnings rather than the cost of equity capital. Further conditions that strengthen the liquidity-firm value relationship have been documented for firms in the real estate investment trust industry (Cheung *et al*., 2015), firms with large blockholdings (Bharath *et al*., 2013), and innovative firms with stronger equity-based managerial incentive contracts (Dass *et al*., 2013). For single-country studies, Li *et al*. (2012) report evidence supporting corporate governance as the channel through which liquidity improves the valuation of Russian firms, while Nguyen *et al*. (2016) find that the higher valuations for liquid Australian stocks are driven mainly by enhanced stock prices.

Given the conclusive empirical evidence on the value gains from higher stock liquidity, one might wonder why all firms do not pursue liquidity-increasing policies. The monotonic positive relationship between liquidity and firm value reported in all the above-cited studies implies the absence of an upper bound on the benefits that firms can derive from their deliberate strategies. In practice, maintaining liquidity is not a costless effort, and thus corporate managers must often weigh the tradeoff between potential costs and the well-reported valuation premium. For instance, Amihud and Mendelson (2000, 2008) highlight the direct costs incurred when providing more information to investors and expanding the investor base, and their indirect effects on firms' competitive advantage and agency costs, respectively. On the other hand, Fang *et al*. (2014) find that higher liquidity exposes firms to a greater risk of hostile takeover and impedes their innovation productivity, while Chang *et al*. (2017) show that liquid firms are vulnerable to higher stock price crash risk due to managerial bad news hoarding. There is also evidence that higher liquidity is harmful for corporate governance (Roosenboom *et al*., 2014; Back *et al*., 2015). It is thus reasonable to expect an optimal or value-maximizing level of liquidity in which the marginal cost is equal to the marginal benefit (see Dass *et al*., 2013).

Returning to the liquidity-firm value relationship, the possibility of a threshold level has been completely ignored by previous empirical studies, including the pioneering work of Fang *et al*. (2009). Although these authors outline five positive channels (liquidity premium, sentiment, positive feedback, pay-for-performance sensitivity and blockholder intervention), they also highlight two negative mechanisms (activist exit and negative feedback) through which liquidity might reduce firm value. While the negative channels might not be dominant in U.S. markets, the same cannot be expected for emerging stock exchanges due to differences in institutional setting, level of information efficiency, ownership structure, shareholder activism and investor sophistication. Ignoring the dynamic interplays among the competing channels is likely to yield incorrect inferences as the relationship might change due to the dominance of opposing effects at different levels of liquidity. To reiterate the importance of functional form, we draw from the rich literature of managerial ownership-firm value, in which the pioneering theoretical work of Jensen and Meckling (1976) predicts a positive and linear relationship because higher managerial ownership better aligns managers' incentives with those of outside shareholders and thus reduces agency costs. This uniformly positive association is later challenged theoretically by Stulz (1988) and empirically by Morck *et al*. (1988), who argue that firm value tends to fall when the equity stakes of managers grow larger as they are more likely to entrench themselves. Subsequent empirical studies generally support the existence of threshold levels in the relationship between managerial ownership and firm value, and fitting a nonlinear model is now the standard practice in ownership research given the tradeoff between the countervailing forces of positive incentive alignment and negative managerial entrenchment (see the survey paper by Chen *et al*., 2004). In stark comparison, the liquidity-firm value literature does not generate a similar level of enthusiasm among researchers, partly because the favorable empirical results are consistent with theoretical prediction and conventional wisdom.

This study re-examines whether the previous consensus of a positive linear relationship between liquidity and firm value prevails in the emerging stock market of Malaysia, Bursa Malaysia.[1] This is pertinent given its profound implications to stock exchange regulators and public listed firms in managing market-wide and firm liquidity, respectively. Apart from data accessibility and the literature gap, we argue that Malaysia presents an ideal testing ground based on four observations, which we further elaborate in Section 2. First, the positive channels driving the liquidity-firm value relationship in Fang *et al*. (2009), informative stock prices and equity-based managerial incentives, might not be dominant in emerging markets. Second, the negative channel

[1] Our investigation is also motivated by Yung and Jian (2017) who re-examine the relationship between shareholder base, which has been found to be positively correlated with liquidity, and firm value. In a seminal paper, Merton (1987) shows theoretically that a larger shareholder base is associated with higher firm value. His theoretical prediction receives wide empirical support, largely from U.S. studies. In spite of this, Yung and Jian (2017) argue that the value benefit of a larger shareholder base might not prevail in emerging markets like China due to institutional heterogeneity such as ownership concentration, weak investor protection and poor corporate governance. Indeed, contrary to the evidence based on U.S. firms, these authors find a negative relationship between shareholder base and the valuation of Chinese firms which they attribute to elevated agency conflicts between the controlling shareholders and dispersed small investors.

of liquidity-induced blockholders exit might be stronger in Malaysia as the anecdotal evidence suggests the large withdrawals of foreign investors from the local bourse are often facilitated by the readiness of state-backed institutions to supply liquidity. Third, Malaysia presents a unique corporate landscape in which business, ethnicity and politics are closely linked. The entrenched culture of state patronage in business allows us to explore the moderating role of political connections on the liquidity-firm value relationship, an issue unexplored in the extant literature. Fourth, the complete ownership dataset for all publicly listed firms assembled by Bursa Malaysia, which is not available in companies' annual reports or commercial databases, sheds further insight on the mechanisms linking liquidity to firm value.

In our empirical analyses, we collect data for all non-financial firms traded on Bursa Malaysia over the sample period of 2000-2015. The baseline quadratic model regresses Tobin's *Q* against "Closing Percent Quoted Spread" (*CPQS*) and a set of standard control variables. We find evidence of a nonlinear relationship between liquidity and firm value, with the U-shaped curve suggesting stocks must be traded at a higher level of liquidity before reaping the benefit of larger firm value. The empirical results also reiterate the importance of functional form, showing that a linear model might yield incorrect inferences when the relationship is driven by competing channels with opposing effects. Our key finding of a nonlinear relationship passes a series of robustness checks – alternative liquidity measures of price impact, alternative estimators (Fama-MacBeth two-step regression and quantile regression), formal statistical test for U-shape, excluding the crisis years of 2008-2009, industry-specific regressions, and endogeneity tests (lagged explanatory variables, change-in-variable regression, firm fixed effects and two-step system GMM). The use of lot size reduction for Malaysian stocks in May 2003 as exogenous liquidity shock establish the causal effect from liquidity to firm value. Further interaction analyses uncover three important moderating variables in the liquidity-firm value relationship, namely, political connections, foreign nominee ownership and foreign institutional ownership. These new findings provide indirect evidence of the mechanisms linking liquidity to firm value, which we hypothesize operate through the channels of cost of capital, stock price informativeness and corporate governance. While we do not expect our findings to be generalizable to developed mature markets, the possibility of a nonlinear relationship in other emerging markets with similar institutional and market features cannot be ruled out but such empirical verification will be left for future studies.

The remainder of the paper is structured as follows. Section 2 formulates the four hypotheses to be tested in this empirical study. The variables and model specification are presented in Section 3, whereas the subsequent section describes the sample selection process and provides preliminary overview of the sample data. We discuss and interpret the key findings drawn from the baseline quadratic model in Section 5. Further interaction analyses on the moderating variables are conducted in Section 6. Concluding remarks are given in the final section.

2. Development of Hypotheses

This section discusses the existing empirical literature and unique Malaysian corporate landscape that provides the basis for our hypotheses, and thus the re-examination of the prevailing positive linear relationship between liquidity and firm value.

2.1 The nonlinear relationship between liquidity and firm value

Fang *et al*. (2009) provide the first empirical evidence supporting the firm value benefit of stock liquidity using data from U.S. stock markets. Their pioneering work lays out five possible theoretical channels through which liquidity might improve firm value, namely liquidity premium, sentiment, positive feedback, pay-for-performance sensitivity and blockholder intervention. However, these authors also highlight the possibility of a negative relationship between liquidity and firm value due to activist exit and negative stock price feedback effect. Through extensive analyses, they find that the positive causal effect of stock liquidity on Tobin's *Q* operates through the channels of informative stock prices and stock-based managerial compensation. Their findings have subsequently received wide empirical support.

We re-examine whether the previous consensus of a positive linear relationship between liquidity and firm value prevails in Bursa Malaysia. Apart from data accessibility and the literature gap, Malaysia nevertheless presents a fruitful avenue for research. First, the two channels that drive the positive liquidity and firm value relationship in Fang *et al*. (2009), informative stock prices and equity-based managerial incentives, might not be dominant in emerging markets such as Malaysia. Existing empirical evidence shows that emerging market firms generally have lower levels of information efficiency than their developed counterparts (see Morck *et al*., 2000; Griffin *et al*., 2010; Lim and Brooks, 2010). In the case of Malaysia, Lim *et al*. (2016)

find that the lower information efficiency is largely attributed to thin trading, illiquidity and the failure of key market participants (security analysts and local institutions) in performing their information roles. The task of improving the efficiency of the local bourse has been solely undertaken by foreign investors through their skilled processing of public information. On the other hand, although the granting of equity-based incentives in Malaysian public listed firms can be traced back to the early 1990s, they are largely allocated to non-executive employees (see Ismail, 2014). In contrast, executive stock options are not widely included as components of total managerial compensation in the local corporate environment, and the limited empirical studies provide conflicting evidence of their value-enhancing benefit (Ismail, 2014; Ibrahimy and Ahmad, 2016).

Second, the negative channel of activist exit in the liquidity-firm value relationship might be stronger in the context of Malaysia. Coffee (1991) and Bhide (1993) argue that higher liquidity reduces the costs of exit and thus deters monitoring incentives, which encourages large shareholders to vote with their feet when firm performance is unsatisfactory. In an exclusive study of the Malaysian stock market, Liew *et al*. (2018) find that the readiness of local state-backed institutions to supply liquidity facilitates the large withdrawals of foreign investors from the local bourse since June 2013.[2] These authors further document a one-way causality from aggregate liquidity to the total sales of local stocks by foreign investors, strengthening our conjecture that the negative effect of liquidity-induced blockholders exit might be a dominant force, especially at a higher level of liquidity. Third, although the performance of Malaysian public listed firms has been widely researched, their liquidity has been severely understudied as highlighted by Lim *et al*. (2017), and no Malaysian studies have been published on the relationship between liquidity and firm value.[3]

Given the above considerations, we thus test the following hypothesis in alternative form:

H_1: There is a nonlinear relationship between stock liquidity and firm value.

[2] Using portfolio flows data provided by Bursa Malaysia, Liew *et al*. (2018) report that foreign investors had been accumulating their holdings of Malaysian stocks since October 2009. The trend was reversed following the "taper tantrum", however, with a net sale of foreign investors in the local bourse amounting to RM45.8 billion over the period June 2013– December 2016.

[3] The only exception is the cross-country study by Huang *et al*. (2014), who also estimate regression for each of the 41 countries in their sample, including Malaysia. The country-specific regression reveals a positive relationship between liquidity and firm value for Malaysian stocks, but their fitted linear model ignores the possibility of a threshold liquidity level.

2.2 The moderating role of political connection on liquidity-firm value relationship

Our choice of Malaysia is also motivated by the unique corporate landscape in which business, ethnicity and politics are closely linked (see Gomez and Jomo, 1997; Gomez, 2004; Gomez and Saravanamuttu, 2013; Gomez *et al*., 2018). The intertwining of politics and business is rooted in the National Economic Policy (NEP), a 20-year national development policy instituted after Malaysia's 1969 race riots to address inter-ethnic socio-economic imbalances. More specifically, to more equitably redistribute wealth that was concentrated in the hands of minority ethnic Chinese, the government strived to achieve 30% corporate equity ownership by Bumiputeras (literally "sons of the soil") through affirmative action and various redistribution policies. This NEP model of state-led development to promote Bumiputera capitalism opens the door for extensive government intervention in the allocation of public investment resources to preferentially selected firms. While relationship-based capitalism is well entrenched in the economies of East Asia (see Rajan and Zingales, 1998), Gomez and Jomo (1997) is perhaps the first published study to systematically trace the close personal friendships between big business owners and top politicians prior to the outbreak of the 1997 Asian financial crisis, and their list of patronized corporations has been widely used to examine the economic consequences of political connections using Malaysia as the laboratory (earlier studies include Johnson and Mitton, 2003; Fraser *et al*., 2006; Gul, 2006).[4] This dataset of Gomez and Jomo (1997) has generally outlived its usefulness, however, mainly because the three dominant political figures were no longer in the Malaysian government during our sample period.[5] While some of these established connections may have disappeared, newly forged political ties are documented by Fung *et al*. (2015), Wong (2016) and Tee *et al*. (2017), suggesting politics continues to be a unique feature of corporate Malaysia.

[4] The literature subsequently experiences a phenomenal growth, especially after Faccio (2006) compiles an extensive database of 541 firms with political ties in 35 countries. While her international sample shows political connection is a worldwide phenomenon, Malaysia stands out with the second highest number of connected firms, accounting for 28.24% of the country's total stock market capitalization.

[5] The dataset of Gomez and Jomo (1997) traces the firms' close relationships with three key political figures since the early 1990s–then-Prime Minister Mahathir Mohamad, then-Deputy Prime Minister Anwar Ibrahim and Daim Zainuddin. After 22 years in power, Mahathir Mohamad handed over the premiership to Abdullah Badawi in October 2003, whereas Najib Razak took over the national leadership in April 2009. All three prime ministers came from the same political party, the United Malay National Organization (UMNO), which is the backbone of the coalition government that has ruled Malaysia since independence in 1957. Anwar Ibrahim was removed from the Malaysian cabinet and expelled from UMNO in September 1998, and subsequently convicted of corruption and jailed for six years. Daim Zainuddin, a former Finance Minister from July 1984–March 1991, was reappointed to the same portfolio in January 1999 but retired completely from public service in May 2001.

There is abundant empirical evidence that political connections exert significance influence on firm value, but the exact effect is ambiguous. On the one hand, the market valuation of firms increases because of the close ties forged with politicians or political parties in power (Johnson and Mitton, 2003; Faccio 2006; Goldman *et al*., 2009). Much of this value gain comes from preferential access to credit (Khwaja and Mian, 2005; Charumilind *et al*., 2006), lower cost of capital (Boubakri *et al*., 2012; Houston *et al*., 2014), higher likelihood of government bailouts (Faccio *et al*., 2006; Blau *et al*., 2013), and lucrative government contracts (Duchin and Sosyura, 2012; Goldman *et al*., 2013). In contrast, political patronage can be detrimental to firm value due to rent-seeking and tunneling activities (Cheung *et al*., 2010; Ma *et al*., 2013; Habib *et al*., 2017), opportunistic earnings management (Ramanna and Roychowdhury, 2010; Braam *et al*., 2015; Habib *et al*., 2017), and lower investment efficiency (Chen *et al*., 2011). Given the opposing effects of helping versus grabbing hands, it is not surprising that Chen *et al*. (2017) find a nonlinear relationship between the strength of political links and firm value.

In the existing Malaysian studies, political connections are a crucial element in the local corporate landscape, serving as an important moderator in the relationship of corporate governance-audit fees (Bliss *et al*., 2011), ethnic diversity-firm value (Gul *et al*., 2016) and foreign institutional ownership-audit fees (Tee *et al*., 2017). We instead hypothesize that political connections are likely to moderate the relationship between liquidity and firm value. In the theoretical model of Amihud and Mendelson (2000), cost of capital is the key channel linking liquidity and firm value, where the liquidity route to lower cost of capital increases firm value. Empirically, there is evidence that political connections influence such key channel. For instance, the cross-country study by Boubakri *et al*. (2012) finds that investors require a lower cost of equity for firms with strong political ties because the latter are perceived to be less risky due to implicit government guarantees, especially during economic recessions. Using U.S. data, Houston *et al*. (2014) report a lower cost of bank loans for politically connected firms because lenders perceive them as having high creditworthiness.

Given the unique corporate landscape of Malaysia, we test the following hypothesis in alternative form:

> H_2: Firms with political connections require higher level of liquidity than non-politically connected firms in order to reap the benefit of larger firm value.

2.3 The moderating role of investor groups on liquidity-firm value relationship

One important channel that might shape the stock liquidity-firm value relationship is the informativeness of stock prices, given the possibility of feedback effects from stock prices to firms' real investment decisions. Several strands of literature support this price efficiency channel. First, existing theoretical and empirical papers establish a significant link between the stock market and real sector activity, confirming that managers do learn and glean information contained in stock prices that they may not otherwise possess when making value-enhancing corporate investment decisions (see the survey paper by Bond *et al*. 2012 and references cited therein). In general, these studies find that informative prices help firms to efficiently allocate their investment resources. Second, the extant theoretical models predict that higher liquidity induces more informed trading as the reduced trading costs incentivize traders to acquire more private information, thereby making stock prices become more informative (see, for example, Kyle, 1985; Easley and O'Hara, 2004). Empirically, the causal relationship between liquidity and price efficiency is firmly established by Chordia *et al*. (2008) and Chung and Hrazdil (2010). Third, it is worth noting that the beneficial effects of liquidity extend beyond stock price informativeness to firm value. For instance, the theoretical model of Edmans (2009) predicts that high liquidity increases the credibility of exit threat by blockholders whose informed trading enhances stock price informativeness. The latter implies that stock prices efficiently reflect firms' fundamentals, and thus discipline managers with stock-based compensation to undertake value-enhancing investments to prevent blockholders from voting with their feet.

Returning to the Malaysian stock market, Lim *et al*. (2016) utilize the ownership dataset provided by Bursa Malaysia and examine the informational role of key market participants. In sharp contrast to the findings from developed markets, the authors find that security analysts and local institutional investors do not play a significant role in the information incorporation process. Instead, their extensive analyses show that only foreign investors who trade through the nominee accounts accelerate the incorporation of common information into the prices of Malaysian stocks, which can be largely attributed to their superior skilled analysis of systematic market-wide factors. Motivated by the unique finding that foreign nominees are elite processors of public news in Bursa Malaysia, we test the following hypothesis in alternative form:

H$_3$: Firms with high foreign nominee ownership require higher level of liquidity than those with low foreign nominee ownership in order to reap the benefit of larger firm value.

Greater stock liquidity may also operate through better corporate governance in deriving higher firm value. Maug (1998) demonstrates theoretically that liquidity facilitates formation of large blockholdings at a lower transaction cost, thereby enhancing blockholders' incentives to voice or intervene. Recent theoretical models emphasize alternative governance mechanism through the threat of exit, in which higher liquidity allows blockholders to dispose their shares easily when they are unhappy with firm performance, and thus exerting downward pressure on stock prices (see the survey papers by Edmans, 2014 and Edmans and Holderness, 2017). Such disciplinary trading is highly effective in aligning managers' incentives with those of outside shareholders when managerial compensation is closely tied to stock prices. In a parallel body of literature, recent empirical evidence advocates strengthening corporate governance as firms with better practices are found to enjoy higher market valuation (see the survey papers of Love, 2011 and Balachandran and Faff, 2015).

A unique feature in the Malaysian corporate landscape is that government-controlled institutions hold more than 70% of total local institutional shareholdings – examples include the Employees Provident Fund, the Armed Forces Fund Board, the National Equity Corporation, the Pilgrimage Fund Board and the Social Security Organization. Apart from their social-economic mandates to support national development goals (see Lim *et al*., 2016 and references cited therein), these state-backed local institutional funds have been entrusted by the government to spearhead shareholder activism through Minority Shareholder's Watchdog Group (MSWG)[6] and the Malaysian Code for Institutional Investors.[7] Empirically, Abdul Wahab *et al*. (2007) and Ameer and

[6] In response to the 1997/1998 Asian financial crisis, the Malaysian government set up the Finance Committee on Corporate Governance (FCCG). One of the FCCG's key recommendations is to institutionalize the monitoring and governance roles of large institutional investors (see https://www.sc.com.my/finance-committee-report-on-corporate-governance/, retrieved on 15 February 2017). This led to the establishment of the Minority Shareholders Watchdog Group (MSWG) in August 2000 as a government initiative to protect the interests of minority shareholders through shareholder activism and promote corporate governance best practices among publicly listed companies. The four founding members of MSWG are the Armed Forces Fund Board, the National Equity Corporation, the Pilgrimage Fund Board, and the Social Security Organization. Further details on MSWG are available at https://www.mswg.org.my/ (retrieved on 15 February 2017).

[7] On 27 June 2014, the Securities Commission and Minority Shareholders Watchdog Group jointly launched the Malaysian Code for Institutional Investors, which outlines six broad principles of effective stewardship by institutional investors, in particularly promoting best corporate governance practices

Abdul Rahman (2009) find that local institutional investors play effective monitoring and governance roles among Malaysian public listed firms.

Given the unique corporate governance landscape of Malaysia, we test the following hypothesis in alternative form:

> H_4: Firms with high local institutional ownership require higher level of liquidity than those with low local institutional ownership in order to reap the benefit of larger firm value.

3. Measurement of Variables and Specification of Baseline Model

Because the key objective of this study is to re-examine the direct relationship between liquidity and firm value, we provide a brief discussion of all the variables used in the main analysis and their respective data sources. Following that, the baseline regression model is specified along with the main estimation method. A complete list of all variables used in this study are provided in the Appendix.

3.1 Dependent variable of firm value

In the extant literature on liquidity-firm value, the latter is consistently proxied by the forward-looking Tobin's *Q*, which measures the market valuation of a firm's assets relative to their replacement cost, with a value greater than unity indicating that the firm has an incentive to make additional capital investment and thus signaling higher future growth opportunities. We follow Fang *et al*. (2009) in defining Tobin's *Q* as the market value of assets scaled by the book value of assets, where the numerator in the formula is computed as the market value of common equity plus the book value of assets minus the sum of the book value of common equity and balance sheet deferred taxes. The year-end data for all the four readily available balance sheet items are sourced from Thomson Datastream.

3.2 Key independent variable of stock liquidity

Although liquidity cannot be directly observed, the literature provides hundreds of proxies at different data frequencies due to its multifaceted nature. In recent years, it

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among their investee companies. The Code can be downloaded from https://www.sc.com.my/wp-content/uploads/eng/html/cg/mcii_140627.pdf (retrieved on 15 February 2017).

has become standard practice for U.S. firm-level studies to measure liquidity using transaction data of bid-ask spreads from the Trades and Quotes (TAQ) database. Unfortunately, accessibility to such high frequency data for emerging markets is a very recent development through Thomson Reuters Tick History (TRTH), but accessing this database requires enormous computational time and high subscription costs, as highlighted by Fong *et al*. (2017). Nevertheless, it is still possible to construct bid-ask spreads using daily data (see Corwin and Schultz, 2012; Chung and Zhang, 2014).

To select the best proxy among the many choices, liquidity horseraces provide useful guides to researchers as the exercises assess the correlations of low frequency liquidity proxies with their intraday benchmarks (see Lesmond, 2005; Goyenko *et al*., 2009; Marshall *et al*, 2013; Fong *et al*., 2017). For Malaysian stocks, Fong *et al*. (2017) recommend the "Closing Percent Quoted Spread" (*CPQS*) developed by Chung and Zhang (2014) as it is the best performer among the ten shortlisted percent-cost liquidity proxies, outperforming its closest competitor by large margins at both the daily and monthly intervals.[8]

The *CPQS* for stock i on day *d* can be written as:

$$CPQS_{i,d} = \frac{\text{Closing Ask}_{i,d} - \text{Closing Bid}_{i,d}}{\left(\text{Closing Ask}_{i,d} + \text{Closing Bid}_{i,d}\right)/2} \text{ x } 100 \tag{1}$$

where $\text{Closing Ask}_{i,d}$ and $\text{Closing Bid}_{i,d}$ are respectively the closing ask and bid prices of stock *i* on day *d*, and the multiplication by 100 is for scaling purpose. The daily *CPQS* measure, which represents the cost an investor must incur to trade immediately, is computed using the closing bid and ask prices sourced from Thomson Datastream. These daily estimates are then averaged to obtain the liquidity measures for each year and each individual Malaysian stock. A higher value for *CPQS* indicates a wider spread and thus higher trading cost, suggesting that *CPQS* is an inverse measure of liquidity.

[8] Our selection of *CPQS* is based on the liquidity horserace conducted by Fong *et al*. (2017), who assemble 189 million trades and 90 million quotes for 960 Malaysian stocks over 12-year sample period from January 1996 to December 2007. At the monthly interval, Fong *et al*. (2017) show that *CPQS* outperforms its closest competitor by margins of 57% in the cross-sectional dimension, 28% in the portfolio time-series dimension and 105% in the individual stock time-series dimension. At the daily interval, *CPQS* again emerges as the best liquidity proxy for the Malaysian stocks, outperforms the "High-Low" bid-ask spread by Corwin and Schultz (2012).

3.3 Control variables

The empirical finance literature has long explored the determinants of firm value, and we thus control for those standard factors in order to isolate the independent effect of liquidity. Our list of control variables is divided into firm and board characteristics, with their definitions provided in the Appendix.

In the first group of firm variables where the year-end data are sourced from Thomson Datastream, we have firm size (*SIZE*), firm age (*AGE*), financial leverage (*LEV*), annual sales growth (*SALES*), capital expenditure (*CAPEX*), return volatility (*VOL*), return on assets (*ROA*), and index membership (*KLCI*). To control for board characteristics, we hand-collect four variables from the annual reports of publicly listed firms, which are available on the website of Bursa Malaysia:[9] (1) total number of directors on the board (*BSIZE*); (2) the proportion of independent non-executive directors (*BINDEP*), which should have at least one-third of the board as mandated by the Bursa Malaysia Listing Requirements; (3) CEO duality (*DUAL*), in which the positions of board chairman and chief executive officer are to be held by the same individual; (4) the board chairman is an independent non-executive director (*CHAIR*), which is a more stringent measure of board independence.

3.4 Specification of baseline model

The pioneering paper by Fang *et al*. (2009) specifies a linear regression model with all contemporaneous variables. To accommodate the possibility of a nonlinear relationship between liquidity and firm value in line with hypothesis H_1, we extend their specification by including a quadratic term for the liquidity variable to form our baseline model:

$$\begin{aligned} Q_{it} = {} & \gamma_0 + \gamma_1 CPQS_{it} + \gamma_2 CPQS_{it}^2 + \gamma_3 \ln SIZE_{it} + \gamma_4 \ln AGE_{it} + \gamma_5 LEV_{it} \\ & + \gamma_6 SALES_{it} + \gamma_7 CAPEX_{it} + \gamma_8 VOL_{it} + \gamma_9 ROA_{it} + \gamma_{10} KLCI_{it} \\ & + \gamma_{11} \ln BSIZE_{it} + \gamma_{12} BINDEP_{it} + \gamma_{13} DUAL_{it} + \gamma_{14} CHAIR_{it} \\ & + \sum_{j=1}^{J} \gamma_{15j} IND_j + \sum_{t=1}^{T} \gamma_{16t} YR_t + \varepsilon_{it} \end{aligned} \qquad (2)$$

[9] The annual reports for all listed companies are publicly available on the Bursa Malaysia website for 2000 forward. The URL link is http://www.bursamalaysia.com/market/listed-companies/company-announcements/ (last retrieved on 30 May 2016).

$\ln$ refers to natural logarithm, and all variables are defined in the Appendix. IND_j is a vector of industry-specific dummy variables constructed based on the sector classification of Bursa Malaysia to control for time-invariant industry effects, where $IND_j = 1$ if firm *i* is in industry *j* and 0 otherwise, and *J* is the number of industries. Year dummies YR_t are included to control for common shocks, where $YR_t = 1$ if firm *i* is in year *t* and 0 otherwise, and *T* is the number of years. A nonlinear relationship between liquidity and firm value requires statistically significant coefficients with opposite signs for γ_1 and γ_2. To ensure valid statistical inferences for pooled OLS, we follow the recommendations of Petersen (2009) to account for the likely presence of within-cluster correlations.[10]

4. The Sample

We first discuss how the sample firms are selected for data collection. Subsequently, descriptive statistics and correlation matrix for the sample data are provided.[11]

4.1 Sample firms

We obtain from Bursa Malaysia the list of stocks that were traded at the end of each calendar year for the sample period 2000–2015, and the list is therefore free from survivorship bias; however, Thomson Datastream only provides data for stocks that are still active at the point of retrieval. For stocks that have been delisted, their historical data must be downloaded from the list of "Dead Stocks" in Thomson Datastream. We include both dead and active stocks on Bursa Malaysia, given that survivorship bias is of primary concern to firm performance studies. Nevertheless, we exclude financial firms because the Malaysian financial system is governed under a different regulatory and supervisory framework set up by the Central Bank of Malaysia. The final sample covers 1250 Malaysian publicly listed firms over the 16-year period, with the number of firm-year observations varies for each variable in our unbalanced panel. All

[10] Petersen (2009) and Gow *et al.* (2010) demonstrate that when within-cluster correlations are not properly accounted for, the OLS estimator produces biased standard errors. Throughout this paper, all the regressions are estimated using White heteroscedastic-robust, firm-clustered, time-clustered, and double-clustered standard errors. To conserve space, however, we mostly report double-clustered standard errors.

[11] The descriptive statistics and correlation matrix for the two moderating variables, political connections (*PCON*) and ownership level (*OWN*), are not reported to conserve space but are available upon request from the authors. It is worth highlighting that the correlation coefficients for the three *PCON* and six *OWN* variables with other regressors are relatively low, the highest being 0.4380.

continuous variables, with the exception of dummies, are winsorized at the 1st and 99th percentiles to reduce the influence of outliers.

4.2 Sample data

After the sample selection, we collect data for the 1250 Malaysian publicly listed firms. Table 1 presents the descriptive statistics for the variables in the baseline quadratic model (2). Turning to our key variable of interest, the mean of Tobin's *Q* for Malaysian stocks is 1.1388, which is slightly lower than the average firm value of 1.828 for U.S. stocks reported by Fang *et al*. (2009). The average *CPQS* is 5.3370, higher than the mean *CPQS* of 2.5 in Fong *et al*. (2017) for 960 Malaysian stocks over the sample period 1996–2007. Since *CPQS* is an inverse measure of liquidity, the higher value indicates that our sample stocks are relatively illiquid, partly due to the inclusion of additional 290 firms (mostly delisted) and data after the global financial crisis.

Table 1: Descriptive Statistics

	Mean	**Median**	**Minimum**	**Maximum**	**Standard Deviation**	***N***
Q	1.1388	0.9267	0.3923	5.6492	0.7796	13479
CPQS	5.3370	2.7051	0.4656	44.2728	7.2572	13827
SIZE	1050911	246614	7519	20700000	2794410	14464
AGE	21.6347	17.0000	0.0000	92.0000	17.4876	18655
LEV	0.2355	0.1872	0.0000	1.6470	0.2518	14441
SALES	13.5744	5.8350	-82.4100	351.3900	54.6952	13848
CAPEX	0.0403	0.0219	0.0000	0.2748	0.0509	14014
VOL	3.5105	2.9221	0.7429	13.7523	2.2864	14034
ROA	0.0271	0.0372	-0.5760	0.3113	0.1171	14393
KLCI	0.0500	0.0000	0.0000	1.0000	0.2179	20161
BSIZE	7.4992	7.0000	4.0000	14.0000	2.0055	13941
BINDEP	0.4258	0.4000	0.1667	0.8000	0.1258	13941
DUAL	0.0449	0.0000	0.0000	1.0000	0.2071	13941
CHAIR	0.3391	0.0000	0.0000	1.0000	0.4734	13941

Notes: The definitions for all the variables are provided in the Appendix. This table presents the descriptive statistics for all the variables in the baseline quadratic model (2). Instead of taking natural logarithm, we report firm size (in Ringgit Malaysia), firm age (year) and board size (number) in the original unit for ease of interpretation. All the continuous variables, with the exception of the three dummies (*KLCI*, *DUAL*, *CHAIR*), are winsorized at the 1st and 99th percentiles to reduce the influence of outliers. *N* denotes the number of firm-year observations.

Table 2: Correlation Matrix

Variable	*Q*	*CPQS*	ln *SIZE*	ln *AGE*	*LEV*
Q	1.0000				
CPQS	-0.1069	1.0000			
ln *SIZE*	-0.0675	-0.4350	1.0000		
ln *AGE*	-0.0838	-0.0901	0.3450	1.0000	
LEV	0.0645	0.0719	0.1563	0.0336	1.0000
SALES	0.0415	-0.0726	0.0334	-0.0790	-0.0397
CAPEX	0.1083	-0.1153	0.0356	-0.1630	-0.0172
VOL	-0.0381	0.6782	-0.4638	-0.1486	0.2417
ROA	0.1402	-0.2760	0.2448	-0.0212	-0.3130
KLCI	0.1416	-0.1641	0.4486	0.1439	0.0236
ln *BSIZE*	0.0097	-0.1631	0.3295	0.0618	-0.0211
BINDEP	-0.0066	0.0558	-0.0361	0.1006	0.0065
DUAL	-0.0029	-0.0296	0.0462	0.0186	0.0037
CHAIR	0.0703	-0.0043	-0.0173	0.0136	-0.0039
	SALES	***CAPEX***	***VOL***	***ROA***	***KLCI***
SALES	1.0000				
CAPEX	0.0634	1.0000			
VOL	-0.0583	-0.1534	1.0000		
ROA	0.2000	0.1573	-0.4544	1.0000	
KLCI	-0.0111	0.0483	-0.1834	0.1218	1.0000
ln *BSIZE*	0.0250	0.0742	-0.2531	0.1643	0.1893
BINDEP	-0.0304	-0.0399	0.1013	-0.1187	-0.0593
DUAL	0.0032	0.0176	-0.0027	0.0016	0.0354
CHAIR	0.0039	0.0113	-0.0037	0.0129	-0.0088
	ln *BSIZE*	***BINDEP***	***DUAL***	***CHAIR***	
ln *BSIZE*	1.0000				
BINDEP	-0.3636	1.0000			
DUAL	-0.0725	0.0369	1.0000		
CHAIR	-0.0230	0.2162	-0.1570	1.0000	

Notes: The definitions for all the variables are provided in the Appendix. This table presents the Pearson correlations between pairs of variables in the baseline quadratic model (2).

Following the common practice, Table 2 presents the correlation matrix for the variables in the baseline quadratic model. The correlation between the explanatory variables and Tobin's *Q* provides a preliminary view of their univariate relationship. All the control variables have the expected relationship, with the sole exception of board independence (*BINDEP*). Turning to the key variable of interest, *CPQS* is negatively correlated with Tobin's *Q*, consistent with the consensus in the empirical literature. We, however, postulate that the liquidity-firm value relationship is nonlinear.

The correlation coefficients between explanatory variables are not highly correlated, downplaying the concern of collinearity plaguing our regression analysis. We further compute the Variance Inflation Factors (VIFs) for all independent variables in the baseline quadratic model (2), but not reported to conserve space. All the independent variables have low VIFs (highest being 2.49), with the exception of *CPQS* (7.99) and $CPQS^2$ (10.24). The latter is inevitable as the quadratic variable is derived from *CPQS* and both are included in the same model. Although multicollinearity is present due to the inclusion of quadratic variable, the issue is not of major concern as the inflated standard error of its coefficient does not undermine the statistical significance.

5. Non-linear Relationship between Liquidity and Firm Value

In this section, we empirically test hypothesis H_1 to determine the existence of a nonlinear relationship between liquidity and firm value. The baseline model is first examined using pooled OLS, and then subjected to a battery of robustness checks to ensure reliable statistical inference.

5.1 Baseline results

The results for the baseline model (2) are presented in Table 3. Heeding the recommendations of Petersen (2009), we accommodate the possible existence of within-cluster correlations by estimating all regressions using White heteroscedastic-robust, firm-clustered, time-clustered, and double-clustered standard errors. To conserve space, only White- and double-clustered standard errors are reported, but the statistical inferences take into account the existence of within-cluster correlations by comparing all four adjustments.

For comparison with the extant literature, in particular the pioneering work of Fang *et al*. (2009), we also specify a linear relationship between liquidity and firm value, and the result of the linear model is presented in Table 3. Consistent with the consensus of the literature, the coefficient of *CPQS* is negative and significant at the 1% level. Because *CPQS* is an inverse measure of liquidity, the significant result implies that higher stock liquidity correlates with larger firm value. Moving to the quadratic model (2), the first-order *CPQS* retains its negative and significant coefficient, whereas its squared term is positively and significantly associated with Tobin’s *Q*. This supports hypothesis H_1 and contradicts the widely documented positive linear relationship between liquidity and firm value. Our finding of a U-shaped curve suggests that when liquidity is at lower levels, liquidity and firm value are negatively related, but the relationship turns positive when liquidity increases and exceeds a certain threshold level.[12] Although our result supports the firm value benefit of higher liquidity, we highlight that such benefit can only be attained after firms reach the threshold level of liquidity. This also offers plausible explanations as to why not all firms pursue liquidity-enhancing policies despite the obvious valuation premium, since the potential costs of maintaining high level of liquidity might outweigh the associated benefits. The empirical result also reiterates the importance of functional form, showing that a linear model might yield incorrect inferences when the relationship is driven by competing channels with opposing effects.

Turning to the control variables in the quadratic model (2), only six regressors are revealed to be statistically significant across all the four robust standard errors: (1) firm size (*SIZE*), with the negative coefficient suggesting that larger Malaysian firms on average report lower firm value, which could be due to operational inefficiencies and costlier monitoring; (2) higher leverage (*LEV*) is found to correlate with a larger Tobin's *Q*, reflecting the monitoring benefit or tax savings of debt obligations; (3) capital expenditures (*CAPEX*) are positively and significantly associated with firm value, as investors highly value those firms that invest for future growth; (4) profitability as reflected by higher return on assets (*ROA*) effectively translates into larger market valuation; (5) greater visibility generated by the inclusion in Bursa Malaysia key stock market index (*KLCI*) yields significant value benefit; and (6) the new dummy variable of *CHAIR*, which takes a value of one if the board chairman is an independent non-executive director, is the only significant corporate governance variable that correlates positively with firm value. In contrast, the explanatory power of the widely used empirical proxies – *BSIZE, BINDEP* and *DUAL* – have largely been subsumed. This implies that having a larger board size, more independent non-executive directors, and separate CEO and board chairmen are no longer sufficient. Instead, a more stringent corporate governance code must be applied for Malaysian publicly listed firms to deliver higher market valuations.

[12] The threshold liquidity level can be computed using the estimated coefficients of *CPQS* and $CPQS^2$ in the baseline quadratic model (2), i.e., $-\gamma_1/2\gamma_2$, which yields a value of 24.1786.

Table 3: Liquidity and Firm Value

	Linear Model		Quadratic Model	
	White	**Double-Clustered**	**White**	**Double-Clustered**
CPQS	-0.0145***	-0.0145***	-0.0677***	-0.0677***
	(0.0014)	(0.0032)	(0.0032)	(0.0072)
$CPQS^2$			0.0014***	0.0014***
			(0.0001)	(0.0002)
ln *SIZE*	-0.1431***	-0.1431***	-0.1824***	-0.1824***
	(0.0096)	(0.0278)	(0.0100)	(0.0268)
ln *AGE*	-0.0001	-0.0001	0.0061	0.0061
	(0.0107)	(0.0278)	(0.0106)	(0.0274)
LEV	0.6714***	0.6714***	0.7115***	0.7115***
	(0.0609)	(0.1271)	(0.0582)	(0.1220)
SALES	-0.000004	-0.000004	-0.00004	-0.00004
	(0.0001)	(0.0002)	(0.0001)	(0.0002)
CAPEX	0.8014***	0.8014***	0.5964***	0.5964**
	(0.1445)	(0.2879)	(0.1425)	(0.2785)
VOL	0.0109**	0.0109	0.0154***	0.0154
	(0.0054)	(0.0101)	(0.0053)	(0.0110)
ROA	1.5406***	1.5406***	1.4343***	1.4343***
	(0.1451)	(0.3736)	(0.1401)	(0.3507)
KLCI	0.5756***	0.5756***	0.5660***	0.5660***
	(0.0367)	(0.0993)	(0.0364)	(0.1006)
ln *BSIZE*	0.0649**	0.0649	0.0679**	0.0679
	(0.0272)	(0.0581)	(0.0266)	(0.0558)
BINDEP	0.0521	0.0521	-0.0086	-0.0086
	(0.0605)	(0.0975)	(0.0588)	(0.0959)
DUAL	-0.0417	-0.0417	-0.0400	-0.0400
	(0.0257)	(0.0496)	(0.0248)	(0.0483)
CHAIR	0.0744***	0.0744**	0.0682***	0.0682**
	(0.0142)	(0.0326)	(0.0139)	(0.0319)
CONSTANT	2.5617***	2.5617***	3.1606***	3.1606***
	(0.1446)	(0.3978)	(0.1484)	(0.3755)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
N	12,349	12,349	12,349	12,349
Adj. R^2	0.1684	0.1684	0.1987	0.1987

Notes: The definitions for all the variables are provided in the Appendix. This table presents the OLS estimation results for the baseline quadratic model in equation (2) where the dependent variable is Tobin's *Q* over the sample period 2000-2015, with the linear model added for comparison purpose. For brevity, year and industry dummies are suppressed but available upon request. Following Petersen (2009), we accommodate the possible existence of within-cluster correlations by estimating all regressions using White heteroscedastic-robust, firm-clustered, time-clustered, and double-clustered standard errors. To conserve space, only White- and double-clustered standard errors are reported in parentheses. *N* denotes the number of firm-year observations.

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

5.2 Robustness checks

In this subsection, we perform a series of robustness checks to ensure the reliability of our statistical inferences drawn from the baseline quadratic model.

5.2.1 Alternative liquidity measures

The "Closing Percent Quoted Spread" (*CPQS*) is selected as our main liquidity measure because it is the best performing percent-cost proxy for Malaysian stocks and captures an important dimension of liquidity: the transaction cost incurred by investors to trade immediately. Another liquidity dimension that is widely considered in the literature, however, is the price impact, in which the Amihud (2002) illiquidity ratio is accepted as the standard proxy in empirical finance research (see Lou and Shu, 2017). For Malaysian stocks, the horserace conducted by Fong *et al.* (2017) finds that the price impact version of *CPQS* performs best at the monthly frequency, and as well as the Amihud illiquidity ratio at the daily interval.

In view of the above development, we consider two price impact measures: (1) *CPQS* Impact (hereafter referred to as *CPQSIM*), which is the daily ratio of the *CPQS* scaled by local currency trading volume; and (2) Amihud illiquidity ratio (hereafter referred to as *ILLIQ*), which is computed as the daily ratio of the absolute stock returns to the local currency trading volume. In both cases, the annual liquidity estimates for each stock are obtained by averaging the computed daily ratios across all trading days for each calendar year. Similar to the case of *CPQS*, the two price impact proxies are inverse measures of liquidity, where higher value indicates a greater degree of illiquidity. The required daily data are all sourced from Thomson Datastream.

We re-estimate the baseline quadratic model (2) using the two price impact measures, and the results are presented in Table 4. While the linear model shows that liquidity and firm value are positively associated, the significance of liquidity and squared liquidity variables lends further credence to our baseline result that their relationship is nonlinear. The consistent results across the two key liquidity dimensions suggest that strategies aimed at lowering transaction cost and price impact are of equal importance in delivering higher firm value. The value gains will only be realized, however, when liquidity exceeds their respective threshold levels. Among the firm characteristics, Tobin's *Q* is higher for firms with fewer total assets, more leverage, larger return on assets, and greater visibility with index membership. In terms of board characteristics, our results suggest that having a larger board size, more independent non-executive directors, and separate CEO and board chairmen are not sufficient to reap the value gains. Instead, it requires a more stringent corporate governance criterion in which an independent non-executive director is appointed as the board chairman.

5.2.2 Alternative estimators

Our main estimator is the pooled OLS with the standard errors adjusted for the existence of within-cluster correlations. As a robustness check, we re-estimate the baseline quadratic model with Fama-MacBeth two-step regression and quantile regression. The first estimator is designed to pick up cross-sectional effects as the procedure involves estimating cross-sectional regression for each year separately, and then inferences are drawn from the time-series averages of the estimated coefficients. Quantile regression, developed by Koenker and Bassett (1978), addresses the shortcomings of OLS regression that estimates the conditional mean effect of liquidity on firm value, and the potential bias arises from the non-normality of our dependent variable. More specifically, the advantage of quantile regression lies in its ability to discern the effects of liquidity along the entire range of the firm value conditional distribution, especially at the extreme upper and lower tails (for a survey, see Koenker and Hallock, 2001).

The regression results for the baseline model using these two alternative estimators are presented in Table 5. In the first column, the Fama-MacBeth regression does not affect the signs and statistical significance of our key variables of liquidity and squared liquidity. We then present the regression estimates at the 0.10^{th}, 0.25^{th}, 0.50^{th}, 0.75^{th} and 0.90^{th} quantiles of the firm value conditional distribution. The coefficients for *CPQS* and $CPQS^2$ are consistently highly significant with the signs remaining unaffected across the five representative quantiles, suggesting the widespread influence of liquidity on all firms.[13] Only the magnitudes of the coefficients vary considerably, gradually increasing as we move from lower to higher firm value quantiles. This indicates that the effect of liquidity is more pronounced for firms with higher Tobin's *Q*, strengthening our interpretation of the documented U-shaped relationship where the value benefit can only be attained when liquidity is high and exceeds a certain threshold level.

[13] To visualize the effects for all quantiles, we plot the coefficients for *CPQS* and $CPQS^2$ with their corresponding 95% confidence intervals against the entire conditional distribution of Tobin's *Q*. The quantile-varying *CPQS* estimates depict clear downward trend, whereas the estimates for $CPQS^2$ slope upward as we move from lower to higher quantiles. More importantly, all the coefficients are statistically significant as their corresponding 95% confidence intervals do not overlap with the zero value. The figures are not presented here to conserve space, but are available upon request from the authors.

Table 4
Robustness Check with Alternative Liquidity Measures

	ILLIQ		***CPQSIM***	
	Linear Model	**Quadratic Model**	**Linear Model**	**Quadratic Model**
PIMPACT	-0.1637***	-0.3948***	-0.1375***	-0.3131***
	(0.0099)	(0.0316)	(0.0080)	(0.0251)
$PIMPACT^2$		0.0259***		0.0255***
		(0.0029)		(0.0030)
ln *SIZE*	-0.2645***	-0.3005***	-0.2311***	-0.2607***
	(0.0283)	(0.0272)	(0.0275)	(0.0268)
ln *AGE*	0.0044	0.0176	0.0096	0.0157
	(0.0250)	(0.0245)	(0.0250)	(0.0245)
LEV	0.7947***	0.8135***	0.7046***	0.7334***
	(0.1373)	(0.1285)	(0.1176)	(0.1136)
SALES	-0.0001	-0.0001	-0.0001	-0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
CAPEX	0.3632	0.2618	0.4316	0.3442
	(0.2787)	(0.2714)	(0.2785)	(0.2717)
VOL	0.0313***	-0.0187**	0.0274***	-0.0134
	(0.0075)	(0.0081)	(0.0087)	(0.0090)
ROA	1.3614***	1.2828***	1.5633***	1.4784***
	(0.3280)	(0.3148)	(0.3228)	(0.3099)
KLCI	0.4837***	0.3579***	0.5058***	0.4300***
	(0.0955)	(0.0819)	(0.0999)	(0.0942)
ln *BSIZE*	0.0712	0.0448	0.0702	0.0523
	(0.0516)	(0.0508)	(0.0541)	(0.0534)
BINDEP	-0.0771	-0.0848	-0.1180	-0.1246
	(0.0910)	(0.0859)	(0.0932)	(0.0890)
DUAL	-0.0452	-0.0300	-0.0424	-0.0333
	(0.0481)	(0.0457)	(0.0487)	(0.0474)
CHAIR	0.0561*	0.0614**	0.0615**	0.0636**
	(0.0312)	(0.0302)	(0.0308)	(0.0298)
CONSTANT	4.7113***	5.7996***	3.6821***	4.1825***
	(0.4258)	(0.4409)	(0.3778)	(0.3684)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
N	11,794	11,794	11,650	11,650
Adj. R^2	0.2773	0.3072	0.2501	0.2719

Notes: The definitions for all the variables are provided in the Appendix. This table presents the OLS estimation results for the baseline quadratic model in equation (2) where the dependent variable is Tobin's *Q* over the sample period 2000-2015, but replaces *CPQS* with two alternative price impact measures for the variable *PIMPACT* – the Amihud (2002) illiquidity ratio (*ILLIQ*) and the price impact version of *CPQS* (*CPQSIM*). For brevity, year and industry dummies are suppressed but available upon request. Double-clustered standard errors are reported in the parentheses. *N* denotes the number of firm-year observations.
***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 5
Robustness Check with Alternative Estimators

	Fama-MacBeth	Quantile Regression				
		10th	25th	50th	75th	90th
CPQS	-0.0754***	-0.0167***	-0.0218***	-0.0310***	-0.0554***	-0.0990***
	(0.0071)	(0.0012)	(0.0012)	(0.0017)	(0.0029)	(0.0071)
$CPQS^2$	0.0021***	0.0003***	0.0004***	0.0006***	0.0012***	0.0024***
	(0.0003)	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0002)
ln *SIZE*	-0.1956***	-0.0488***	-0.0451***	-0.0543***	-0.1082***	-0.2270***
	(0.0205)	(0.0039)	(0.0041)	(0.0046)	(0.0068)	(0.0182)
ln *AGE*	0.0154	-0.0149***	-0.0193***	-0.0250***	-0.0275***	-0.0012
	(0.0156)	(0.0036)	(0.0040)	(0.0059)	(0.0091)	(0.0211)
LEV	0.5286***	0.5816***	0.4843***	0.4055***	0.4687***	0.7800***
	(0.0786)	(0.0141)	(0.0165)	(0.0248)	(0.0502)	(0.1025)
SALES	-0.0001	0.0002***	0.0003***	0.0003***	0.0002*	-0.0001
	(0.0001)	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0002)
CAPEX	0.5432**	0.2378***	0.2719***	0.4669***	0.7568***	0.8074***
	(0.2119)	(0.0467)	(0.0464)	(0.0870)	(0.1674)	(0.2192)
VOL	0.0174	-0.0036**	0.0023	0.0090***	0.0148***	0.0123
	(0.0103)	(0.0016)	(0.0020)	(0.0035)	(0.0052)	(0.0084)
ROA	1.4425***	0.5357***	0.6096***	0.6775***	0.8280***	1.4777***
	(0.2251)	(0.0576)	(0.0618)	(0.0651)	(0.1138)	(0.1602)
KLCI	0.7616***	0.1057***	0.1371***	0.2314***	0.5216***	0.9876***
	(0.0712)	(0.0124)	(0.0131)	(0.0199)	(0.0366)	(0.1192)
ln *BSIZE*	0.0924**	0.0561***	0.0602***	0.0502***	0.0843***	0.0962*
	(0.0343)	(0.0087)	(0.0108)	(0.0150)	(0.0269)	(0.0537)
BINDEP	0.0337	-0.0231	-0.0509**	-0.0433	0.0019	0.1188
	(0.0356)	(0.0261)	(0.0238)	(0.0277)	(0.0528)	(0.1354)
DUAL	-0.0352	-0.0304*	-0.0195	0.0071	0.0118	-0.0333
	(0.0276)	(0.0163)	(0.0154)	(0.0138)	(0.0221)	(0.0614)
CHAIR	0.0627***	0.0135***	0.0147***	0.0132*	0.0629***	0.1254***
	(0.0158)	(0.0038)	(0.0056)	(0.0070)	(0.0152)	(0.0318)
CONSTANT	3.1802***	1.2285***	1.2502***	1.5238***	2.2858***	3.8612***
	(0.3733)	(0.0747)	(0.0828)	(0.0912)	(0.1345)	(0.3239)
Year	No	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
N	12,349	12,349	12,349	12,349	12,349	12,349
R^2/Pseudo R^2	0.2795	0.1514	0.1177	0.0957	0.1177	0.1690

Notes: The definitions for all the variables are provided in the Appendix. This table presents the estimation results for the baseline quadratic model in equation (2) where the dependent variable is Tobin's *Q* over the sample period 2000-2015, but replaces pooled OLS estimator with Fama-MacBeth two-step regression and quantile regression. For brevity, year and industry dummies are suppressed but available upon request. Standard errors are reported in the parentheses. *N* denotes the number of firm-year observations.
***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

The quantile regression results also demonstrate considerable heterogeneity in the relationship between firm value and the control variables. For instance, variables that have been found to be insignificant in the baseline OLS regression are now becoming statistically significant in the quantile analysis, such as firm age (*AGE*), annual sales growth (*SALES*), return volatility (*VOL*) and board size (*BSIZE*). While these variables appear unimportant for average firms, they are significant determinants for firms located at different quantiles of the Tobin's *Q* distribution. On the other hand, firm size (*SIZE*), leverage (*LEV*), capital expenditures (*CAPEX*), return on assets (*ROA*), stock index membership (*KLCI*) and independent non-executive chairman (*CHAIR*) are crucial drivers for firm value as they remain highly significant across different estimators: pooled OLS, Fama-MacBeth regression and quantile analysis.

5.2.3 Confirming the U-shape relationship

The baseline quadratic results support our hypothesis that stock liquidity and firm value are nonlinearly associated, with the signs consistent with a U-shaped relationship. Lind and Mehlum (2010) argue, however, that the statistically significant coefficients with opposite signs for *CPQS* and $CPQS^2$ might erroneously yield a U-shape when the true relationship is convex but monotone over relevant data values. These authors then propose a formal U-test that gives not only the exact necessary and sufficient conditions in finite samples but also the confidence intervals for the threshold point. Table 6 presents the results of the formal U-test, which is a joint test on the two null hypotheses of an inverted-U or monotone relationship. The test statistic rejects the combined null hypotheses at the 1% level of significance in favor of a U-shaped relationship with an estimated threshold level of 24.73, which is within the upper and lower bounds of [23.6621, 25.9548]. The table also shows that the illiquidity-firm value curve has a negative and statistically significant slope before the threshold level, but becomes upward sloping after reaching the minimum point. This implies that firms must achieve higher level of liquidity before reaping the benefit of larger firm value.

Table 6: Robustness Check with the Formal Statistical Test for U-Shape

	Dependent Variable
	Q
Slope at Lower Bound	-0.0712 (0.0000)
Slope at Upper Bound	0.0574 (0.0000)
Lind and Mehlum (2010) Test for U-Shape	13.11 (0.0000)
Threshold Point	24.7300
Fieller 95% Confidence Interval	[23.6621, 25.9548]

Notes: This table presents the estimation results for the U-test on the baseline quadratic model in equation (2), which is a joint test on the two null hypotheses of an inverted-U or monotone relationship. Entries in parentheses indicate *p*-values.

5.2.4 Excluding the crisis years of 2008-2009

In an exclusive study on the Malaysian stock market, Liew *et al*. (2016) report a huge drop in the aggregate liquidity of the local bourse during the 2008-2009 global crisis. Anecdotal reports also suggest that the market valuations of Malaysian firms were severely affected by the crisis. To address the above concern, we re-estimate the quadratic model for three sub-periods: (i) 2000-2007 (before crisis); (ii) 2010-2015 (after crisis); (iii) 2000-2015 but excluding the crisis years of 2008-2009. Table 7 shows that our baseline results remain intact across all three columns, with the coefficients for liquidity and squared liquidity remaining highly significant and their signs unaffected. It is interesting to note that *BSIZE*, *DUAL* and *CHAIR* are only significant in the sub-period of 2010-2015, suggesting that the crisis has made corporate governance an important driver of firm market valuations.

5.2.5 Industry-specific regressions

Our sample consists of non-financial firms from a large number of industries. Thus, it is possible that the significant baseline results from pooled sample might be the net effect of varying relationships across industries offsetting each other. We re-estimate the quadratic model for each industry in the sample including financial sector, but exclude those with less than 100 firm-year observations. The within-industry results in Table 8 show that the nonlinear relationship between liquidity and firm value is widespread across industries, with the exception of the financial sector, which we exclude in the original sample, and hence challenge the conjecture of Cheung *et al*. (2015) that the value gain of higher liquidity is more pronounced in the real estate investment trust industry.

Table 7
Robustness Check with the Exclusion of Crisis Years

	2000-2007 (Before Crisis)	2010-2015 (After Crisis)	2000-2015 (Excludes 2008-2009)
CPQS	-0.1268***	-0.0850***	-0.1010***
	(0.0155)	(0.0091)	(0.0095)
$CPQS^2$	0.0054***	0.0020***	0.0030***
	(0.0007)	(0.0003)	(0.0003)
ln *SIZE*	-0.2690***	-0.1252***	-0.1955***
	(0.0346)	(0.0210)	(0.0278)
ln *AGE*	0.0285	0.0031	0.0142
	(0.0378)	(0.0286)	(0.0289)
LEV	0.8960***	0.1288	0.7625***
	(0.1004)	(0.1033)	(0.1302)
SALES	0.0002	-0.0005***	-0.0001
	(0.0002)	(0.0002)	(0.0002)
CAPEX	-0.0534	1.2103**	0.5462*
	(0.2369)	(0.4932)	(0.3042)
VOL	0.0068	0.0415***	0.0232*
	(0.0157)	(0.0113)	(0.0126)
ROA	1.4936***	2.0184***	1.6600***
	(0.3297)	(0.4189)	(0.3426)
KLCI	0.5820***	1.0598***	0.5823***
	(0.1093)	(0.1951)	(0.1161)
ln *BSIZE*	-0.0453	0.2316***	0.0486
	(0.0493)	(0.0750)	(0.0570)
BINDEP	0.0113	0.0080	-0.0357
	(0.1202)	(0.1342)	(0.0958)
DUAL	0.0202	-0.1352**	-0.0411
	(0.0722)	(0.0568)	(0.0523)
CHAIR	0.0402	0.1002***	0.0650**
	(0.0408)	(0.0367)	(0.0330)
CONSTANT	4.5108***	1.4806***	3.3944***
	(0.4331)	(0.2977)	(0.3891)
Year	Yes	Yes	Yes
Industry	Yes	Yes	Yes
N	5,887	4,704	10,591
Adj. R^2	0.2613	0.2768	0.2101

Notes: The definitions for all the variables are provided in the Appendix. This table presents the OLS estimation results for the baseline quadratic model in equation (2) where the dependent variable is Tobin's *Q* over sample periods that exclude the crisis years of 2008-2009. For brevity, year and industry dummies are suppressed but available upon request. Double-clustered standard errors are reported in the parentheses. *N* denotes the number of firm-year observations.
***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 8: Liquidity-Firm Value Relationship by Industry

Industry	***CPQS***	***CPQS²***	***N***	**Adjusted *R²***
Construction	-0.0472***	0.0014***	730	0.3490
	(0.0170)	(0.0004)		
Consumer Products	-0.0650***	0.0014***	1870	0.3378
	(0.0117)	(0.0002)		
Finance	-0.0517	0.0028	623	0.0893
	(0.0416)	(0.0025)		
Industrial Products	-0.0553***	0.0010***	3813	0.1578
	(0.0087)	(0.0002)		
Plantation	-0.1187**	0.0078***	632	0.2180
	(0.0493)	(0.0024)		
Properties	-0.0220***	0.0005***	1311	0.1669
	(0.0078)	(0.0002)		
Real Estate Investment Trusts	-0.0656**	0.0086*	110	0.8412
	(0.0327)	(0.0045)		
Technology	-0.1475***	0.0028***	1020	0.2427
	(0.0230)	(0.0005)		
Trading/Services	-0.0718***	0.0016***	2659	0.1971
	(0.0147)	(0.0004)		

Notes: This table presents the OLS estimation results for the baseline quadratic model in equation (2) where the dependent variable is Tobin's *Q* over the sample period 2000-2015, for industries with firm-year observations greater than 100. For brevity, estimates for control variables, constant and year dummies are suppressed but available upon request. Double-clustered standard errors are reported in the parentheses. *N* denotes the number of firm-year observations. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

5.2.6 Endogeneity

We perform a number of robustness checks to address the usual suspect of endogeneity. First, we re-estimate the baseline model using one-year lagged explanatory variables instead of taking their contemporaneous values (see Bellemare *et al*., 2017). The results in Column (1) from the predictive regression show that our main conclusion on the U-shaped relationship between liquidity and firm value remains intact. Second, we follow Chung *et al*. (2010) and conduct a change-in-variable regression, where all the dependent and continuous independent variables in the baseline model are specified in terms of annual changes. The results show that the year-to-year changes in liquidity are significantly associated with changes in firm value, reinforcing our main conclusion drawn from variables in levels. Third, it is possible that some unobserved time-invariant firm characteristics simultaneously determine both liquidity and firm value. To rule out the unobserved omitted variable concern, we use the fixed effects approach, which has been shown to yield consistent estimates in the presence of unobserved heterogeneity (see Gormley and Matsa, 2014). The firm fixed effects estimation results in Column (3) show that the coefficients for liquidity and liquidity squared are still statistically significant with the expected signs. It is thus unlikely the documented liquidity-firm value relationship is driven by their correlation with common unobservable firm factors. Last but not least, a more pertinent concern is the reverse causality from firm value to liquidity. Given the difficulty of finding a strictly exogenous external instrument, we heed the advice of Wintoki *et al*. (2012) in using the generalized method-of-moments (GMM) dynamic panel framework. The lagged dependent variable of Tobin's *Q* is added to the right-hand-side of the baseline model, and the resulting dynamic panel model is estimated using a two-step system GMM. The results in the last column show a causal relationship running from liquidity to firm value.[14]

5.2.7 Exogenous Liquidity Shock

To reiterate, the results from using lagged explanatory variables, change-in-variable regression, firm fixed effects and dynamic panel GMM estimators indicate that our reported nonlinear relationship between liquidity and firm value is not undermined by endogeneity. However, the standard in the empirical finance literature to establish causal relation is through natural experiments or strictly exogenous experiments.[15] For instance, Fang *et al*. (2009) further use the decimalization of tick size in 2001 to identify the causal effect from liquidity to firm value, which is now a standard exogenous liquidity shock for U.S. studies (see Bharath *et al*., 2013; Edmans *et al*., 2013; Fang *et al*., 2014; Cheung *et al*., 2015; Huang *et al*., 2017; Dou *et al*., 2018). Apart from that, events that have been used as natural experiments include the 1997 reduction in tick size (Fang *et al*., 2014; Huang *et al*., 2017), stock splits (Jayaraman and Milbourn, 2012), analyst coverage terminations (Balakrishnan *et al*., 2014; Back *et al*., 2015) and financial crises (Bharath *et al*., 2013; Dou *et al*., 2018).

[14] The two-step system GMM is implemented in Stata using the xtabond2 command based on the recommendations of Roodman (2009a, b). The consistency of the GMM estimator depends on two types of specification tests: (1) *AR*(1) and *AR*(2) tests are under the null of no first-order and second-order serial correlation, respectively, in the first-differenced residuals; (2) Sargan and Hansen tests of over-identifying restrictions are under the null that all instruments are valid. The regression satisfies the specification tests in that there is no evidence of second-order serial correlation, and both the Sargan and Hansen tests fail to reject the null that all instruments are valid. The results are not reported to conserve space, but are available upon request.

[15] We thank one of the reviewers for this suggestion and the insistence to pursue this additional endogeneity test using exogenous liquidity shock, which lends further credence to our claim of causal effect from liquidity to firm value.

Table 9: Robustness Check on Endogeneity

	Lag in Variables (1)	Changes in Variables (2)	Firm Fixed Effects (3)	2-Step System GMM (4)
CPQS	-0.0549***	-0.1853***	-0.0671***	-0.0321***
	(0.0051)	(0.0289)	(0.0028)	(0.0100)
$CPQS^2$	0.0011***	0.0218***	0.0014***	0.0006***
	(0.0001)	(0.0048)	(0.0001)	(0.0002)
ln *SIZE*	-0.1608***	-2.9214***	-0.1805***	-0.2034***
	(0.0241)	(0.3540)	(0.0068)	(0.0616)
ln *AGE*	0.0248	-0.0612	0.0074	-0.0372
	(0.0266)	(0.0578)	(0.0088)	(0.1032)
LEV	0.6543***	0.0081***	0.7019***	2.6202***
	(0.1558)	(0.0017)	(0.0325)	(0.3296)
SALES	-0.0004**	0.0001	-0.0001	0.0020*
	(0.0002)	(0.0004)	(0.0001)	(0.0011)
CAPEX	0.2917	0.0008*	0.5697***	6.4132***
	(0.2689)	(0.0005)	(0.1279)	(2.0880)
VOL	0.0119	0.0615***	0.0152***	0.0284
	(0.0097)	(0.0169)	(0.0044)	(0.0345)
ROA	1.3942***	0.0031***	1.4295***	1.2937*
	(0.3828)	(0.0007)	(0.0705)	(0.7306)
KLCI	0.5938***		0.5686***	0.8093**
	(0.1045)		(0.0261)	(0.3984)
ln *BSIZE*	0.0287	0.0653	0.0620**	0.4835
	(0.0572)	(0.0557)	(0.0263)	(0.5272)
BINDEP	-0.0310	0.0184	0.0126	-1.0542
	(0.0991)	(0.0144)	(0.0562)	(0.8604)
DUAL	-0.0555		-0.0448	-0.5872
	(0.0468)		(0.0292)	(1.0406)
CHAIR	0.0801**		0.0756***	0.2297
	(0.0327)		(0.0131)	(0.3274)
Q_{t-1}				-0.2447***
				(0.0523)
CONSTANT	2.9211***	-0.0421*	3.4779***	2.3148*
	(0.3347)	(0.0241)	(0.1131)	(1.3040)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	No	Yes
N	11,146	9,738	12,349	11,536
R^2	0.1709	0.1608	0.2165	

Notes: The definitions for all the variables are provided in the Appendix. Columns (1) and (2) present the pooled OLS regression results for equation (2) but specify the independent variables in one-year lagged (*t*-1) and annual changes (Δ), respectively. Column (3) estimates equation (2) with a firm fixed effects estimator, while Column (4) specifies the baseline model as a dynamic panel and estimates with two-step system GMM. To conserve space, the coefficients for year and industry dummies are not reported. Entries in parentheses are standard errors, with Columns (1) & (2) the double-clustered standard errors. *N* denotes the number of observations.
***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Unlike the U.S. stock exchanges, there is no reference study for the Malaysian stock market in terms of exogenous liquidity shocks. We thus browse through the major policies since year 2000 undertaken by Bursa Malaysia with the aim of increasing stock liquidity. The reduction of lot size from 1000 units to 100 units in May 2003, which is exogenous to corporate financial decisions, appears to be a good candidate to generate exogenous variation in liquidity for three reasons.[16] First, previous studies from Japan show that the reduction in lot size has led to a significant increase in liquidity, especially among high-priced stocks. Amihud *et al*. (1999) and Ahn *et al*. (2014) find that liquidity increases because the reduction in lot size makes high-priced stocks more affordable and expands substantially the number of small individual investors. Thus, the increases in liquidity induced by this regulatory change vary in the cross-section of stocks. Second, the lot size reduction is unlikely to be directly associated with firms' fundamentals such as firm value. Likewise, the probability for the changes in firm value to affect liquidity variation generated by the policy change is rather remote. Third, several studies caution that the decimalization-induced liquidity shock might be overstated as it coincides with Enron scandal, WorldCom fraud, the passage of Sarbanes–Oxley Act and the burst of dot-com bubble (see Fang *et al*., 2014; Huang *et al*., 2017). However, there is no market-wide confounding event surrounding the lot size reduction by Bursa Malaysia in 2003.

Thus, we use the lot size reduction in May 2003 as the liquidity-increasing exogenous shock, and follow Fang *et al*. (2009) to augment the baseline quadratic model (2) with all the dependent and continuous independent variables specified in terms of changes, written as follows:

[16] In April 2003, the Kuala Lumpur Stock Exchange (KLSE, renamed as Bursa Malaysia on 14 April 2004) commenced standardizing lot size at 100 units in stages for all securities listed on the Main Board, Second Board and MESDAQ market. The exercise, fully completed on 26 May 2003, serves to eliminate multiple board lots of 100, 200 and 1000 units. In the total 906 stocks listed on KLSE in 2003, all the 32 MESDAQ stocks were already traded in lot size of 100 units, about 16 blue-chip stocks have been traded in lots of 200 units since 1995, while 1000 units are the common lot size for more than 90% of the listed stocks. According to the stock exchange, the aim of the lot size standardization is to make the securities more accessible and affordable especially to retail investors, and thus improve liquidity. See https://www.thestar.com.my/business/business-news/2003/02/01/board-lots-to-be-fixed-at-100/ and http://bursa.listedcompany.com/misc/market_review_2002.pdf (retrieved on 31 May 2018).

$$
\begin{aligned}
\Delta Q_{i,t-1\ to\ t+1} = {} & \gamma_0 + \gamma_1 \Delta CPQS_{i,t-1\ to\ t+1} + \gamma_2 \Delta CPQS^2_{i,t-1\ to\ t+1} + \gamma_3 \Delta \ln SIZE_{i,t-1\ to\ t+1} \\
& + \gamma_4 \ln \Delta AGE_{i,t-1\ to\ t+1} + \gamma_5 \Delta LEV_{i,t-1\ to\ t+1} + \gamma_6 \Delta SALES_{i,t-1\ to\ t+1} \\
& + \gamma_7 \Delta CAPEX_{i,t-1\ to\ t+1} + \gamma_8 \Delta VOL_{i,t-1\ to\ t+1} + \gamma_9 \Delta ROA_{i,t-1\ to\ t+1} \\
& + \gamma_{10} \Delta \ln BSIZE_{i,t-1\ to\ t+1} + \gamma_{11} \Delta BINDEP_{i,t-1\ to\ t+1} \\
& + \sum_{j=1}^{J-1} \gamma_{12j} IND_j + \varepsilon_{i,t-1\ to\ t+1}
\end{aligned} \tag{3}
$$

To operationalize equation (3), we compute the changes from the pre-shock year ($t-1$) to the post-shock year ($t+1$), where t is the calendar year during which the reduction of lot size occurred for firm i. Table 10 presents the endogeneity test with exogenous liquidity shock, examining the change in Tobin's Q in response to change in *CPQS* induced by lot size reduction. The OLS estimation results in Column (1) establish that the nonlinear relationship between liquidity and firm value is robust to reverse causality, with the coefficients for *CPQS* and $CPQS^2$ are still highly significant and the signs consistent with a U-shape. Column (2) considers a narrower measurement window from year ($t-1$) to year t, so as to ensure that the change in liquidity is induced entirely by the mandated policy and not confounded by other market-wide events. Again, the results confirm the direction of causality running from liquidity to firm value and not vice versa.

6. The Moderating Variables in Liquidity-Firm Value Relationship

After establishing the nonlinear relationship between liquidity and firm value, we proceed to explore the variables that are expected to moderate this relationship so as to shed light on the underlying channels.

6.1 Political connections

Given the entrenched culture of state patronage in Malaysian business, we hypothesize that politically connected firms require higher level of liquidity than their non-connected peers in order to reap the benefit of larger firm value. To test hypothesis H_2, we must identify firms that have close ties with politicians or political parties in power. Such an exercise has been pioneered in the academic literature by Gomez and Jomo (1997), who systematically trace the close personal friendships between big business owners and top politicians prior to the outbreak of the 1997 Asian financial crisis. Their list of patronized Malaysian corporations has been updated by Fung *et al*. (2015), Wong (2016) and Tee *et al*. (2017) up to 2007, 2013 and 2011, respectively.

Table 10
Robustness Check with Exogenous Liquidity Shock

	2002-2004 (1)	2002-2003 (2)
$\Delta CPQS$	-0.4008***	-0.3451**
	(0.0811)	(0.1437)
$\Delta CPQS^2$	0.0863***	0.1146*
	(0.0255)	(0.0603)
$\Delta\ln SIZE$	-3.3115***	-3.0493***
	(0.6646)	(0.6579)
$\Delta\ln AGE$	0.1789	0.5568**
	(0.1802)	(0.2298)
ΔLEV	0.0047***	0.0024
	(0.0015)	(0.0043)
$\Delta SALES$	-0.0009	-0.0022**
	(0.0015)	(0.0010)
$\Delta CAPEX$	0.0037**	0.0074**
	(0.0018)	(0.0032)
ΔVOL	0.1090***	0.0412
	(0.0363)	(0.0314)
ΔROA	0.0005	0.0047*
	(0.0025)	(0.0025)
$\Delta\ln BSIZE$	-0.0838	-0.1141
	(0.1451)	(0.1388)
$\Delta BINDEP$	0.0164	0.0037
	(0.0465)	(0.0470)
CONSTANT	0.0892	0.0219
	(0.1152)	(0.0630)
Year	No	No
Industry	Yes	Yes
N	589	600
Adj. R^2	0.1910	0.1153

Notes: The definitions for all the variables are provided in the Appendix. This table presents the OLS estimation results for equation (3) where the exogenous liquidity shock is the reduction of lot size from 1000 to 100 units by the Malaysian stock exchange in May 2003. Column (1) computes the changes (Δ) from the pre-shock year ($t-1$) to the post-shock year ($t+1$), where t is the calendar year 2003 during which the reduction of lot size occurred for firm i. Column (2) considers a narrower measurement window from year ($t-1$) to year t. To conserve space, the coefficients for industry dummies are not reported. Entries in parentheses are standard errors adjusted for heteroskedasticity. N denotes the number of observations.
***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively

We therefore use these updated lists of connected Malaysian firms in our empirical analysis and construct a dummy variable *PCON* that takes a value of one if a firm is politically connected, and zero otherwise. In Fung *et al*. (2015), *PCON* firms are those that satisfy any of the following criteria: (1) government cabinet members and/or members of parliament sit on corporate boards; (2) government or UMNO-linked organizations/individuals hold significant ownership; and (3) managers are politically connected individuals. Tee *et al*. (2017) define a firm as under political patronage if one of its controlling shareholders or top officers is a member of parliament, a minister, a head of state, or is closely related to a senior cabinet minister. A broader definition is used by Wong (2016) to consider four types of political connections that are forged through personal friendships between business owners and politicians, former government servants serving as board of directors, government-link companies, and having immediate family members of leading politicians on corporate boards. The total numbers of *PCON* firms in Fung *et al*. (2015), Wong (2016) and Tee *et al*. (2017) are 122, 256 and 69, respectively.

To test hypothesis H_2, we augment the baseline quadratic model with the new dummy variable of *PCON* and its interaction terms with our key variable of liquidity, written as follows:

$$\begin{aligned} Q_{it} &= \gamma_0 + \gamma_1 CPQS_{it} + \gamma_2 CPQS_{it}^2 + \gamma_3 \ln SIZE_{it} + \gamma_4 \ln AGE_{it} + \gamma_5 LEV_{it} \\ &\quad + \gamma_6 SALES_{it} + \gamma_7 CAPEX_{it} + \gamma_8 VOL_{it} + \gamma_9 ROA_{it} + \gamma_{10} KLCI_{it} \\ &\quad + \gamma_{11} \ln BSIZE_{it} + \gamma_{12} BINDEP_{it} + \gamma_{13} DUAL_{it} + \gamma_{14} CHAIR_{it} + \gamma_{15} PCON_{it} \\ &\quad + \gamma_{16} PCON_{it} \cdot CPQS_{it} + \gamma_{17} PCON_{it} \cdot CPQS_{it}^2 + \sum_{j=1}^{J} \gamma_{18j} IND_j + \sum_{t=1}^{T} \gamma_{19t} YR_t + \varepsilon_{it} \end{aligned} \tag{4}$$

The estimation results for equation (4) are presented in Table 11.[17] Despite the inclusion of *PCON* in the baseline model, liquidity remains a highly significant determinant of firm value across all three columns, with *CPQS* and $CPQS^2$ retaining their signs of a U-shaped relationship. Turning to the dummy variable of *PCON*, all columns consistently show that political connections are positively and significantly associated with firm value, lending further support to the existing empirical evidence that firms derive value benefit from their close ties with politicians or political parties in power (Johnson and Mitton, 2003; Faccio 2006; Goldman *et al*., 2009). In the Malaysian

[17] One of the reviewers rightly points out that equations (4) & (5) suffer from the issue of multicollinearity. This is inevitable as the interaction variables are derived from the other explanatory variables that are also present in the model. The problem affects only the interaction variables, but not the other explanatory variables. While the statistical properties of the estimators are known not to be affected by multicollinearity, the standard errors of the estimators could be inflated. Despite the issue, the dummy variable for political connection and its interaction with measures of liquidity are significant (Table 11). Statistical significance is also found for the ownership variable and its interaction with measures of liquidity but this is limited to only foreign ownership (Table 12). Thus, the issue of multicollinearity is not of major concern as the inflated standard errors of the coefficients to these variables do not undermine their statistical significance.

context, anecdotes in the media suggest well-connected firms receive preferential state treatment that grants them economic advantages such as lucrative concessions, licenses or monopoly rights, favorable regulations, easy access to credit financing, and government subsidies. Empirically, Johnson and Mitton (2003) estimate a \$60 billion loss in market value for their sampled 67 politically connected firms during the early phase of the Asian financial crisis from July 1997 to August 1998, largely due to market's perception that the Malaysian government would be unable to continue subsidizing them. These authors find evidence, however, that the subsequent imposition of capital controls in September 1998 facilitated the government's financial support of patronized firms badly hit by the crisis, resulting in the rebound of their stock prices to the tune of a \$5 billion gain in market value. The above evidence shows that investors generally react positively when firms are under the patronage of top politicians, suggesting that the value gains might operate through the stock price channel.

To determine the moderating role of political connections on the liquidity-firm value relationship, we turn to the two interaction terms in equation (4). The coefficients for $PCON \text{ x } CPQS$ and $PCON \text{ x } CPQS^2$ are highly significant across all three lists of politically connected firms. The turning points suggest that stocks of connected firms must be traded at a relatively higher level of liquidity before reaping the value benefit, thus lending support to hypothesis H_2.[18] While Huang *et al*. (2014) establish the crucial role of investor protection in shaping the liquidity-firm value relationship, we extend the literature by showing that the patronage offered by politicians to firms is another important institutional determinant. Apart from the stock price channel mentioned above, we also highlight the possibility that the moderating role of political connections operates through the lower cost of capital. For instance, Houston *et al*. (2014) report a lower cost of bank loans for politically connected firms in the U.S. because lenders

[18] In equation (4), the turning point when *PCON*=0 is $-\gamma_1/2\gamma_2$, whereas *PCON* = 1 yields a turning point of $-(\gamma_1+\gamma_{16})/2(\gamma_2+\gamma_{17})$. For hypothesis H_2 to be true, the turning point for the politically connected firms must be smaller (i.e., occurring at higher liquidity) than the turning point for the non-politically connected firms. The condition is therefore: $\gamma_2\gamma_{16} > \gamma_1\gamma_{17}$. In Table 11, our results show that the estimates for γ_1, γ_2, γ_{16} and γ_{17} are statistically significant. Taken together, the above condition is met for all three separate lists of *PCON* firms. This indicates that the turning point for the U-shape liquidity-firm value curve occurs at a higher liquidity level for *PCON*=1, thus lending support to hypothesis H_2. The subsample analysis for *PCON* and non-*PCON* firms suggested by both reviewers has been conducted, and the unreported results are consistent with the interpretation of our interaction terms ($PCON^{*}CPQS$ and $PCON^{*}CPQS^2$) in model (4).

perceive them as having high creditworthiness. The cross-country study by Boubakri *et al*. (2012) finds that investors require a lower cost of equity for *PCON* firms that enjoy implicit government guarantee. It is thus possible for political connections to strengthen the liquidity-firm value relationship through the cost of capital channel. Because identifying the exact mechanism is not central to our study, we leave this unresolved issue to future research.

6.2 Investor heterogeneity

In this section, we utilize the unique finding of Lim *et al*. (2016) that only foreign nominees enhance the price efficiency of Malaysian stocks to provide indirect evidence for the stock price informativeness channel via interaction analysis. More specifically, hypothesis H_3 states that firms with high foreign nominee ownership require higher level of liquidity than those with low foreign nominee ownership in order to reap the benefit of larger firm value. On the other hand, the unique Malaysian institutional setting whereby state-backed local institutional funds have been entrusted by the government to spearhead shareholder activism permits us to test the corporate governance channel. This leads to hypothesis H_4, where firms with high local institutional ownership require higher level of liquidity than those with low local institutional ownership in order to reap the benefit of larger firm value.

Both hypotheses H_3 and H_4 require complete ownership data, which are not available in existing commercial databases or annual reports of public listed companies. Following Lim *et al*. (2016), we subscribe to the annual ownership dataset "End of Year Shareholdings by Type of Investor" from the primary and sole source, Bursa Malaysia, but for a longer sample period of 16 years from 2000 to 2015. The dataset first divides investors into two major groups – Malaysian and foreign – and further classifies them into seven types: (1) individuals; (2) banks; (3) investment trusts; (4) other corporations; (5) government agencies; (6) nominees; and (7) other. For each investor type, we are supplied with the total number of shareholders and the total number of shares as of December of each year. Following the convention in the literature, we put banks, investment trusts and other corporations under the category of institutions.

Table 11
Corporate Political Connections and Liquidity-Firm Value Relationship

	Fung *et al*. (2015)	Wong (2016)	Tee *et al*. (2017)
CPQS	-0.0680***	-0.0622***	-0.0678***
	(0.0071)	(0.0075)	(0.0071)
$CPQS^2$	0.0014***	0.0012***	0.0014***
	(0.0002)	(0.0002)	(0.0002)
ln *SIZE*	-0.2042***	-0.1929***	-0.1983***
	(0.0287)	(0.0270)	(0.0285)
ln *AGE*	0.0048	0.0067	0.0063
	(0.0270)	(0.0278)	(0.0271)
LEV	0.7234***	0.7252***	0.7228***
	(0.1196)	(0.1198)	(0.1210)
SALES	-0.00003	-0.00005	-0.00005
	(0.0002)	(0.0002)	(0.0002)
CAPEX	0.5908**	0.5421*	0.5899**
	(0.2676)	(0.2774)	(0.2794)
VOL	0.0135	0.0143	0.0140
	(0.0110)	(0.0111)	(0.0110)
ROA	1.4433***	1.4301***	1.4503***
	(0.3411)	(0.3475)	(0.3448)
KLCI	0.5039***	0.5280***	0.5005***
	(0.0885)	(0.0958)	(0.0872)
ln *BSIZE*	0.0604	0.0658	0.0555
	(0.0568)	(0.0538)	(0.0549)
BINDEP	-0.0155	-0.0127	-0.0036
	(0.0945)	(0.0970)	(0.0932)
DUAL	-0.0335	-0.0395	-0.0509
	(0.0505)	(0.0478)	(0.0498)
CHAIR	0.0643**	0.0684**	0.0692**
	(0.0313)	(0.0314)	(0.0317)
PCON	0.8660***	0.2224***	1.0463***
	(0.2011)	(0.0765)	(0.2941)
PCON x *CPQS*	-0.7061***	-0.1115***	-1.1106***
	(0.1533)	(0.0211)	(0.3056)
PCON x $CPQS^2$	0.1188***	0.0064***	0.2699***
	(0.0246)	(0.0012)	(0.0765)
CONSTANT	3.4757***	3.3019***	3.3979***
	(0.4012)	(0.3764)	(0.3946)
Year	Yes	Yes	Yes
Industry	Yes	Yes	Yes
N	12,349	12,349	12,349
Adj. R^2	0.2119	0.2064	0.2076

Notes: The definitions for all the variables are provided in the Appendix. This table presents the OLS estimation results for the augmented model in equation (4) where the dependent variable is Tobin's *Q* over the sample period 2000-2015. For brevity, year and industry dummies are suppressed but available upon request. Double-clustered standard errors are reported in the parentheses. *N* denotes the number of firm-year observations.
***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

To test hypotheses H_3 and H_4, we augment the baseline quadratic model with the new ownership variable of *OWN* and its interaction terms with the key variable of liquidity, written as follows:

$$\begin{aligned} Q_{it} &= \gamma_0 + \gamma_1 CPQS_{it} + \gamma_2 CPQS_{it}^2 + \gamma_3 \ln SIZE_{it} + \gamma_4 \ln AGE_{it} + \gamma_5 LEV_{it} \\ &+ \gamma_6 SALES_{it} + \gamma_7 CAPEX_{it} + \gamma_8 VOL_{it} + \gamma_9 ROA_{it} + \gamma_{10} KLCI_{it} \\ &+ \gamma_{11} \ln BSIZE_{it} + \gamma_{12} BINDEP_{it} + \gamma_{13} DUAL_{it} + \gamma_{14} CHAIR_{it} + \gamma_{15} OWN_{it} \\ &+ \gamma_{16} OWN_{it} \cdot CPQS_{it} + \gamma_{17} OWN_{it} \cdot CPQS_{it}^2 + \sum_{j=1}^{J} \gamma_{18j} IND_j + \sum_{t=1}^{T} \gamma_{19t} YR_t + \varepsilon_{it} \end{aligned} \tag{5}$$

Ownership (*OWN*) is computed as the total shares held by each investor group divided by the total shares outstanding in each firm at the end of every calendar year. We enter the different types of investor shareholdings separately into equation (5). Apart from foreign nominee ownership and local institutional ownership as clearly specified in the hypotheses, we also include other investor types to provide a complete analysis on the impact of investor heterogeneity on liquidity-firm value relationship.

The estimation results for equation (5) are presented in Table 12. Despite the inclusion of *OWN* in the baseline model, the coefficients for *CPQS* and $CPQS^2$ remain highly significant with the U-shaped relationship unaffected across all six investor types – foreign institutions, foreign individuals, foreign nominees, local institutions, local individuals and local nominees. The interaction terms of $OWN \text{ x } CPQS$ and $OWN \text{ x } CPQS^2$ are highly significant for foreign nominee ownership. The turning point suggests that stocks with high foreign nominee ownership must be traded at a relatively higher level of liquidity before reaping the value benefit, thus lending support to hypothesis H_3 which can be attributed to the stock price informativeness channel.[19] Consistent with Lim *et al*. (2016), we find that the significant result is not due to the nominee effect per se but the foreign nature of ownership, as the interaction terms with

[19] In equation (5), the turning point for *CPQS* is $-(\gamma_1 + \gamma_{16}\text{OWN})/2(\gamma_2 + \gamma_{17}\text{OWN})$. For hypotheses H_3 and H_4 to be true, the turning point must be smaller (i.e., occurring at higher liquidity) when the level of ownership is higher. The condition is therefore: $\gamma_2\gamma_{16} > \gamma_1\gamma_{17}$. In Table 12, our results show that the estimates for γ_1, γ_2, γ_{16} and γ_{17} are all statistically significant for foreign nominee and foreign institutional ownership. Taken together, the above condition is met for these two foreign ownership categories. This indicates that the turning point for the U-shape liquidity-firm value curve occurs at a higher liquidity level for higher foreign ownership. This supports hypothesis H_3 that a higher liquidity level is needed for firms with high foreign nominee ownership to reap the value benefit. For the local institutional ownership, as the estimates for γ_{16} and γ_{17} are not significant, the condition is not statistically meaningful even if met. The subsample analysis for bottom 25% and top 25% ownership suggested by the reviewer has been conducted, and the unreported results are consistent with the interpretation of our interaction terms (OWN^*CPQS and OWN^*CPQS^2) in model (5).

local nominees provide no statistically significant evidence that the liquidity-firm value relationship is stronger for firms with higher local nominee ownership.

As for the corporate governance channel, the results in Table 12 show that the interaction terms of $OWN \times CPQS$ and $OWN \times CPQS^2$ are not statistically significant when local institutional ownership is entered into the regression. Although local institutional investors have been entrusted by the Malaysian government to spearhead shareholder activism, coupled with the empirical evidence that they play an effective monitoring and governance role among Malaysian publicly listed firms (Abdul Wahab *et al*., 2007; Ameer and Abdul Rahman, 2009), we do not find evidence to support hypothesis H_4 that firms with high local institutional ownership require higher level of liquidity to reap the value benefit. This insignificant result could be due to two reasons: (1) the positive impact of local institutions on corporate governance might have become weaker in recent years; and (2) liquidity does not operate through the corporate governance channel in the Malaysian context.

Table 12: Investor Heterogeneity and Liquidity-Firm Value Relationship

Industry	***CPQS***	***CPQS²***	***OWN***	***CPQS* x *OWN***	***CPQS²* x *OWN***
			Panel A: Foreign Investors		
Foreign Institutional	-0.0609***	0.0012***	0.0217***	-0.0083***	0.0005***
Ownership	(0.0073)	(0.0002)	(0.0048)	(0.0016)	(0.0001)
Foreign Individual	-0.0667***	0.0013***	-0.0054**	-0.0002	0.0001***
Ownership	(0.0078)	(0.0002)	(0.0024)	(0.0007)	(0.00003)
Foreign Nominee	-0.0570***	0.0010***	0.0190***	-0.0053***	0.0003***
Ownership	(0.0063)	(0.0001)	(0.0033)	(0.0010)	(0.0001)
			Panel B: Local Investors		
Local Institutional	-0.0628***	0.0012***	0.0014	-0.0002	0.000007
Ownership	(0.0084)	(0.0002)	(0.0010)	(0.0002)	(0.000005)
Local Individual	-0.1159***	0.0023***	-0.0135***	0.0013***	-0.00002***
Ownership	(0.0155)	(0.0004)	(0.0015)	(0.0002)	(0.000007)
Local Nominee	-0.0643***	0.0011***	-0.0005	-0.0003	0.00002***
Ownership	(0.0084)	(0.0002)	(0.0013)	(0.0003)	(0.000009)

Notes: The definitions for all the variables are provided in the Appendix. This table presents the OLS estimation results for the augmented model in equation (5) where the dependent variable is Tobin's *Q* over the sample period 2000-2015. For brevity, estimates for control variables, constant, industry and year dummies are suppressed but available upon request. Double-clustered standard errors are reported in the parentheses.
***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Addressing the first possibility, we note that our paper covers more sample firms (1250) over a longer sample period (2000-2015) than Abdul Wahab *et al*. (2007) and Ameer and Abdul Rahman (2009). The former collect data for 440 Malaysian public listed companies from 1999 to 2002, whereas the latter examine 224 listed firms over 2005-2008. It thus warrants further study to examine the relationship between local institutional ownership and corporate governance using more recent data, especially data after the 2008/2009 global financial crisis. For the second possibility, we cannot completely rule out the role of corporate governance in shaping the liquidity-firm value relationship. The significant interaction terms when foreign institutional ownership serves as the proxy for *OWN* in equation (5) lends some weight to our conjecture. Furthermore, there is indirect empirical evidence suggesting that foreign institutional investors in Malaysia promote good corporate governance practices among their investee companies. For instance, Foong and Lim (2016) find that foreign institutional ownership is negatively and significantly associated with cost of equity, and their interaction analysis suggests it operates through the corporate governance channel. The significant relationship disappears, however, when foreign nominees enter the model, possibly because they do not exert influence on the corporate governance process. Using data on Malaysian listed firms from 2003 to 2011, Tee *et al*. (2017) show that institutional ownership is positively and significantly associated with audit fees, suggesting that institutions play an effective monitoring role by demanding greater audit efforts and thus higher audit fees. Their disaggregate analysis reveals that the significant result is driven only by foreign institutional investors, while the coefficient for local institutions is statistically insignificant.

7. Conclusion

Using the emerging Malaysian stock market as a laboratory, this paper provides at least three additional insights to the empirical literature of liquidity and firm value. First, we find that previous consensus of a positive linear relationship between liquidity and firm value, largely drawn from mature developed markets, cannot be generalized to Malaysian stocks due to differences in institutional setting, level of information efficiency, ownership structure, shareholder activism and investor sophistication. Instead, the baseline quadratic model shows that liquidity is nonlinearly associated with firm value, with the beneficial effects only kicking in when liquidity exceeds the threshold level. Second, the analysis complements existing evidence on the value impact of establishing close ties with top politicians or political parties in power. More specifically, corporate political connections strengthen the liquidity-firm value relationship, in which the value impact occurs only at a higher level of liquidity for politically connected firms than their non-connected peers. Third, two unique Malaysian institutional features – the higher efficiency of stocks with greater foreign nominee ownership and the government mandate for state-backed local institutions to spearhead shareholder activism – provide an ideal setting to test two important channels driving liquidity-firm value relation, namely, stock price informativeness and corporate governance, respectively. We find liquidity to be a more important criterion for value impact to set in for firms with higher foreign nominee ownership and foreign institutional ownership.

In addition to the above scholarly contributions, our study has direct implications for exchange regulators and publicly listed firms in Malaysia. In terms of policy implications, the evidence that the value benefit will only kick in at a higher level of liquidity suggests additional government effort is needed. It is generally acknowledged that emerging market firms still suffer from poor liquidity relative to their counterparts in developed economies (see Lesmond, 2005; Griffin *et al*., 2010). While numerous initiatives have been undertaken by the stock exchange since the inception of Bursa Malaysia (see Lim *et al*., 2017), our finding commends the Malaysian government's efforts to further liberalize the Malaysian stock market since 2009 given that the value impact demands a more liquid market for stocks with higher foreign ownership. For publicly listed firms, our finding lends further support to the repeated calls by Amihud and Mendelson (1988, 1991, 2000, 2008) for managers to actively pursue liquidity-enhancing policies. We caution that firms should evaluate the costs and benefits of these policies, however, as achieving a higher level of liquidity incurs greater costs that might outweigh the value benefit. Nevertheless, the local bourse will benefit greatly if regulators and listed firms cooperate and make concerted efforts to improve liquidity.

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Appendix: Definitions for All Variables

Variables	Definitions
Q	Tobin's *Q* ratio is the measure of firm value, computed as the market value of assets scaled by the book value of assets at year-end. Following Fang *et al*. (2009), the numerator is computed as the market value of common equity plus book value of assets minus the sum of the book value of common equity and balance sheet deferred taxes. The book value of assets serves as the proxy for the replacement value of assets in the denominator.
CPQS	Our main proxy of liquidity is the "Closing Percent Quoted Spread" proposed by Chung and Zhang (2014), computed as the ratio of the difference of closing ask and closing bid prices over the mid-point of these prices. The *CPQS* is computed using daily data, and then averaged to obtain the liquidity estimate for each year and each stock.
ILLIQ	Amihud (2002) illiquidity ratio is used as an alternative liquidity measure in the robustness check, computed as the daily ratio of the absolute stock returns to the local currency trading volume. The annual *ILLIQ* estimates for each stock are obtained by averaging the computed daily ratios across all trading days for each year.
CPQSIM	The price impact version of the *CPQS* is used as an alternative liquidity measure in the robustness check, computed as the daily ratio of the *CPQS* scaled by the local currency trading volume. The annual *CPQSIM* estimates for each stock are obtained by averaging the computed daily ratios across all trading days for each year.
ln *SIZE*	Natural logarithm of firm size, measured by the book value of total assets at year-end.
ln *AGE*	Natural logarithm of firm age, proxied by the number of years since incorporation prior to year-end.
LEV	Leverage is computed as the ratio of book value of debts over the book value of assets at year-end.
SALES	Sales growth is defined as the annual percentage change in sales.
CAPEX	The ratio of capital expenditures over the book value of assets measured at year-end.
VOL	Volatility is computed as the standard deviation of daily stock returns over the year.
ROA	Return on assets is computed as the operating income divided by the book value of assets measured at year-end.
KLCI	A dummy variable of stock index membership which takes a value of one if a stock is included in the main index of the Malaysian stock market (namely Kuala Lumpur Composite Index prior to 6 July 2009, and FTSE Bursa Malaysia KLCI Index thereafter), and zero otherwise.
ln *BSIZE*	Natural logarithm of board size, measured by the total number of directors on a firm's board at year-end.
BINDEP	Board independence is proxied by the ratio of independent non-executive directors over board size at year-end.
DUAL	A CEO duality dummy variable which takes a value of one if the chief executive officer is also the board chairman at year-end, zero otherwise.
CHAIR	A dummy variable which takes a value of one if the board chairman is an independent non-executive director at year-end, zero otherwise.

PCON	A dummy variable which takes a value of one if a firm is politically connected, zero otherwise. We use three separate lists of patronized Malaysian corporations constructed by Fung *et al*. (2015), Wong (2016) and Tee *et al*. (2017).
OWN	Corporate ownership is computed as the total shares held by each investor group divided by the total shares outstanding in each firm at year-end. From the complete ownership dataset provided by Bursa Malaysia, we compute foreign institutional ownership, foreign individual ownership, foreign nominee ownership, local institutional ownership, local individual ownership and local nominee ownership.