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Abstract

The Chinese government implemented the Qualified Foreign Institutional Investor (QFII) system in order to advance the quality of local capital markets by participation of foreign institutional investors. This paper identifies the channels through which foreign institutional investors influence the liquidity on the Chinese stock markets. Firstly, we find that market participation by foreign institutional investors promotes liquidity both for state-owned enterprises (SOEs) and non-SOEs. Secondly, foreign institutions influence liquidity through the informational frictions channel, but not through the real frictions channel. Thirdly, foreign institutions are not informationally disadvantaged when investing in SOEs. Finally, the link between foreign institutional participation and liquidity remains strong before, during, and after the recent financial crisis.

Keywords: liquidity; emerging markets; foreign institutional investors; real frictions; informational frictions

JEL codes: G12; G18; G32; C23

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1. Introduction

China is by far the largest emerging market in the world. In addition, it has a unique institutional and corporate governance environment that differs from other emerging economies. Unlike many other emerging markets, most listed firms are only partially privatized and corporate ownership is often highly concentrated in the hands of a single investor associated with the central or local government, or a government controlled so-called state-owned enterprise (SOE). There is a well-established literature indicating that SOEs are characterized by lower governance transparency and by less effective corporate governance mechanisms (Shleifer and Vishny, 1997; La Porta et al., 1999; Johnson et al. 2000) and lower financial transparency (Bushman et al. 2004; Wang et al. 2008; Chaney et al. 2008), which may create information asymmetries between foreign and local investors. Nevertheless, in an effort to promote foreign institutions' participation in the financial market, in 2002 the government implemented the qualified foreign institutional investor (QFII) program, which is a policy measure that allows stock market quota to foreign institutional investors.¹ This system permits overseas institutional investors to buy domestically listed stocks in the A-share market. Prior to the QFII system, foreign investors could only invest in the B-share market.² Even though it is sensible to assume that financial liberalization in general improves liquidity, there are no attempts in the literature to evaluate how foreign institutions influence liquidity in the unique institutional and corporate governance environment in China.

The literature suggests two primary mechanisms through which foreign institutional investors can affect market liquidity: (1) by changing the level of trading activity on the market and (2) by altering the information environment on the market. Stoll (2000) refers to the former mechanism as a real frictions effect and to the latter as an informational frictions effect. The presence of foreign institutional investors can affect the real friction component of liquidity by changing the level of trading activity in the market. In particular, if participation by foreign institutional investors elicits more trade, the increase in trading activity will reduce real friction costs by spreading fixed real costs over more trades. Considering the informational friction component of liquidity, a common argument is that foreign institutional investors are better informed and, therefore, regarded as informed traders. Market makers are concerned about the potential losses of trading against informed traders, accordingly leading them to increase spreads (an adverse selection effect). However, Stulz (1999a,b) argues that liquidity in local financial market is likely to improve as a result of better information disclosure and higher trading activity engendered by participation of international financial institutions. When prices reflect better and more relevant information, market makers decrease spreads due to the lower price uncertainty (a price discovery effect).

¹ QFII refers to "overseas fund management institutions, insurance companies, securities companies and other assets management institutions which have been approved by the China Securities Regulatory Commission (CSRC) to invest in China's securities market and granted investment quota by SAFE". Term 18 of the Provisional Measure states that QFIIs can invest in A-shares, treasuries, convertible bonds and corporate bonds listed in China's stock exchanges and other financial instruments as approved by CSRC.

² A-shares are denominated in renminbi. B-shares are denominated in foreign currency (US dollars in Shanghai and Hong Kong dollars in Shenzhen).

This paper offers a number of distinct contributions. Firstly, it is the first study to investigate the influence of foreign institutional investors on the liquidity on the stock markets in China (Shanghai and Shenzhen). Secondly, we disentangle the influence on liquidity provided by foreign investors into the effects on real frictions and on informational frictions. Thirdly, we examine the question of potential information asymmetries between foreign and domestic institutions by studying SOEs and non-SOEs separately. Finally, our sample from April 2004 to March 2012 allows us to look into the matter of whether the link between foreign institutions and liquidity has changed over time, with special reference to the recent financial crisis.

Our understanding of how foreign institutional investors improve (or impede) market liquidity has direct implications for asset pricing, corporate governance and regulation. With respect to asset pricing, in the face of real frictions, traders need to offset the real costs of trading, which leads to lower prices and higher expected returns (Stoll, 2000; Amihud, 2002). More generally, there is a growing literature suggesting that both the level of liquidity and the risk (uncertainty) in liquidity influence asset prices (Amihud and Mendelson, 1986; Pástor and Stambaugh, 2003; Acharya and Pedersen, 2005; Lee, 2011). In addition, informational frictions have a distributional effect on the wealth of informed and uninformed traders (Stoll, 2000). Should foreign institutional investors actively trade on superior information to the detriment of uninformed traders, there is scope for stricter corporate governance regulations to reduce information asymmetries between local and foreign investors. Very few studies directly address the issue of how participation of foreign institutions affects liquidity on emerging markets. Rhee & Wang (2009) study this question on the Indonesian stock market, and conclude that market participation by foreign institutional investors actually contributes negatively to liquidity even though market liberalization in general has improved liquidity. They attribute this finding mainly to information asymmetries between domestic and foreign investors (an adverse selection effect). Earlier work by Levine and Zervos (1998) and Bekaert, Harvey and Lumsdaine (2002) emphasize the role of financial liberalization for market quality in general, and argue that liquidity improves as markets become financially more liberal. Bekaert, Harvey and Lundblad (2007) study the implications of financial liberalization (openness) on the relation between stock market liquidity and asset prices on emerging markets. They find that there is a remaining effect of liquidity on asset prices even after financial deregulation.

Our first main result is that market participation by foreign institutional investors promotes liquidity for both SOEs and non-SOEs. This finding contrasts the result in Rhee & Wang (2009) for the Indonesian stock market. Secondly, these improvements of liquidity by foreign institutional investors act through the informational frictions channel. This result implies that price discovery effects dominate adverse selection effects, which may explain the contrasting results for China and Indonesia. Interestingly, it also suggests that foreign institutional investors are not informationally disadvantaged with respect to SOEs. Furthermore, there are no effects on liquidity through the real frictions channel. Finally, we compare the influence on liquidity by foreign institutional investors before, during, and after the recent financial crises and find no differences. This result suggests a strong link between market participation of foreign institutional investors and liquidity; during crises, liquidity is adversely affected because participation of foreign institutional investors decreases, and conversely liquidity is improved during periods when

participation increases. Taken together, our evidence is indicative of that the QFII system successfully promotes liquidity on the Chinese stock market.

The paper is structured as follows. Section 2 develops our hypotheses related to the real and informational friction channels. Section 3 explains the measurement of liquidity as well as real and informational frictions for individual stocks in the context of the Chinese market. We use intraday data from the Shanghai and Shenzhen exchanges to calculate spread measures and daily data to calculate the price impact measure of Amihud (2002). The informed trading components are estimated using the methods of Lin, Sanger and Booth (1995) and Huang and Stoll (1997). This section also develops econometric specifications of our panel data regressions. Section 4 describes the data sources and provides descriptive statistics for liquidity measures, firm characteristics and the variables measuring institutional market participation. Section 5 reports the results of our main panel data regressions. Section 6 contains results of various robustness checks. The final section summarizes and provides some concluding remarks.

2. Related literature and hypothesis development

2.1 Real frictions channel

Higher liquidity of a stock is usually associated with greater market capitalization of the firm since a larger market capitalization would make a stock more attractive to a larger number of investors who have restrictions on the size of companies in which they invest. Furthermore, stocks with larger market capitalization tend to have a larger number of shares outstanding, which may increase trading volume. The liquidity of a stock also relates to the average transaction costs, which depend on the number of shareholders participating in trade. With greater foreign institutional participation, the level of trading activity increases, thereby reducing the average transaction cost and promoting liquidity. However, the effect on liquidity from participation of foreign institutional investors is not as clear-cut in China. Given the dominant presence of SOEs with highly concentrated ownership, it is less apparent that participation of foreign institutional investors will increase trading activity. When firm ownership is concentrated, there is a limited free float and consequently there are fewer trades, leading to a fall in liquidity (Demsetz, 1968). In addition, the ownership structure may affect liquidity through the production of information. When ownership is concentrated, it reduces the benefits of monitoring the firm, thus reducing the amount of public information available about the firm (Holmstrom and Tirole, 1993). Furthermore, the number of market participants willing to invest in information acquisition in a firm directly relates to the anticipated gains from trade, which in turn relates to the firm's free float.

Past studies investigate the liquidity effects of foreign institution's involvement in the stock market, but none explicitly identifies the channels through which this influence occurs. We follow Stoll (2000), who suggests decomposing total friction (such as quoted or effective spread) into real friction and informational friction. We disentangle real and informational effects by examining the impact of foreign institutional investors' participation on the real costs of trading. These real friction effects are directly associated with the level of trading activity, such as the

stock's average turnover, number of trades and trade size. We then examine the impact of foreign institutional participation on market liquidity through the informational frictions channel, while controlling for the real friction effects.

2.2 Informational frictions channel

Many studies show that information drives institutional trading (Ali et al. 2004; Ke and Petroni, 2004 and Bushee and Goodman, 2007). To the extent that large institutional ownership increases the degree of information asymmetry (Dennis and Weston, 2001; Agarwal, 2007; Rubin, 2007; Brockman and Yan, 2009), foreign institutions are less likely to have a positive impact on liquidity. This is due to the fact that foreign institutional investors are perceived to be better traders given that they are better informed (Grinblatt and Keloharju, 2004 and Seasholes, 2004); they monitor corporate management better than local institutions (Khanna and Palepu, 1999); and they produce more timely and accurate forecasts than local analysts (Bachmann and Bolliger, 2001). Another possible reason for a negative impact of foreign institutional investors' participation is that a shift in the majority ownership to foreign institutions may weaken the informal information channels that exist between local government and industries in emerging markets. The company therefore appears "foreign" to local investors and liquidity decreases (Rhee and Wang, 2009).

Potentially, liquidity is negatively related to the concentration of institutional ownership (Rubin, 2007). Concentrated ownership is costly because blockholders may have private information about firm value.³ Naturally, in response to a higher probability of informed trading, liquidity providers widen spreads (Glosten and Milgrom, 1985). In this study, where our sample largely reflects firms that are SOEs with highly concentrated ownership, it is of interest to investigate if foreign institutional investors influence market liquidity, and if Chinese data support the prediction of Rubin (2007) about the negative association between concentration of ownership and liquidity.

While a number of empirical studies find evidence of a negative impact of institutional trading on liquidity via information asymmetry, there are a number of theoretical works that point in the opposite direction. These works predict that because of the presence of more informed traders, there will be greater information efficiency, which results in higher liquidity. Kyle (1985) develops a theoretical model to study the effect of informed traders and their information advantage on liquidity and price efficiency. Using an augmented version of Kyle's model, Mendelson and Tunca (2004) demonstrate that as prices reflect more information about the security's value, there is a reduction in the risk of trading the security, which leads to greater liquidity trading. The process of dissemination of information through increased trading is known as information efficiency. A number of papers show that information

³ A blockholder is a shareholder who owns a large amount of stock and, in general, the shareholder is an institutional investor. There is no specific definition of a "block" of shares in the literature, but a shareholder who holds 5% or more of share value is usually regarded a blockholder.

efficiency improves by competition amongst informed investors. Subrahmanyam (1991) develops a model, which predicts that as the number of informed traders increase, the stock price becomes less sensitive to the order flow. Spiegel and Subrahmanyam (1992) generalizes the model of Subrahmanyam (1991) by endogenizing liquidity trades based on hedging needs and demonstrate that the greater competition amongst traders/investors results in higher liquidity. Holden and Subrahmanyam (1992), Foster and Viswanathan (1996), and Back, Cao, and Willard (2000) further investigate the effect of multiple informed traders acting strategically on liquidity. These studies share the common finding of faster incorporation of information into prices caused by increased competition amongst investors, particularly when there are a large number of informed investors with perfectly correlated signals.

2.3 The role of state-owned enterprises

The relationship between state ownership and the impact of foreign institutional investors on market liquidity has never been examined before. We predict that foreign institutional investors exert a different impact on state-owned enterprises (SOEs) than on non-SOEs. Specifically, we hypothesize that foreign institutional investors have a more pronounced impact on liquidity of non-SOEs. This differential effect on liquidity across the two types of firms can be explained by the unique characteristics of SOEs. Given the dominant presence of SOEs in China, the impact of foreign institutional investors on market liquidity in China may differ from other emerging markets.

SOEs in China are characterized by frequent government interventions, and foreign institutional investors from market-oriented economies sometimes struggle to understand some of the corporate practices of these firms. For example, involvements of the government include the appointment of CEOs with former or current government bureaucrats (Fan, Wong and Zhang, 2007). In some cases counter-productive practices of the SOEs have resulted in lower operating performance even though there has been privatization of the SOEs in China (Sun and Tong, 2003), an outcome that contrasts the rest of the world (Dewenter and Malatesta, 2001; Boubakri, Cosset and Guedhami, 2005).

In addition, SOEs are characterized by lower information transparency and higher information asymmetries. There are little incentives for SOEs to provide high quality accounting reports to outside shareholders because SOEs are not obliged to disclose information to the public. Furthermore, they are closely connected with the central or local governments and receive preferential treatment by the government and state banks in the form of lower bank loan rates, generous financial support and ultimately government bailout in times of financial crises. According to Chaney, Faccio and Parsley (2011), politically connected firms with poor quality of information are not penalized by a higher cost of debt, thus market pressure fails to discipline politically connected firms by forcing them to increase the quality of financial disclosure. In an environment of poor disclosure policy, this would worsen the information asymmetry problem. Coupled with the problem of expropriation, minority shareholders may refuse to buy shares leading to poor market liquidity. The

literature clearly suggests that a good investor protection environment is closely associated with narrower spreads (Brockman and Chung, 2003).

3. Measurement of variables and model specification

3.1 Measurement of dependent variables

(a) Measuring liquidity

Due to the latent nature of liquidity and its multiple dimensions, it is difficult for a single measure to capture all aspects of liquidity. We apply three measures of liquidity to ensure the robustness of our results. The measures include the relative quoted bid-ask spread, the relative effective bid-ask spread and the Amihud (2002) price impact measure (*ILLIQ*). The spread is a measure of tightness in the market for a stock as it reflects the cost of an immediate round-trip trade. It is also a measure of the total friction, as it summarizes the costs of a market maker (inventory risk, adverse selection risk, and operating fees). The relative quoted bid-ask spread is defined as the difference between ask and bid, scaled by the midpoint of the prevailing quote. The weakness of the quoted spread is that trades often occur within the spread and not at the bid or ask. A possible remedy is to use the effective spread. The relative effective bid-ask spread is defined as twice the absolute value of the difference between a transaction price and the midpoint of the prevailing bid and ask quotes (scaled by the midpoint). We calculate both the daily quoted spread and effective spread for each firm using intraday data (see Section 4 for a description of the data). The *ILLIQ* measure proxies for market depth by relating daily absolute returns to daily trading volumes measured in monetary units (excluding days with zero volume). Given that deep markets are able to absorb large trading volumes without large price changes, this ratio intuitively measures market depth. We average the daily liquidity observations to obtain quarterly liquidity measures for each firm.

(b) Measuring trading activity

We calculate three straightforward daily measures of trading activity: number of shares per transaction (share trading volume divided by the number of trades), number of transactions, and turnover (trading volume divided by the number of shares outstanding). We average the daily trading activity observations to obtain quarterly measures of trading activity for each firm.

(c) Decomposing the spread

We use two methods to estimate the adverse selection component of the bid-ask spread in order to isolate the informed trading component of the spread. The two methods are by Lin, Sanger and Booth (1995) and Huang and Stoll (1997), which we hereafter denote as *LSB* and *HS*, respectively.

We apply one of the extended models introduced by Huang and Stoll (1997) to estimate the adverse selection spread component. The model is different from their basic model by making no assumption about the probability of trades, and therefore the extended model can distinguish between the inventory and adverse selection components. The following firm-specific regression describes the extended model, estimated using ordinary least squares:

$$\Delta P_{i,t} = \beta_{1,i}Q_{i,t} + \beta_{2,i}Q_{i,t-1} + \beta_{3,i}Q_{A,t-1} + \varepsilon_{i,t}, \quad (1)$$

where $\Delta P_{i,t} = P_{i,t} - P_{i,t-1}$ is the change in transaction price of firm i between time $t - 1$ and time t , and $Q_{i,t}$ is an indicator for trade type at time t that takes the value of $+1$ if the trade is a buyer-initiated transaction and -1 if the trade is a seller-initiated transaction.⁴ The aggregate buy/sell indicator $Q_{A,t-1}$ equals $+1$ ($-1, 0$) if the sum of $Q_{i,t-1}$ across all sample stocks is positive (negative, zero) and is, therefore, a proxy for the market-wide pressure on the market maker's inventory levels. Following Huang and Stoll (1997), the estimated adverse selection component equals $2(\beta_{1,i} + \beta_{2,i})$.

The Lin, Sanger and Booth (1995) adverse selection spread component is estimated by the following firm-specific regression using ordinary least squares:

$$\Delta M_{i,t} = \delta(P_{i,t-1} - M_{i,t-1}) + \varepsilon_{i,t}, \quad (2)$$

where $\Delta M_{i,t} = M_{i,t} - M_{i,t-1}$ is the change in the spread midpoint between time $t - 1$ and time t for firm i , and $P_{i,t}$ is the transaction price at time t . The estimate of the adverse selection component is the regression coefficient δ .

3.2 Measurement of independent variables

Many prior studies find that stock volatility, firm size, share price and turnover are associated with liquidity (Benston and Hagerman, 1974; Stoll and Whaley, 1983; Agarwal (2007), Brockman, Dennis and Yan, 2009). Volatility increases the market makers inventory risk and the risk of engaging in short-term speculative trades (Chordia, Roll and Subrahmanyam, 2001). Stoll and Whaley (1983) suggest that it is more expensive to trade smaller stocks as there is less relevant information available about these firms. Following Agarwal (2007), turnover captures different effects, for example high turnover may be a result of dispersion in beliefs induced by information differences among investors. In our panel data regressions, we control for stock return volatility (*VOL*) estimated by the standard deviation of daily

⁴ Using high frequency data, we classify trades at prices above the prevailing quote midpoint as buyer-initiated trades ($Q_{i,t} = 1$) and trades at prices below the prevailing quote midpoint as seller-initiated trades ($Q_{i,t} = -1$). In addition, we employ a tick test (Lee and Ready, 1991) if the trade's price is equal to the prevailing quote midpoint. A tick test involves assigning $Q_{i,t} = 1$ ($Q_{i,t} = -1$) for trades that occur at a price higher (lower) than the price at $t - 1$.

stock returns, firm size measured by market capitalization ($MCAP$), the reciprocal of share price ($1/P$), and turnover (TO).⁵

We also include a group of financial control variables, degree of leverage (LEV), book to market (BM) and earnings per share (EPS). The degree of leverage is included as the security design literature has recognized that the capital structure of a firm can affect the degree of information disclosure (Diamond and Verrecchia, 1991) and consequently the firms' capital structure can be associated with market liquidity through the informational channel. In addition, Agarwal (2007) finds that lower book to market ratio (growth firms) and higher earnings per share are associated with higher liquidity as these types of firms are more likely to attract both media and investors. In the same vein, Dahlquist and Robertsson (2000) argue that financial characteristics govern foreign institutions' preference for stocks.

3.3 Specifications of panel regressions

We first specify the model to examine the effects of participation of foreign institutions on stock market liquidity. Three measures of liquidity are employed for the dependent variable in the panel regression: the relative quoted spread (QS), the relative effective spread (ES) and the Amihud (2002) price impact measure ($ILLIQ$). The panel regression is:

$$LIQ_{i,t} = \alpha_0 + \alpha_1 FI_{i,t-1} + \alpha_2 DI_{i,t-1} + \alpha_3 MCAP_{i,t-1} + \alpha_4 VOL_{i,t} + \alpha_5 /P_{i,t} + \alpha_6 TO_{i,t} + \alpha_7 BM_{i,t-1} + \alpha_8 EPS_{i,t-1} + \alpha_9 LEV_{i,t-1} + \sum_k \beta_k D_k + \varepsilon_{i,t}, \quad (3)$$

where LIQ denotes the various liquidity measures, FI (DI) the number of foreign (domestic) institutional investors participating in the stock. The quarterly time dummy D captures the common shock and also takes into account the time trend of the variables to circumvent any potential problem of spurious regressions. We normalize the number of foreign institutional investors being top 10 outstanding shareholders of a firm by their respective cross-sectional standard deviations in each quarter. This allows us to make meaningful comparisons across the coefficients. Due to high skewness and kurtosis all dependent variables are transformed by taking the natural logarithm. To circumvent the problem of endogeneity, it is common practice to use the lagged value of the number of foreign (FI) and domestic institutions (DI). If the participation of foreign institutional investors promote liquidity by reducing real frictions (i.e., increasing trading activity) and/or informational frictions (i.e., improving the informational environment by enhancing competition amongst informed traders), the coefficient on the number of foreign institutions α_1 in regression (3) should have a negative sign. For each dependent variable, we run two panel data regressions: one with firm characteristics control variables and one

⁵ Following Heflin and Shaw (2000) and Brockman, Chung and Yan (2009), instead of turnover, we alternatively use the number of trades or trade size as control variable. In addition, we run the panel regressions with (i) the natural logarithm of P and (ii) both the natural logarithm and the reciprocal of P . All results remain qualitatively unchanged.

without. One of the objectives of this paper is to identify potential differences in the impact of foreign institutional investors' participation on market liquidity between state-owned and privately owned companies. Therefore, in addition we estimate the regression separately for SOEs and non-SOEs.

We next examine whether the impact of the presence of foreign institutions on liquidity is due to the real frictions effects, the informational frictions effect, or both, while controlling for firm characteristics. Real friction measures of trading activity variables include turnover (TO), the number of trades (TRA), and trade size (TS). We estimate the adverse selection component of the bid-ask spread, which captures the informational frictions effect, using the methods of HS and LSB described in Section 3.1. The panel regression is:

$$X_{i,t} = \alpha_0 + \alpha_1 FI_{i,t-1} + \alpha_2 DI_{i,t-1} + \alpha_3 MCAP_{i,t-1} + \alpha_4 VOL_{i,t} + \alpha_5 /P_{i,t} + \alpha_6 BM_{i,t-1} + \alpha_7 EPS_{i,t-1} + \alpha_8 LEV_{i,t-1} + \sum_k \beta_k D_k + \varepsilon_{i,t}, \quad (4)$$

where $X_{i,t} = TO_{i,t}, TRA_{i,t}$ or $TS_{i,t}$ for the trading activity measures, and $X_{i,t} = HS_{i,t}$ or $LSB_{i,t}$ for the adverse selection measures. Due to high skewness and kurtosis all dependent variables are transformed by taking the natural logarithm. Should foreign institutions give rise to higher trading activity, the coefficient α_1 in the corresponding regression should have a positive sign. When the adverse selection component is the dependent variable, turnover is included as an additional control variable. Should foreign institutions give rise to lower adverse selection costs, the coefficient α_1 should have a negative sign.

The panel regressions (3) and (4) are fitted to quarterly unbalanced panel data with time period varying from 4 to 33 quarters (the cross-section includes 2413 firms in total, see Section 4.1 for a description of the data filtering). A specific feature of our data is that it has a large number of firms with relatively few time-series observations. Consequently, it is important to recognize the effects of cross-sectional correlation among firms and serial correlation across time, which can result in biased standard errors if not addressed properly. The most common approaches to adjust standard errors includes the use of (1) White standard errors to correct for heteroskedastic residuals, (2) Rogers standard errors or clustered standard errors to correct for residuals which are correlated within firms but are uncorrelated between firms, and (3) Newey-West standard errors for serially correlated residuals. Unfortunately, these adjusted standard errors fail to allow for the contemporaneous correlation among firms, let alone non-contemporaneous cross-dependence in the residuals. Furthermore, restricting the forms of cross-sectional dependence does not give reliable standard errors if the true spatial correlation is not contemporaneous. In our estimation, we use the Driscoll-Kraay (1998) nonparametric covariance matrix estimator that is robust to different forms of spatial and temporal dependence.⁶ More

⁶ See Hoechle (2007) for the application of Driscoll-Kraay standard errors to unbalanced panel data. We also run fixed-effect regressions using the Driscoll-Kraay standard errors. In addition, following Rhee and Wang (2009), we employ the Fama-MacBeth estimation methodology. The results from both

specifically, Driscoll-Kraay standard errors are robust to correlation across residuals, both within a firm over time, and across firms in the same period and between different periods.⁷

4. Data and sample description

4.1 Data

The trade and quote data are collected from Thomson Reuters. To ensure the integrity of the database, the analysis is confined to transactions coded as regular trades and quotes that are best bid or offer (BBO) eligible. We restrict the dataset to five seconds interval and the last trade from each five seconds interval is used in the sample. The last quote from the previous interval is used to match the last trade from the present interval, or further back if there is no quote available in the previous interval.⁸ The sample includes all stocks listed on the Shanghai (SHSE) and Shenzhen (SZSE) stock exchanges from the beginning of April 2004 to the end of March 2012. The two stock exchanges open with a call market and operate as a continuous market for the remainder of the trading day. To avoid contaminating the data with different trading structures, we do not use the trade and quote data before the exchanges open or after they close. The quote data are used to construct various liquidity measures while the trade data proxy for trading activity.

We exclude stocks listed less than 100 days. In addition, a firm's outstanding shares in China include A-shares, B-shares, H-shares and other negotiable overseas shares. We adjust the sample by taking into consideration only firms listed in the A-share market. The reasons for focusing on the A-share market are that (1) the scale of the A-share market is much bigger than the other markets and it dominates the Chinese stock market, (2) the trading data for the listed firms correspond to the A-share market, and (3) by focusing on the A-share market, we mitigate the problem of cross-market effects of institutional holdings arising from market microstructure differences. These exclusions leave a sample of 2413 firms.

The CCER database provides daily data on closing price, trading volume, share turnover, earning per share, number of total shares, number of tradable shares, number of A-shares, quarterly data on ownership structure, total liability, total asset,

of these regressions are qualitatively unchanged. For brevity, the results are not reported, but are available from the authors upon request.

⁷ We specify a maximum lag of four in the autocorrelation structure to control for the persistence in the measures of liquidity for a firm over time. The results are qualitatively unchanged when we specify a maximum lag of two or three.

⁸ Trades and quotes from the Thomson Reuters are time-stamped to the second, but the sequence of quotes and transactions can be misaligned due to delays in the reporting of transactions. Lee and Ready (1991) suggest identifying a quote as prevailing at the time of the transaction if it was the latest quote for the stock and was at least five seconds old. Blume and Goldstein (1997) suggest a 16 second lag may be more appropriate, and we adopt their procedure to determine the time of quotes. In addition, all the results are qualitatively unchanged when we use both the last trade and last quote from the present interval, or the last quote from previous intervals when the last quote from the present interval is not available.

long-term debt, intangible assets, profit and industry classification.⁹ In order to remove the effect of outliers, we winsorize the data at the 99% level for leverage, earning per share, and book to market ratio.¹⁰

We obtain the top 10 firm-level outstanding shares held by foreign institutions and the three big domestic institutions (security, insurance and trust companies) from two websites.¹¹ The data are widely used and closely monitored by the press, investors and the general public. Institutional investment strategies are of significant interest to the public and so are data on total holding shares, purchases and sales by large institutions. These data are released quarterly to the public since every listed company has an obligation to report their top 10 outstanding shareholders to the China Securities Regulatory Commission (CSRC). Following Blume and Keim (2012), we use the number of foreign institutions rather than ownership. They argue that the number of institutions that own and trade a stock tends to have higher explanatory power than ownership for the cross-sectional variability of illiquidity.¹² Foreign institutions in China have two channels of obtaining A-shares, namely through the QFII and FSI.¹³ The former channel has a shareholding ceiling of 20% (10%) for all (a single) QFIIs in any listed company in China's A-share market. The latter channel is less restrictive in terms of the shareholding ceiling. Our data on large foreign institutional investors' holdings mainly come from QFIIs as the data have only 80 observations with a single foreign holding exceeding 10% and 96 observations with total foreign holding exceeding 10%, of which there are only four observations with total foreign holding exceeding 20%. We keep these observations since there are no data to verify whether their holding is after or before lock-up expiration.¹⁴

4.2 Descriptive statistics

Table 1 presents the summary statistics of the variables used in this study. We see that, on average, 1.456 foreign institutions hold 2.766% of a firm's outstanding shares. Categorizing domestic institutions in subtypes, we find that, of the three types of companies (insurance, trust and securities companies), securities firms command the highest company ownership, with on average 1.197 securities firms holding 3.262% of a firm's outstanding shares. Both the average relative effective spread and the average relative quoted spread are about 0.22%, indicating that most trades occur at the bid or ask. Referring to Amihud's price impact measure, the mean is 0.385.

⁹ This database is produced and maintained by the Pacific-Basin Capital Markets (PACAP) Research Center of the College of Business Administration at the University of Rhode Island and the SinoFin Information Services affiliated with the China Center for Economic Research, Peking University.

¹⁰ Since the variables analyzed have uncontroversial minimum values, we do not winsorize at 1% level.

¹¹ The data with respect to foreign institutions are also available from CCER database. The URLs for the source of primary data are: <http://data.eastmoney.com/> and <http://data.10jqka.com.cn/>

¹² In a robustness check, we rerun the regressions using ownership data, see Section 6.

¹³ As of January 30, 2006, foreign investors can invest in Chinese publicly listed companies under the new regulation called "Measures for Strategic Investment by Foreign Investors upon Listed Companies". A foreign strategic investor (FSI) is defined as a foreign entity that has an equity interest of at least 10 percent at initial investment with a holding period of more than three years in an existing Chinese publicly listed company (PLC) in the A-share market, which has completed the non-tradable shares reform.

¹⁴ Excluding these observations from the sample does not affect our results.

This value indicates that a trade of size 1 million yuan, on average induces a price change of 0.385%.¹⁵ The median adverse selection component based on the *LSB* measure is 0.288 while the median adverse selection component using *HS* is 0.003, indicating that the adverse selection component is respectively 28.8% and 0.3% of the spread.¹⁶ As for trading activity, Table 1 shows that the average turnover rate per quarter is 1.881%, the average daily number of trades is 3074 while the average daily trade size is 3226 shares. Furthermore, the average market capitalization is about 3.604 billion yuan, the average of return volatility is 1.259% per day, and the average share price is 11.792 yuan. Finally, for the financial control variables, the average book-to-market ratio is 0.530, the mean earnings per share is 0.499 yuan, while, on average, the leverage ratio is 0.498. All three liquidity measures and the two adverse selection component estimates exhibit large positive skewness and kurtosis. The same holds true for three measures of trading activity, the market capitalization and the volatility. In view of this, we apply the natural logarithm transformation to these variables.

- Table 1 about here -

- Figure 1 about here -

To provide a visual impression of the dynamic relationship between liquidity (left vertical axis) and foreign institutional investors' participation (right vertical axis), we plot the total number of foreign institutions that are among the top 10 outstanding shareholders of firms and the three quarterly liquidity measures, spanning the period 2004Q2 and 2012Q1.¹⁷ Referring to the plot in Figure 1, the total number of foreign institutions reaches a peak at 2007Q1 with 326 foreign institutional investors, it then decreases and reaches its lowest level with 139 investors in 2008Q4. This visual evidence suggests that a negative relationship exists between the participation of foreign institutional investors and market illiquidity over time. Note that all three measures displayed in the figures, the relative quoted bid-ask spread, the relative effective bid-ask spread, and the Amihud's price impact, measure illiquidity rather than liquidity.

- Table 2 about here -

We perform preliminary univariate tests on the different liquidity measures, adverse selection components and trading activity measures for two subsamples of

¹⁵ The figure displays the Amihud measure scaled up by 10^8 .

¹⁶ The value the *HS* measure is comparable to Heflin and Shaw (2000), while the *LSB* measure is comparable to Lin, Sanger and Booth (1995) and Rhee and Wang (2009). We also estimate the so-called basic model of Huang and Stoll (1997), which yields a median value of the adverse selection component of 0.261. Although this value is closer to the value based on the *LSB* measure, the basic *HS* model does not separate the inventory component from the adverse selection component of the spread. Moreover, we find that panel regression results are qualitatively unchanged when instead using the basic *HS* model.

¹⁷ We aggregate all foreign institutions across the firms for each quarter.

firms, one for firms with foreign institutional investors (*FI*) and the other for firms without foreign institutional investors (*non-FI*). The rationale is that if participation of foreign institutional investors reduce total frictions, increase trading activity or reduce informational frictions, we expect to find different (average) values of the various measures for the two groups of firms. Referring to Table 2, we find that the average relative effective spread for *FI* firms is 0.170%, which is smaller than the average spread of 0.221% for *non-FI* firms. The average relative quoted spread and the average *ILLIQ* measure are also lower for *FI* firms, 0.168% and 0.093, respectively, compared to 0.223% and 0.416 for *non-FI* firms. The two measures of the adverse selection component exhibit the same pattern; the *LSB (HS)* measure is 0.398 (0.005) for *FI* firms compared to 0.409 (0.006) for *non-FI* firms. Finally, all three measures of trading activity indicate that the level of trading activity is higher for *FI* firms than for *non-FI* firms. The *p*-values in column four of Table 2 indicate that the difference in mean between *FI* and *non-FI* firms is statistically significant at the 5% level for all measures.

5. Empirical results

5.1 Do foreign institutions promote liquidity?

Table 3 presents the regression results from model (3) for effective spread in the first two columns (first column is without financial control variables, second column is with financial control variables included in the regression), for quoted spread in columns three and four, and for the Amihud *ILLIQ* measure in the last two columns. Consistent with the preliminary analysis in Table 2, the number of foreign institutions is negatively related to the relative effective spread (column one) and the coefficient estimate of -0.009 implies that a one standard deviation increase in the number of foreign institutional investors results in 0.9 basis points reduction in relative effective spread. The coefficient on domestic institutions is also negative but much smaller in magnitude and not statistically significant. Coefficients on control variables are mostly consistent with previous studies of liquidity determinants. Higher market capitalization and higher share price are significantly associated with a lower relative effective spread. The level of order processing and inventory costs is highly dependent on trading activity and therefore we expect a negative relation between the bid-ask spread and trading activity.¹⁸ In line with these expectations, the estimated coefficient on turnover is negative and statistically significant.

- Table 3 about here -

The same pattern holds for the coefficient on the number of foreign institutions in the regressions with quoted spread and Amihud's price impact measure as the dependent variable (see columns three and five). Coefficient estimates on foreign institutions are again negative and statistically significant. More specifically, the estimate in the quoted spread regression (-0.008) is approximately the same as in the effective spread regression, while the coefficient estimate for Amihud's price

¹⁸ See, for example, Benston and Hagerman (1974) and Stoll (2000).

impact is larger in absolute terms at -0.015. For the *DI* coefficients, the *ILLIQ* regression yields a negative and significant estimate and the quoted spread regression yields a positive and insignificant estimate. Taken together, our findings on the effect of participation of domestic institutions on liquidity are clearly inconclusive. In contrast, we find clear evidence that participation of foreign institutional investors improve liquidity.

When including financial characteristic variables in the panel regressions (see columns two, four and six), we find that the relationship between foreign institutional participation and liquidity remains essentially unchanged, with respect to both magnitude and statistical significance. As for the coefficients on domestic institutions, the results are again mixed and inconclusive. Despite the adjusted R^2 being only slightly higher in the regressions when controlling for financial characteristics, many of the coefficients for financial characteristic variables are statistically significant. Furthermore, the signs of the coefficients for financial characteristic variables are consistent with our expectations. Higher book-to-market ratio, higher earnings per share and lower leverage ratio are related to lower spread and lower price impact.

5.2 Do foreign institutions promote liquidity through the real effects channel or informational effects channel?

Table 4 presents the regression results from model (4) for the three measures of trading activity in the first three columns and for the two measures of the adverse selection components of the spread in the last two columns. In light of the univariate tests in Table 2, it is interesting to note that none of the coefficients of foreign institutions is statistically significant for the trading activity measures. The evidence in Table 2 is however only tentative as it fails to control for firm characteristics. Our panel regression result strongly suggests that the presence of foreign institutions does not significantly affect trading activity. In other words, participation by foreign institutional investors does not appear to reduce real transaction costs. As for the coefficient of domestic institutions, it is consistently positive for the three measures of trading activity, although it is only statistically significant in the regression with the number of trades as dependent variable. This result suggests that domestic institutions to some extent increase the level of trading activity. The signs of the coefficients for control variables are consistent with those from Brockman, Chung and Yan (2009). More specifically, small, high-priced, volatile firms are associated with high turnover while big, low-priced firms are associated with high number of trades and large trade size.

- Table 4 about here -

Turning to the regressions for the adverse selection components in the last two columns of Table 4, higher participation of foreign institutional investors is significantly related to a lower adverse selection component of the spread. A one standard deviation increase in the participation of foreign institutions decreases the adverse selection component by about 1.3% (1.5%) for the *LSB* (*HS*) measures. These results are consistent with our findings in the univariate tests in Table 2, and imply

that the positive impact on liquidity by foreign institutions documented in Section 5.1 operates by reducing informational frictions costs. The coefficients on domestic institutions are negative both for *LSB* and *HS*, however only (marginally) significant in the *HS* regression. Coefficient estimates for non-financial control variables are largely consistent with previous results in Table 3. For financial characteristics, statistical significance varies, but a high book-to-market ratio tends to be associated with a lower adverse selection component of the spread, while higher earnings per share and lower leverage ratio tend to indicate higher adverse selections costs. Taken together, we find evidence that participation by foreign institutional investors on the stock market in China promote liquidity through the informational effects channel, but no evidence of improved liquidity through the real effects channel.

5.3 Are foreign institutional investors informationally disadvantaged when investing in SOEs?

To test our third hypothesis on the differential impact of foreign institutional investors on market liquidity across SOEs and non-SOE, we turn to the results in Table 5. For reasons highlighted in Section 2.3, there is a greater propensity for SOEs to exhibit higher degree of information asymmetry relative to non-SOEs. Under these circumstances, one can expect that foreign institutional investors are informationally disadvantaged in SOEs. Interestingly, when we split the sample into SOEs and non-SOEs, we observe that participation of foreign institutions continues to exert a positive effect on liquidity for both SOEs and non-SOEs. This finding shows that the participation of foreign institutional investors is not only significantly associated with liquidity only for non-SOEs, but also for SOEs. The overall results are therefore not supportive of our hypothesis that foreign institutional investors are disadvantaged in accessing private information about SOEs.

- Table 5 about here -

- Figure 2 about here -

However, coefficients tend to be slightly smaller in magnitude for SOEs. The coefficient of foreign institutions for effective spread is -0.70% for SOEs and -0.84% for non-SOEs, the coefficients for quoted spread are -0.50% and -0.93%, while the coefficients for *ILLIQ* are -0.94% and -1.36%. This result is interesting given that a large portion of foreign holdings are in SOEs (72%, see Figure 2), compared to non-SOEs or private companies (20%). Yet we observe that the liquidity effect is more pronounced in non-SOEs. At face value, this could be attributed to some degree of information asymmetry arising from poor transparency in financial reporting and corporate governance, which may hamper the positive impact of foreign institutional participation on liquidity. However, upon further investigation, this observed discrepancy in the effect on liquidity by foreign institutions across the two types of firms is not statistically significant.¹⁹ There is, therefore, no evidence to suggest that

¹⁹ We run regressions involving an interactive dummy between the SOE and FI variables and between the non-SOE and FI variables, and the null of equality of the two coefficients associated with these interactive dummies, which measure the impact of FI on liquidity across the two types of firms, is not

foreign institutional investors are informationally disadvantaged when investing in Chinese SOEs.

5.4 Do foreign institutional investors destabilize the Chinese stock market during the crisis period?

Like many developing countries, China has enjoyed a stock market boom, with the CSI 300 index increasing fivefold between 2005 and 2007 (see Figure 3). However, the Chinese stock market was not immune to the global financial crisis (GFC) of 2007-2008. Figure 3 shows that from October 2007, the stock market in China crashed and more than two-thirds of the value was wiped out during the period between October 2007 and December 2008, as judged by the CSI 300 index. Furthermore, the total holding value of large foreign institutions dropped from the beginning of 2008 until the end of 2008, before it again increased to the pre-crisis level in the first half of 2009. Given the regime shift experienced by the Chinese stock market caused by the GFC, we perform a sub-period analysis using panel regression (3) to investigate whether the effect of foreign institutions on liquidity has changed over time. We divide the sample into three subsamples defined as follows: sample 1 (pre-crisis) as the period 2004Q2-2007Q4, sample 2 (post-crisis) as the period 2008Q1-2012Q1, and sample 3 (during crisis) as the period 2007Q4-2008Q4.²⁰ The results are reported in Table 6.

- Figure 3 about here -

- Table 6 about here -

We find that the association between participation of foreign institutions and liquidity documented in Section 5.1 remains strong before, after, and during the GFC. For domestic institutions, subperiod results are again similar to full sample results, yielding inconclusive evidence. Furthermore, the coefficient of *FI* is statistically significant for all subsamples and all liquidity measures (the only exception is Amihud's price impact measure during the crisis period). The estimated negative association implies that liquidity is improved if participation by foreign institutions increases. However, the plots in Figure 1 reveal that the number of foreign institutions decreases dramatically during the crisis period from 2007Q1 to 2008Q4. Therefore, the estimated negative association between the presence of foreign institutions and liquidity for the "during crisis" period implies that liquidity is adversely affected during the GFC due to the reduced number of foreign institutional investors.

rejected for any of the three different measures of liquidity. For brevity, the results are not reported but they are available from the authors upon request.

²⁰ For the post-crisis sample, data for the number of pension funds that are in the top 10 shareholder of a firm are available. For this reason, they are included in our second period panel regression.

6. Robustness checks

6.1 Shenzhen versus Shanghai stock exchange

We investigate whether the liquidity promoting effect of foreign institutional participation is prevalent in both the Shanghai (SHSE) and Shenzhen Stock Exchange (SZSE). We perform a panel regression analysis of model (3) by splitting the total sample into samples of stocks from the two stock exchanges. Table 7 shows that the coefficient on foreign institution is always negative for both stock exchanges and for all three liquidity measures. The coefficient of *FI* is also mostly statistically significant except for the case of SZSE in the quoted spread regression. Although magnitudes of coefficient estimates are similar to the full sample estimates in Table 3, we find a slight tendency of a lower influence on spreads on SZSE by foreign institutions. One possible reason for this differential effect is that there are distinct inherent factors such as transaction costs differences in the two markets that potentially govern the influence on liquidity of foreign institutional investors. For example, SHSE attracts more big firms and state-owned firms, while SZSE attracts more small and medium sized firms.

- Table 7 about here -

6.2 Foreign ownership

As discussed in Section 4.1, throughout the analysis we have relied on the number of foreign institutions that are in the top 10 outstanding shareholders of a firm. To verify that our results are indeed robust to instead using foreign ownership data for top 10 shareholders we reestimate the model (3) using ownership data. The coefficient on *FI* is of the order that is similar to the results based on the number of foreign institutions and it carries a statistically significant negative sign. To conserve space, results are not reported but they are available from the authors upon request.

6.3 Types of domestic institutions

We examine if the nature of business of the domestic institution has a differential effect on results. We perform this analysis by classifying the domestic institutions into trusts, insurance and securities companies. The coefficient on foreign institutions continues to have a statistically significant negative value, independent of the type of domestic institution and consistent with previously reported results on the influence on liquidity of foreign institutions. However, for the three types of domestic institutions, the coefficients have differing signs. The results show that insurance companies unambiguously promote liquidity, while for trusts and securities companies results are mixed and inconclusive. Again, to conserve space, results are not reported, but they are available from the authors upon request.

6.4 Endogeneity of foreign institutions

We test whether our results are subject to the problem of endogeneity arising from foreign and domestic institutions. Specifically, both foreign and domestic institutional investors' decision to become the top 10 outstanding shareholders of a firm could be influenced by the stock's liquidity. To determine whether there is an endogeneity problem in the model specifications (3) and (4), we perform a two-stage regression based on the approach described by Wu (1973) and Hausman (1978). In the first stage, the dependent variable of foreign institutions or domestic institutions is regressed on liquidity, firm size, volatility, book-to-market, earning per share, leverage, industry classifications and time dummies.²¹ The resulting residuals from these two regressions are saved and incorporated as explanatory variables in the second stage for which models (3) and (4) are regressed. The test for endogeneity amounts to testing the significance of the coefficients associated with the two residuals in the second stage regression. The statistical insignificance in the coefficients of the residuals suggests there is no problem of endogeneity associated with foreign and domestic institutions variables. Results from the first stage regression show that financial characteristics can explain foreign investors' preference for stocks, which is consistent with the results reported in Tables 3 and 4. The results of the second-stage regression suggest no evidence of endogeneity problem in regressions (3) and (4). Results of the endogeneity tests are not reported to conserve space but they are available from the authors upon request.

7. Summary and concluding remarks

There is a large literature arguing that financial liberalization in emerging market through foreign institutional participation leads to greater market liquidity by reducing information asymmetry. This paper investigates whether this belief holds in the world's largest emerging market. The Chinese stock market is characterized by a unique institutional and corporate governance structure, whereby most listed firms are SOEs. Despite the fact that it is more than a decade since China first liberalized its financial market through the QFII system by allowing foreigners to hold domestically listed stocks, surprisingly little is known about the impact of this program on stock market liquidity.

Our research suggests that with greater participation of foreign institutions, stock market liquidity improves in both the Shanghai and Shenzhen exchanges. Specifically, our evidence shows that the improvement in liquidity operates through the informational frictions channel and not through the real frictions channel, indicating that foreign institutional participation decreases information asymmetries in the market. Furthermore, our results are consistent across different measures of liquidity; relative quoted spread, relative effective spread and the Amihud price impact measure. We find that the positive effect of foreign institution's participation on liquidity is slightly smaller for SOEs compared to non-SOEs. Interestingly, the difference is however not statistically significant, suggesting that foreign institutional investors are not informationally disadvantaged investing in state-owned enterprises,

²¹ Following Shastri (1999), and Heflin and Shaw (2000), we normalize the number of foreign institutions and domestic institutions.

contrary to what the literature on information asymmetry in SOEs suggest. The mechanism that delivers this outcome is not known, but is certainly worthy of investigation in future research.

From a policy perspective, our results are indicative of a higher market quality, in particular of decreased informational asymmetries, since the inception of the QFII system. The significant impact of the program on liquidity is also interesting given the relatively small quota of US\$ 30 billion, only around 1% of stock market capitalization, allocated for foreign holdings of domestic equity. The positive impact of the first round of the QFII system on market liquidity also suggests that the decision by the central government in 2012 to increase the foreign holding quota to US\$ 80 billion is heading in the right direction and is likely to improve market liquidity further in the future.

Table 1. Summary statistics for dependent and independent variables

The data for the top 10 foreign outstanding institutional shareholder are from CCER, while the data for the domestic outstanding institutional shareholders are obtained from <http://data.eastmoney.com/> and <http://data.10jqka.com.cn/>. Intraday data from Thomson Reuters are used to compute the relative effective spread (ES), the relative quoted spread (QS), the adverse selection components based on Lin, Sanger and Booth (1995) (LSB) and Huang and Stoll (1997) (HS), and the three trading activity measures turnover rate, number of trades and trade size. The ES, QS, LSB, HS, number of trades and trade size are averaged across all trading days for each stock in each quarter. Market capitalization, share price, stock return, book-to-market ratio, earnings per share and leverage ratio are from the CCER database. The Amihud's (2002) price impact measure (ILLIQ) is calculated using daily data from CCER database and averaged over quarters. The turnover rate is calculated as total trading volume in a quarter divided by shares outstanding. Volatility is calculated as standard deviation of daily stock returns over quarters. The book-to-market ratio is measured as the book value of a firm divided by the market value of a firm, leverage ratio is measured as long-term debt divided by market value of total assets, while earning per share is measured as a firm's profit divided by outstanding shares. The data period is from beginning of April 2004 to end of March 2012.

Variable	Obs.	Mean	Standard Deviation	Max	75th Percentile	Median	25th Percentile	Skewness	Kurtosis
Number of foreign institutions (FI)	4108	1.456	0.947	8.000	2.000	1.000	1.000	2.669	11.028
Foreign ownership (%)	4108	2.766	3.837	83.374	3.285	1.662	0.808	7.260	114.433
Number of insurance companies (INS)	6387	1.328	0.590	5.000	2.000	1.000	1.000	1.864	6.664
Insurance ownership (%)	6387	2.505	2.595	24.409	3.233	1.706	0.901	3.159	18.699
Number of trust companies (TRU)	5714	1.267	0.634	9.000	1.000	1.000	1.000	3.298	18.353
Trust ownership (%)	5714	2.366	3.985	122.787	2.473	1.123	0.564	8.177	167.637
Number of securities companies (SC)	6923	1.197	0.563	10.000	1.000	1.000	1.000	5.389	55.150
Securiteis ownership (%)	6922	3.262	7.234	93.333	3.254	1.613	0.812	8.645	92.987
Relative effective spread	42278	0.216	0.140	2.875	0.273	0.179	0.123	2.888	24.275

(ES, %)

Relative quoted spread (QS, %)	42309	0.217	0.125	3.037	0.273	0.183	0.132	2.506	22.274
Amihud's illiquidity (ILLIQ)	42931	0.385	0.094	1573.001	0.233	0.081	0.035	130.207	19633.0
LSB	40120	0.319	0.183	0.999	0.412	0.288	0.190	0.956	3.916
HS (x100)	38537	0.534	0.754	40.395	0.637	0.320	0.159	9.405	279.775
Turnover rate (per quarter)	44700	1.881	15.257	1506	2.152	1.235	0.672	70.637	5586.311
Number of trades ('000 per day)	42325	3.074	5.860	209.716	3.046	1.258	0.579	8.014	127.009
Average trade size ('000 per day)	42325	3.226	3.037	115.808	4.046	2.269	1.478	6.722	136.851
Market capitalization (billion yuan)	44700	3.604	9.213	269.800	3.294	1.476	0.649	10.620	163.070
Volatility (% per day)	44683	1.259	1.779	56.102	1.436	0.795	0.417	7.010	95.513
Share price (yuan)	44700	11.792	10.721	196.960	14.300	8.540	5.400	3.675	29.652
Book-to-market ratio	42606	0.530	0.254	1.130	0.726	0.519	0.322	0.154	2.142
Earnings per share (yuan)	38459	0.499	0.670	4.514	0.621	0.249	0.087	2.584	10.918
Leverage ratio	44474	0.498	0.245	2.219	0.642	0.501	0.336	1.098	8.118

Table 2. Univariate analysis of relation between foreign institutions and market liquidity

Comparison between mean values of spreads, adverse selection components and trading activity variables for firms with (FI) and without (non-FI) foreign institutional investors among the top 10 investors, listed in the Shanghai and Shenzhen Stock Exchanges during the sample period 2004Q2-2012Q1. Column four shows the p-value for a two-tailed t-test of equality of the variable values for FI and non-FI firms (columns two and three). Data on the number of foreign institutions among the top 10 investors are from the CCER database. Intraday data from Thomson Reuters are used to calculate the relative effective spread (ES), the relative quoted spread (QS), the adverse selection components based on Lin, Sanger and Booth (1995) (LSB) and Huang and Stoll (1997) (HS), and the three trading activity measures turnover rate, number of trades and trade size. The Amihud (2002) price impact measure is calculated using daily data from CCER database.

Variable	Mean for non-FI firms N=2076	Mean for FI firms N=921	p-value
Relative effective spread (ES, %)	0.221	0.170	0.000
Relative quoted spread (QS, %)	0.223	0.168	0.000
Amihud's illiquidity (ILLIQ)	0.416	0.093	0.038
LSB	0.409	0.398	0.016
HS (x100)	0.621	0.499	0.000
Turnover rate (per quarter)	1.542	1.589	0.014
Number of trades ('000 per day)	2940	4330	0.000
Trade size ('000 per day)	3195	3519	0.000

Table 3. Influence of foreign institutional participation on liquidity

Panel regression results using the three measures of liquidity regressed on lagged number of foreign institutions that are among the top 10 outstanding shareholder for a firm listed on SHSE and SZSE. The three measures of liquidity are the effective spread (ES), the quoted spread (QS) and the Amihud (2002) price impact measure (ILL). FI (DI) denotes lagged value of the number of foreign (domestic) institutions. Firm's characteristics are controlled for by book-to-market ratio (BTM), earnings per share (EPS), debt leverage (LEV), the log of the turnover rate of shares traded (TO), firms size measured by the log of market capitalization (MCAP), the log volatility of stock returns (VOL), and the reciprocal of share price (PINV). The period of study is from 2004Q2 to 2012Q1. A pooled regression is run using yearly fixed effects due to the unbalanced panel. We normalize number of foreign and domestic institutions variables each quarter by their respective cross-sectional standard deviations. Driscoll-Kraay standard errors reported in parenthesis are robust to correlation across residuals within a firm over time and across firms in the same year and different years. ***, ** and * denote that the coefficient is significant at 1%, 5% and 10%, respectively.

Independent Variables	Dependent Variables					
	(1) Log (ES)	(2) Log (ES)	(3) Log (QS)	(4) Log(QS)	(5) Log(ILL)	(6) Log(ILL)
FI	-0.009*** (0.002)	-0.008*** (0.002)	-0.008*** (0.002)	-0.007*** (0.001)	-0.015*** (0.004)	-0.011*** (0.003)
DI	-0.003 (0.003)	-0.000 (0.003)	0.002 (0.001)	0.005*** (0.001)	-0.035*** (0.004)	-0.028*** (0.003)
MCAP	-0.186*** (0.016)	-0.183*** (0.017)	-0.213*** (0.012)	-0.210*** (0.013)	-0.921*** (0.022)	-0.923*** (0.019)
VOL	0.050* (0.029)	0.030 (0.030)	0.012 (0.028)	-0.011 (0.030)	0.181*** (0.030)	0.130*** (0.030)
PINV	1.981*** (0.324)	1.932*** (0.334)	1.878*** (0.241)	1.826*** (0.233)	0.748*** (0.160)	0.586*** (0.153)
TO	-0.116*** (0.013)	-0.110*** (0.013)	-0.150*** (0.012)	-0.149*** (0.012)	-0.467*** (0.029)	-0.459*** (0.032)
BTM		-0.013 (0.037)		-0.051 (0.040)		-0.311*** (0.057)
EPS		-0.027* (0.014)		-0.0255** (0.010)		-0.066*** (0.019)
LEV		0.044* (0.023)		0.033** (0.016)		0.015 (0.022)
Observations	40,358	34,725	40,442	34,775	41,006	35,183
Adjusted R ²	0.71	0.72	0.76	0.77	0.89	0.91
# of groups	2,033	2,017	2,033	2,017	2,080	2,049
Time dummy	YES	YES	YES	YES	YES	YES

Table 4. Influence of foreign institutional participation on trading activity and adverse selection cost

Panel regression results for real frictions and informational frictions. The real frictions regressions use as dependent variables three measures of trading activity regressed on lagged total number of foreign institutions that are among the top 10 outstanding shareholder for a firm listed on SHSE and SZSE. The three measures of trading activity are the shares turnover (TO), the number of trades (TRA) and trade size (TS). The informational frictions regressions use as dependent variables the adverse selection component of the spread based on Lin, Sanger and Booth (1995) (LSB) and Huang and Stoll (1997) (HS). FI (DI) denotes lagged value of the number of foreign (domestic) institutions. Firm's characteristics are controlled for by book-to-market ratio (BTM), earnings per share (EPS), debt leverage (LEV), firms size measured by the log of market capitalization (MCAP), the log volatility of stock returns (VOL), and the reciprocal of share price (PINV). The period of study is from 2004Q2 to 2012Q1. A pooled regression is run using yearly fixed effects due to the unbalanced panel. We normalize number of foreign and domestic institutions variables each quarter by their respective cross-sectional standard deviations. Driscoll-Kraay standard errors reported in parenthesis are robust to correlation across residuals within a firm over time and across firms in the same year and different years. ***, ** and * denote that the coefficient is significant at 1%, 5% and 10%, respectively.

Independent Variables	Dependent Variable				
	(1) Log(TO)	(2) Log(TRA)	(3) Log(TS)	(4) Log(LSB)	(5) Log(HS)
FI	-0.006 (0.009)	0.002 (0.005)	0.004 (0.003)	-0.013** (0.006)	-0.015** (0.006)
DI	0.010 (0.008)	0.0304*** (0.007)	0.005 (0.008)	-0.003 (0.006)	-0.014* (0.007)
MCAP	-0.323*** (0.038)	0.562*** (0.018)	0.146*** (0.034)	-0.008 (0.026)	-0.065*** (0.021)
VOL	0.996*** (0.099)	0.726*** (0.075)	0.174*** (0.024)	0.289*** (0.053)	0.387*** (0.056)
PINV	-1.213*** (0.324)	1.447*** (0.413)	2.812*** (0.247)	1.523*** (0.323)	-6.061*** (0.825)
TO				0.029** (0.014)	-0.029 (0.020)
BTM	0.319*** (0.099)	0.485*** (0.092)	0.229*** (0.019)	-0.066 (0.067)	-0.543*** (0.059)
EPS	0.036 (0.030)	-0.114*** (0.035)	-0.071*** (0.019)	0.073*** (0.020)	0.242*** (0.023)
LEV	-0.044 0.068	0.273*** (0.060)	0.005 (0.020)	-0.074 (0.053)	-0.165** (0.066)
R ²	0.53	0.68	0.31	0.14	0.38
# of groups	2,049	2,017	2,017	2,006	2,014
Time dummy	YES	YES	YES	YES	YES

Table 5. Influence of foreign institutions on liquidity in SOEs and non-SOEs

Regression results for effective spread, quoted spread and the Amihud (2002) price impact measure regressed on lagged total number of foreign institutions that are among the top 10 outstanding shareholder for a firm listed on SHSE and SZSE. For each measure of liquidity, we run two separate regressions based on whether the sample of firms is SOEs or non-SOEs. FI (DI) denotes lagged value of the number of foreign (domestic) institutions. Firm's characteristics are controlled for by book-to-market ratio (BTM), earnings per share (EPS), debt leverage (LEV), the log of the turnover rate of shares traded (TO), firms size measured by the log of market capitalization (MCAP), the log volatility of stock returns (VOL), and the inverse of share price (PINV). The period of study is from 2004Q2 to 2012Q1. A pooled regression is run using yearly fixed effects due to the unbalanced panel. We normalize number of foreign and domestic institutions variables each quarter by their respective cross-sectional standard deviations. Driscoll-Kraay standard errors reported in parenthesis are robust to correlation across residuals within a firm over time and across firms in the same year and different year. ***, ** and * denote that the result is significant at 1%, 5% and 10%, respectively.

Independent Variables	Dependent Variables					
	Log(ES)		Log(QS)		Log(ILL)	
	(1) SOE	(2) Non-SOE	(3) SOE	(4) Non-SOE	(5) SOE	(6) Non-SOE
FI	-0.0070*** (0.002)	-0.0084** (0.003)	-0.0050*** (0.001)	-0.0093*** (0.003)	-0.0094*** (0.003)	-0.0136*** (0.005)
DI	0.002 (0.002)	-0.004 (0.005)	0.007*** (0.001)	0.002 (0.003)	-0.025*** (0.004)	-0.031*** (0.004)
MCAP	-0.173*** (0.018)	-0.191*** (0.017)	-0.200*** (0.015)	-0.218*** (0.013)	-0.938*** (0.018)	-0.899*** (0.019)
VOL	0.019 (0.035)	0.048 (0.031)	-0.013 (0.033)	-0.006 (0.035)	0.147*** (0.039)	0.114*** (0.039)
PINV	2.019*** (0.349)	1.793*** (0.335)	1.980*** (0.246)	1.609*** (0.245)	0.749*** (0.191)	0.280** (0.116)
TO	-0.101*** (0.014)	-0.121*** (0.013)	-0.143*** (0.012)	-0.156*** (0.013)	-0.487*** (0.039)	-0.428*** (0.027)
BTM	0.030 (0.037)	-0.098** (0.047)	-0.030 (0.038)	-0.111** (0.045)	-0.314*** (0.065)	-0.313*** (0.053)
EPS	-0.042*** (0.012)	-0.016 (0.015)	-0.037*** (0.013)	-0.021** (0.010)	-0.062** (0.023)	-0.071*** (0.017)
LEV	0.095*** (0.020)	-0.001 (0.021)	0.091*** (0.017)	-0.016 (0.018)	0.028 (0.018)	-0.004 (0.026)
Observations	19,902	14,823	19,933	14,842	20,286	14,897
R ²	0.74	0.69	0.79	0.72	0.92	0.89
# of groups	1,041	1,292	1,041	1,292	1,069	1,297
Time dummy	YES	YES	YES	YES	YES	YES

Table 6 Influence by foreign institutions on liquidity before, after, and during the recent financial crises

Panel regression results using three measures of liquidity as dependent variables regressed on lagged total number of foreign institutions that are among the top 10 outstanding shareholder for a firm listed on SHSE and SZSE. The three measures of liquidity are the effective spread (ES), the quoted spread (QS) and the Amihud (2002) price of impact measure (ILL). FI (DI) denotes lagged value of the number of foreign (domestic) institutions. Firm's characteristics are controlled for by book-to-market ratio (BTM), earnings per share (EPS), debt leverage (LEV), the log of the turnover rate of shares traded (TO), firms size measured by the log of market capitalization (MCAP), the log volatility of stock returns (VOL), and the inverse of share price (PINV). The pre-crisis (post-crisis, during crisis) period is 2004Q2-2007Q4 (2008Q1-2012Q1, 2007.Q4-2008.Q4). A pooled regression is run using yearly fixed effects due to the unbalanced panel. We normalize number of foreign and domestic institutions variables each quarter by their respective cross-sectional standard deviations. Driscoll-Kraay standard errors reported in parenthesis are robust to correlation across residuals within a firm over time and across firms in the same year and different year. ***, ** and * denote that the result is significant at 1%, 5% and 10%, respectively.

Independent Variables	Dependent Variables								
	Log(ES)			Log(QS)			Log(ILL)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	2004Q2-2007Q4	2008Q1-2012Q1	2007.Q4-2008.Q4	2004Q2-2007Q4	2008Q1-2012Q1	2007.Q4-2008.Q4	2004Q2-2007Q4	2008Q1-2012Q1	2007.Q4-2008.Q4
FI	-0.009** (0.003)	0.007*** (0.001)	0.010*** (0.002)	-0.006* (0.003)	0.007*** (0.001)	0.009*** (0.001)	0.019*** (0.004)	-0.004** (0.002)	-0.001 (0.002)
DI	-0.000 (0.003)	-0.001 (0.004)	0.004 (0.004)	-0.003 (0.003)	0.005*** (0.002)	0.007** (0.002)	0.026*** (0.001)	0.024*** (0.005)	0.012 -0.007
MCAP	- 0.177*** (0.033)	- 0.183*** (0.019)	- 0.267*** (0.021)	- 0.205*** (0.030)	- 0.211*** (0.013)	- 0.293*** (0.017)	- 0.977*** (0.020)	- 0.887*** (0.013)	- 0.934*** (0.006)
VOL	0.098** (0.033)	-0.019 (0.042)	0.047 (0.098)	0.045 (0.035)	-0.050 (0.042)	-0.0341 (0.076)	0.154*** (0.045)	0.107** -0.046	0.0977 (0.126)
PINV	1.704*** (0.342)	2.206*** (0.658)	0.176 (0.309)	1.606*** (0.199)	2.153*** (0.496)	0.507 (0.406)	0.519 (0.314)	0.476*** (0.117)	0.560*** (0.083)
TO	0.121*** (0.026)	0.104*** (0.014)	0.163*** (0.011)	0.163*** (0.021)	0.141*** (0.013)	0.206*** (0.021)	0.516*** (0.081)	0.429*** (0.028)	0.481*** (0.010)
BTM	-0.048 (0.057)	-0.010 (0.037)	-0.264** (0.092)	0.141*** (0.030)	-0.019 (0.040)	0.352*** (0.068)	0.338*** (0.091)	0.302*** (0.065)	0.633*** (0.093)
EPS	0.044*** (0.014)	-0.021 (0.016)	-0.0271* (0.010) 0.0727**	-0.023** (0.008)	-0.026** (0.012)	0.00117 (0.008)	0.133*** (0.040)	-0.048** (0.018)	0.017 (0.020)
LEV	0.071*** (0.013)	0.028 (0.039)	* (0.012)	0.042*** (0.008)	0.020 (0.031)	0.0306 (0.018)	0.022 (0.016)	(0.000) (0.027)	0.005 (0.024)
Observations	13,032	21,693	5,282	13,047	21,728	5,299	13,315	21,868	5,375
R ²	0.639	0.662	0.709	0.733	0.678	0.681	0.901	0.878	0.86
# of groups	1,281	1,987	1,289	1,281	1,987	1,291	1,312	2,006	1,311
Time dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 7 Influence of foreign institutions on liquidity on the Shanghai and Shenzhen stock exchanges

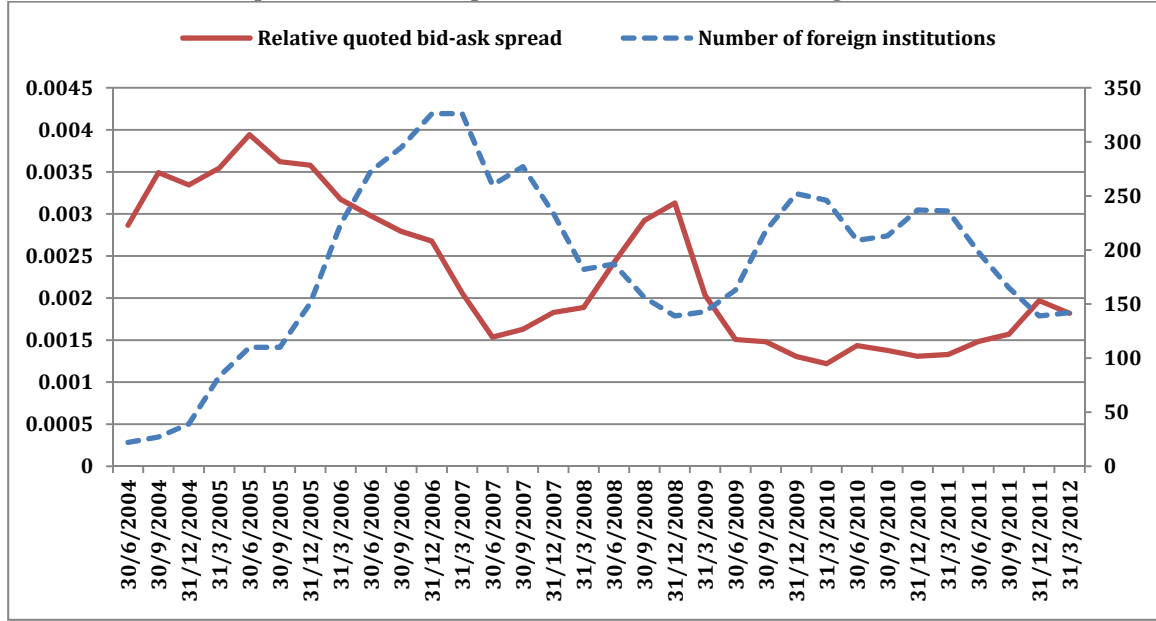
Regression results for three measures of liquidity regression as dependent variables regressed on lagged total number of foreign institutions which are the top 10 outstanding shareholder for a firm listed on SHSE and SZSE. The three measures of liquidity are the effective spread (ES), the quoted spread (QS) and the Amihud (2002) price of impact measure (ILL). FI (DI) denotes the lagged value of the number of foreign (domestic) institutions. Firm's characteristics are controlled for by book-to-market ratio (BTM), earnings per share (EPS), debt leverage (LEV), the log of the turnover rate of shares traded (TO), firms size measured by the log of market capitalization (MCAP), the log volatility of stock returns (VOL), and the inverse of share price (PINV). A pooled regression is run using yearly fixed effects due to the unbalanced panel. We normalize number of foreign and domestic institutions variables each quarter by their respective cross-sectional standard deviations. Driscoll-Kraay standard errors reported in parenthesis and are robust to correlation across residuals within a firm over time and across firms in the same year and different year. ***, ** and * denote that the result is significant at 1%, 5% and 10%, respectively.

Independent Variables	Dependent Variables					
	Log(ES)		Log(QS)		Log(ILL)	
	SHSE (1)	SZSE (2)	SHSE (1)	SZSE (2)	SHSE (1)	SZSE (2)
FI	-0.008*** (0.002)	-0.006* (0.003)	-0.008*** (0.002)	-0.004 (0.003)	-0.009** (0.004)	-0.013*** (0.004)
DI	-0.002 (0.003)	0.002 (0.005)	0.003 (0.002)	0.005 (0.003)	-0.026*** (0.004)	-0.030*** (0.005)
MCAP	-0.171*** (0.018)	-0.196*** (0.018)	-0.195*** (0.014)	-0.234*** (0.016)	-0.931*** (0.020)	-0.915*** (0.017)
VOL	0.018 (0.031)	0.049 (0.033)	-0.014 (0.032)	-0.002 (0.034)	0.156*** (0.033)	0.112*** (0.040)
PINV	1.969*** (0.369)	1.901*** (0.324)	1.881*** (0.258)	1.774*** (0.231)	0.487*** (0.156)	0.699*** (0.197)
TO	-0.104*** (0.014)	-0.119*** (0.012)	-0.143*** (0.013)	-0.157*** (0.013)	-0.493*** (0.040)	-0.427*** (0.029)
BTM	0.006 (0.043)	-0.054 (0.038)	-0.071 (0.044)	-0.060 (0.038)	-0.259*** (0.073)	-0.369*** (0.049)
EPS	-0.042*** (0.010)	-0.018 (0.016)	-0.0363** (0.012)	-0.019 (0.011)	-0.0790*** (0.029)	-0.057*** (0.013)
LEV	0.077*** (0.019)	0.017 (0.029)	0.069*** (0.021)	-0.012 (0.025)	0.025 (0.018)	0.002 (0.031)
Observations	18,442	16,283	18,452	16,323	18,763	16,420
R ²	0.729	0.702	0.772	0.75	0.92	0.887
# of groups	800	1,217	800	1,217	820	1,229
Time dummy	YES	YES	YES	YES	YES	YES

Figure 1. Liquidity and the number of foreign institutions over time

The two spread measures – the relative quoted and relative effective spread – are computed using intraday data provided by Thomson Reuters. The Amihud (2002) price impact measure is computed based on daily data from CCER database. We average all three liquidity measures across firms and sum the number of foreign institutions for all firms in each quarter.

Panel A: Relative quoted bid-ask spread and number of foreign institutions.



Panel B: Relative effective bid-ask spread and number of foreign institutions.

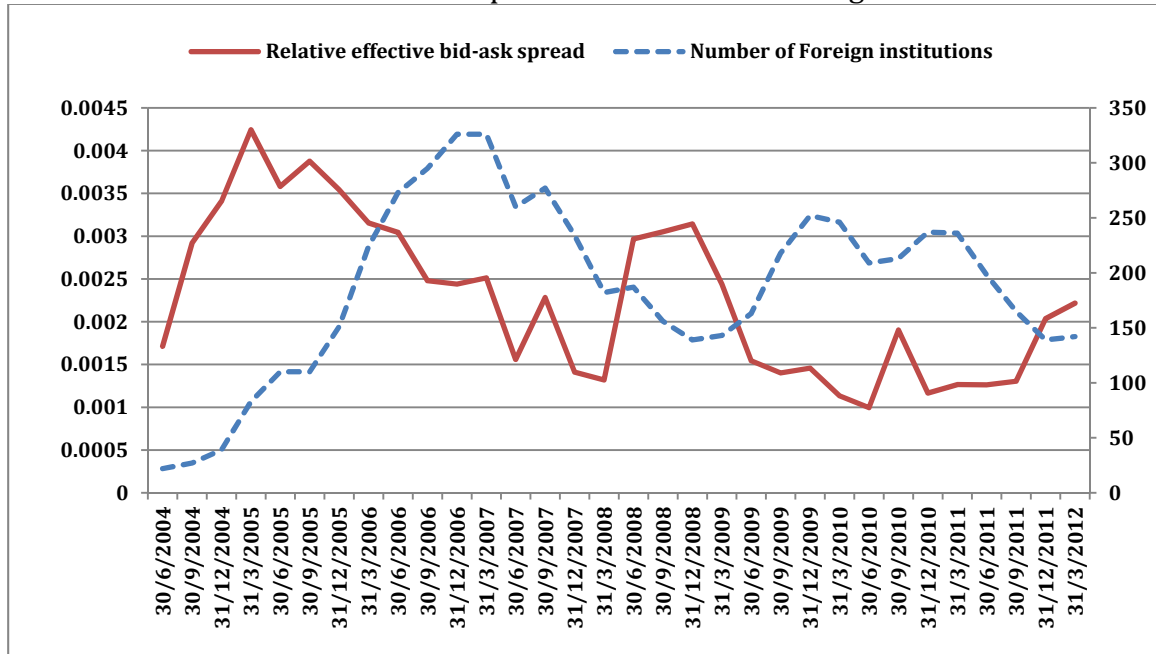


Figure 1. (Continued)

Panel C: Amihud price impact measure and number of foreign institutions.

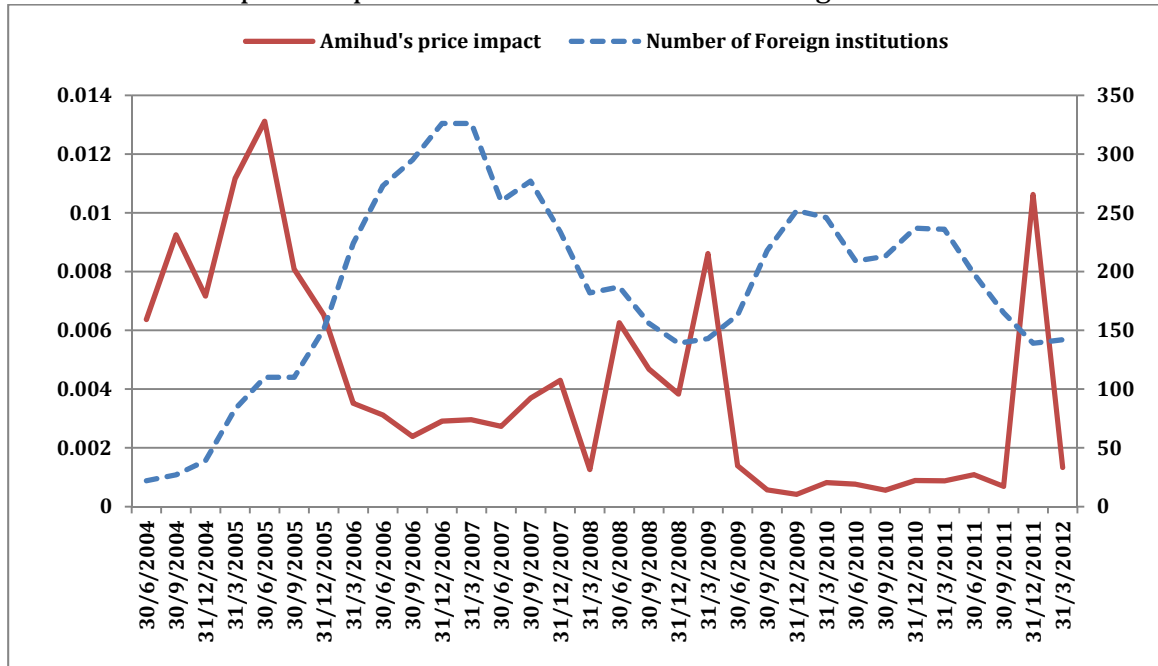


Figure 2. Portfolio profile (holdings) of foreign institutions

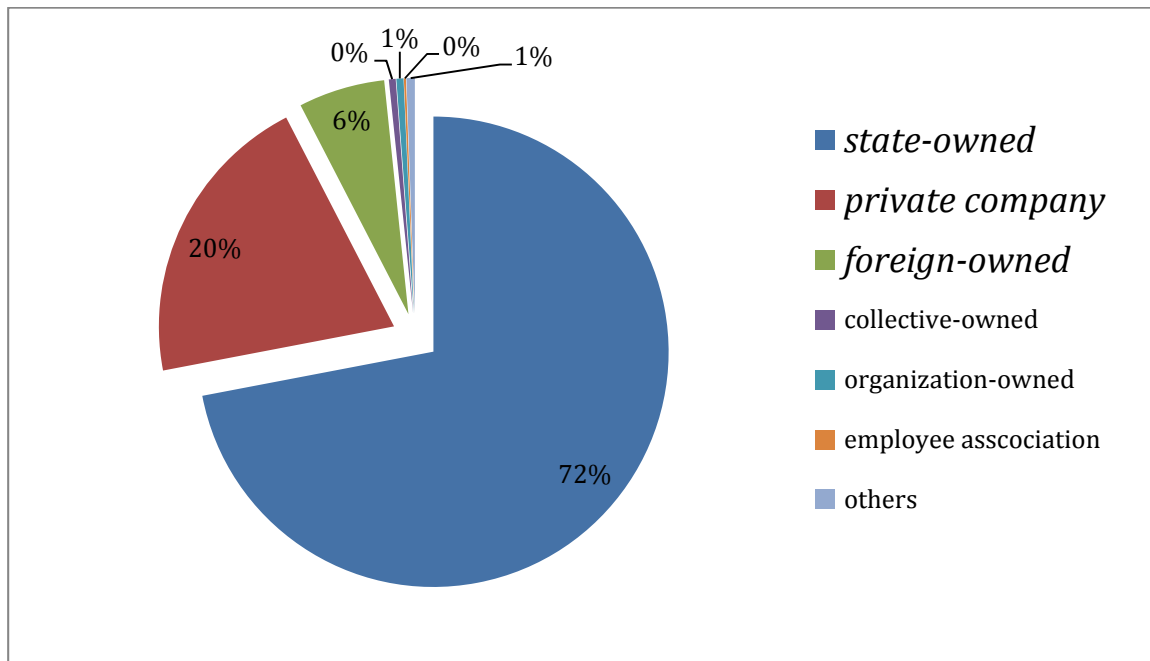
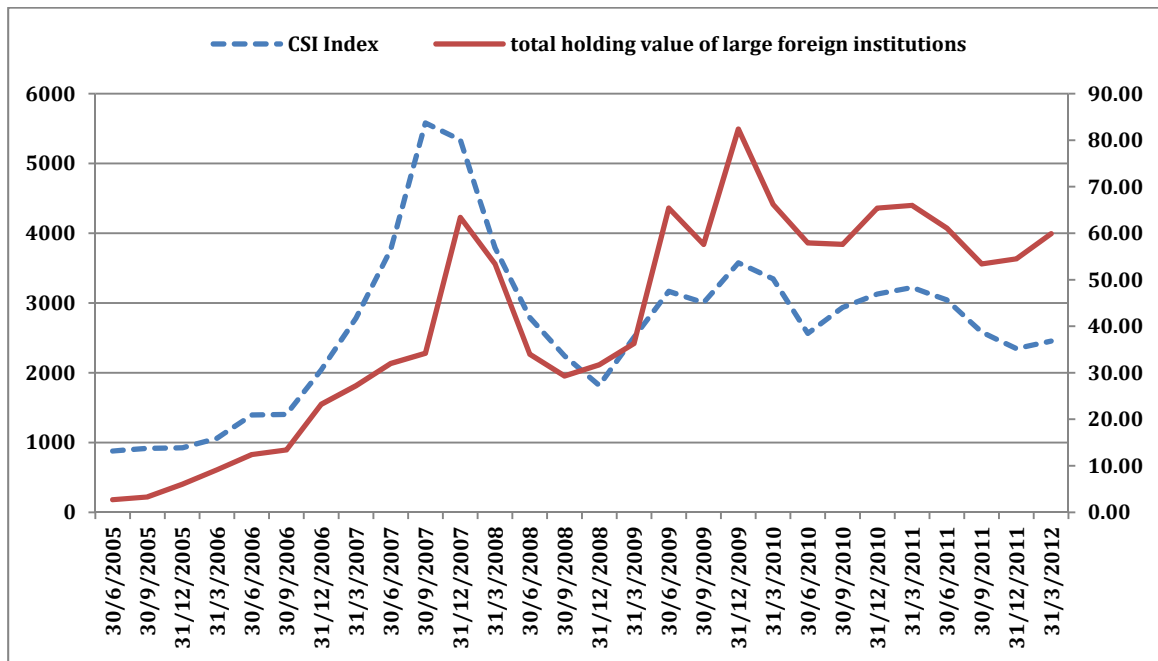


Figure 3. CSI index and total value of large foreign institutional holdings



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