Corporate Shareholdings and the Liquidity of Malaysian Stocks: Investor Heterogeneity, Trading Account Types and the Underlying Channels

Lim, Kian-Ping and Thian, Tze-Chung and Hooy, Chee-Wooi

Department of Economics, Faculty of Economics Administration, University of Malaya, Labuan School of International Business and Finance, Universiti Malaysia Sabah, Finance Section, School of Management, Universiti Sains Malaysia

25 July 2015

Full Title: **Corporate Shareholdings and the Liquidity of Malaysian Stocks: Investor Heterogeneity, Trading Account Types and the Underlying Channels**

Authors: Kian-Ping Lim[a*], Tze-Chung Thian[b], Chee-Wooi Hooy[c],

Affiliations: [a] Department of Economics, Faculty of Economics & Administration University of Malaya
[b] Labuan School of International Business and Finance, Universiti Malaysia Sabah
[c] Finance Section, School of Management, Universiti Sains Malaysia

Abstract: This paper examines the relationship between shareholdings of various investor groups and stock liquidity for Malaysian public listed firms over the 2002-2009 sample period. Using the Amihud illiquidity ratio, we extend the literature by addressing the issues of investor heterogeneity, trading account types and the interactions of competing liquidity channels. The analysis reveals that only local institutions and local individual investors who trade through the direct accounts are significantly associated with the liquidity of domestic firms. In contrast, the significant liquidity effect for foreign investors operates through the nominee accounts. While institutional ownership exhibits a linear negative relationship, our findings on local individuals and foreign nominees differ greatly from previous studies in that their relationship with stock liquidity is non-monotonic. Apart from the widely researched information asymmetry and trading effects, we find that liquidity is also driven by the largely ignored information competition channel. An important insight from our findings is that the large shareholdings by any particular investor group is detrimental to stock liquidity as they exacerbate information asymmetry, reduce the degree of competition and lower the level of trading activity.

JEL Classifications: G12; G32

Keywords: Investor groups; Stock liquidity; Information asymmetry; Information competition; Trading; Malaysia

First Version: 25 July 2015

* Corresponding author. Kian-Ping Lim, Department of Economics, Faculty of Economics & Administration, University of Malaya, 50603 Kuala Lumpur, Malaysia. Tel: +603-79673666; Fax: +603-79567252; Email: kianpinglim@um.edu.my.

1. Introduction

The liquidity in interbank markets, balance sheet assets and financial markets have received extensive media coverage during the 2008-2009 global financial crisis. The crisis suggests that the three markets are interconnected, further reaffirmed by recent empirical evidence that stock liquidity is affected by a firm's own liquid assets and liquidity in the interbank markets (see Gopalan *et al*., 2012; Nyborg and Östberg, 2014). However, the focus of this study is not on their interactions, but rather on the liquidity of public listed stocks so as to identify the internal driving forces from the equity market itself. The extensive surveys conducted by Amihud *et al*. (2006) and Holden *et al*. (2014) clearly demonstrate the breadth and depth of the stock liquidity literature. On the theoretical front, many models have been developed to explore the different dimensions of liquidity. Earlier framework generally addresses the effects of informed trading on liquidity (see Glosten and Milgrom, 1985; Easley and O'Hara, 1987). However, in recent years, greater emphasis has been given to the modelling of financial constraints and liquidity dry-ups (see Gârleanu and Pedersen, 2007; Brunnermeier and Pedersen, 2009). The empirical literature, on the other hand, explores the determinants and effects of stock liquidity.[1, 2]

It is worth highlighting that empirical liquidity studies focus mainly on developed stock markets, in particularly the United States. One of the main reasons is the lack of liquidity measures for firms traded in emerging stock markets, since the commercially accessible trading volume does not measure trading costs or the price impact of transactions. Bid-ask spread, widely used as a liquidity benchmark, is unfortunately difficult to collect for emerging market firms over extended time periods. Given this limitation, several studies propose new liquidity proxies that can be constructed using data available at the daily frequency such as closing prices, trading volume, low and high

[1] As an independent variable, academic studies find that liquidity is a priced risk factor of stock returns (see the survey paper by Amihud *et al*., 2006). Liquidity also influences the decision of capital structure (Lipson and Mortal, 2009), enhances market efficiency (Chordia *et al*., 2008), increases firm performance (Fang *et al*., 2009) and improves corporate governance (Edmans *et al*., 2013).

[2] As a dependent variable, the literature explores the contributing factors of stock liquidity, which include corporate governance (Chung *et al*., 2010), financial transparency (Heflin *et al*., 2005), financial liberalization (Vagias and van Dijk, 2012), security analysts (Roulstone, 2003), local institutions (Agarwal, 2007), local blockholders (Brockman *et al*., 2009), local individual investors (Amihud *et al*., 1999) and foreign institutions (Rhee and Wang, 2009).

prices (for the liquidity menu, see Goyenko *et al*., 2009; Fong *et al*., 2014b). This positive development has contributed to a gradual increase in the understudied emerging markets in recent decade. Among others, Lesmond (2005) and Griffin *et al*. (2010) find that the liquidity of emerging market firms is still at a lower level relative to those in more developed economies. Given the profound effects of liquidity on many aspects of corporate finance, it warrants more research to uncover the list of factors underlie the poor liquidity in emerging market firms.

This paper focuses exclusively on the stock market of a developing economy– Malaysia, since there is no one-size-fits-all policy that can be derived from broad cross-country results. Though the Kuala Lumpur Stock Exchange (KLSE) was incorporated in 1976 (renamed as Bursa Malaysia in 2004), there has been very few published studies on the liquidity of Malaysian stocks over nearly four decades. Our literature search only finds Foo and Mat Zain (2010), Ramlee and Ali (2012) and Azevedo *et al*. (2014) the few Malaysian liquidity papers. From a policy perspective, improving the liquidity of Bursa Malaysia has always been a key objective for the stock exchange regulators. Numerous initiatives have been undertaken by the Malaysian authorities over the years to improve liquidity such as demutualization, the launching of Capital Market Masterplan, reducing lot size from 1000 to 100, promoting investor relations, introducing Capital Market Development Fund-Bursa Research Scheme, boosting retail participation and introducing proprietary day traders. In his keynote address at Invest Malaysia on 30 June 2009, the Prime Minister of Malaysia announced a series of bold liberalization measures to boost foreign portfolio investments and put Bursa Malaysia on the radar screen of international fund managers. Reading through the objectives of these initiatives, we find that the Malaysian policymakers generally define liquidity in terms of trading activity such as share volume or turnover. This is understandable because the demutualized Bursa Malaysia needs to attract huge trading volume to remain profitable. Despite counterintuitive, the empirical results in Lesmond (2005) and Barinov (2014) show that more frequently traded stocks do not necessarily correspond with higher liquidity. The "Flash Crash" in the U.S. stock markets that took place on May 6, 2010 is a good example of liquidity drying up amid very high trading volume.

Thus, the lack of Malaysian liquidity studies and the narrow interpretation of liquidity by the local authorities motivate our empirical investigation.

A pertinent issue to Malaysian policymakers, which we take up here, is to distinguish the types of investor which improve liquidity from those that reduce the liquidity of local public listed stocks. There is no prior research on the liquidity roles of various investor groups mainly because Malaysian ownership data are not reported in public listed companies' annual reports and commercial databases (such as Standard & Poor's Emerging Markets Database or Thomson Datastream). Only in recent years that Bursa Malaysia is engaged in the business of providing information products and services for its equities and derivatives markets. We are able to obtain the commercial corporate ownership dataset from the local bourse for all public listed firms over the sample period 2002-2009. Table 1 provides the shareholdings by investor types at the end of each calendar year. In terms of nationality, it is obvious that Malaysian investors dominate the local stock market, holding more than 80% of the total outstanding shares for all sampled years. Among the domestic investors, institutions and nominees are the major holders with each of them having around 25% shareholdings. Unlike the distribution of Malaysian investors, about two-thirds of the foreign shareholdings are held through the nominee accounts. Another observation is the negligible shareholdings by foreign government agencies throughout the sample period, and hence they will not be included in our empirical analysis on investor heterogeneity. This leaves us with five mutually exclusive investor types– local individual investors, local institutional investors, local government agencies, foreign individuals and foreign institutions.[3] The extant literature generally focuses on one specific investor type in each study, covering local individual investors (Amihud *et al*., 1999; Ahn *et al*., 2014; Wang and Zhang, 2015), local institutions (Agarwal, 2007; Rubin, 2007; Jiang *et al*., 2011), local government (Choi *et al*., 2010; Borisova and Yadav, 2012; Ding, 2014) and foreign institutions (Rhee and Wang, 2009; Agudelo, 2010; Ng *et al*., 2015). We thus

[3] In many existing studies, the relationship between ownership structure and liquidity is examined from the sole perspective of information asymmetry, and thus the investor groups examined are potential informed traders– corporate insiders, blockholders and local institutions, in which their shareholdings are overlapped. Without partitioning, one cannot confidently pinpoint the specific investor group that drives liquidity (for details, see Rubin, 2007).

extend the literature by exploring the competing roles of five different investor groups in the Malaysian stock market.

Table 1
End of Year Shareholdings for All Public Listed Companies on Bursa Malaysia (in %)

	2002	2003	2004	2005	2006	2007	2008	2009
Number of Listed Firms	849	865	890	918	1016	991	981	968
				Panel A: Malaysian				
Individuals	18.81	18.71	19.49	19.63	21.93	21.56	21.89	21.69
Institutions	23.80	26.38	26.48	26.32	25.35	25.13	25.46	27.04
Government	10.38	9.58	9.48	9.14	8.69	7.73	9.18	9.04
Nominees	30.12	28.39	27.5	27.86	26.53	25.27	26.61	26.07
Others	0.25	0.19	0.16	0.15	0.12	0.11	0.10	0.03
				Panel B: Foreign				
Individuals	1.18	1.26	1.20	1.33	1.51	1.43	1.39	1.29
Institutions	3.22	3.12	3.51	3.29	3.15	3.14	3.06	3.30
Government	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Nominees	11.57	11.76	11.57	11.63	12.19	15.24	12.20	11.42
Others	0.67	0.61	0.61	0.65	0.53	0.38	0.11	0.12

Source: Authors' calculation based on the firm-level shareholdings data provided by Bursa Malaysia.
Note: Institutional shareholdings are the sum of shareholdings by banks, investment trusts and other corporations.

The uniqueness of this dataset allows us to compare the liquidity roles of investors that trade through direct versus nominee accounts, a novel contribution to the extant literature since the stock market effects of nominee trading have not hitherto been addressed.[4] During the 1997 Asian financial crisis, foreign nominees received wide negative coverage in the Malaysian press. The government constantly blamed foreign investors registered under the name of nominee companies for the downfall of Kuala Lumpur Composite Index, arguing that they lent shares to speculators who short sell and cause stock prices to plunge. To prevent speculation, the overseas trading of

[4] The closest that we find is the classification of individual investors based on the types of retail brokers they use–discount versus full-service retail brokers (Fong *et al*., 2014a; Tian *et al*., 2015).

Malaysian listed securities, in particular those on Singapore's Central Limit Order Book (CLOB) International over-the-counter market, was prohibited on 1 September 1998. Stockbroking companies were also required to take all reasonable steps to obtain essential particulars and information of their clients. Under this 'know your client" rule, all nominee accounts must state the full name and other particulars of the beneficiary. This ruling does not deter domestic and foreign investors from trading through the nominee accounts as they constitute about one-thirds of the total shareholdings in Bursa Malaysia. Their substantial stakes, however, do not generate any interest from researchers until recently when Lim *et al*. (2013) conduct a pioneering work on the relationship between foreign investors and price efficiency of Malaysian stocks. Using the same ownership dataset provided by Bursa Malaysia, these authors find that foreign investors who trade through the nominee accounts are responsible for the swift incorporation of public information into stock prices. However, such price discovery does not occur when foreign investors trade through the direct accounts. We thus complement Lim *et al*. (2013) on the analysis of nominee accounts, but expanding the scope to stock liquidity.

In the literature, existing theoretical models offer rich insights on the underlying channels through which investors affect stock liquidity. The proposed mechanisms include information asymmetry, competition among informed traders and the level of trading activity. While previous studies develop their hypotheses and rationalize their empirical findings based on these theories, most of them do not formally explore the underlying liquidity channels, with Agarwal (2007), Rubin (2007), Brockman *et al*. (2009), Ding (2014) and Ng *et al*. (2015) the notable exceptions. Agarwal (2007) explores the trade-off between information asymmetry and competition, whereas the remaining four studies consider separately the channels of information asymmetry and trading activity. This study adds to the literature by examining all three possible mechanisms, which serves to uncover the forces that drive the relationship between each investor group and stock liquidity. Since these channels are theoretically grounded, the analysis partially alleviates the concern of reverse causality from liquidity to corporate shareholdings. In the context of Malaysia, some of the policies formulated are directed towards attracting the participation of specific investor groups, such as boosting retail participation, stock market liberalization measures and the divestment of government shareholdings in public listed companies. However, these initiatives might not yield the intended liquidity benefit if the investor type-liquidity relationship is non-monotonic, implying the interplay of different driving forces at varying levels of shareholdings. Hence, further analysis of the underlying mechanisms is pertinent so that effective policies can be prescribed.

Given our access to the corporate ownership data assembled by Bursa Malaysia for the sample period 2002-2009, we explore the liquidity roles of various investor groups in the local bourse. We use the Amihud (2002) illiquidity ratio as our dependent variable because of its theoretical appeal and empirical reliability as verified in a series of liquidity horseraces. Our aggregate to disaggregate analysis demonstrates the differing liquidity effects of those investor groups under study. First, even though the aggregate analysis using total local ownership or total foreign ownership shows strong liquidity effect, the disaggregate shareholdings reveal that the significant results are driven by certain investor groups. This highlights the shortcomings of empirical liquidity studies using macro-level portfolio equity flows (see Tesar and Werner, 1995; Vagias and van Dijk, 2012) as they ignore within-country investor heterogeneity. Second, we find that only local institutions and local individual investors who trade through the direct accounts are significantly associated with the liquidity of domestic firms. In contrast, the significant liquidity effect for foreign investors operates through the nominee accounts. This significant result for nominee accounts is a new addition to the literature, after recent studies uncover informed trading through the accounts of children by their guardians (Berkman *et al*., 2013) and the accounts with full-service retail brokers by individual investors (Fong *et al*., 2014a).

Existing liquidity studies mostly specify their model in the linear form, mainly because of their sole focus on asymmetric information effect. Our empirical results underscore the importance of functional form and the possibility of drawing incorrect inferences when linearity in assumed.

Given the opposing effects predicted by existing liquidity channels, the possibility of a non-monotonic relationship cannot be ruled out. Indeed, while institutional ownership exhibits a linear negative relationship, our findings on local individuals and foreign nominees differ greatly from previous studies in that their association with stock liquidity is non-monotonic. Further analysis indicates that the dominance of government-owned public institutions might account for the negative liquidity effect, as their large shareholdings exacerbate information asymmetry, reduce the degree of competition and lower the level of trading activity. For individual investors, we observe the interactions of two opposing effects which might give rise to the non-monotonic relationship. On one hand, individual investors increase the level of information asymmetry and lower the degree of competition, possibly due to the concentration of ownership in the hands of family (see Carney and Child, 2013). On the contrasting end, the active trading activity of individual investors improves the liquidity of Malaysian stocks. Finally, we find that higher foreign shareholdings are associated with lower level of information asymmetry, higher degree of competition and more trading activity. All three channels imply a monotonic positive relationship in which higher shareholdings by foreign nominees increase the level of stock liquidity. We conjecture that the reported reduction in liquidity after foreign shareholdings exceed the threshold point is due to the dominance of a strong negative effect, which is not captured by the three theoretically grounded liquidity channels.

The remainder of the paper is structured as follows. Section 2 discusses the theories, variables and model specification. Section 3 describes the sample selection process and provides descriptive statistics for the sample data. Section 4 presents the empirical results using aggregate and disaggregate shareholdings. The underlying liquidity channels are further explored in Section 5. The final section contains the conclusion.

2. Theories, Measurement of Variables and Model Specification

This section provides a brief discussion on the existing theoretical models that predict the relationship between investor types and stock liquidity. The subsections also discuss the measurement of all variables and their respective data sources. Finally, we outline our baseline regression models and the estimation method.

2.1 Existing theories on investor type-stock liquidity relation

When exploring the investor type-liquidity relation, the information asymmetry between informed and uninformed traders stands out as the popular explanation. Under this hypothesis, a key determinant of liquidity is the extent to which the amount of information varies from one investor group to another. More specifically, this strand of models predicts that when privately informed traders possess superior information relative to other market participants, such information asymmetry reduces stock liquidity due to the adverse selection costs of trading (see Glosten and Milgrom, 1985; Kyle, 1985; Easley and O'Hara, 1987). The theoretical prediction that liquidity decreases with the level of information asymmetry has been widely used to infer which investor group is better informed. For instance, based on the negative relationship between local blockholdings and liquidity, the empirical studies by Heflin and Shaw (2000) and Rubin (2007) identify blockholders as having privileged access to private information who exacerbate information asymmetry. Ng *et al*. (2015) find that controlling foreign direct investors impair stock liquidity because their information advantage increases the level of information asymmetry. Chung *et al*. (1995) and Jiang *et al*. (2011) report a negative relationship between analyst coverage and stock liquidity, arguing that extensive analyst coverage is perceived as a signal of higher information asymmetry.

The liquidity dampening effect of informed trading has become the focal point that its positive influence is largely neglected by existing empirical studies. One central prediction of strategic trader models (Subrahmanyam, 1991; Spiegel and Subrahmanyam, 1992) is that liquidity improves when the number of informed investors increases. In these models, the increasing competition among informed traders who act strategically accelerates the rate at which information is incorporated into stock prices. With the information efficiency of stock prices increases, traders are more willing to accommodate supply shocks, resulting in improved liquidity. Empirically, only Agarwal (2007) explores this information competition channel. The author criticizes previous liquidity studies for their sole focus on adverse selection costs imposed by informed institutions. Instead, he predicts a non-monotonic relationship between institutional ownership and liquidity due to the trade-off between the two competing effects of information asymmetry and competition. His analysis using U.S. firm-level data confirms the existence of a threshold level, with the positive effect of liquidity reverses after institutional ownership reaches 35%–40%.

Another possible channel that investors might affect liquidity is through the level of their trading activity. Some theoretical models predict an inverse relation between blockholdings and liquidity because a large block reduces free float, causing fewer trades and a fall in liquidity (see Holmström and Tirole, 1993; Bolton and von Thadden, 1998). Admati and Pfleiderer (1988) show theoretically that liquidity is an increasing function of noise trading. Rubin (2007) contends that institutions tend to turn over their portfolio more often than other investors, driven by their investment policies, agency problems or investment objectives. Such frequent trading reduces the average transaction cost and leads to an increase in stock liquidity. His subsequent empirical analysis finds a positive association between institutional ownership and liquidity which is primarily driven by higher trading activity. The empirical work of Brockman *et al*. (2009) reveals that liquidity decreases with institutional blockholdings, and this occurs mainly through reduced trading activity and not due to greater adverse selection costs. Apart from information asymmetry, Ng *et al*. (2015) find that the liquidity effect of foreign investors depends on the level of their trading intensity. Foreign portfolio investors, who gain ownership without the control of local firms, improve the liquidity of local stocks through their active trading activity. Foreign direct investors, who hold at least 5% of a firm's outstanding shares, have a detrimental effect on stock liquidity because of the inactive trading of their large block of shares.

2.2 Measuring stock liquidity

Liquidity is a multi-dimensional concept that cannot be directly observed. Even at present, there is still no consensus in the academic literature on its definition and measurement. From the perspective of investors, liquidity simply refers to the ease of trading large quantities of stocks quickly without a major price concession. We thus define liquidity from the aspect of market depth, using the Amihud (2002) illiquidity ratio to measure the price change per unit of volume. This low-frequency measure is consistent with the notion of illiquidity espoused in the theoretical model of Kyle (1985), the lambda parameter which captures the impact of order flow on stock price. Empirically, the reliability of the Amihud (2002) illiquidity ratio has been verified in a series of horseraces using data from the U.S. (Goyenko *et al*., 2009), emerging markets (Lesmond, 2005), frontier markets (Marshall *et al*., 2013) and global stock exchanges (Fong *et al*., 2014b). In these four studies, the Amihud ratio is found to exhibit one of the highest correlations among cost-per-volume proxies with intraday benchmarks. Hence, the theoretical appeal and empirical performance has made Amihud price impact the most popular liquidity measure in finance research.[5]

The Amihud illiquidity ratio is computed as the daily ratio of the absolute stock returns to the local currency trading volume. The illiquidity ratio for stock i on trading day d can be written as:

$$ILLIQ_{i,d} = \frac{\left|R_{i,d}\right|}{P_{i,d} \cdot VO_{i,d}} \tag{1}$$

where $R_{i,d}$ is the daily stock returns, $P_{i,d}$ is the daily closing stock prices and $VO_{i,d}$ is the number of shares traded on day d. To obtain the annual Amihud illiquidity measure for stock i, we average the computed daily ratios across all trading days for each calendar year. Higher values of $ILLIQ$ indicate greater illiquidity, which occur when the prices move a lot but the volumes traded are low.

[5] For instance, Lou and Shu (2014) report that over one hundred papers using the Amihud illiquidity ratio in their empirical analysis have been published in the Journal of Finance, Journal of Financial Economics and Review of Financial Studies during 2009-2013.

On the other hand, when stocks are traded in large trading volume but with small price change, the resulting *ILLIQ* will have smaller values and thus considered as highly liquid. Thomson Datastream provides the daily data on stock prices and number of shares traded for computing the Amihud illiquidity ratio.

2.3 Independent variables for investor groups

Our annual ownership dataset "End of Year Shareholdings by Type of Investor" for the sample period 2002-2009 is provided by Bursa Malaysia, which includes all publicly listed firms on the local stock exchange. The ownership dataset first divides investors along nationality of Malaysian and foreign, and then classifies them into seven types: (1) individuals; (2) banks; (3) investment trusts; (4) other corporations; (5) government agencies; (6) nominees; (7) others. For each investor type, the stock exchange provides the total number of shareholders and the total number of shares. Following the convention in the literature, we put banks, investment trusts and other corporations under the category of institutions. Shareholding 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. Due to the nature of the data, we explore the relationship between investor types and stock liquidity in three stages. First, investor heterogeneity is examined along nationality, aggregating the shareholdings for all seven investor types to compute total local ownership and total foreign ownership for each firm in each year. Second, we determine whether trading account types affect the investor type-liquidity relationship by computing shareholdings for direct and nominee accounts. Finally, the direct accounts are disaggregated into local institutions, local individuals, local government agencies, foreign institutions and foreign individuals. Bursa Malaysia does not provide such breakdown for the nominee accounts.

2.4 Control variables

We control for a set of standard liquidity determinants– analyst coverage, firm size, stock returns, turnover, and return volatility. Roulstone (2003) documents a positive relationship between analyst coverage and stock liquidity because the former increases public information. However, Chung *et al*. (1995) and Jiang *et al*. (2011) report contradictory negative relationship, arguing that extensive analyst coverage is perceived as a signal of higher information asymmetry. Unlike analyst coverage, there is a consensus on the relationship between liquidity and the four firm characteristics. Firms with larger size, better return performance and higher turnover are expected to be more liquid. Return volatility, on the other hand, is negatively associated with liquidity because volatile stocks reflect greater uncertainty and higher inventory costs.

We collect from the Institutional Brokers Estimate System (I/B/E/S) the number of unique analysts issuing earnings forecasts for a particular stock in each year. Following the common practice, analyst coverage is set equal to zero for a firm-year observation if a firm is not listed on the I/B/E/S database or does not have earnings forecasts for any given year. One limitation of I/B/E/S is that its coverage is bias towards larger firms, which is supported by the strong positive correlation between analyst coverage and firm size. To address this problem, we thus follow the literature to regress the natural logarithm of one plus the analyst coverage on natural logarithm of firm size. The residual from this regression, known as residual analyst coverage, is used as our proxy for analyst following. The data for the remaining four control variables are collected from Thomson Datastream. First, firm size is measured by market capitalization at the end of each trading day and averaged over the calendar year. Second, we compute annual stock returns by taking the time series average of daily returns. Third, stock turnover is defined as the number of shares traded scaled by the number of shares outstanding. We average the daily turnover ratios across the year as our annual measure for each firm. The last variable is stock return volatility, computed as the standard deviation of daily returns over the year.

2.5 Model specification

In the literature on investor type-liquidity relation, most empirical studies focus solely on the theoretical prediction of asymmetric information models, and thus their regression is specified in the linear form. However, Agarwal (2007) highlights the neglected information competition channel, in which liquidity improves as a result of growing competition among informed traders. Another channel that investors might affect liquidity is through the level of their trading activity. The interplay among the three effects of information asymmetry, competition and trading intensity might give rise to a non-monotonic relationship. Nevertheless, the absence of mandatory requirements for corporate disclosure by Bursa Malaysia during our sample period suggests certain investor groups might have privileged access to private information, and hence the dominance of the information asymmetry effect. To accommodate these possibilities, we specify the pooled ordinary least squares (OLS) regression model in both linear and quadratic forms as follows:

$$\begin{aligned}\ln\left(ILLIQ\right)_{i,t} = \alpha_0 + \beta_1 INVESTOR_{i,t-1} + \beta_2\left(ANALYSTS_{RESID}\right)_{i,t-1} + \\ \beta_3 \ln SIZE_{i,t-1} + \beta_4 \ln TURNOVER_{i,t-1} + \\ \beta_5 RETURN_{i,t-1} + \beta_6 VOLATILITY_{i,t-1} + \varepsilon_{i,t}\end{aligned} \tag{2}$$

$$\begin{aligned}\ln\left(ILLIQ\right)_{i,t} = \alpha_0 + \gamma_1 INVESTOR_{i,t-1} + \gamma_2 INVESTOR^2_{i,t-1} + \\ \gamma_3\left(ANALYSTS_{RESID}\right)_{i,t-1} + \gamma_4 \ln SIZE_{i,t-1} + \\ \gamma_5 \ln TURNOVER_{i,t-1} + \gamma_6 RETURN_{i,t-1} + \\ \gamma_7 VOLATILITY_{i,t-1} + \varepsilon_{i,t}\end{aligned} \tag{3}$$

$\ln(\ )$ refers to the natural logarithm. The dependent variable $ILLIQ$ is the annual Amihud (2002) illiquidity ratio, with the daily Amihud ratios averaged across all trading days for each calendar year. The key variable of $INVESTOR$ represents the shareholdings of investors, classified based on nationality, trading accounts or investor types. $ANALYSTS_{RESID}$ denotes residual analyst coverage, where the residual comes from a regression of natural logarithm of one plus the analyst coverage on natural logarithm of firm size. The analyst coverage is the number of analysts issuing earnings forecasts for a firm over the year. We measure firm size $(SIZE)$ as the market capitalization for a firm at the end of each trading day and averaged over a year. $TURNOVER$ is the annual average of daily turnover ratios, *RETURN* the time series average of daily returns for each year, and *VOLATILITY* the standard deviation of daily returns over the year.

3. The Sample

We first discuss how the sample for this research is constructed using the Bursa Malaysia's annual ownership dataset "End of Year Shareholdings by Type of Investor".

3.1 Sample firms

Even though the corporate ownership dataset covers all public listed firms on Bursa Malaysia, not all of them are included in the final sample due to delisting, suspension and incomplete stock data. The first criterion in our sample construction is to ensure that those selected firms are in existence throughout the 8-year sample period to ensure sufficient data points, and this matching procedure produces 654 firms. The second step of filtering aims to ensure that data for all the 654 firms are available in Thomson Datastream, so that our liquidity proxy can be constructed. It is found that some of the firms have no price data (denoted N/A) for extended time, which is obviously due to suspension. However, it is less clear-cut for those firms with stale closing prices because this situation could arise due to: (1) no price movement; (2) public holidays; (3) trading suspension. The first case is genuine because stocks with low liquidity and high transaction costs can have valid zero return even on positive volume days (see Lesmond, 2005). For public holidays or trading suspension, Datastream will use the closing prices of the last trading day. We manually delete public holidays from the Datastream dataset which affect all stocks. To determine whether the listed firms are suspended by the stock exchange, we cross-check with the "Company Announcements" from Bursa Malaysia's website.[6] From this verification process, we then exclude those suspended firms that have stale closing prices and zero trading volume for more than one calendar year. As a result of these filters and checks, the final sample comprises 600 stocks over the 8-year period from 2002 to 2009. Table 2 provides the shareholdings by investor types for all the

[6] http://www.bursamalaysia.com/market/listed-companies/company-announcements/.

600 sample firms. The distribution for the sample closely resembles those of the population in Table 1.

Table 2
End of Year Shareholdings for Public Listed Companies in the Final Sample (in %)

	2002	2003	2004	2005	2006	2007	2008	2009
Number of Sample Firms	600	600	600	600	600	600	600	600
				Panel A: Malaysian				
Individuals	17.93	17.83	18.69	18.72	18.56	17.59	17.87	18.31
Institutions	24.23	25.69	25.36	25.09	23.83	24.38	24.92	26.04
Government	12.07	10.87	10.61	10.03	10.34	9.24	10.17	9.41
Nominees	29.16	28.53	27.74	28.87	28.64	27.17	29.51	29.11
Others	0.26	0.22	0.18	0.15	0.14	0.12	0.11	0.02
				Panel B: Foreign				
Individuals	1.18	1.31	1.26	1.30	1.28	1.07	1.10	1.04
Institutions	3.45	3.38	3.55	3.39	3.44	3.08	2.96	3.22
Government	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Nominees	10.87	11.38	11.79	11.65	13.11	16.90	13.19	12.67
Others	0.85	0.79	0.82	0.80	0.66	0.43	0.17	0.18

Source: Authors' calculation based on the firm-level shareholdings data provided by Bursa Malaysia.
Note: Institutional shareholdings are the sum of shareholdings by banks, investment trusts and other corporations.

3.2 Descriptive statistics

Table 3 provides the descriptive statistics for all the variables used in the empirical analysis. Both the Amihud illiquidity ratio and its natural logarithm are included in the table. Previous studies generally use log transformation because the ratio is highly skewed. We find similar distribution for the Amihud measure in our sample, and logging the variable is able to eliminate its natural skewness. The average Amihud ratio reported for Malaysian stocks in Lesmond (2005) is 0.773 for the sample period of 1987-2000. With a mean of 1.1260, Table 3 suggests that the liquidity of Malaysian stocks has deteriorated in the 2000s despite numerous initiatives undertaken by Bursa Malaysia. Given the lack of Malaysian liquidity studies, it is timely to examine the determinants of stock liquidity in the local bourse so that effective policies can be prescribed. Our focus is on the liquidity roles of various investor groups given that the market cannot function without their participation. The statistical measures for central tendency and dispersion further complement Table 2, providing an overall picture of the variability in the shareholdings of various investor groups, both at the cross-sectional and time series dimensions. Notably, local individuals, local institutions and local nominees are the top three investor groups in Bursa Malaysia. However, it remains to be determined whether their large stakes are significantly associated with the level of stock liquidity.

Table 4 presents the correlation matrix for all the variables. The correlation between the explanatory variables and the Amihud illiquidity ratio provides a preliminary view of their univariate relationship. In this univariate framework, all the control variables for firm characteristics have the expected relationship, consistent with previous liquidity studies. Security analysts have negative coefficient, indicating their participation is associated with an improvement in stock liquidity. Shareholdings by various investor groups have differing signs, suggesting that they play different liquidity roles in the Malaysian stock market. However, these univariate relationships might change or become insignificant when all competing variables are included in the same multivariate regression model. The correlation coefficients between explanatory variables are within plausible ranges. When the correlation between two variables is high, they will not be included in the same model. For instance, total local ownership $\left(LOCAL_{ALL}\right)$ and total foreign ownership $\left(FOREIGN_{ALL}\right)$ have perfect negative correlation, and thus separate regressions are estimated to avoid the problem of perfect multicollinearity.

Table 3
Descriptive Statistics for All Variables

	Mean	Median	Standard Deviation	Skewness	Kurtosis
$ILLIQ$	1.1260	0.1064	7.1736	29.1424	1217.7280
$\ln(ILLIQ)$	-2.4930	-2.2407	2.5457	-0.4064	3.2853
$LOCAL_{ALL}$	0.8602	0.9413	0.1829	-1.7914	5.4510
$LOCAL_{DIR}$	0.5989	0.6116	0.2314	-0.2682	2.0072
$LOCAL_{NOM}$	0.2613	0.2117	0.1910	0.7799	2.7703
$LOCAL_{IND}$	0.2970	0.2572	0.2030	0.8288	3.1823
$LOCAL_{INST}$	0.2508	0.1977	0.2121	0.7501	2.5498
$LOCAL_{GOV}$	0.0496	0.0019	0.1115	3.8594	20.2172
$FOREIGN_{ALL}$	0.1398	0.0588	0.1829	1.7914	5.4510
$FOREIGN_{DIR}$	0.0629	0.0091	0.1424	2.9297	10.6774
$FOREIGN_{NOM}$	0.0769	0.0262	0.1151	2.6384	11.6539
$FOREIGN_{IND}$	0.0200	0.0059	0.0594	6.9705	59.2454
$FOREIGN_{INST}$	0.0358	0.0002	0.1148	3.8337	17.3476
$ANALYST_{RESID}$	0.5596	0.0000	0.9481	1.6947	4.8531
$\ln(SIZE)$	5.1409	4.8727	1.5702	0.8528	3.9049
$RETURN$	-0.0113	0.0000	0.2027	-0.6261	9.5282
$\ln(TURNOVER)$	-7.1048	-7.1455	1.5397	0.0298	3.1969
$VOLATILITY$	3.2949	2.7146	2.3825	5.2812	74.7015

Notes: $ILLIQ$ refers to the Amihud (2002) illiquidity ratio, with the daily Amihud ratios averaged across all trading days for each calendar year. $\ln(ILLIQ)$ refers to the natural logarithm of Amihud (2002) illiquidity ratio. $LOCAL$ and $FOREIGN$ denote the proportion of shareholdings owned by Malaysian and foreign investors at year end, respectively; the subscripts indicate the types of investor– ALL: total shareholdings, DIR: direct shareholdings, NOM: nominee shareholdings, IND: individual shareholdings, $INST$: institutional shareholdings, GOV: government shareholdings. $ANALYST_{RESID}$ refers to residual analyst coverage, where the residual comes from a regression of natural logarithm of one plus the analyst coverage on natural logarithm of firm size. The analyst coverage is the number of analysts issuing earnings forecasts for a firm over the year. $\ln(SIZE)$ is the natural logarithm of market capitalization at the end of each trading day and averaged over a year. $RETURN$ is the time series average of daily returns for each year. $\ln(TURNOVER)$ is the time series average of daily natural logarithm of turnover ratios. $VOLATILITY$ is the standard deviation of daily returns over the year.

Table 4
Correlation Matrix for All Variables

	$\ln(ILLIQ)$	$ANALYST_{RESID}$	$\ln(SIZE)$	$RETURN$	$\ln(TURNOVER)$	$VOLATILITY$	$LOCAL_{ALL}$
$\ln(ILLIQ)$	1.0000						
$ANALYST_{RESID}$	-0.6060	1.0000					
$\ln(SIZE)$	-0.8228	0.7112	1.0000				
$RETURN$	-0.1807	0.0943	0.1510	1.0000			
$\ln(TURNOVER)$	-0.4248	0.1241	0.1011	0.2058	1.0000		
$VOLATILITY$	0.5227	-0.2886	-0.4765	-0.0982	-0.0447	1.0000	
$LOCAL_{ALL}$	0.2451	-0.2285	-0.3323	-0.0721	0.0899	0.1801	1.0000
$LOCAL_{DIR}$	0.2892	-0.2265	-0.3361	-0.0328	-0.0908	0.1152	0.5969
$LOCAL_{NOM}$	-0.1155	0.0556	0.0888	-0.0294	0.1961	0.0330	0.2348
$LOCAL_{IND}$	0.3914	-0.4053	-0.5935	-0.0953	0.0985	0.2565	0.3641
$LOCAL_{INST}$	0.0502	0.0032	0.0429	0.0455	-0.1602	-0.0413	0.2922
$LOCAL_{GOV}$	-0.2067	0.2598	0.2973	0.0184	-0.0568	-0.1457	0.0194
$FOREIGN_{ALL}$	-0.2451	0.2285	0.3323	0.0721	-0.0899	-0.1801	-1.0000
$FOREIGN_{DIR}$	-0.0079	0.0381	0.0781	0.0232	-0.1785	-0.1059	-0.7771
$FOREIGN_{NOM}$	-0.3800	0.3160	0.4314	0.0859	0.0781	-0.1552	-0.6275
$FOREIGN_{IND}$	0.0689	-0.0777	-0.0890	-0.0071	-0.0354	-0.0138	-0.3386
$FOREIGN_{INST}$	-0.0232	0.0470	0.0960	0.0233	-0.1558	-0.0883	-0.6328

	$LOCAL_{DIR}$	$LOCAL_{NOM}$	$LOCAL_{IND}$	$LOCAL_{INST}$	$LOCAL_{GOV}$	$FOREIGN_{ALL}$	$FOREIGN_{DIR}$
$LOCAL_{DIR}$	1.0000						
$LOCAL_{NOM}$	-0.6398	1.0000					
$LOCAL_{IND}$	0.4634	-0.2127	1.0000				
$LOCAL_{INST}$	0.5824	-0.4257	-0.3058	1.0000			
$LOCAL_{GOV}$	0.1272	-0.1355	-0.2695	-0.1267	1.0000		
$FOREIGN_{ALL}$	-0.5969	-0.2348	-0.3641	-0.2922	-0.0194	1.0000	
$FOREIGN_{DIR}$	-0.4068	-0.2516	-0.2042	-0.2354	-0.0239	0.7771	1.0000
$FOREIGN_{NOM}$	-0.4452	-0.0617	-0.3259	-0.1731	-0.0012	0.6275	-0.0024
$FOREIGN_{IND}$	-0.1441	-0.1498	0.0064	-0.1274	-0.0661	0.3386	0.4580
$FOREIGN_{INST}$	-0.3413	-0.1927	-0.1954	-0.1766	-0.0132	0.6328	0.8117

	$FOREIGN_{NOM}$	$FOREIGN_{IND}$	$FOREIGN_{INST}$
$FOREIGN_{NOM}$	1.0000		
$FOREIGN_{IND}$	-0.0286	1.0000	
$FOREIGN_{INST}$	0.0012	0.0509	1.0000

Notes: The descriptions for all the variables listed above are given in the notes to Table 3.

4. Investor Types and Stock Liquidity

In this section, we use a top-down approach where the investor type-liquidity relationship is first examined at the aggregate level of total shareholdings, in view of the unabated debate on whether local or foreign investors are more informed (see references cited in Bae *et al*., 2012). Following that, we compare the liquidity roles of investors that trade through direct versus nominee accounts, providing the first evidence on the stock market effects of nominee trading. The last analysis addresses investor heterogeneity in which the direct accounts are disaggregated into five mutually exclusive investor groups– local individual investors, local institutional investors, local government agencies, foreign individuals and foreign institutions.

4.1 Foreign versus local investors: aggregate shareholdings

In the first stage of aggregate analysis, we estimate the linear and quadratic models using total foreign ownership and total local ownership as the proxies for *INVESTOR*. By construction, these two variables must add up to 100%, and thus including both in the same model would lead to perfect multicollinearity. Panel A of Table 5 presents the estimation results for equations (2) and (3) in the case of total foreign ownership-liquidity relation. In the linear model, the coefficient for total foreign ownership is insignificant, or weakly significant when year and industry dummies are added to account for potential year and industry fixed effects, respectively. Existing liquidity studies generally estimate a linear model due to their sole focus on asymmetric information effect, and in this case, will erroneously infer that the participation of foreign investors has no effect on the liquidity of Malaysian stocks. However, our results from the quadratic model confirm that a monotonic relationship is unrealistic given the dynamics of foreign investor heterogeneity and competing liquidity channels. More specifically, the coefficients for total foreign ownership, both the first-order variable and its squared term, are highly significant in all model specifications with their signs consistent with a U-shaped relationship. This suggests that the Amihud illiquidity ratio (stock liquidity) decreases (increases) up to a certain level of foreign ownership, and then increases (decreases) as the shareholdings rise further.

Panel B of Table 5 presents the estimation results for total local ownership-liquidity relation. By construction, the coefficient for total local ownership should yield an opposite sign to total foreign ownership given that both variables are perfectly negatively correlated. This is clearly reflected in the linear model where total local ownership has a positive coefficient, and similarly, it is insignificant or weakly significant at the 10% level. However, the opposing liquidity roles of foreign and local investors are not reflected in the quadratic model since the coefficients for total local ownership and its squared term do not yield an inverted U-shaped graph. Instead, the result depicts a similar pattern as total foreign ownership where the Amihud illiquidity ratio decreases at lower levels of shareholding but reverses after reaching the threshold point. The quadratic model thus captures the net effect from the dynamic interactions of different types of local investors through competing liquidity channels. In terms of the control variables, with the sole exception of analyst coverage, all the firm characteristics have their expected signs and are highly significant in all model specifications.

4.2 Foreign versus local investors: direct and nominee accounts

For shares trading in Bursa Malaysia, investors need to open a Central Depository System (CDS) account, which acts as the central database representing ownership and movement of securities. There are two types of CDS account, namely direct CDS account and indirect (nominee) CDS account, and their key differences are summarized in the Appendix. In general, a CDS account can only be opened if the person is opening it either as a beneficial owner or as an Authorized Nominee.[7] Our corporate ownership dataset provides shareholdings for direct and nominee accounts, and thus allows us to determine the role of trading account types in the investor type-liquidity relation.

[7] Under Part VIII of the Rules of Bursa Malaysia Depository, a nominee account can only be opened by Authorized Nominee, such as banks, brokers and trust companies. These authorized nominees are appointed by Bursa Depository for the purpose of holding any deposited securities on behalf of another person. On the other hand, an authorized nominee shall furnish to the Bursa Depository the names and other particulars of the beneficial owners of the securities deposited in the accounts.

Table 5
Aggregate Corporate Shareholdings and Stock Liquidity

	Linear Model			Quadratic Model		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Total Foreign Ownership						
$FOREIGN_{ALL}$	-0.1025	-0.2245	-0.2779*	-1.9947***	-1.9674***	-1.9916***
	(0.1842)	(0.1821)	(0.1618)	(0.5113)	(0.4448)	(0.4593)
$FOREIGN^2_{ALL}$				3.0745***	2.8306***	2.7888***
				(0.8202)	(0.6866)	(0.6973)
$ANALYST_{RESID}$	-0.1572*	-0.0880	-0.1078	-0.1674*	-0.0980	-0.1106
	(0.0907)	(0.0769)	(0.0687)	(0.0896)	(0.0753)	(0.0677)
$\ln(SIZE)$	-1.1381***	-1.2086***	-1.1720***	-1.1181***	-1.1900***	-1.1597***
	(0.0403)	(0.0376)	(0.0332)	(0.0404)	(0.0360)	(0.0321)
$RETURN$	-0.8280	-0.9379***	-0.9274***	-0.8430	-0.9504***	-0.9374***
	(0.7834)	(0.3273)	(0.3220)	(0.7819)	(0.3239)	(0.3218)
$\ln(TURNOVER)$	-0.3987***	-0.4632***	-0.4638***	-0.3902***	-0.4549***	-0.4552***
	(0.0758)	(0.0424)	(0.0426)	(0.0768)	(0.0427)	(0.0431)
$VOLATILITY$	0.1107**	0.0730***	0.0751***	0.1127**	0.0747***	0.0759***
	(0.0439)	(0.0193)	(0.0187)	(0.0441)	(0.0194)	(0.0187)
Constant	0.3364	1.7601***	2.0679***	0.3940	1.8160***	2.2059***
	(0.6417)	(0.3442)	(0.3331)	(0.6442)	(0.3439)	(0.3327)
Adj. R-squared	67.89%	74.51%	74.60%	68.06%	74.65%	74.73%
Panel B: Total Local Ownership						
$LOCAL_{ALL}$	0.1025	0.2245	0.2779*	-4.1542***	-3.6938***	-3.5860***
	(0.1842)	(0.1821)	(0.1618)	(1.1682)	(0.9784)	(0.9733)
$LOCAL^2_{ALL}$				3.0744***	2.8306***	2.7888***
				(0.8202)	(0.6866)	(0.6973)
$ANALYST_{RESID}$	-0.1572*	-0.0880	-0.1078	-0.1674*	-0.0980	-0.1106
	(0.0907)	(0.0769)	(0.0687)	(0.0896)	(0.0753)	(0.0677)
$\ln(SIZE)$	-1.1381***	-1.2086***	-1.1720***	-1.1181***	-1.1900***	-1.1597***
	(0.0403)	(0.0376)	(0.0332)	(0.0404)	(0.0360)	(0.0321)
$RETURN$	-0.8280	-0.9379***	-0.9274***	-0.8430	-0.9504***	-0.9374***
	(0.7834)	(0.3273)	(0.3220)	(0.7819)	(0.3239)	(0.3218)
$\ln(TURNOVER)$	-0.3987***	-0.4632***	-0.4638***	-0.3902***	-0.4549***	-0.4552***
	(0.0758)	(0.0424)	(0.0426)	(0.0768)	(0.0427)	(0.0431)
$VOLATILITY$	0.1107**	0.0730***	0.0751***	0.1127**	0.0747***	0.0759***
	(0.0439)	(0.0193)	(0.0187)	(0.0441)	(0.0194)	(0.0187)
Constant	0.2339	1.5355***	1.7900***	1.4737*	2.6791***	3.0031***
	(0.7112)	(0.3898)	(0.4065)	(0.7868)	(0.5100)	(0.5438)
Adj. R-squared	67.89%	74.51%	74.60%	68.06%	74.65%	74.73%
Year	NO	YES	YES	NO	YES	YES
Industry	NO	NO	YES	NO	NO	YES

Notes: The descriptions for all the variables listed above are given in the notes to Table 3. The dependent variable is $\ln(ILLIQ)$, with all the independent variables take lag one ($t-1$), as specified in equations (2) and (3) for linear and quadratic models, respectively. The key independent variable of total foreign ownership and total local ownership enter separately into the regression. Coefficients for year and industry dummies are not reported for brevity. Double-clustered standard errors are reported in parentheses. The number of observations for all columns is equal to 4192. The asterisks ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

In this analysis by trading account types, we have four proxies for *INVESTOR*, namely foreign direct account, foreign nominee account, local direct account and local nominee account. Panel A of Table 6 presents the estimation results for equations (2) and (3) in the case of foreign ownership-liquidity relation. The variable for foreign direct account is insignificant in the linear model and merely significant at the 10% level when a quadratic model is fitted. Instead, the analysis reveals that the significant relationship between total foreign ownership and liquidity in the previous Table 5 is driven solely by those foreign investors trading through the nominee accounts. Since most of the beneficial owners are foreign institutions, the significance of the first-order and squared coefficients for foreign nominees indicates that the non-monotonic relationship arises because of competing liquidity channels.

In the case of local ownership, Panel B shows that local nominee accounts, with mean shareholding at least three times larger than foreign nominee accounts, are not significantly associated with liquidity. Instead, the liquidity roles are taken up by local investors who trade through the direct accounts. The significance of the first-order and squared coefficients for local direct account suggests that a monotonic relationship is unrealistic because the variable consists of local institutions, local individual investors and local government agencies. Each investor group might influence liquidity through different channels, and the interactions of investor heterogeneity and competing liquidity channels could be responsible for the reported non-monotonic relationship between aggregate local direct account and stock liquidity. The results underscore the importance of functional form when specifying the liquidity model. If researchers focus only on the asymmetric information effect, they will draw their conclusion based on the insignificant coefficient for local direct account in the linear model, and hence erroneously disregard the liquidity roles played by local investors.

Our results complement the findings of Lim *et al*. (2013) who find that foreign investors who trade through the nominee accounts are responsible for the swift incorporation of public information into the prices of Malaysian stocks. However, such price discovery does not occur when foreign investors trade through the direct accounts. These authors attribute the information advantage of foreign investors in the local market to their superior skills in processing public news. To further determine whether this is purely a "nominee" effect, Lim *et al*. (2013) re-estimate their models by replacing foreign nominees with local nominees. Their results show that local nominees and the squared term are statistically insignificant, thus confirming the significant effect of foreign nominees is due to the "foreign" nature of ownership and not "nominee" *per se*. Taken together, the price efficiency finding of Lim *et al*. (2013) and our result on liquidity reaffirm the importance of trading account types in general, and nominee accounts in particular.

4.3 Foreign versus local investors: disaggregate shareholdings

The empirical results thus far demonstrate that when the level of shareholdings is aggregated, its relationship with liquidity does not conform to a monotonic function. The significance of the first-order variable and its squared term in the quadratic model for $INVESTOR$ (Table 5: total foreign ownership and total local ownership; Table 6: foreign nominee account and local direct account) indicates the existence of optimality in ownership, in which stock liquidity increases at lower levels of ownership but decreases as the shareholdings rise beyond the threshold point. Going beyond the interpretation, the non-monotonic relationship in the quadratic model reflects the competing liquidity roles of various investor groups and the interactions of different liquidity channels. We first explore the issue of investor heterogeneity by decomposing investor types into institutions, individuals, government agencies and nominees.

Table 6
Corporate Shareholdings (Direct Versus Nominee Accounts) and Stock Liquidity

	(A) Foreign Ownership		(B) Local Ownership	
	Linear Model	Quadratic Model	Linear Model	Quadratic Model
$FOREIGN_{DIR}$	0.0643	1.3965*		
	(0.1604)	(0.7289)		
$FOREIGN^2_{DIR}$		-2.3849*		
		(1.3787)		
$FOREIGN_{NOM}$	-0.8801***	-3.0409***		
	(0.3028)	(0.5631)		
$FOREIGN^2_{NOM}$		4.3488***		
		(0.9356)		
$LOCAL_{DIR}$			0.2585	-1.3920**
			(0.1864)	(0.6931)
$LOCAL^2_{DIR}$				1.4772**
				(0.5911)
$LOCAL_{NOM}$			0.3311*	0.0617
			(0.1906)	(0.5866)
$LOCAL^2_{NOM}$				0.4942
				(0.7124)
$ANALYST_{RESID}$	-0.1047	-0.1035	-0.1070	-0.1052
	(0.0677)	(0.0673)	(0.0674)	(0.0668)
ln(*SIZE*)	-1.1575***	-1.1337***	-1.1740***	-1.1834***
	(0.0328)	(0.0322)	(0.0329)	(0.0335)
RETURN	-0.9307***	-0.9345***	-0.9247***	-0.9551***
	(0.3195)	(0.3218)	(0.3225)	(0.3276)
ln(*TURNOVER*)	-0.4551***	-0.4499***	-0.4654***	-0.4530***
	(0.0431)	(0.0428)	(0.0421)	(0.0414)
VOLATILITY	0.0778***	0.0788***	0.0745***	0.0743***
	(0.0189)	(0.0190)	(0.0188)	(0.0190)
Constant	2.0762***	2.0938***	1.7719***	2.2158***
	(0.3199)	(0.3258)	(0.4015)	(0.4811)
Year	YES	YES	YES	YES
Industry	YES	YES	YES	YES
N	4192	4192	4192	4192
Adj. *R*-squared	74.68%	74.84%	74.59%	74.68%

Notes: The descriptions for all the variables listed above are given in the notes to Table 3. The dependent variable is $\ln(ILLIQ)$, with all the independent variables take lag one ($t-1$), as specified in equations (2) and (3) for linear and quadratic models, respectively. The key independent variable of corporate shareholdings is decomposed into foreign direct account, foreign nominee account, local direct account and local nominee account. Coefficients for year and industry dummies are not reported for brevity. Double-clustered standard errors are reported in parentheses. The asterisks ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

In the case of foreign ownership, Panel A of Table 7 reaffirms that only foreign investors who trade through the nominee accounts are significantly associated with the liquidity of Malaysian stocks. While the significant negative coefficient in the linear model suggests liquidity improvement with higher foreign nominee shareholdings, the quadratic model implies the existence of a threshold level which might be driven by the interactions of competing liquidity channels. In contrast, foreign institutions and foreign individual investors who trade through the direct accounts are not significantly associated with liquidity, confirming our earlier results in Table 6. This piece of evidence highlights not only the importance of within-country foreign investor heterogeneity but also the selection of trading account types. In the extant literature, cross-country liquidity studies are generally in favor of opening the domestic stock markets to foreign investors (Tesar and Werner, 1995; Vagias and van Dijk, 2012). However, Ng *et al*. (2015) show that the liquidity effects depend on the types of foreign investors– controlling foreign direct investors reduce liquidity in the domestic equity markets, whereas foreign portfolio investors contribute significantly to liquidity improvement. We complement Ng *et al*. (2015) by showing that the types of account that foreign investors trade do matter for liquidity. In country-specific studies on Indonesia, Rhee and Wang (2009) and Agudelo (2010) find that stocks with higher foreign institutional ownership experience lower liquidity. However, for the local Malaysian market, our results are uniquely different because the liquidity effect is only manifested in the nominee accounts of foreign investors. Unlike all previous studies, we further document that the relationship between foreign investors and stock liquidity is non-monotonic, highlighting the presence of optimality in foreign shareholdings.

When disaggregating local ownership, Panel B of Table 7 shows that not all types of local investors who trade through the direct accounts are affecting the liquidity of Malaysian stocks. Only local individual investors and local institutions are playing their important liquidity roles. The level of government shareholdings is not significantly associated with stock liquidity. It is worth highlighting that the capital market effects of government ownership have been extensively examined in the context of state-owned enterprises, privatization and political connections. However, its relationship with stock liquidity is not well established, with our literature search only finds Choi *et al*. (2010), Borisova and Yadav (2012) and Ding (2014). Using the China stock markets as case study, Choi *et al*. (2010) find that firms with higher government ownership experience increases in bid-ask spread before the period of institutional reforms (1995-2000). However, in the post-period of institutional reforms (2001-2003), the link between government shareholdings and stock liquidity becomes insignificant which they attribute to the reduction of information asymmetry. In stark contrast, Ding (2014) finds that government participation as top ten shareholders increases the liquidity of Chinese listed firms, driven mainly by higher trading activity from investors who see the value-enhancing benefits of political connections. Borisova and Yadav (2012) report a lower overall level of information asymmetry for partially privatized firms because they are subject to greater public scrutiny. Coming back to Table 7, the insignificant result might be because our variable for government shareholdings is merely capturing government participation. A stronger and active government involvement in these Malaysian firms, measured by the concentration of government ownership (such as the largest shareholdings, blockholdings or ultimate ownership), might exacerbate information asymmetry as the government is privy to a much wider base of firm, political and macro-level private information. We leave this possibility for future research.

Moving to local individual investors, previous studies generally report a positive relationship with stock liquidity. Amihud *et al*. (1999) contend that liquidity should be an increasing function of noise trading, consistent with the theoretical prediction in models of Glosten and Milgrom (1985) and Admati and Pfleiderer (1988). To test their hypothesis, the authors capitalize on the unique setting in Tokyo Stock Exchange where companies are permitted to reduce their stocks' minimum trading unit (MTU) so that a larger number of small investors can afford to invest. Amihud *et al*. (1999) find that a reduction in MTU over 1991-1996 increases the number of individual shareholders, and their noise trading leads to liquidity improvement. This finding is further confirmed by Ahn *et al*. (2014) for latter sample period of 1996-2005. They find that the substantial increase in individual investors due to Japan's MTU reduction is associated with greater noise trading and higher level of liquidity. Using retail trading dataset, Wang and Zhang (2015) report higher liquidity for U.S. stocks that are more heavily traded by individual investors, and the positive liquidity effect is stronger for firms with greater information asymmetry. In Table 7, the negative coefficient for local individual shareholdings in the linear model is consistent with previous findings that the participation of individual investors is associated with liquidity improvement. However, the quadratic model suggests that the relationship is not merely driven by noise trading, given that the increases in liquidity will reverse once the individual shareholdings reach the threshold level.

Last but not least, the linear model in Table 7 shows that the variable for local institutions has a highly significant positive coefficient, indicating that higher local institutional ownership is associated with greater illiquidity ratio where prices move a lot but the volumes traded are low. The results contradict existing findings reported by Rubin (2007) and Jiang *et al*. (2011). Both studies find that local institutions improve liquidity through higher trading activity and effective monitoring of corporate managers from exploiting private information, respectively. On the other hand, Agarwal (2007) predicts a non-monotonic relationship between institutional ownership and liquidity due to the trade-off between the two competing effects of information asymmetry and competition. His analysis using U.S. firm-level data establishes the existence of a threshold level for institutional ownership. Again, our results are inconsistent with the literature, as the level and squared coefficients for local institutional ownership are statistically insignificant in the quadratic model. This indicates the dominance of the negative liquidity effect, which we conjecture is attributable to the large shareholdings held by government-owned institutions– examples include the Employees Provident Fund, the Armed Forces Fund Board, the National Equity Corporation, the Pilgrimage Fund Board and the Social Security Organization. These five public institutions account for about

70% of total local institutional shareholdings in Bursa Malaysia (see references cited in Lim *et al*., 2013). Their blockholdings might impair liquidity through two possible channels– the privileged access to private information (Heflin and Shaw, 2000; Rubin, 2007) and/or infrequent trading activity through buy-and-hold strategies (Brockman *et al*., 2009). These two channels apply even in the context of foreign blockholders as Ng *et al*. (2015) find they are the driving forces for the negative relationship between controlling foreign direct investors and stock liquidity.

4.4 Corporate shareholdings and stock liquidity: a synthesis

Our analysis from aggregate to disaggregate shareholdings identifies three investor groups that are significantly associated with the liquidity of Malaysian stocks, namely foreign nominees, local institutions and local individual investors. Given that the estimations are performed separately for foreign and local investors, we now put them in the same model to determine whether their explanatory power still remains intact when competing against each other. The first panel of Table 8 presents the pooled OLS estimation results for our final liquidity model. The coefficients for foreign nominees and local individuals are highly significant, with their relationship with Amihud illiquidity ratio follows a U-shape. With the addition of foreign nominee variable in the final model, the explanatory power of local institutions is somewhat subsumed, only significant at the 10% level. The results for firm characteristics have been very consistent throughout this paper in terms of having the expected signs and highly significant coefficients. Analyst coverage turns significant with a negative coefficient, suggesting that firms with more analyst coverage are associated with higher liquidity, lending support to the finding of Roulstone (2003) that security analysts play the role of information intermediaries whose services level the playing field for uninformed investors. Though only double-clustered standard error is reported to account for both time and firm effects since the precise form of the within-cluster correlation is unknown, our results nevertheless are robust to different treatments of the standard errors as suggested by Peterson (2009)– White heteroscedastic-robust, firm-clustered and time-clustered.

Table 7
Disaggregate Corporate Shareholdings and Stock Liquidity

	(A) Foreign Ownership		(B) Local Ownership	
	Linear Model	Quadratic Model	Linear Model	Quadratic Model
$FOREIGN_{IND}$	-0.2978 (0.4270)	-1.4395 (1.6924)		
$FOREIGN^2_{IND}$		2.4814 (2.9682)		
$FOREIGN_{INST}$	0.0556 (0.1702)	1.1758 (0.9696)		
$FOREIGN^2_{INST}$		-2.0629 (1.8185)		
$FOREIGN_{NOM}$	-0.8770*** (0.3002)	-2.8618*** (0.5461)		
$FOREIGN^2_{NOM}$		4.1019*** (0.9308)		
$LOCAL_{IND}$			-0.4599* (0.2753)	-3.6837*** (0.7762)
$LOCAL^2_{IND}$				3.8226*** (0.9725)
$LOCAL_{INST}$			0.5426*** (0.1817)	0.5517 (0.3976)
$LOCAL^2_{INST}$				0.1264 (0.6008)
$LOCAL_{GOV}$			0.4024 (0.2952)	-0.1069 (0.5774)
$LOCAL^2_{GOV}$				0.8027 (0.7502)
$LOCAL_{NOM}$			0.3228* (0.1926)	0.1458 (0.7422)
$LOCAL^2_{NOM}$				0.3555 (0.9158)
Year	YES	YES	YES	YES
Industry	YES	YES	YES	YES
N	4192	4192	4192	4192
Adj. R-squared	74.67%	74.82%	74.88%	75.27%

Notes: The descriptions for all the variables listed above are given in the notes to Table 3. The dependent variable is $\ln(ILLIQ)$, with all the independent variables take lag one ($t-1$), as specified in equations (2) and (3) for linear and quadratic models, respectively. The key independent variable of corporate shareholdings is decomposed into individual investors, institutions, government agencies and nominees. For brevity, estimates for control variables, constant, year and industry dummies are suppressed but available upon request. Double-clustered standard errors are reported in parentheses. The asterisks ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 8
Robustness Checks on Final Liquidity Model

	Pooled OLS	Fama-MacBeth	Two-Step System GMM
$\ln(ILLIQ)$			0.2070^{**}
			(0.1008)
$FOREIGN_{NOM}$	-2.7676^{***}	-2.6383^{***}	-10.2307^{***}
	(0.4919)	(0.3617)	(2.1791)
$FOREIGN^2_{NOM}$	3.8190^{***}	3.7415^{***}	21.6208^{***}
	(0.8596)	(0.6755)	(4.7504)
$LOCAL_{IND}$	-3.9815^{***}	-4.0586^{***}	-3.1536^{***}
	(0.7129)	(0.5397)	(0.6960)
$LOCAL^2_{IND}$	3.7381^{***}	3.8053^{***}	4.4122^{***}
	(0.9203)	(0.7467)	(0.9121)
$LOCAL_{INST}$	0.2692^{*}	0.2747^{*}	1.5072^{***}
	(0.1618)	(0.1151)	(0.3367)
$ANALYST_{RESID}$	-0.1245^{**}	-0.1290^{*}	0.2615^{***}
	(0.0614)	(0.0543)	(0.0913)
$\ln(SIZE)$	-1.2716^{***}	-1.2668^{***}	-0.7820^{***}
	(0.0396)	(0.0346)	(0.0960)
$RETURN$	-1.0669^{***}	-1.2111^{**}	-0.7003
	(0.3260)	(0.3393)	(0.7799)
$\ln(TURNOVER)$	-0.3969^{***}	-0.3780^{***}	-0.5437^{***}
	(0.0456)	(0.0442)	(0.1132)
$VOLATILITY$	0.0717^{***}	0.0842^{**}	0.1108^{**}
	(0.0185)	(0.0311)	(0.0446)
Constant	3.8128^{***}	2.3605^{***}	-2.1039^{**}
	(0.4883)	(0.5817)	(1.0132)
Year	YES	NO	YES
Industry	YES	YES	YES
N	4192	4192	3591
R-squared	75.62%	75.79%	

Notes: The descriptions for all the variables listed above are given in the notes to Table 3. The dependent variable is $\ln(ILLIQ)$, with all the independent variables take lag one (t −1). The analyses from aggregate to disaggregate shareholdings identify foreign nominess, local institutions and local individual investors as playing significant liquidity roles, and thus these variables are included in the final liquidity model. Coefficients for year and industry dummies are not reported for brevity.

In the pooled OLS, double-clustered standard errors are reported in parentheses. For the Fama-MacBeth two-step regression, the standard errors reported in parentheses are adjusted using the Newey-West procedure.

In the two-step system GMM, the final liquidity model is rewritten as a dynamic panel by including lagged value of Amihud illiquidity ratio as a regressor. The model passes the standard diagnostic tests for dynamic panel, namely: (1) $AR(1)$ and $AR(2)$ tests with the the null of no first-order and second-order serial correlation, respectively, in the first-differenced residuals; (2) the Hansen test of over-identification with the null that all instruments are valid. These results are not reported for brevity, but are available upon request.

N denotes the number of observations. The asterisks ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

As a robustness check, we estimate the final liquidity model with Fama-MacBeth two-step regression which aims to pick up cross-sectional effect, possibly the main source of variation in our data given the short time series of 8 years. This procedure involves estimating cross-sectional regression for each year separately, and then inferences are drawn from the time-series averages of the estimated coefficients. Peterson (2009) shows that the Fama-MacBeth regression produces unbiased standard errors and correctly sized confidence intervals when the data exhibit only cross-section dependence in which the residuals are correlated across different firms in a given year. In the analysis, year dummies are excluded due to its cross-sectional nature, and the standard errors are adjusted for potential autocorrelations using the Newey-West procedure. The second set of results in Table 8 shows that the Fama-MacBeth regression does not affect the signs and statistical significance of all independent variables, implying that the inferences drawn from our main pooled OLS estimator are robust.

To address the concern of endogeneity, in particularly unobserved time-invariant firm characteristics and reverse causality, we use the two-step system generalized method-of-moments (GMM) estimator. The dynamic panel GMM is now an accepted mechanical approach to handle endogeneity in corporate finance research, mainly because of the difficulty in finding a strictly exogenous external instrument (see Wintoki *et al*., 2012). The system GMM estimator is designed to account for both the unobserved firm-fixed effects and the potential joint endogeneity of all regressors. The results from the two-step system GMM are presented in the last column of Table 8. All the variables retain their signs and statistical significance with three exceptions. First, the coefficient for local institutions, which is weakly significant at the 10% level in pooled OLS and Fama-MacBeth regressions, becomes highly significant with the positive sign unaffected. Second, the coefficient for analyst coverage switches from negative to positive sign, indicating that more analysts are associated with lower level of liquidity. However, the sensitivity of this variable to different models and estimators cautions against drawing strong inference for security analysts.

Third, the once highly significant variable of stock return has been rendered insignificant when the model is specified as a dynamic panel. Nevertheless, the significant results for our three investor groups in pooled OLS, Fama-MacBeth and system GMM estimators confirm that their liquidity effects are robust. With the model passes the standard diagnostic tests for dynamic panels, this suggests that the final liquidity model is not plagued by endogeneity concern. Adding further credence to our conclusion, the documented non-monotonic relationship is not consistent with a story of reverse causality that these investor groups prefer to hold more liquid stocks. However, we acknowledge that there is no statistical way to ascertain that the endogeneity problem has been fully resolved.

5. The Channels Underlie Investor Types and Stock Liquidity Relationship

Our earlier theoretical discussions have singled out three potential channels through which investors might affect stock liquidity. The proposed mechanisms include information asymmetry, competition among informed traders and the level of trading activity. We start with identifying the best available proxies and then present the empirical results.

5.1 Selection of proxies for the liquidity channels

The most widely cited channel that links investor types to stock liquidity is the asymmetric information effect, in which the trading of privately informed investors exacerbates information asymmetry. This group of theoretical models predicts that informed (noise) trading reduces (improves) stock liquidity. Since information asymmetry is not directly observable, existing liquidity studies generally decompose the bid-ask spreads to extract the adverse selection component (see Agarwal, 2007; Brockman *et al*., 2009; Ding 2014).[8] Given the absence of high frequency bid-ask spreads data for Malaysian stocks, we follow Ng *et al*. (2015) in using the

[8] The early literature has proposed covariance-based and trade-indicator-based models to decompose bid-ask spreads into three components of order processing, inventory holding and adverse selection. Despite their popularity, the empirical performance of the adverse selection component in quantifying information asymmetry among traders has received relatively less attention. Even among the few studies, the results for these adverse selection models of the spread are not encouraging (see Neal and Wheatley, 1998; Van Ness *et al*., 2001).

probability of information-based trading (PIN) to test the information asymmetry channel on four grounds. First, the adverse selection component is an outcome measure of information asymmetry, whereas the source of the latter comes from the trading of informed traders who possess private information. Second, the PIN measure originates from the theoretical model of Easley *et al*. (1996), and this theoretically derived measure is designed to measure the proportion of trades motivated by private information. Third, PIN is a widely used empirical proxy for information asymmetry and has been subject to extensive scrutiny and continuous refinements. Confirming its empirical validity, previous studies show that PIN is highly correlated with both the adverse selection component of spread (Chung and Li, 2003; Brennan *et al*., 2015) and ex-ante firm characteristics associated with information asymmetry (Aslan *et al*., 2011; Lai *et al*., 2014). Fourth, Lai *et al*. (2014) are able to access intraday stock transaction data for 30,095 firms from 47 countries worldwide, and show that their constructed PIN estimate is a reliable proxy for information asymmetry. We obtain the annual PIN data for Malaysian stocks from Lai *et al*. (2014), where a higher value of PIN indicates greater level of information asymmetry among market participants.[9]

Strategic trader models (Subrahmanyam, 1991; Spiegel and Subrahmanyam, 1992) predict that liquidity improves when the number of informed investors increases. Browsing through existing theoretical models with multiple informed traders, a typical feature is that the number of informed traders characterizes the extent of competition among them. Empirically, Agarwal (2007) is the only liquidity study that explores this information competition channel using the number of local institutions as its proxy, where a higher number indicates greater competition over information. The pioneering empirical work on information competition by Armstrong *et al*. (2011) and Akins *et al*. (2012) confirms the validity of this proxy when they explore the moderating role of competition on the pricing of information asymmetry. Thus, guided by the existing theories and the consensus in empirical literature, we examine the competition channel using the summation of holders for three investor groups– the number of foreign nominees, the number of local institutions and the number

[9] Lai *et al*. (2014) construct the annual firm-level PIN estimates for the sample period 1996-2010 using newly available global high frequency data provided by Thomson Reuters Tick History (TRTH) database.

local individuals, all extracted from the ownership dataset provided by Bursa Malaysia.

The trading activity of investors is another possible channel that links corporate shareholdings to stock liquidity. Previous liquidity studies generally refer to the work of Stoll (2000) in which total liquidity costs are partitioned into information and real friction costs. The former is associated with information asymmetry, whereas the latter arises due to differences in trading activity. Within this framework, the common proxies used for testing the trading channel are share trading volume, stock turnover, number of trades or trade sizes (see Rubin, 2007; Brockman *et al*., 2009; Ding, 2014; Ng *et al*. 2015). However, the above indicators measure aggregate level of trading activity but do not capture the trades of each investor group. An exception is Wang and Zhang (2015) who have access to a comprehensive retail trading dataset, which permits them to attribute the higher liquidity of U.S. stocks to the intense trading of individual investors. While we acknowledge that the best proxy for testing the trading channel should be derived from the actual trades of each investor group, unfortunately, Bursa Malaysia does not compile investors' trading data at the firm level. Constrained by data availability, we thus follow the convention in the literature and use stock turnover from Datastream as our proxy for the trading channel.

5.2 Estimation results and discussions

We follow Ng *et al*. (2015) in estimating two regressions separately. In the first stage, the proxy for liquidity channel is regressed against the selected investor group. The second stage involves re-estimating the original liquidity model but with the addition of the proxy for liquidity channel. The sign and statistical significance for the liquidity channel proxies in both regressions are used to draw inferences on their mediating roles.

Table 9 presents the estimation results to uncover the underlying channels that link the three investor groups to stock liquidity. Even though the table is organized according to liquidity channels, our discussions here will move from one investor group to another. We start with foreign investors who trade through the nominee accounts, in which their relationship with Amihud illiquidity ratio follows a U-shape. Such non-monotonic relationship reflects the dominance of different channels at each side of the threshold point. In the first channel of information asymmetry, the variable for foreign nominees is negatively associated with PIN, suggesting that the higher foreign shareholdings are associated with lower level of informed trading based on private information. In column (2), PIN yields the expected positive coefficient, consistent with the theoretical prediction that higher level of informed trading reduces stock liquidity. The two regressions indicate that foreign nominees improve liquidity because they lower the level of information asymmetry. Following similar line of interpretation, we can infer that both competition and trading channels lead to further improvement in liquidity. Putting the whole results into perspective, all three channels imply a monotonic positive relationship in which higher shareholdings by foreign nominees increase the level of stock liquidity. We conjecture that the reported reduction in liquidity after foreign shareholdings exceed the threshold point is due to the dominance of a strong negative effect, which is not captured by the widely cited and theoretically grounded liquidity channels. This undetected channel could be unique to nominee trading and thus warrants an in-depth analysis in future research.

Turning to local institutions, column (1) shows that its variable is positively associated with PIN. Ng *et al*. (2015) find similar positive relationship for their foreign direct investors who hold at least 5% of the outstanding shares. Their argument is that foreign direct investors have controlling stakes, and thus are privy to private information of the domestic firms. In the context of Malaysian stock market, more than 70% of local institutional ownership are held by government-owned institutions. Their large shareholdings with control rights give them privileged access to private information, and thus increase the level of information asymmetry. The empirical literature consistently shows that local blockholders exacerbate information asymmetry and cause liquidity to decrease (see Heflin and Shaw, 2000; Rubin, 2007). This reduction in liquidity also operates through the competition and trading channels, as reported in columns (3) and (5), respectively. In other words, the large shareholdings of these government-owned institutions reduce the number of outstanding shares available to other investors, and thus lower the degree of competition among traders which has a negative effect on stock liquidity. Furthermore, their infrequent trading activity due to the use of buy-and-hold strategies also impairs the liquidity of Malaysian stocks. All three channels suggest a reduction in stock liquidity, consistent with the monotonic negative relationship between local institutional shareholdings and stock liquidity.

Our disaggregate analysis reports a U-shaped relationship between local individual investors and the Amihud illiquidity ratio, reflecting the interactions of competing liquidity channels. Table 9 shows two opposing effects are at play. On one hand, local individual investors increase the level of information asymmetry (column 1) and reduce the degree of competition among traders (column 3), both of which lead to a reduction in liquidity. The positive relationship between individual investors and PIN seems puzzling because the former have been regarded as uninformed traders due to behavioral biases (Barber and Odean, 2000), noise trading (Foucault *et al*., 2011) and the lack of information advantage about local stocks (Seasholes and Zhu, 2010). However, there is growing empirical evidence that individual investors possess valuable private information and engage in informed trading (Kelley and Tetlock, 2013; Fong *et al*., 2014a; Tian *et al*., 2015). This possibility of individuals having private information cannot be ruled out in the context of Malaysia, given the prevalence of ownership concentration in the hands of family (see Carney and Child, 2013). If this possibility is valid, then the large shareholdings of individuals will reduce the number of outstanding shares available to other investors, and thus lower the degree of competition among traders. On the contrasting end, the active trading activity of small individual investors improves the liquidity of Malaysian stocks (column 5), consistent with theoretical predictions and previous empirical findings (Amihud *et al*., 1999; Ahn *et al*., 2014; Wang and Zhang, 2015). The U-shaped relationship implies the dominance of positive trading effect at lower levels of shareholdings for individual investors. However, once their shareholdings exceed the threshold point, the negative effects brought by information asymmetry and competition become the dominant force.

Table 9
Information Asymmetry, Competition and Trading Channels

	Information Asymmetry		Competition		Trading	
	PIN	$\ln(ILLIQ)$	$\ln(HOLDER)$	$\ln(ILLIQ)$	$\ln(TURNOVER)$	$\ln(ILLIQ)$
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
PIN		2.6060^{***}				
		(0.6072)				
$\ln(HOLDER)$				-0.3642^{***}		
				(0.1029)		
$\ln(TURNOVER)$						-0.3969^{***}
						(0.0456)
$FOREIGN_{NOM}$	-0.0695^{***}	-3.5426^{***}	1.6896^{***}	-2.8129^{***}	1.0906^{*}	-2.7676^{***}
	(0.0199)	(0.6796)	(0.3728)	(0.6718)	(0.5773)	(0.4919)
$FOREIGN^2_{NOM}$		5.4154^{***}		3.6615^{***}		3.8190^{***}
		(1.0628)		(1.0762)		(0.8596)
$LOCAL_{IND}$	0.0279^{***}	-6.8804^{***}	-0.5884^{***}	-5.3732^{***}	0.5704^{*}	-3.9815^{***}
	(0.0098)	(0.8074)	(0.1593)	(0.7011)	(0.2913)	(0.7129)
$LOCAL^2_{IND}$		6.4776^{***}		5.0855^{***}		3.7381^{***}
		(1.0288)		(0.9079)		(0.9203)
$LOCAL_{INST}$	0.0167^{**}	0.5964^{**}	-0.2942^{**}	0.5246^{***}	-0.8533^{***}	0.2692^{*}
	(0.0082)	(0.2309)	(0.1457)	(0.1912)	(0.2329)	(0.1618)
$ANALYST_{RESID}$		-0.2098^{***}		-0.2820^{***}		-0.1245^{**}
		(0.0630)		(0.0639)		(0.0614)
$\ln(SIZE)$		-1.3401^{***}		-1.1700^{***}		-1.2716^{***}
		(0.0455)		(0.0483)		(0.0396)
$RETURN$		-1.9139^{***}		-1.6091^{***}		-1.0669^{***}
		(0.4874)		(0.5624)		(0.3260)
$VOLATILITY$		0.0487^{**}		0.0893^{***}		0.0717^{***}
		(0.0225)		(0.0142)		(0.0185)
Constant	0.3055^{***}	3.7497^{***}	8.3602^{***}	6.3716^{***}	-7.1491^{***}	3.8128^{***}
	(0.0067)	(0.5546)	(0.0897)	(0.6299)	(0.1863)	(0.4883)
Year	NO	YES	NO	YES	NO	YES
Industry	NO	YES	NO	YES	NO	YES
N	3388	3424	4200	4192	4195	4192
Adj. R-squared	1.81%	72.29%	7.54%	72.53%	2.93%	75.47%

Notes: The descriptions for all the variables listed above are given in the notes to Table 3. The three competing liquidity channels of information asymmetry, competition and trading are proxied by the probability of information-based trading (PIN), the natural logarithm of the total number of foreign nominees plus total number of local institutions plus total number of local individuals $\{\ln(HOLDER)\}$, and the natural logarithm of stock turnover $\{\ln(TURNOVER)\}$, respectively.

To determine the significance of each channel, we estimate two sets of pooled OLS regressions. In the first regression, the proxy for liquidity channel is regressed against the three investor types. In the second regression, the liquidity channel is added as a regressor to our final liquidity model where the dependent variable is $\ln(ILLIQ)$. All the independent variables in these regressions take lag one $(t-1)$.

Coefficients for year and industry dummies are not reported for brevity. Double-clustered standard errors are reported in parentheses. The asterisks ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

6. Conclusion

Motivated by the lack of Malaysian liquidity studies, we examine the liquidity roles of various investor groups using recently acquired ownership dataset from Bursa Malaysia. This study shows the value added of individual country analysis, as our findings on foreign investors and local individuals differ greatly from those reported by existing literature including the available cross-country studies. Both variables exhibit a non-monotonic relationship with stock liquidity, which are driven by the interactions of competing liquidity channels. Apart from country heterogeneity, our research design highlights several issues that are pertinent to future research on liquidity. First, since existing liquidity channels predict countervailing effects, it is unrealistic to assume a monotonic linear relationship between investor types and stock liquidity, and thus the functional form of the liquidity model should be given serious consideration. In fact, it is a standard practice in the managerial ownership literature to specify a quadratic model due to the trade-off between incentive alignment and managerial entrenchment effects. Second, our analysis from aggregate to disaggregate shareholdings highlights the shortcomings of empirical liquidity studies using macro-level portfolio equity flows (see Tesar and Werner, 1995; Vagias and van Dijk, 2012) as they ignore within-country investor heterogeneity. It is important to consider the types of investor as the liquidity effects might differ. Third, the types of account that investors trade do matter for liquidity, which in the Malaysian context, is between direct and nominee accounts. In Australia, Fong *et al*. (2014a) and Tian *et al*. (2015) find that the types of retail brokers (discount versus full-service) that investors engage are important to the informativeness of trades. Last but not least, apart from the popular information asymmetry and trading effects, liquidity is also driven by the largely ignored competition channel.

The dearth of empirical studies deprives exchange regulators of useful input on the liquidity roles of different investor groups in Bursa Malaysia. Our findings fill this policy gap. First, consistent with theoretical prediction, information asymmetry is detrimental to stock liquidity. It is found that the participation of foreign investors in domestic firms helps to reduce information asymmetry, and thus policies to further liberalize the Malaysian stock market are commendable. However, the non-monotonic relationship challenges the popular policy view that "more is better" and caution against the move for full liberalization, as a large negative effect will kick in and dominate when the foreign shareholdings exceed the threshold level. Such ownership concentration is a plausible reason why local institutional investors and local individual investors are associated with higher information asymmetry, the former dominated by state-controlled institutions whereas the latter concentrated in the hands of family. Since corporate ownership structure is beyond regulatory control, the literature prescribes alternative measures to mitigate information asymmetry such as insider trading laws, stricter corporate governance, high quality public disclosure and transparent financial reporting. Second, in the presence of information asymmetry, our findings suggest that increasing the number of investors and trading activity has a positive effect on liquidity. The policy responses to these two channels are unambiguous.

Acknowledgements

We thank the participants at the 11th Asian Academy of Management Conference 2015 for their valuable comments, and Bohui Zhang for his generosity in sharing their PIN data for Malaysian firms. The first author acknowledges financial funding from the Fundamental Research Grant Scheme (Grant No: FP020-2014B) provided by the Malaysian Ministry of Higher Education.

References

Admati, A.R. & Pfleiderer, P. (1988). A theory of intraday patterns: Volume and price variability. *Review of Financial Studies*, *1*(1), 3–40.

Agarwal, P. (2007). Institutional ownership and stock liquidity. SSRN Working Paper, available at http://doi.org/10.2139/ssrn.1029395.

Agudelo, D.A. (2010). Friend or foe? Foreign investors and the liquidity of six Asian markets. *Asia-Pacific Journal of Financial Studies*, *39*(3), 261–300.

Ahn, H.J., Cai, J., Hamao, Y. & Melvin, M. (2014). Little guys, liquidity, and the informational efficiency of price: Evidence from the Tokyo Stock Exchange on the effects of small investor participation. *Pacific-Basin Finance Journal*, *29*, 163–181.

Akins, B.K., Ng, J. & Verdi, R.S. (2012). Investor competition over information and the pricing of information asymmetry. *Accounting Review*, *87*(1), 35–58.

Amihud, Y. (2002). Illiquidity and stock returns: Cross-section and time-series effects. *Journal of Financial Markets*, *5*(1), 31–56.

Amihud, Y., Mendelson, H. & Pedersen, L.H. (2006). Liquidity and asset prices. *Foundations and Trends in Finance*, *1*(4), 269–364.

Amihud, Y., Mendelson, H. & Uno, J. (1999). Number of shareholders and stock prices: Evidence from Japan. *Journal of Finance*, *54*(3), 1169–1184.

Armstrong, C.S., Core, J.E., Taylor, D.J. & Verrecchia, R.E. (2011). When does information asymmetry affect the cost of capital? *Journal of Accounting Research*, *49*(1), 1–40.

Aslan, H., Easley, D., Hvidkjaer, S. & O'Hara, M. (2011). The characteristics of informed trading: implications for asset pricing. *Journal of Empirical Finance*, *18*(5), 782–801.

Azevedo, A., Karim, M., Gregoriou, A. & Rhodes, M. (2014). Stock price and volume effects associated with changes in the composition of the FTSE Bursa Malaysian KLCI. *Journal of International Financial Markets, Institutions and Money*, *28*, 20–35.

Bae, K.H., Ozoguz, A., Tan, H. & Wirjanto, T.S. (2012). Do foreigners facilitate information transmission in Emerging markets? *Journal of Financial Economics*, *105*(1), 209–227.

Barber, B.M. & Odean, T. (2000). Trading is hazardous to your wealth: the common stock investment performance of individual investors. *Journal of Finance*, *55*(2), 773–806.

Barinov, A. (2013). Turnover: liquidity or uncertainty? *Management Science, 60*(10), 2478–2495.

Berkman, H., Koch, P.D. & Westerholm, P.J. (2014). Informed trading through the accounts of children. *Journal of Finance*, *69*(1), 363–404.

Bolton, P., & Von Thadden, E.L. (1998). Blocks, liquidity, and corporate control. *Journal of Finance*, *53*(1), 1–25.

Borisova, G. & Yadav, P.K. (2012). Government ownership, informed trading, and private information. SSRN Working Paper, available at http://doi.org/10.2139/ssrn.1333999.

Brennan, M.J., Huh, S.W. & Subrahmanyam, A. (2015). Asymmetric effects of informed trading on the cost of equity capital. *Management Science,* forthcoming.

Brockman, P., Chung, D.Y. & Yan, X. (2009). Block ownership, trading activity, and market liquidity. *Journal of Financial and Quantitative Analysis*, *44*(6), 1403–1426.

Brunnermeier, M.K. & Pedersen, L.H. (2009). Market liquidity and funding liquidity. *Review of Financial Studies*, *22*(6), 2201–2238.

Carney, R.W. & Child, T.B. (2013). Changes to the ownership and control of East Asian corporations between 1996 and 2008: The primacy of politics. *Journal of Financial Economics*, *107*(2), 494–513.

Choi, J.J., Sami, H. & Zhou, H. (2010). The impacts of state ownership on information asymmetry: Evidence from an emerging market. *China Journal of Accounting Research*, *3*(1), 13–50.

Chordia, T., Roll, R. & Subrahmanyam, A. (2008). Liquidity and market efficiency. *Journal of Financial Economics*, *87*(2), 249–268.

Chung, K.H., Elder, J. & Kim, J.C. (2010). Corporate governance and liquidity. *Journal of Financial and Quantitative Analysis*, *45*(2), 265–291.

Chung, K.H. & Li, M. (2003). Adverse-selection costs and the probability of information-based trading. *Financial Review*, *38*(2), 257–272.

Chung, K.H., McInish, T.H., Wood, R.A. & Wyhowski, D.J. (1995). Production of information, information asymmetry, and the bid-ask spread: Empirical evidence from analysts' forecasts. *Journal of Banking & Finance*, *19*(6), 1025–1046.

Ding, M. (2014). Political connections and stock liquidity: Political network, hierarchy and intervention. Working Paper, Lund University.

Easley, D., Kiefer, N.M.K. & O'Hara, M. (1996). Cream-skimming or profit-sharing? The curious role of purchased order flow. *Journal of Finance*, *51*(3), 811–833.

Easley, D. & O'Hara, M. (1987). Price, trade size, and information in securities markets. *Journal of Financial Economics*, *19*(1), 69–90.

Edmans, A., Fang, V.W. & Zur, E. (2013). The effect of liquidity on governance. *Review of Financial Studies*, *26*(6), 1443–1482.

Fang, V.W., Noe, T.H. & Tice, S. (2009). Stock market liquidity and firm value. *Journal of Financial Economics*, *94*(1), 150–169.

Fong, K.Y.L., Gallagher, D.R. & Lee, A.D. (2014a). Individual investors and broker types. *Journal of Financial and Quantitative Analysis*, *49*(2), 431–451.

Fong, K.Y.L., Holden, C.W. & Trzcinka, C.A. (2014b). What are the best liquidity proxies for global research? SSRN Working Paper, available at http://doi.org/10.2139/ssrn.1558447.

Foo, Y.B. & Zain, M.M. (2010). Board independence, board diligence and liquidity in Malaysia: A research note. *Journal of Contemporary Accounting and Economics*, *6*(2), 92–100.

Foucault, T., Sraer, D. & Thesmar, D.J. (2011). Individual investors and volatility. *Journal of Finance*, *66*(4), 1369–1406.

Garleanu, N. & Pedersen, L.H. (2007). Liquidity and risk management. *American Economic Review*, *97*(2), 193–197.

Glosten, L.R. & Milgrom, P.R. (1985). Bid, ask and transaction prices in a specialist market with heterogeneously informed traders. *Journal of Financial Economics*, *14*(1), 71–100.

Gopalan, R., Kadan, O. & Pevzner, M. (2012). Asset liquidity and stock liquidity. *Journal of Financial and Quantitative Analysis*, *47*(2), 333–364.

Goyenko, R.Y., Holden, C.W. & Trzcinka, C.A. (2009). Do liquidity measures measure liquidity? *Journal of Financial Economics*, *92*(2), 153–181.

Griffin, J.M., Kelly, P.J. & Nardari, F. (2010). Do market efficiency measures yield correct inferences? A comparison of developed and emerging markets. *Review of Financial Studies*, *23*(8), 3225–3277.

Heflin, F.L., Shaw, K.W. & Wild, J.J. (2005). Disclosure policy and market liquidity: Impact of depth quotes and order sizes. *Contemporary Accounting Research*, *22*(4), 829–865.

Heflin, F.L. Shaw, K.W. (2000). Blockholder ownership and market liquidity. *Journal of Financial and Quantitative Analysis*, *35*(4), 621–633.

Holden, C.W., Jacobsen, S. & Subrahmanyam, A. (2014). The empirical analysis of liquidity. *Foundations and Trends in Finance*, *8*(4), 263–365.

Holmstrom, B. & Tirole, J. (1993). Market liquidity and performance monitoring. *Journal of Political Economy*, *101*(4), 678–709.

Jiang, C.X., Kim, J.C. & Zhou, D. (2011). Liquidity, analysts, and institutional ownership. *International Review of Financial Analysis*, *20*(5), 335–344.

Kelley, E. K. & Tetlock, P.C. (2013). How wise are crowds? Insights from retail orders and stock returns. *Journal of Finance*, *68*(3), 1229–1265.

Kyle, A.S. (1985). Continuous auctions and insider trading. *Econometrica*, *53*(6), 1315–1335.

Lai, S., Ng, L. & Zhang, B. (2014). Does PIN affect equity prices around the world? *Journal of Financial Economics*, *114*(1), 178–195.

Lesmond, D.A. (2005). Liquidity of emerging markets. *Journal of Financial Economics*, *77*(2), 411–452.

Lim, K.P., Hooy, C.W., Chang, K.B., & Brooks, R.D. (2013). Foreign shareholding and stock price efficiency: Firm-level evidence from Malaysia. SSRN Working Paper, available at http://doi.org/10.2139/ssrn.2373482.

Lipson, M.L. & Mortal, S. (2009). Liquidity and capital structure. *Journal of Financial Markets*, *12*(4), 611–644.

Lou, X. & Shu, T. (2014). Price impact or trading volume: Why is the Amihud (2002) illiquidity measure priced? SSRN Working Paper, available at http://doi.org/10.2139/ssrn.2291942.

Marshall, B.R., Nguyen, N.H. & Visaltanachoti, N. (2013). Liquidity measurement in frontier markets. *Journal of International Financial Markets, Institutions and Money*, *27*, 1–12.

Neal, R. & Wheatley, S.M. (1998). Adverse selection and bid-ask spreads: Evidence from closed-end funds. *Journal of Financial Markets*, *1*(1), 121–149.

Ng, L., Wu, F., Yu, J. & Zhang, B. (2015). Foreign investor heterogeneity and stock liquidity around the world. *Review of Finance*, forthcoming.

Nyborg, K.G. & Östberg, P. (2014). Money and liquidity in financial markets. *Journal of Financial Economics*, *112*(1), 30–52.

Petersen, M.A. (2009). Estimating standard errors in finance panel data sets: Comparing approaches. *Review of Financial Studies*, *22*(1), 435–480.

Ramlee, R. & Ali, R. (2012). Liquidity, initial public offering (IPO) long-term return and government ownership: Evidence from Bursa Malaysia IPO stocks. *Asian Academy of Management Journal of Accounting and Finance*, *8*(1), 39–66.

Rhee, S.G. & Wang, J. (2009). Foreign institutional ownership and stock market liquidity: Evidence from Indonesia. *Journal of Banking & Finance*, *33*(7), 1312–1324.

Roulstone, D.T. (2003). Analyst following and market liquidity. *Contemporary Accounting Research*, *20*(3), 551–578.

Rubin, A. (2007). Ownership level, ownership concentration and liquidity. *Journal of Financial Markets*, *10*(3), 219–248.

Seasholes, M.S. & Zhu, N. (2010). Individual investors and local bias. *Journal of Finance*, *65*(5), 1987–2010.

Spiegel, M. & Subrahmanyam, A. (1992). Informed speculation and hedging in a noncompetitive securities market. *Review of Financial Studies*, *5*(2), 307–329.

Stoll, H.R. (2000). Friction. *Journal of Finance*, *55*(4), 1479–1514.

Subrahmanyam, A. (1991). Risk aversion, market liquidity, and price efficiency. *Review of Financial Studies*, *4*(3), 417–441.

Tesar, L.L. & Werner, I.M. (1995). Home bias and high turnover. *Journal of International Money and Finance*, *14*(4), 467–492.

Tian, X., Do, B., Duong, H.N. & Kalev, P.S. (2015). Liquidity provision and informed trading by individual investors. *Pacific-Basin Finance Journal*, forthcoming.

Vagias, D. & van Dijk, M.A. (2012). International capital flows and liquidity. SSRN Working Paper, available at http://doi.org/10.2139/ssrn.1744161.

Van Ness, B.F., Van Ness, R.A. & Warr, R.S. (2001). How well do adverse selection components measure adverse selection. *Financial Management*, *30*(3), 77–98.

Wang, Q. & Zhang, J. (2015). Individual investor trading and stock liquidity. *Review of Quantitative Finance and Accounting*, forthcoming.

Wintoki, M.B., Linck, J.S. & Netter, J.M. (2012). Endogeneity and the dynamics of internal corporate governance. *Journal of Financial Economics*, *105*(3), 581–606.

Appendix

Differences between Direct Account and Nominee Account

Direct Account	Nominee Account
It is an account held directly under the name of the beneficial owner (such as individual, corporate body, institutional investors).	The nominee account is opened under the name of the Authorized Nominee, with a specific description on who the beneficial owner.
The account holder is the owner of the securities in the CDS account, and will be registered as shareholder.	The Authorized Nominee is the owner of the securities in the CDS account. Hence, its name will be registered as the shareholder.
The beneficial owner is the operator of the account.	The Authorized Nominee is the operator of the account.
Eligible for IPO application.	Ineligible for IPO application.
All the paperwork on corporate exercise is handled by the shareholder.	The stock broker will monitor and manage corporate actions for securities kept in custody such as rights issues, dividend payout, bonus issues, and proxy voting. The beneficial owner will be charged a service fee.
Dividend entitlement will be mailed directly to the account holder.	Dividend entitlement will be received by the Authorized Nominee, which will then be redirected to the beneficial owner.
Eligible to attend AGM.	Ineligible to attend AGM, unless stock broker provides authorization letter.
Transfer of securities to third party can be done directly.	Transfer of securities to third party is complicated.
Shareholding for account holder is not known to third party.	Shareholding for beneficial owner is known to Authorized Nominee.
Shareholding for the account holder is unaffected in the event the stock broker is declared bankrupt.	There is implication on the shareholding of the beneficial owner if the nominee company is declared bankrupt.

Sources: Authors compilation based on information collected from Malaysian stockbroking companies.