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Xiaojun Chu

Nanjing University of Information Science and Technology, xchu@uow.edu.au

Qigui Liu

University of Wollongong, qigui@uow.edu.au

Gary Tian

University of Wollongong, gtian@uow.edu.au

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Abstract

This paper examines how institutional characteristics of emerging economies influence the effect of control-ownership divergence on market liquidity. We find that the divergence is negatively associated with liquidity and that this negative relationship is more pronounced in firms with more severe agency problems and information asymmetry. We argue that in an emerging market, the negative effect of the divergence on liquidity is worsened by state ownership and poorer shareholder protection, both of which result in more severe agency conflicts; we also find, however, that this effect is alleviated by the NTS reform, which aligns the interest of different shareholders.

Keywords

control, ownership, divergence, impair, does, market, emerging, liquidity, china, evidence

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**Does control-ownership divergence impair market liquidity in an emerging market?
Evidence from China**

Xiaojun Chu

School of Economics and Management,
Nanjing University of Information Science & Technology
lpchxj@nuist.edu.cn

Qigui Liu

School of Accounting and Finance
University of Wollongong
qigui@uow.edu.au

Gary Gang Tian *

School of Accounting and Finance
University of Wollongong
gtian@uow.edu.au

Abstract

This paper examines how institutional characteristics of emerging economies influence the effect of

* *Corresponding author: E-mail: gtian@uow.edu.au Ph: 61242214301. We acknowledge the valuable suggestions and comments on this paper by Prof. Steven Cahan, the editor of Accounting and Finance, an anonymous referee, and participants in Financial Markets & Corporate Governance Conference, 12-13 April, 2012, Melbourne, Australia.*

control-ownership divergence on market liquidity. We find that the divergence is negatively associated with liquidity, and that this negative relationship is more pronounced in firms with more severe agency problems and information asymmetry. We argue that in an emerging market, the negative effect of the divergence on liquidity is worsened by state ownership and poorer shareholder protection, both of which result in more severe agency conflicts; we also find, however, that this effect is alleviated by the NTS reform, which aligns the interest of different shareholders.

Keywords: Control-ownership divergence; market liquidity; emerging markets; state ownership; Chinese NTS reform.

JEL: *G14; G32; G34*

1. Introduction

The negative effect that control-ownership divergence of ultimate owners (the divergence between their control rights and cash-flow rights, also called excess control rights) has on firm value has been widely documented by previous studies¹. This value-destroying effect is especially severe in countries with weak protection for minority shareholders². Only recently have some studies begun to examine the effect of control-ownership divergence on market liquidity, although there is abundant evidence that direct ownership (such as block, institutional, and insider ownership) affects market liquidity (Bolton and Von Thadden, 1998; Stoll, 2000; Cao et al., 2004; Rubin, 2007; Brockman et al., 2009). Attig et al. (2006) show that control-ownership divergence in Canadian firms is negatively related to market liquidity because ultimate owners of firms with excess control rights tend to disclose poor information, as they tend to have selfish agendas due to higher agency costs in those firms.

Nevertheless, there is still no direct evidence on how control-ownership divergence affects market liquidity in emerging markets such as China, where legal protection for minority shareholders is weak. Particularly, there is no comprehensive analysis showing how the relationship between control-ownership divergence and stock liquidity is influenced by the unique institutional features in these emerging markets, which differ from those in a developed market as examined by Attig et al. (2006). First, state-owned enterprises (SOEs) and privately owned firms (so-called non-SOEs) coexist. Compared to non-SOEs, SOEs have a more complex principal-agent relationship chain, which may result in more severe agency issue. Second, the legal system in China is weak, and the implementation of the legal system differs greatly across regions. Given that a better legal system can reduce information asymmetry, the variation in the legal system results in a variation in information asymmetry and agency problems in firms in different regions. Finally, Chinese firms have experienced an important market transformation (from the split share structure to a fully tradable share structure) through the non-tradable share (NTS) reform. The reform aligns the interests of different shareholders because it allows the originally non-tradable shares held by large shareholders

¹ Previous studies include Faccio and Lang (2002), Lins (2003), Lemmon and Lins (2003), Maury and Pajuste (2004), Bennedsen and Nielsen (2006), Gompers et al. (2010), and Lin et al. (2011).

² For example, Claessens et al. (2000, 2002), Faccio et al. (2001, 2010).

to be tradable. Given that state ownership, a poorer legal system in some regions and the split share structure (before the NTS reform) are all associated with greater agency problems between controlling and minority shareholders (Shleifer and Vishny, 1997; Demircug-Kunt and Maksimovic, 1999; Beltratti et al., 2011; Campello et al., 2011; Liu and Tian, 2012; Chen et al., 2012), those institutional features in China provide a unique settings to verify Attig et al. (2006)'s conjecture that the negative relationship between control-ownership divergence and stock liquidity is mainly caused by information asymmetry and agency conflicts between controlling and minority shareholders. This paper examines how the relationship between control-ownership divergence and stock liquidity varies across firms with and without state ownership; in regions with stronger or poorer legal systems; and before and after the NTS reform. Furthermore, the results by Attig et al. (2006) may be influenced by an endogeneity issue because there may be uncontrolled factors that jointly affect control-ownership divergence and stock liquidity. The NTS reform in China provides an ideal event to address the endogeneity issue because it was implemented by the Chinese government, and has thus been an exogenous shock to all Chinese firms.

Using a sample from Chinese listed firms from 2005 to 2009, our paper first confirms that control-ownership divergence has a negative impact on market liquidity, which is consistent with Attig et al. (2006). We also provide direct evidence that firms with control-ownership divergence have higher information asymmetry by using stock-price synchronicity as a measure of the information environment. In addition, we find that the negative effect of control-ownership divergence on market liquidity is greater in firms with severe agency problems and information asymmetry: SOEs and firms that locate in regions with weak protection for minority shareholders. This study thus documents that both the weak corporate governance mechanism in SOEs and the weak protection of minority shareholders worsen the negative effect that control-ownership divergence has on stock liquidity. We further provide evidence that the negative relationship between control-ownership divergence and stock liquidity is greatly weakened after the NTS reform, especially in firms with more-severe agency conflicts. Our results are supported when liquidity variables are measured by low-frequency data. Our additional evidence shows the negative relationship between control-ownership divergence and stock

liquidity and the reduction of the negative relationship after the NTS reform are both more pronounced in SOEs controlled by local governments than in SOEs controlled by the central government.

By providing empirical evidence for the impact of control-ownership divergence on stock liquidity, this study contributes to the current literature in several ways. First, this study extends the paper by Attig et al. (2006) by exploring institutional features in an emerging market (in this case, China) such as state ownership, the legal environment and market reforms, that influence the negative relationship between control-ownership divergence and market liquidity. We provide direct evidence that control-ownership divergence's negative effect on market liquidity is worsened by increased agency problems caused by both state ownership and weak protection for minority shareholders. Our study therefore contributes to agency theory and literature on the implications of control-ownership divergence for the stock market. In addition, literature on the effect of control-ownership divergence on stock liquidity may suffer from the potential endogeneity issue. This study provides fresh evidence that is less likely to be influenced by the endogeneity issue, as the study uses a natural-experiment method. Furthermore, the financial market in emerging markets is usually underdeveloped and hampered by various policy barriers for historical reasons; our study confirms that the importance of a proper privatisation process (such as the NTS reform) for an emerging market that aims to remove those barriers can greatly improve market liquidity. Therefore, this current study also has implications for market-oriented reforms in transition economies. Finally, one of the major consequences of the recent global financial crisis is that markets overall have become severely illiquid, which prolongs their recovery even further. Therefore, our study will have significant and timely policy implications for regulatory authorities in emerging markets.

We organise the remainder of this paper as follows: Section 2 introduces the controlling structures and institutional environment in China, reviews the relevant literature, and develops testable hypotheses. Section 3 describes the sample selection, variable definition, and regression models. Section 4 discusses the results of our main empirical and robustness tests. Section 5 concludes the paper.

2 Institutional environment, literature review, and hypotheses development

2.1 Controlling structures and institutional environment in China

This study has chosen to examine Chinese firms because of their specific controlling structures and institutional environment, resulting in different agency conflicts and corporate governance in firms with different types of controlling shareholders, those in different regions, and those before and after the NTS reform.

Over the past three decades, China has moved toward a market economy where ownership structures of Chinese corporations have been transformed from nearly 100% state-owned to a relatively diversified ownership. Initially, all Chinese listed firms were ultimately owned by the state. Over time, private entities or individuals have been allowed to become controlling shareholders in some listed firms through MBOs, or through mergers and acquisitions (Chow, 2007). Although the government still maintains its control or influence over SOEs through substantial ownership (Chen et al., 2008), non-SOEs established by entrepreneurs and other individual entities have also been encouraged to list their shares on Chinese stock markets in recent years. Therefore, a typical characteristic of the Chinese stock market is the co-existence of SOEs and non-SOEs. In the meantime, most Chinese corporations (both SOEs and non-SOEs) have a pyramid ownership structure established by the controlling shareholders with relatively low cash-flow rights (Fan et al., 2007). Therefore, there is sufficient variation of ownership to examine whether the relationship between control-ownership divergence and market liquidity varies between SOEs and non-SOEs.

In addition, an important feature of the Chinese institutional environment is that the legal system is still quite weak and minority shareholders are weakly protected (Peng, 2001; Kato and Long, 2005). Nevertheless, although the legal system within China does not differ much from region to region, its implementation does³, which results in unequal protection for minority shareholders in different

³ As a typical example, according to the Supreme Court's judicial interpretation, the right of jurisdiction over all listed companies as defendants in a civil action belongs to the regional People's Intermediate Court. In this

regions. China provides a unique dataset to examine whether the effect of control-ownership divergence on stock liquidity is affected by different levels of protection for minority shareholders within one country.

For historical reasons, a split share structure was established in the Chinese capital market, whereby tradable shares were mostly held by individual investors and non-tradable shares (NTS) were mostly held by large shareholders before the NTS reform, which caused severe agency conflict and information asymmetry between majority and minority shareholders. The NTS reform, which was implemented from 2005 to 2007, required large shareholders to convert their shareholdings to tradable shares. By removing a significant market friction, the reform greatly reduced the agency conflict between large and minority shareholders, because their interests were now aligned. Therefore, the effect of control-ownership divergence on stock liquidity can be examined from a vertical frame; that is, to see whether the effect of control-ownership divergence on liquidity changes when the agency issue between shareholders is alleviated.

2.2 Literature review

2.2.1 Ownership structure and stock liquidity

Prior studies show that corporate ownership structure has a great impact on stock liquidity, especially under a concentrated-ownership structure. Theoretical works by Bolton et al. (1998) and Maug (1998) indicate that block ownership may influence firms' stock liquidity through two major mechanisms: the trading-activity effect and the informed-trading effect. The trading-activity effect argues that if a large shareholder is present, the availability of shares is limited and fewer shareholders can trade the stock, which reduces the trade frequency (Demsetz, 1968); and discourages the acquisition and production of information (Holmstrom and Tirole, 1993). The informed-trading effect indicates that because large

situation, the implementation of the legal system depends on whether the region has a well-developed free market with less government intervention in the economy. In regions that do not have a well-developed free-market economy, listed companies are more likely to influence the local judicial department (the regional People's Intermediate Court) through networks or relationships, which dominate the Chinese economy. For example, Shanghai is considered to better implement the legal system than Tibet due to the former's freer market and better-developed economy.

shareholders usually have private information about the firm's value, the higher probability of informed trading decreases the liquidity.

Empirical studies in recent years have attempted to investigate the relationship between ownership structure and stock liquidity by distinguishing the two effects. For example, Rubin (2007) finds that stock liquidity is positively related to total institutional ownership (a proxy for trading activity) but negatively related to institutional block holdings (a proxy for informed trading). Similarly, Brockman et al. (2009) find that block ownership is detrimental to stock liquidity, and that the relative lack of trading, rather than the threat of informed trading, better explains the negative relationship between block ownership and stock liquidity.

2.2.2 The effect of control-ownership divergence

After Claessens et al.'s (2000) seminal paper, which identifies the pyramiding ownership structure in eight East Asian economies, control-ownership divergence has been found to be associated with more-severe information asymmetry and agency conflicts between large controlling and minority shareholders, and that this impairs firm value (Claessens et al., 2002; Faccio and Lang, 2002; Lemmon and Lins, 2003; Lins, 2003; Maury and Pajuste, 2004; Gompers et al., 2009) or results in value-destroying financial policies (Faccio et al., 2010; Liu and Tian, 2012). A few studies in recent years have also linked control-ownership divergence to stock liquidity. Attig et al. (2006) is the first of these to examine the relationship between control-ownership divergence and stock liquidity. Using a sample of Canadian publicly traded firms for the year 1996, they find that greater control-ownership divergence results in more severe information asymmetry and wider bid-ask spreads. They further argue that ultimate owners of firms with control-ownership divergence usually have a strong incentive to adopt a poor information-disclosure policy to pursue their private benefit. Similarly, Ginglinger and Hamon (2010) confirm Attig et al. (2006)'s argument using a sample of French firms, reporting that control-ownership divergence inherited in a pyramid structure impairs market liquidity, but double voting rights increase stock liquidity.

To sum up, the literature indicates that firms' ownership structure does have an impact on market liquidity, but the few studies examining the effect of control-ownership divergence on stock liquidity are all based on developed markets. This study attempts to complement the current literature by investigating the relationship between control-ownership divergence and liquidity in an emerging market with a unique institutional setting.

2.3 Hypothesis development

2.3.1 Control-ownership divergence and market liquidity

As mentioned above, the literature implies that control-ownership divergence is associated with poor stock liquidity because the ultimate owners in these firms become entrenched, and they usually disclose inadequate information so they can pursue their private benefit (Attig et al., 2006). The conflict of interest between the ultimate owners and minority shareholders is particularly severe in transition economies like China, where protection for minority shareholders is still quite weak (Shleifer and Vishny, 1997; Kato and Long, 2005; Lin et al., 2011). Under this circumstance, ultimate owners with more excess-control rights may have a stronger incentive to minimise and delay the disclosure of information in an emerging market, which is harmful to market liquidity. Therefore we expect that the negative relationship between control-ownership divergence and stock liquidity also exists in Chinese firms. Thus our first hypothesis is that:

H1: Control-ownership divergence is negatively (positively) related to market liquidity (bid-ask spread or adverse selection cost) of Chinese firms.

2.3.2 Control-ownership divergence, agency problem and stock liquidity

However, the relationship between control-ownership divergence and liquidity may differ between SOEs and non-SOEs because their corporate governance mechanisms differ. In particular, the property rights of non-SOEs in China are naturally personal or family-based, which is similar to firms in the west, but SOEs have a specific corporate governance model with a multilayered principal-agent framework and an unclear clarification of ultimate property rights. Local and central government officials serving as principals hold the control rights in the name of the state, but they are not the residual claimants. Thus, no one in the principal-agent relationship chain has any incentive to

maximise profits for the actual principal (Liu et al., 2011). This means that everyone in the chain may have a strong incentive to pursue their own personal benefit, which results in a much more severe agency problem and information asymmetry in SOEs. Chung et al. (2010) find that better stock liquidity is positively related to firms' corporate governance. Thus, we expect that this poor corporate governance and the severe agency problem in SOEs strengthen the negative relationship between control-ownership divergence and stock liquidity. Thus we propose the following hypothesis:

H2a: The interaction of control-ownership divergence and the SOE dummy is negatively (positively) related to stock liquidity (bid-ask spread or adverse selection cost).

If the negative relationship between control-ownership divergence and liquidity stems from a firm's poorer information disclosure (Attig et al., 2006), it is reasonable to expect that this relationship is particularly strong in regions where the minority shareholders are poorly protected. This is because the legal system operating in regions with strong protection for minority shareholders can reduce opportunism and asymmetric information (Demirguc-Kunt and Maksimovic, 1999). Therefore, we expect that the negative relationship between control-ownership divergence and liquidity is stronger in regions with poorer protection for shareholders and vice-versa, and propose the following hypothesis:

H2b: The interaction of control-ownership divergence and the poor legal system dummy is negatively (positively) related to stock liquidity (bid-ask spread or adverse selection cost).

2.3.3 Control-ownership divergence, NTS reform, and stock liquidity

As discussed above, the split share structure harmed market liquidity because it increased the agency conflict between controlling shareholders and minority shareholders. However, after the NTS reform, shares held by large shareholders gradually become tradable, which aligned the interests of large and minority shareholders by linking large shareholders' wealth directly to share prices. Thus we propose the following hypothesis to provide evidence for this expectation:

H3a: The interaction of control-ownership divergence and NTS reform is positively (negatively) associated to stock liquidity (bid-ask spread or adverse selection cost).

If, as expected, the agency problems are more severe in SOEs and firms in regions with a weak legal system, and such agency problems are alleviated after the NTS reform, it would be reasonable to argue that the negative relationship between control-ownership divergence and stock liquidity is weakened more significantly in SOEs and firms in regions with a weak legal system. Thus we hypothesise that:

H3b: The interaction of control-ownership divergence and NTS reform has a stronger positive (negative) effect on stock liquidity (bid-ask spread or adverse selection cost) in SOEs or firms that locate in regions with a poor legal system that provides weak protection for investors.

3. Research design

3.1 Data collection and sample selection

Our data is collected mainly from the CSMAR database. Particularly, the spread of information is collected from the High Frequency Database of Chinese Listed Firms (2005–2009); the information regarding firms' ownership structure (including proportion of tradable in each year) is collected from the Chinese Listed Firm Shareholder Research Database (2005–2009); and the NTS reform information is collected from the Chinese Listed Firms Non-Tradable Share Reform Database (2005–2009).

To calculate market liquidity, we exclude (1) data observations that are not during normal trading times (i.e., 9:30-11:30 and 13:00-15:00)⁴; and (2) the volume, price, and quote non-positive data records. In addition, we exclude 'ST' or negative-equity firms (financially distressed firms) because these shares are traded according to different rules. The final sample consists of 1,718 observations of 345 firms' panel data from 2005 to 2009⁵.

⁴ Stock exchanges in China operate five days a week, except for holidays. The normal trading hours are 9:30 AM to 11:30 AM and 13:00 PM to 15:00 PM. There is also a pre-trading session from 9:00 AM to 9:30 AM each day. However the pre-trading session uses a periodic call auction, which is a different method from that used during the normal trading hours (the continuous, discriminating auction) (Xu, 2000).

⁵ There are two Securities Exchanges in China: the Shanghai Securities Exchange (SHSE) and the Shenzhen Securities Exchange (SZSE). A significant difference between the two stock exchanges is the sizes of the listed companies. In addition, the closing price for stock on the Shanghai Stock Exchange is the last traded price of a continuous transaction. In contrast, the closing price of stock on the Shenzhen Stock Exchange is determined

3.2 Measuring variables

3.2.1 Dependent variables

In accordance with Brockman, Chung, and Yan (2009), we calculate two variables to measure stock liquidity using high-frequency data. The first is the bid-ask effective spread (*BAES*)⁶, which is defined as the absolute value of twice the difference between the transaction price and the mid-price recorded at the time of the transaction. Second, according to Glosten and Harris (1988), information asymmetry is another important component for measuring stock liquidity, so we further calculate the adverse selection cost (*ADSC-GH*) as a proxy for information friction⁷. As our regressions are based on years, we use the annual average of the above two measures of liquidity to reduce the errors associated with a single day, and obtain a single observation for each firm in each year.

Stock-price synchronicity (*SYNCH*) is also calculated in this paper to measure the information asymmetry of individual firms. Following Morck et al. (2000), we first estimate the following regression:

$$R_{i,t} = \beta_{i0} + \beta_{i1}R_{m,t} + \varepsilon_{i,t} \quad \text{Equation (1)}$$

where $R_{i,t}$ is the return of stock i at day t , and $R_{m,t}$ is the market return at day t . The variable

SYNCH is defined as:

using the call auction, whose closing time is three minutes (that is, from 14:57 to 15:00). Apart from that, there is no other significant difference between them; they are both typical, pure order-driven markets that have adopted a centralised, scriptless, computerised order matching system which has functioned remarkably well. Due to the availability of data, we only included those firms listed on the SZSE.

⁶ We also calculate the bid-ask quoted spread (*BAQS*), which is defined as the daily average value of the difference between the bid price and the ask price, and conduct regressions using this variable as measure of stock liquidity. The regression results are not reported in the study because they are very much similar to the results using *BAES* as dependent variable. Both variables are highly correlated.

⁷ Based on Glosten and Harris (1988), the total adverse selection cost percentage is $2(z_0 + z_1 \bar{V}) / [2(z_0 + z_1 \bar{V}) + 2(c_0 + c_1 \bar{V})]$. Where the numerator is information asymmetry or adverse selection component, and the denominator is the sum of the order processing component and the inventory holding component. In this formula, $\bar{V}$ is the average share volume, while z_0 , z_1 , c_0 , and c_1 are estimated from the following equation: $\Delta P_t = c_0 \Delta Q_t + c_1 \Delta Q_t V_t + z_0 Q_t + z_1 Q_t V_t + e_t$. Where P_t is the trade price at time t ; $Q_t = +1$ if the trade at time t is buyer-initiated and $Q_t = -1$ if it is seller-initiated, and V_t is the number of shares traded per transaction at time t . ΔP_t and ΔQ_t are the change of P_t and Q_t at time t ; and e_t is the error item.

$$SYNCH_{i,t} = \log\left(\frac{R^2}{1-R^2}\right) \quad \text{Equation (2)}$$

where R^2 is the coefficient of determination from the estimation of Eq (1). We then calculate the annual average of the daily *SYNCH* to obtain a single observation for each firm in each year.

For robust results, we further calculate three low-frequency liquidity measures: trading volume (*VOLUME*), turnover ratio (*TURNOVER*), and illiquidity ratio (*ILLIQUIDITY*). *VOLUME* and *TURNOVER* are defined as the yearly average trading volume (turnover ratio), while *ILLIQUIDITY* is the yearly average daily illiquidity ratio, which is defined as the average ratio of the daily absolute return to the (dollar) trading volume on that day (Amihud, 2002).

3.2.2 Independent variables

Control-ownership divergence (*DIVERGENCE*) is defined in this paper, as in Lin et al. (2011), as the difference between the control rights and cash-flow rights of the ultimate owners⁸. Cash-flow rights are measured by the sum of the products of the proportion of ownership along the control chains, while control rights are the minimum proportion of ownership along the control chains.

NTS reform (*REFORM*) is defined in this paper as a dummy variable that equals 1 for a firm-year observation in the post-reform period, and 0 for observations before or in the NTS reform year.

We also define a dummy variable (*SOE*) that equals 1 if the firm is ultimately owned by Chinese central or local governments and 0 otherwise. Within the SOEs sample, a dummy variable (*CENTRALSOE*) is further defined if the SOE is ultimately controlled by the central government.

According to Liu et al. (2011), the regional-division criterion widely used to measure variations in

⁸ According to the CSRC definition, the “ultimate owner” of a listed company is: (1) the largest shareholder, or (2) the shareholder with more voting rights than the largest shareholder, or (3) the shareholder with shareholding or voting rights above 30% of the total shares or voting rights in the company, or (4) the shareholder who can determine over half of the board members.

institutional development in China is the division between the eastern (coastal) region and the non-eastern region, including both the central and western regions. The eastern region (the coastal provinces) is considered to protect its minority shareholders better due to its advantageous geographical positioning, as well as its well-established market economy and effective legal system⁹. Thus, we define a region dummy variable (*POORREGION*) that equals 1 if the firm is registered in the central or western regions and 0 otherwise.

Finally, to control the effect of other factors that have an impact on market liquidity, we also include several control variables. The percentage of tradable shares, institutional ownership, stock closing price, total market capitalisation, and trading risk are included to control the effect of firm-specific factors, while market return and market trading volume are there to control the potential effect of market conditions (Chordia et al., 2001; Rosch and Kaserer, 2013; Qian et al., 2013). Table 1 defines in detail all variables used in this paper.

<Table 1>

3.3 Regression models

Our base regression models are as follows:

$$Y_{i,t} = \alpha + \beta_1 DIVERGENCE_{i,t} + \beta_2 X + \varepsilon \quad \text{Equation (3)}$$

$$Y_{i,t} = \alpha + \beta_1 DIVERGENCE_{i,t} + \beta_2 REFORM + \beta_3 DIVERGENCE_{i,t} * REFORM + \beta_4 X + \varepsilon \quad \text{Equation (4)}$$

In Equations (3) and (4), *i* and *t* represent the firm and year, and ε is the error term. The dependent variables *Y* are proxies for market liquidity and information asymmetry, which includes bid-ask effective spreads (*BAES*), adverse selection cost (*ADSC-GH*), trading volume (*VOLUME*), turnover ratio (*TURNOVER*), illiquidity ratio (*ILLIQUIDITY*), and stock-price synchronicity (*SYNCH*). The key independent variables are control-ownership divergence (*DIVERGENCE*), NTS reform (*REFORM*), and their interaction term, while *X* is a vector of control variables.

⁹ The eastern region covers Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan. The central and west regions include Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan, Inner Mongolia, Guangxi, Sichuan, Chongqing, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang, and Tibet.

4. Empirical results

4.1 Sample description and univariate tests

The descriptive statistics and univariate test results are reported in Table 2, of which panel A gives the summary statistics; panel B presents the results for univariate tests of stock liquidity based on whether the firms have control-ownership divergence or not; and panel C presents the results for difference-in-difference tests of stock liquidity of firms with and without control-ownership divergence, and with different levels of agency problems. Lastly, panel D presents the results for difference-in-difference tests of stock liquidity in firms with and without control-ownership divergence and before and after the NTS reform.

Panel A shows that the average effective spread in the Chinese stock market is 0.02 RMB, and the adverse selection costs account for 39.1% of spread, on average. In addition, the average stock-price synchronicity is -0.12, which is close to the -0.23 reported by Hasan et al. (2013) for Chinese markets, but much higher than the -1.74 reported for the US market (Piotroski and Roulstone, 2004). Consistent with Hasan et al. (2013), our results indicate that the information-asymmetry problem in the Chinese market is more severe than in the US because the stock price in the Chinese market is more likely to co-move with the market index. Our low-frequency measurements of market liquidity show that the average trading volume, turnover ratio, and illiquidity are 81.90 million RMB, 3%, and 0.04 ($\times 10$ Million) respectively. Regarding the independent variables, we find that the average control-ownership divergence of our sample firms is around 6%, with controlling shareholders' cash-flow rights of 39%.

Panel B shows that firms with control-ownership divergence have a higher bid-ask effective spread (*BAES*) and adverse selection cost (*ADSC-GH*) than firms without it, and the differences are statistically significant in terms of both mean and median. As high *BAES* and *ADSC-GH* both indicate poor stock liquidity, our results provide evidence that control-ownership divergence has a negative impact on stock liquidity.

As expected, panel C shows that SOEs with control-ownership divergence have significantly higher *BAES* and *ADSC-GH* (poor liquidity), indicating that control-ownership divergence has a significantly negative impact on stock liquidity. Similarly, control-ownership divergence is found to have a significantly negative effect on stock liquidity for firms in regions with a poor legal system. However, no significant relationship between control-ownership divergence and stock liquidity is found for non-SOEs or firms in regions with an effective legal system (only one out of four tests of difference is significant). In contrast, the difference-in-difference test results are all significant, indicating that the interaction effect of *SOE* (*POORREGION*) and control-ownership divergence is also significantly associated to stock liquidity.

Panel D shows that the *BAES* and *ADSC-GH* both decrease significantly after the NTS reform in firms with control-ownership divergence only, suggesting that the stock liquidity in those firms is greatly improved after the NTS reform. The difference-in-difference test results are both significant, which confirms that the interaction of control-ownership divergence and NTS reform have a negative (positive) effect on the study's dependent variables (stock liquidity).

We also conduct correlation-coefficient tests between independent variables, but the results are not reported to save space. Our correlation matrix results indicate that our results do not suffer from serious multi-collinearity problems.

<Table 2>

4.2 Control-ownership divergence and market liquidity

Table 3 presents the regression results of control-ownership divergence on market liquidity using *BAES* and *ADSC-GH* as measures of market liquidity.

Consistent with our expectation and the results from the univariate test, the coefficients of *DIVERGENCE* are consistently positive and significant in both economic magnitude and statistical significance, when stock liquidity is measured using *BAES* or *ADSC-GH* as dependent variables. Specifically, we suggest that a 1% increase in control-ownership divergence by the controlling

shareholders results in an increase of 0.017% in bid-ask spreads, and 0.195% in adverse selection cost. Therefore, the overall results in Table 3 support our hypothesis H1, indicating that control-ownership divergence has a negative impact on stock liquidity.

In addition, the results show that the ultimate owners' cash-flow rights have a negative impact on stock liquidity. The proportion of tradable shares is negatively related to both the bid-ask spread and adverse selection cost, which indicates that there is a positive relationship between the proportion of tradable shares and market liquidity. This result is consistent with our expectation that firms' stock liquidity increases when the proportion of tradable shares increases after the NTS reform. Furthermore, we show that bid-ask spreads and adverse selection costs (stock liquidity) are negatively associated with institutional ownership, and that the year-end closing price and stock trading risk are positively related to stock liquidity, while firms with large market capitalisation have better liquidity. This confirms previous studies from Attig et al. (2006), Rubin (2007), and Brockman et al. (2009). Finally, similar to Qian et al. (2013), the results confirm that the market-commonality component has strong explanatory power for individual stocks by showing that stock liquidity increases when the market return is higher.

<Table 3>

4.3 The effect of control-ownership divergence on liquidity of firms with different levels of agency problems

We have shown that control-ownership divergence has a negative effect on market liquidity. If, as expected, the negative relationship between control-ownership divergence and stock market liquidity stems from the agency problem and its induced poor information disclosure, this negative relationship should be strengthened in SOEs and firms in regions with poor legal systems, both of which suffer from more-severe agency problems. In this subsection, we attempt to examine the effect of control-ownership divergence on stock liquidity in firms with different levels of agency problems.

Table 4 presents the regression results on the interaction effect of *DIVERGENCE* and the *SOE* dummy

(*POORREGION* dummy) on stock liquidity. The results in columns 1 and 2 of Table 4 show that the interaction term of *DIVERGENCE* and the *SOE* dummy are statistically and economically related in a significantly positive way to adverse selection cost. Thus our results suggest that the positive (negative) relationship between control-ownership divergence and adverse selection costs (stock liquidity) is weakened in SOEs, which is consistent with our hypothesis H2a.

Columns 3 and 4 present the effect of control-ownership divergence and regional legal system on stock liquidity. We expect that control-ownership divergence should have a stronger positive impact on bid-ask spread and adverse selection cost in firms in regions with poor legal systems. Not surprisingly, our results confirm that the interaction of *DIVERGENCE* and the *POORREGION* dummy is significantly positively associated with our dependent variables. Therefore our hypothesis H2b is also proven, indicating that the negative impact of the control-ownership divergence on stock liquidity is exaggerated by a poor legal system.

<Table 4>

4.4 The effect of control-ownership divergence and NTS reform on stock liquidity

To investigate whether the negative impact of the control-ownership divergence on market liquidity is alleviated when controlling shareholders' incentive to expropriate is reduced after the NTS reform, the interaction effect of control-ownership divergence and NTS reform on stock liquidity is examined. Our expectation is that the negative effect of control-ownership divergence on stock liquidity should be weakened after the NTS reform, particularly in firms with severe agency problems. The results are reported in Table 5, of which panel A reports the full sample regression results, while panels B and C report the regression results based on different subsamples.

The results in panel A show that the interaction of *DIVERGENCE* and the *REFORM* dummy is significantly negatively related to the study's dependent variables. This confirms that the positive (negative) effect of control-ownership divergence on both bid-ask spread and adverse selection cost (liquidity) are weakened after the NTS reform. These results are also consistent with our hypothesis

H3a. Panels B and C show that the interaction of control-ownership divergence and NTS reform has a statistically significantly negative effect only on the adverse selection cost of firms with severe agency problems; that is, SOEs and firms in regions with a poor legal-protection system, although it has a similar effect on the bid-ask spread of firms with different levels of agency problems. The results confirm that the positive (negative) relationship between control-ownership divergence and adverse selection cost (stock liquidity) is weakened more significantly in firms with more-severe agency problems.

<Table 5>

4.5 The effect of control-ownership divergence on information asymmetry

So far we have provided evidence that control-ownership divergence does have a negative impact on stock liquidity, and conjectured that the negative impact is caused by information asymmetry and agency problems. However, we have not had direct evidence about whether control-ownership divergence has an effect on information asymmetry that can be directly measured by stock-price synchronicity. Thus, in this section we examine the effect of control-ownership divergence (and NTS reform) on stock-price synchronicity.

Columns 1 and 2 of Table 6 present the results based on the full sample. We find that *DIVERGENCE* is positively associated with stock-price synchronicity, indicating that the information asymmetry in firms with higher control-ownership divergence is higher than that in firms with lower or no divergence; this is consistent with our expectation. Further, we show that the interaction of *DIVERGENCE* and NTS reform is significantly negatively associated with firms with severe agency problems; that is, SOEs and firms in regions with poor legal systems. This indicates that the information asymmetry in firms with more-severe agency problems is significantly reduced after the NTS reform. Overall, the results in Table 6 confirm our argument that information asymmetry is the channel through which control-ownership divergence affects stock liquidity.

<Table 6>

4.6 Additional tests

This section provides robustness test results for our main results. First, we conduct a change regression to see whether the control-ownership divergence before the NTS reform is associated with a greater change in stock liquidity¹⁰; second, we repeat our main test using a low-frequency measurement of stock liquidity; and finally, we further examine whether control-ownership divergence's impact on the liquidity of SOEs controlled by central governments is different from its impact on the liquidity of those controlled by local governments.

4.6.1 The effect of control-ownership divergence on change of stock liquidity after the NTS reform

Table 7 gives the regression results on the effect of control-ownership divergence (before the NTS reform) on the change of stock liquidity after the NTS reform. The bid-ask spread and adverse selection cost of firms with higher control-ownership divergence fall significantly after the NTS reform, which is consistent with the findings in Table 5. We also conduct regressions on the effect of *DIVERGENCE* and NTS reform on change of stock liquidity for firms with different levels of agency problems. The results are also quite similar to the results in Table 5, and are thus not reported here to save space.

<Table 7>

4.6.2 The effect of control-ownership divergence on stock liquidity (low-frequency data)

Table 8 presents the results showing the effect of control-ownership divergence, NTS reform, and their interaction on stock liquidity using low-frequency data to measure stock liquidity. Following Amihud (2002), we adopt trading volume (*VOLUME*), turnover ratio (*TURNOVER*), and illiquidity ratio (*ILLIQUIDITY*) as low-frequency liquidity measures.

Columns 1 to 3 of Table 8 show that control-ownership divergence is significantly negatively associated with trading volume, and significantly positively associated with illiquidity ratio. This indicates that firms

¹⁰ Normally the change of stock liquidity after the NTS reform should be used to regress on the change of all independent variables, including change in *DIVERGENCE* and change in *TRA*; however, there are very few changes of *DIVERGENCE* and *TRA* during the lock-up period. So we examine the effect of the average value of *DIVERGENCE* and *TRA* before the NTS reform on the change of stock liquidity.

with more control-ownership divergence usually have poorer market liquidity. The interaction of *DIVERGENCE* and NTS reform is significantly positively (negatively) associated with trading volume (illiquidity ratio), which implies that the negative (positive) relationship between control-ownership divergence and trading volume (illiquidity ratio) is weakened significantly after the NTS reform. Thus our main results are confirmed by the results shown in Table 8.

<Table 8>

4.6.3 The effect of control-ownership divergence and NTS reform on stock liquidity of SOEs controlled by central and local governments

Recent studies by Chen et al. (2009) and Cheung et al. (2012) find that local and central government ownership have different impacts on firm performance. In particular, SOEs controlled by local governments usually perform worse than those controlled by the central government due to weak monitoring and supervision from the government. This suggests that the negative relationship between control-ownership divergence and stock liquidity should be more pronounced in local SOEs due to weaker monitoring and supervision leading to their more-severe agency problems. Not surprisingly, the results in Table 9 do show that *DIVERGENCE* is significantly positively associated with bid-ask spread and adverse selection cost of SOEs controlled by local governments. In addition, we find the positive impact of control-ownership divergence on bid-ask spread and adverse selection cost is weakened more significantly in local SOEs after the NTS reform.

<Table 9>

5. Conclusion

This paper examines the effect of control-ownership divergence on market liquidity using a unique sample of Chinese listed firms. We find that firms with larger control-ownership divergence have higher bid-ask spreads and adverse selection costs – i.e., poorer market liquidity – than firms with smaller divergence. We further show that the negative impact of control-ownership divergence on stock liquidity is exaggerated by the more-severe agency problems in SOEs and firms in regions with poor legal systems that provide weak protection for minority shareholders. Moreover, using the NTS reform as an exogenous shock, we find that the negative (positive) relationship between

control-ownership divergence and stock liquidity (stock-price synchronicity) is alleviated after the NTS reform which has greatly reduced the agency conflicts between controlling and minority shareholders, particularly in firms with severe agency problems. Our additional evidence supports our findings by showing that firms with larger control-ownership divergence are associated with greater reduction in bid-ask spread and adverse selection cost after the NTS reform; control-ownership divergence is associated with greater stock illiquidity, measured by low-frequency data; and the negative relationship between control-ownership divergence and stock liquidity is more pronounced in local SOEs than in central SOEs.

Overall, this study provides evidence from an emerging market for a negative effect of control-ownership divergence on market liquidity. The results are consistent with previous literature from Attig et al. (2006) for developed markets. More importantly, we provide further evidence that in emerging markets such as China, the negative impact of control-ownership divergence on market liquidity is exacerbated by both state ownership and weak protection for minority shareholders, both of which increase information asymmetry and agency conflict between controlling shareholders and minority shareholders. However, the NTS reform, which aims to improve the efficiency of capital markets and align the interests of controlling shareholders and minority shareholders, has reduced the negative impact that control-ownership divergence has on market liquidity. Our results suggest that in emerging markets, institutional features, such as state ownership, regional development, and market reform, play important roles in the effect of control-ownership divergence on market liquidity.

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Tables:

Table 1. Definition of variables

Variables	Symbols	Calculation
Dependent variables		
<i>High-frequency liquidity measures</i>		
Bid-ask effective spread	<i>BAES</i>	Annual average of the daily absolute value of twice the difference between the transaction price and the mid-price recorded at the time of the transaction.
Adverse selection cost	<i>ADSC-GH</i>	Glosten and Harris (1988) adverse selection ¹¹ .
<i>Information asymmetry measures</i>		
Stock-price synchronicity	<i>SYNCH</i>	Stock-price synchronicity, following Morck et al. (2000) ¹² .
<i>Low frequency liquidity measures</i>		
Trading volume	<i>VOLUME</i>	Yearly average trading volume of the stock.
Turnover	<i>TURNOVER</i>	Yearly average turnover ratio of the stock.
Illiquidity ratio	<i>ILLIQUIDITY</i>	Yearly average daily illiquidity ratio, which is defined as the average ratio of the daily absolute return to the (dollar) trading volume on that day (Amihud, 2002).
Independent variables		
Control-ownership divergence (excess control rights)	<i>DIVERGENCE</i>	Divergence between the control rights and cash-flow rights of the ultimate owner.
NTS reform	<i>REFORM</i>	A dummy variable that equals 1 if the observation is in the post-reform period, and 0 otherwise.
Cash-flow rights	<i>CASHFLOW</i>	Sum of the products of the proportion of ownership along the control chains.
Tradable-shares percentage	<i>TRA</i>	Tradable shares to Total outstanding shares.
Institution ownership	<i>IO</i>	Year-end fund's holdings/total shares.
Price	<i>PRICE</i>	Year-end closing prices.
Total size	<i>SIZE</i>	Year-end total market capitalisation.
Stocks trading risk	<i>RISK</i>	Daily returns standard deviation of year.
Market return	<i>MRETURN</i>	Yearly return of the market index.
Market trading volume	<i>MVOL</i>	Yearly trading volume of the overall market.
Classification variables		
SOE dummy	<i>SOE</i>	A dummy variable that equals 1 if the firm is ultimately controlled by the government and 0 otherwise.
Poor region dummy	<i>POORREGION</i>	A dummy variable that equals 1 if the firm is located in a region with a poor legal system and 0 otherwise ¹³ .

¹¹ See footnote 6 for detailed calculation for this variable.

¹² See Section 3.2.1 for a detailed definition.

¹³ See Section 3.2.2 for a detailed definition.

Central SOEs dummy	<i>CENTRALSOE</i>	A dummy variable that equals 1 if the SOE is ultimately controlled by the central government and 0 if the SOE is controlled by a local government.
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In regression analysis, natural logarithms of VOLUME, ILLIQUIDITY, and SIZE are used to eliminate extreme values.

Table 2. Descriptive statistics*Panel A. Summary statistics*

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
<i>BAES (RMB)</i>	1718	0.02	0.14	0.02	0.01	0.21
<i>ADSC-GH</i>	1723	0.39	0.40	0.18	-3.19	1.85
<i>SYNCH</i>	1725	-0.12	-0.10	0.42	-3.26	0.91
<i>VOLUME</i> (Million RMB)	1725	81.90	43.60	139.00	0.09	2120.00
<i>TURNOVER</i>	1725	0.03	0.03	0.02	0.00	0.25
<i>ILLIQUIDITY</i> (10 Million)	1725	0.04	0.01	0.28	0.00	10.6
<i>DIVERGENCE</i>	1720	0.06	0.00	0.08	0.00	0.38
<i>REFORM</i>	1725	0.66	1.00	0.47	0.00	1.00
<i>CASHFLOW</i>	1720	0.31	0.28	0.17	0.01	0.85
<i>TRA</i>	1725	0.59	0.56	0.21	0.06	1.00
<i>IO</i>	1718	0.05	0.00	0.08	0.00	0.67
<i>PRICE</i>	1718	9.74	7.05	9.17	1.65	85.60
<i>SIZE</i> (Million RMB)	1725	5933.57	2511.27	12619.84	263.47	208502.00
<i>RISK</i>	1718	0.04	0.04	0.02	0.01	0.62
<i>MRETURN</i>	1725	0.62	1.03	0.85	-0.63	1.68
<i>MVOL</i> (Billion RMB)	1725	1807.29	1795.99	1290.70	190.79	3453.64
<i>SOE</i>	1725	0.72	1.00	0.45	0.00	1.00
<i>REGION</i>	1725	0.49	0.00	0.50	0.00	1.00
<i>CENTRAL</i>	1236	0.28	0.00	0.45	0.00	1.00

Panel B. Univariate tests of stock liquidity for firms with and without control-ownership divergence

Var.	DIVERGENCE		NON-DIVERGENCE		Diff.	
	Mean	Median	Mean	Median		
<i>BAES (%)</i>	2.02	1.48	1.68	1.36	0.34***	0.12***
<i>ADSC-GH (%)</i>	40.64	41.87	37.47	39.02	3.18***	2.85***

‘DIVERGENCE’ and ‘NON-DIVERGENCE’ refer to firms with and without control-ownership divergence respectively;

‘DIFF.’ refers to the differences of mean and median of stock liquidity in firms with and without control-ownership

divergence; and *** indicates significance at the 1% level.

Panel C. Difference-in-difference test for stock liquidity of firms with and without control-ownership divergence in firms with different levels of agency conflict

Var.		SOEs	NON-SOEs	Diff.
<i>BAES (%)</i>	DIVERGENCE	2.12	1.93	0.19
	NON-DIVERGENCE	1.65	1.97	-0.32***
	Diff.	0.47***	-0.04	0.51***
<i>ADSC-GH (%)</i>	DIVERGENCE	41.73	39.56	2.17
	NON-DIVERGENCE	37.31	39.03	-1.72
	Diff.	4.42***	0.53	3.89***
		POORREGION	RICHREGION	Diff.
<i>BAES (%)</i>	DIVERGENCE	2.09	1.96	0.13
	NON-DIVERGENCE	1.63	1.72	0.09
	Diff.	0.46***	0.24**	0.22*
<i>ADSC-GH (%)</i>	DIVERGENCE	41.9	38.4	3.50***
	NON-DIVERGENCE	37.77	37.17	0.6
	Diff.	4.13***	1.23	2.90***

‘DIVERGENCE’ and ‘NON-DIVERGENCE’ represent firms with and without control-ownership divergence respectively; ‘SOEs’ and ‘NON-SOEs’ represent firms that are ultimately controlled by the government or not; ‘POORREGION’ and ‘RICHREGION’ represent firms located in regions with poor or strong legal systems; ‘DIFF.’ refers to the difference-in-difference tests of mean; and *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel D. Difference-in-difference test for stock liquidity of firms with and without control-ownership divergence before and after NTS reform

		PRE-REFORM	POST-REFORM	Diff.
<i>BAES (%)</i>	DIVERGENCE	2.25	1.92	0.33**
	NON-DIVERGENCE	1.77	1.79	-0.02
	Diff.	0.48***	0.13*	0.35***
<i>ADSC-GH (%)</i>	DIVERGENCE	43.42	39.31	4.11**
	NON-DIVERGENCE	37.81	37.28	0.53
	Diff.	5.61***	2.03***	3.58**

‘DIVERGENCE’ and ‘NON-DIVERGENCE’ represent firms with and without control-ownership divergence respectively; ‘PRE-REFORM’ and ‘POST-REFORM’ represent the pre- and post-NTS reform periods; ‘DIFF.’ refers to the difference-in-difference tests of mean; and *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 3. The effect of control-ownership divergence on stock liquidity

Var.	<i>BAES</i>	<i>ADSC-GH</i>
<i>DIVERGENCE</i>	0.017***	0.195***
	0.000	0.000
<i>CASHFLOW</i>	-0.007**	-0.009
	0.013	0.763
<i>TRA</i>	-0.011***	-0.159***
	0.000	0.000
<i>IO</i>	0.000	0.006***
	0.128	0.000
<i>PRICE</i>	0.001***	0.008***
	0.000	0.000
<i>SIZE</i>	-0.001***	-0.042***
	0.003	0.000
<i>RISK</i>	-0.005	-0.112
	0.766	0.587
<i>MRETURN</i>	-0.005***	-0.039***
	0.000	0.000
<i>MVOL</i>	0.001	0.024***
	0.127	0.000
CONS	0.031***	0.620***
	0.000	0.000
YEAR	Yes	Yes
INDUSTRY	Yes	Yes
OBS.	1718	1718
ADJ.R2	0.308	0.260

Dependent variables are bid-ask effective spreads (*BAES*) and adverse selection costs (*ADSC-GH*). Variable definitions are detailed in Table 1; CONS is the constant for each regression; P-values are displayed below the coefficients; and ** and *** indicate significance at the 5% and 1% levels respectively.

Table 4. The effect of control-ownership divergence and agency problem on stock market liquidity

Var.	BAES	ADSC-GH	BAES	ADSC-GH
<i>DIVERGENCE</i>	0.012*	0.099	0.005	0.140**
	0.096	0.263	0.408	0.037
<i>SOE</i>	-0.001	-0.004		
	0.591	0.767		
<i>SOE* DIVERGENCE</i>	0.008	0.153**		
	0.393	0.021		
<i>POORREGION</i>			-0.001	0.004
			0.640	0.673
<i>POORREGION* DIVERGENCE</i>			0.031***	0.135*
			0.000	0.055
<i>CASHFLOW</i>	-0.007**	-0.014	-0.006**	-0.007
	0.019	0.661	0.024	0.842
<i>TRA</i>	-0.011***	-0.160***	-0.012***	-0.163***
	0.000	0.000	0.000	0.000
<i>IO</i>	0.000***	0.006***	0.000	0.005***
	0.126	0.000	0.153	0.000
<i>PRICE</i>	0.001***	0.008***	0.001***	0.008***
	0.000	0.000	0.000	0.000
<i>SIZE</i>	-0.001***	-0.043***	-0.001***	-0.041***
	0.003	0.000	0.005	0.000
<i>RISK</i>	-0.006	-0.122	-0.005	-0.110
	0.745	554	0.789	0.594
<i>MRETURN</i>	-0.006***	-0.039***	-0.005***	-0.040***
	0.000	0.000	0.000	0.000
<i>MVOL</i>	0.001	0.024***	0.001	0.024***
	0.128	0.000	0.115	0.000
CONS	0.031**	0.636***	0.029**	0.600***
	0.031	0.000	0.046	0.000
YEAR	Yes	Yes	Yes	Yes
INDUSTRY	Yes	Yes	Yes	Yes
OBS.	1718	1718	1718	1718
ADJ.R2	0.308	0.261	0.316	0.271

Variable definitions are detailed in Table 1; CONS is the constant for each regression; P-values are displayed below the coefficients; and *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

Table 5. The effect of control-ownership divergence and NTS reform on market liquidity*Panel A. Full sample regression results*

Var.	<i>BAES</i>	<i>ADSC-GH</i>
<i>DIVERGENCE</i>	0.050*** 0.000	0.398*** 0.000
<i>REFORM</i>	-0.001** 0.023	-0.020*** 0.001
<i>REFORM* DIVERGENCE</i>	-0.049*** 0.000	-0.311*** 0.001
<i>CASHFLOW</i>	-0.006** 0.035	-0.002 0.958
<i>TRA</i>	-0.010*** 0.000	-0.153*** 0.000
<i>IO</i>	0.001** 0.042	0.006*** 0.000
<i>PRICE</i>	0.001*** 0.000	0.008*** 0.000
<i>SIZE</i>	-0.002*** 0.001	-0.042*** 0.000
<i>RISK</i>	-0.008 0.651	-0.141 0.491
<i>MRETURN</i>	-0.006*** 0.000	-0.044*** 0.000
<i>MVOL</i>	0.002*** 0.006	0.041*** 0.000
CONS	-0.009 0.697	0.131 0.620
YEAR	Yes	Yes
INDUSTRY	Yes	Yes
OBS.	1718	1718
ADJ.R2	0.325	0.267

Panel A presents the full sample regression results. Panel B presents the regression results on the SOE and non-SOE subsamples. Panel C presents the regression results on firms in regions with poor and strong legal systems. Variable definitions are detailed in Table 1; CONS is the constant for each regression; P-values are displayed below the coefficients; and *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

Panel B. The effect of control-ownership divergence and NTS reform on liquidity in SOEs and non-SOEs

Var.	<i>BAES</i>		<i>ADSC-GH</i>	
	SOE	NON-SOE	SOE	NON-SOE
<i>DIVERGENCE</i>	0.058***	0.041***	0.614***	0.051
	0.000	0.004	0.000	0.795
<i>REFORM</i>	-0.002**	-0.004	-0.004***	-0.090
	0.036	0.189	0.000	0.116
<i>REFORM*DIVERGENCE</i>	-0.053***	-0.053***	-0.488***	0.029
	0.000	0.002	0.000	0.906
<i>CASHFLOW</i>	-0.007**	-0.001	-0.011	-0.029
	0.022	0.898	0.699	0.750
<i>TRA</i>	-0.009***	-0.013**	-0.119***	-0.261***
	0.000	0.014	0.000	0.000
<i>IO</i>	0.000**	0.000	0.006***	0.007*
	0.02	0.675	0.000	0.080
<i>PRICE</i>	0.001***	0.001***	0.009***	0.007***
	0.000	0.000	0.000	0.000
<i>SIZE</i>	-0.001**	-0.002*	-0.041***	-0.054***
	0.027	0.082	0.000	0.001
<i>RISK</i>	0.001	-0.0067	-0.165	-0.037
	0.963	0.198	0.346	0.959
<i>MRETURN</i>	-0.005***	-0.006***	-0.046***	-0.043**
	0.000	0.000	0.000	0.011
<i>MVOL</i>	0.002***	0.002	0.029***	0.079***
	0.009	0.302	0.000	0.003
<i>CONS</i>	-0.019	0.014	0.479**	-0.813
	0.448	0.803	0.043	0.291
<i>YEAR</i>	Yes	Yes	Yes	Yes
<i>INDUSTRY</i>	Yes	Yes	Yes	Yes
<i>OBS.</i>	1232	486	1232	486
<i>ADJ.R2</i>	0.312	0.355	0.395	0.155

Panel C. The effect of control-ownership divergence and NTS reform on liquidity in firms with poor and strong legal systems

var.	BAES		ADSC-GH	
	POORREGION	RICHREGION	POORREGION	RICHREGION
<i>DIVERGENCE</i>	0.093*** 0.000	0.021*** 0.005	0.365*** 0.000	0.436*** 0.007
<i>REFORM</i>	-0.004** 0.012	-0.001 0.525	-0.017** 0.016	-0.030 0.370
<i>REFORM*DIVERGENCE</i>	-0.089*** 0.000	-0.024*** 0.007	-0.318*** 0.003	-0.303 0.018
<i>CASHFLOW</i>	-0.007 0.131	-0.001 0.669	-0.013 0.663	-0.020 0.742
<i>TRA</i>	-0.016*** 0.000	-0.007*** 0.006	-0.101*** 0.000	-0.232*** 0.000
<i>IO</i>	0.001*** 0.002	0.000 0.485	0.005*** 0.000	0.009*** 0.000
<i>PRICE</i>	0.001*** 0.000	0.001*** 0.000	0.008*** 0.000	0.009*** 0.000
<i>SIZE</i>	-0.002*** 0.009	-0.001* 0.064	-0.038*** 0.000	-0.047*** 0.000
<i>RISK</i>	0.009 0.838	-0.015 0.373	-0.169*** 0.0300	0.026 0.966
<i>MRETURN</i>	-0.004*** 0.000	-0.007*** 0.000	-0.040*** 0.000	-0.050*** 0.000
<i>MVOL</i>	0.003** 0.019	0.002** 0.023	0.029*** 0.001	0.057*** 0.001
CONS	-0.011 0.766	-0.022 0.365	0.373 0.124	0.205 0.688
YEAR	Yes	Yes	Yes	Yes
INDUSTRY	Yes	Yes	Yes	Yes
OBS.	837	881	837	881
ADJ.R2	0.244	0.507	0.191	0.436

Table 6. The effect of control-ownership divergence and NTS reform on stock-price synchronicity

Var.	<i>SYNCH</i>					
	Full sample	Full sample	SOE	NON-SOE	POORREGION	RICHREGION
<i>DIVERGENCE</i>	0.184**	0.379**	1.003***	-0.242	0.707***	-0.124
	0.013	0.04	0.000	0.428	0.007	0.638
<i>REFORM</i>		-0.068*	-0.312***	-0.404***	-0.359***	-0.312***
		0.089	0.000	0.000	0.000	0.000
<i>REFORM*DIVERGENCE</i>		-0.298	-0.948***	0.169	-0.827**	0.331
		0.156	0.001	0.653	0.006	0.255
<i>CASHFLOW</i>	0.047	0.041	0.099	0.008	0.068	0.020
	0.497	0.466	0.247	0.953	0.503	0.834
<i>TRA</i>	0.004	0.003	0.028	0.147	0.080	0.067
	0.942	0.959	0.699	0.189	0.362	0.443
<i>IO</i>	-0.001	-0.001	-0.000	-0.007	-0.004	0.003
	0.606	0.637	0.930	0.325	0.259	0.291
<i>PRICE</i>	-0.011***	-0.011***	-0.012***	-0.009***	-0.012***	-0.010***
	0.000	0.000	0.000	0.000	0.000	0.000
<i>SIZE</i>	0.010	0.008	0.008	-0.004	-0.014	0.030*
	0.379	0.488	0.566	0.863	0.431	0.069
<i>RISK</i>	-3.509***	-3.480***	-2.489***	-8.025***	-2.470***	-7.378***
	0.000	0.000	0.000	0.000	0.000	0.000
<i>MRETURN</i>	-0.222***	-0.217***	-0.212***	-0.228***	-0.209***	-0.236***
	0.000	0.000	0.000	0.000	0.000	0.000
<i>MVOL</i>	0.195***	0.174***	0.181***	0.154***	0.186***	0.178***
	0.000	0.000	0.000	0.000	0.000	0.000
CONS	-5.860***	-5.246***	-5.408***	-4.618***	-5.157***	-5.670***
	0.000	0.000	0.000	0.000	0.000	0.000
YEAR	Yes	Yes	Yes	Yes	Yes	Yes
INDUSTRY	Yes	Yes	Yes	Yes	Yes	Yes
OBS.	1718	1718	1232	486	837	881
ADJ.R2	0.316	0.316	0.309	0.195	0.313	0.347

Variable definitions are detailed in Table 1; CONS is the constant for each regression; P-values are displayed below the coefficients; and *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

Table 7. The effect of control-ownership divergence (before the NTS reform) on change of stock liquidity after the NTS reform

Var.	$\Delta BAES$	$\Delta ADSC-GH$
<i>DIVERGENCE</i>	-0.036**	-0.174**
	0.026	0.037
<i>CASHFLOW</i>	0.013	0.278***
	0.172	0.008
<i>TRA</i>	0.006	0.360***
	0.507	0.002
<i>IO</i>	0.001	0.002
	0.124	0.470
<i>PRICE</i>	0.000***	-0.001
	0.005	0.365
<i>SIZE</i>	-0.002	0.021
	0.142	0.189
<i>RISK</i>	0.037	0.347
	0.288	0.364
<i>MRETURN</i>	0.004	0.286*
	0.807	0.088
<i>MVOL</i>	-0.006	-0.209
	0.643	0.16
CONS	0.212	5.032
	0.583	0.239
YEAR	Yes	Yes
INDUSTRY	Yes	Yes
OBS.	345	345
ADJ.R2	0.086	0.067

$\Delta BAES$ and $\Delta ADSC-GH$ represent the change in the bid-ask spread and adverse selection cost after the NTS reform, which equals the average $BAES$ and $ADSC-GH$ in the post-NTS reform period minus the average of the pre-NTS reform period. Variable definitions are detailed in Table 1; CONS is the constant for each regression; all independent variables are the average value during the pre-reform period; P-values are displayed below the coefficients; and *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

Table 8. The effect of control-ownership divergence on stock liquidity (low frequency)

Var.	<i>LNVL</i>	<i>TURNVER</i>	<i>LNILLIQ</i>	<i>LNVL</i>	<i>TURNVER</i>	<i>LNILLIQ</i>
<i>DIVERGENCE</i>	-0.933***	-0.012**	0.824***	-1.171***	-0.009	1.320***
	0.000	0.034	0.000	0.000	0.308	0.000
<i>REFORM</i>				0.250***	0.006***	-0.281***
				0.000	0.001	0.000
<i>REFORM* DIVERGENCE</i>				0.389**	0.004	-0.786**
				0.039	0.642	0.023
<i>CASHFLOW</i>	-0.573***	-0.003	0.473***	-0.577***	-0.003	0.484***
	0.000	0.313	0.000	0.000	0.337	0.000
<i>TRA</i>	0.728***	0.007***	-1.130***	0.732***	-0.007**	-1.133***
	0.000	0.009	0.000	0.000	0.011	0.000
<i>IO</i>	0.013***	0.001**	-0.013***	0.011***	0.000**	-0.012***
	0.001	0.012	0.001	0.002	0.017	0.004
<i>PRICE</i>	-0.017***	0.000*	0.023***	-0.017***	0.000*	0.023***
	0.000	0.069	0.000	0.000	0.091	0.000
<i>SIZE</i>	0.772***	-0.004***	-0.879***	0.768***	-0.004***	-0.876***
	0.000	0.000	0.000	0.000	0.000	0.000
<i>RISK</i>	3.195***	0.042**	7.643***	3.272***	0.044**	7.547***
	0.000	0.044	0.000	0.000	0.037	0.000
<i>MRETURN</i>	0.001	0.009***	-0.194***	0.033*	0.010***	-0.233***
	0.965	0.000	0.000	0.079	0.000	0.000
<i>MVOL</i>	0.568***	0.010***	-0.331***	0.456***	0.008***	-0.196***
	0.000	0.000	0.000	0.000	0.000	0.000
CONS	-16.356***	-0.178***	8.288***	-13.070***	-0.107***	4.343***
	0.000	0.000	0.000	0.000	0.000	0.000
YEAR	Yes	Yes	Yes	Yes	Yes	Yes
INDUSTRY	Yes	Yes	Yes	Yes	Yes	Yes
OBS.	1718	1718	1718	1718	1718	1718
ADJ.R2	0.853	0.405	0.816	0.855	0.408	0.820

Variable definitions are detailed in Table 1; CONS is the constant for each regression; P-values are displayed below the coefficients; and *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

Table 9. The effect of control-ownership divergence and NTS reform on stock liquidity of SOEs controlled by central and local governments

Var.	<i>BAES</i>		<i>ADSC-GH</i>	
	CENTRALSOE	LOCALSOE	CENTRALSOE	LOCALSOE
<i>DIVERGENCE</i>	-0.008	0.075***	0.110	0.683***
	0.313	0.000	0.334	0.000
<i>REFORM</i>	-0.001	0.001	-0.026	0.006***
	0.410	0.573	0.194	0.003
<i>REFORM* DIVERGENCE</i>	0.002	-0.071***	-0.073	-0.591***
	0.779	0.000	0.562	0.000
<i>CASHFLOW</i>	-0.000	-0.014***	0.037	-0.067*
	0.969	0.004	0.380	0.074
<i>TRA</i>	-0.008***	-0.015***	-0.109***	-0.244***
	0.000	0.000	0.001	0.000
<i>IO</i>	-0.000	0.000***	0.001	0.006***
	0.729	0.004	0.399	0.000
<i>PRICE</i>	0.001***	0.001***	0.011***	0.010***
	0.000	0.000	0.000	0.000
<i>SIZE</i>	-0.003***	-0.000	-0.043***	-0.043***
	0.000	0.914	0.000	0.000
<i>RISK</i>	0.114**	0.012	4.203***	-0.013
	0.015	0.576	0.000	0.951
<i>MRETURN</i>	-0.004***	-0.004***	-0.043***	-0.066***
	0.000	0.000	0.000	0.000
<i>MVOL</i>	0.001	0.001	-0.024**	0.025**
	0.248	0.556	0.032	0.017
CONS	0.045**	0.007	1.918***	0.733**
	0.040	0.823	0.000	0.016
YEAR	Yes	Yes	Yes	Yes
INDUSTRY	Yes	Yes	Yes	Yes
OBS.	350	881	350	881
ADJ.R2	0.630	0.275	0.544	0.332

‘CENTRALSOE’ and ‘LOCALSOE’ represent SOEs controlled by the central government and local governments respectively. Variable definitions are detailed in Table 1; CONS is the constant for each regression; P-values are displayed below the coefficients; and *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.