Powerful Subordinates: Internal Governance and Stock Market Liquidity

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This Draft: September 2013

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Abstract

Acharya, Myers, and Rajan (2011) develop a model of internal governance where subordinate managers may effectively monitor the CEO to maintain the future of the firm. Using a measure of internal governance based on the difference in horizons between a CEO and his subordinates, we show that firms with better internal governance are more liquid. We also show that internal governance is more effective in enhancing liquidity for firms with CEOs close to retirement, with experienced subordinate managers, and firms that require higher firm-specific skills. Our results are robust to inclusion of conventional governance measures, alternative model specifications, and different measures of internal monitoring and liquidity.

Keywords: Internal monitoring, Corporate governance, Subordinate managers, Liquidity.

JEL Classification: G30, G34, G39

* For helpful comments, we thank Marc Lipson, Alex Butler, Michael Shill, Mao Ye, Robert Van Ness, Syed Kamal, James Malm, Hyacinthe Y. Somé, as well as, participants of the finance seminars and conferences at the University of Memphis, 2013 European Financial Management Association meeting in Luxembourg, 2013 Midwest Finance Association meeting in Chicago, 2013 Eastern Finance Association meeting in Saint Pete Beach, and 2012 Southern Finance Association meeting in Charleston. We thank the Center of International Business Education and Research, Egyptian Cultural and Educational Bureau, and the Department of Finance, Insurance, and Real Estate at the University of Memphis for financial support. Any errors are authors' responsibility.

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1. Introduction

Despite the fact that corporate governance has received much attention in finance literature, it seems that we still have a long way to go to really understand the different mechanisms that can protect shareholders' rights. Much of empirical literature examines the impact of corporate governance (e.g., board structure, managerial compensation, charter provisions, legal/regulatory environments, and markets for corporate control) on firm performance, firm valuation, cost of capital, insider trading and stock market liquidity.[1] Particularly, with respect to the relationship between governance and liquidity, it has been shown that, improved financial and operational transparency, which mitigates management's ability to distort information disclosure, is a significant channel through which corporate governance affects liquidity (Faure-Grimaud and Gromb 2004; Leuz, Nanda and Wysocki 2003; Daske, Hail, Leuz and Verdi 2013; Chung, Elder and Kim 2010).[2] However, previous literature mostly ignores the role of stakeholders inside the firm as a governance mechanism. In this paper, we highlight the importance of internal governance by analyzing the effect of subordinate managers' effective monitoring of the CEO on stock market liquidity.

Acharya, Myers and Rajan (2011) define a corporation as a composition of diverse agents with different horizons, interests, and opportunities for misappropriation and growth. In such a structure, a younger subordinate manager is more likely to have the opportunity to succeed the CEO who is about to retire. This divergence of horizon between CEO and the subordinate

[1] See Shleifer and Vishny (1997), La Porta et al. (2000), Mitton (2002), Gompers, Ishii, and Metrick (2003), Bebchuk and Cohen (2005), Bebchuk, Cohen, and Ferrell (2005), Chi (2005), Ashbaugh, Collins, and LaFond (2006), Masulis, Wang, and Xie (2006), and Chung, Elder, and Kim (2010).

[2] Chung, Elder and Kim (2010) suggest that improving financial and operational transparency decreases information asymmetries between insiders and outside investors as well as among outside investors.

managers creates a bottom-up incentive mechanism, which is internal governance in the spirit of Acharya, Myers and Rajan (2011).[3] The power of younger subordinate managers comes from their ability to withdraw their contributions to the firm. Subordinate managers engage in firm-specific learning effort during their career path that helps them become more knowledgeable and productive to the firm. Such specific knowledge also provides subordinate managers with the ability of producing and disclosing reliable and accurate information, which increases the financial and operational transparency of the firm in the financial markets. This will in turn result in higher liquidity for the firm.

The relationship between corporate governance and stock market liquidity is not original to our paper. However, prior literature yields contradicting explanations. One stream of literature suggests that liquidity and governance are negatively related because poor governance increases the incentive of large shareholders to trade on inside information, resulting in higher information asymmetry or lower liquidity (Maug1998, 2002).[4] Another stream of literature argues for a positive correlation between liquidity and governance. Shareholders can vote with their feet through their trading behavior, even if they face barriers to voice (Admati and Pfleiderer, 2009; Edmans, 2009; Edmans and Manso 2010).[5] Using trading as a governance mechanism is desirable because it improves the value of the firm and leads to a more liquid trading (Edmans, 2009).

[3] A CEO is close to retirement has a short horizon and wants to extract the maximum possible rents. However, subordinate managers have a longer horizon and if they see that the CEO will leave nothing behind then they can withdraw their contributions to the firm. Acharya, Myers and Rajan (2011) find that about 80% of new CEOs are internally promoted.

[4] Coffee (1991) and Bhide (1993) suggest that poor monitoring leads to large shareholders exiting the market, leading to lower liquidity.

[5] The survey evidence of McCahery, Sauntner, and Starks (2010) finds that institutions use exit more frequently than any other governance mechanism, and Parrino, Sias and Starks (2003) document direct evidence of this channel. Examples of voice barriers are; diversification requirements, lack of expertise, conflicts of interests, small ownership and rarely succeed if they do (Armour et al., 2009; Yermack 2010; Del Guercio and Hawkins 1999).

We contribute to this debate by introducing internal governance mechanism which has not been studied in previous literature on the relationship between governance and liquidity.[6] This line of inquiry is highly connected to Chung, Elder and Kim (2010) which suggests that corporate governance through board, audit committee, charter, state laws, and managerial compensations affect stock market liquidity by improving financial and operational transparency.[7] We go a step further to examine whether the aspiring future CEOs, a group of the highest-ranking executives in an organization who are responsible for the daily operation of the company, can exert effective monitoring of a self-interested CEO. Internal governance is not the only form of corporate governance that may affect firm value and liquidity. However, if internal governance is highly effective, there may be less need to rely on other forms of governance such as board, analysts, and institutional ownership.

Measuring the level of internal governance empirically can be quite challenging. The essence of internal governance in Acharya, Myers and Rajan (2011) is linked to the difference in appropriation horizons between the CEO and his subordinates. In this paper, we use the mean relative age difference between the top subordinate managers' and the CEO as a proxy of the divergence in their horizons within the firm. Adjustments to the raw age difference are made to control for other factors that may affect the age difference. Using various liquidity measures, such as Gibbs estimate, percentage spread, and turnover, we find a consistent, positive relation between internal governance and stock market liquidity. Our results support the notion that

[6] Aggarwal et al., (2013) find a hump-shaped relation between internal governance and corporate investment as well as firm performance. In addition, Landier et al, (2012) finds that firms with a smaller fraction of independent executives exhibit a lower level of profitability and lower shareholder returns following large acquisitions.

[7] Chung, Elder and Kim (2010) suggest that Improving financial and operational transparency decreases information asymmetries between insiders and outside investors as well as among outside investors. Poor transparency insulates and impedes the ability of traders to discern the extent to which management can expropriate firm value through shirking, empire building, risk aversion, and prerequisites (Gompers, Ishii and Metrick 2003; Bebchuk, Cohen and Ferrell 2009). However, providing reliable and accurate information facilitates resource allocation decision and enforcement of contracts for investors.

subordinate managers, with longer horizon than the firm's CEO, are effective in monitoring the CEO and help increase operational and informational transparency of the firm. Their efforts lead to an increase in the liquidity, making the firm more attractive to investors.

We further document that internal governance is effective in improving the stock market liquidity for the firms with CEOs approaching their retirement. Our results are consistent with Acharya, Myers, and Rajan's (2011) conjecture that young subordinate managers are more effective in monitoring CEOs close to retirement. In addition, we show that internal governance is more effective in human capital intensive industries that require young subordinate managers to engage in industry and firm specific learning effort prior to their appointment for an executive position. Such firms and industry specific knowledge increases the importance and power of the subordinate manager and increases their influence on the CEO behavior. Finally, we find that experienced managers are more effective in exerting internal governance.

Our results are robust across different measures of internal governance, subsamples, measures of liquidity, and estimation methods. To avoid spurious correlations we control for other governance mechanisms (analysts following, institutional ownership, and the governance index compiled by Institutional Shareholder Service). Consistent with Chung, Elder and Kim (2010), we find that the level of institutional holding and governance index are significantly positively related to liquidity while the number of analysts following is negatively related to liquidity. Monitoring is costly and hence, any organizational structure that promotes internal governance would be very beneficial for the investors and will improve the efficiency of the capital markets.

2. Hypothesis development

Acharya, Myers and Rajan (2011) define a public corporation as a structure of people working together to maximize shareholders' residual claim. This structure separates firm management from firm control, and investment decision from risk bearing. The CEO makes the strategic decisions including the investment decisions, while the subordinate managers' are responsible for managing the daily operations of the firm.[8] On the other side, the board of directors is responsible for decision control while shareholders bear the risk. Hence, this public corporation management and ownership structure leads to the agency problem because of the conflict of interests between a firm's management and its stakeholders.

Effective corporate governance is one possible solution to this agency problem (Jensen and Meckling, 1976). However, defining "*effective corporate governance*" is a big challenge faced by practitioners and researchers. Corporate governance is not a predefined set of mechanisms or procedures that each firm has to follow, rather a set of puzzle pieces that all fit together to complete the governance picture. Corporate governance is comprised of different mechanisms to assure that the agents act for the benefits of stockholders and other stakeholders (Shlelifer and Vishny, 1997, La porta et al 2000, Gompers et al., 2003, and Cremers and Nair, 2005). In this paper we test the efficacy of internal governance mechanism, in addition to existing governance measures, in explaining the stock market liquidity.

2.1. Internal governance

Traditionally, the term "internal governance" has been used to describe different governance mechanisms such as board independence, audit committee independence,

[8] Graham, Harvey, and Puri (2013) suggest that managers, other than the CEO, perform important functions, especially in large and complex firms.

shareholders' activism and institutional holding.[9] However, Acharya, Myers, and Rajan (2011) depart from these conventional views by introducing internal governance based on partnership between the current CEO and his subordinates, who are the potential future CEO(s). The main distinction in their model is that they see the firm as a composition of diverse agents with different horizons, interests, and opportunities for misappropriation and growth.

A self-interested CEO may want to extract rent at the expense of the shareholders and other stakeholders. While the CEO is the top ranking executive within a firm's managerial hierarchy, he is not the single productive asset in the firm. The CEO needs the cooperation of his subordinates, in order to operate the firm. An older CEO has a shorter employment horizon than his younger subordinates in the firm. Younger subordinate managers have long-term interests in the firm's prospects, especially if they see a sufficient scope for career development within the firm (Prendergast, 1999). This divergence of horizons is the crux of internal governance. If subordinate managers see that the CEO will leave nothing behind, they are less motivated to exert effort and cash flow will fall significantly. To forestall such an outcome, incumbent CEO commits to invest now to preserve value for the future of his young subordinates in the firm.

The constraints that parties inside the firm impose on each other ensure that the firm can function and survive, even if outside governance is weak. Subordinate managers' power to withdraw their contributions to the firm forces the CEO to act in a more public-spirited and far-sighted manner. The importance of subordinate managers is not limited to contribution withdrawal, but also comes from their ability to produce and disclose reliable and accurate information about the prospects of the firm. This will increase the financial and operational transparency in the financial market, decrease the information asymmetry and hence enhance stock market liquidity. We test this argument by analyzing the following hypothesis:

[9] See Johnstone, Li, and Rupley (2011), Cremers and Nair (2005), and Chung, Elder and Kim (2010).

H1: There is a positive relationship between internal governance and stock market liquidity.

2.2. *Other governance mechanisms*

We extend our analysis to include other external and external/internal governance mechanisms that are established in the literature and are known to affect stock market liquidity.[10]

2.2.1. External governance

There are two widely accepted external corporate governance measures, institutional ownership and number of analysts following a firm. Chung and Zhang (2011) find that institutional investors prefer stocks of better-governed firms for fiduciary responsibilities, monitoring costs and liquidity reasons. A block holder participates in value increasing activities in proportion to his equity stake in a firm, a larger stake increases his benefit from higher firm value (Faure-Grimaud and Gromb, 2004) and alleviate the free-rider problem pervasive in firms with passive dispersed investors (Shleifer and Vishny, 1997). The recent literature suggest that the role of block holders not only add value through direct intervention, but also can improve the firm value through trading (McCahery, Sautner, and Starks, 2010, Admati and Pfleiderer, 2009, Edmans 2009, Edmans and Manso 2010). Edmans (2009) and Brockman and Yan (2009) argue that block holders increase the trading liquidity because they have more incentive to gather information, trade on private information, compete in trading profits, and hence reflect the true fundamental value of the firm and improve the stock market liquidity.

Analyst coverage has two competing effects on the corporate governance. The first perspective argues that the firms that are widely followed by analysts may be pressured to adopt better corporate governance which results in less information asymmetry and higher liquidity (Brennan, Jegadeesh, and Swaminathan, 1993; Brennan and Subrahmanyam, 1995; Lang, Lins

[10] In this paper, we define internal governance as the governance mechanism that works inside the managerial structure of the firm. Under this definition, we assume that other stakeholders outside the managerial structure, such as institutional investors, are external forces.

and Miller, 2004). Alternatively, analysts have incentive to build their own reputation to increase their compensation. Hence, they follow the stocks with greater information asymmetry among market participants or stocks with lower liquidity for which the marginal benefit of information production is the greatest (Chung, Elder, and Kim, 2010; Van Ness, Van Ness, and Warr, 2001; Chung, McInish, Wood, and Wyhowski, 1995).

2.2.2. External/Internal governance

Firm's charter, bylaws, and state laws can also play an important role in corporate governance. Gompers, Ishii, and Metrick (2003) (GIM) design an index primarily to capture anti-takeover provisions in a firm's charter, bylaws, and state law. However, Chung, Elder and Kim (2010) argue that the GIM governance metrics are not appropriate in understanding the effect of governance on liquidity. They propose a new governance index which captures governance standards related to the independence of the audit committee, independence and effective functioning of the board, executive and director compensation and ownership, provisions in the firm's charter and bylaws, and incorporated state provision. Chung, Elder, and Kim (2010) document a positive relationship between Gov-Index and stock market liquidity.

We analyze the following hypothesis to test if the internal governance improves a firm's liquidity beyond what is explained by the other governance mechanisms.

H2: There is a positive relationship between internal governance and stock market liquidity after controlling for other governance mechanisms.

2.3. CEO Horizon and Internal Governance

Gibbons and Murphy (1992) and Xu (2011) document that a CEO with a shorter remaining horizon within the firm loses incentives for focusing on the long term firm performance. Such myopic CEOs pass up investment in projects with positive long term payoffs in order to boost contemporaneous earnings (Stein, 1989), overinvest to signal that they have

investment opportunities (Bebchuk and Stole, 1993), or take excessive risk (Chevalier and Ellison, 1999). It is worth mentioning that such CEO's foolish behavior is also visible in practice. One such example is the Merck scandal. In last quarter of 2004, Merck had to pull Vioxx off the market due to concern linking Vioxx to increased risk for heart attack or stroke, resulting in the stock prices declining by 28%. Despite the firm's poor stock performance in 2004, Ray Gilmartin, the 64-Year-Old CEO, received not only his base salary but performance based bonuses worth $37.8 millions. Ray Gilmartin was scheduled to retire at the age of 65, ended up leaving his position 8 months prior to his mandatory retirement age.

Acharya, Myers, and Rajan (2011) suggest that the internal governance should be more effective for the firms with CEOs close to retirement. To this argument, we test the following hypothesis:

H3: Internal governance is more effective in improving liquidity for firms with shorter horizon CEOs.

2.4. Firm-specific learning and internal governance

Acharya, Myers, and Rajan (2011) conjecture that subordinate managers can be a reliable part of internal governance only if they have a stake in the future of the firm. This requires some firm-specific rents, which can come from some firm-specific ability or costs of leaving the firm. The absence of such rents for subordinate managers would make internal governance less effective.

In human capital intensive industries, managers are required to engage in industry and firm-specific learning efforts prior to their appointment for an executive position, which increases their importance, power, and influence on the CEO behavior. Pantzalis and Park (2009) rank Fama and French 48 industries based on excess value of human capital. For example, the pharmaceutical industry, a research-intensive and highly innovative industry that depends on

intellectual capital as a source of growth, scores the highest rank. Other top-ranked industries, such as, natural gas, real estate, financial services, precious metals, communication and energy, share similar characteristics. On the other extreme, the capital intensive industries, such as manufacturing industries, are less innovative and do not depend heavily on intellectual capital, and hence, are ranked in the bottom tier. We follow Pantzalis and Park (2009) rank of industries to test the following hypothesis:

H4: Internal governance is more effective in improving the stock market liquidity for firms that require greater firm specific skills and knowledge than other firms.

2.5. *Subordinate manager experience and internal governance*

Acharya, Myers and Rajan (2011) suggest that learning effort by subordinate managers' is very critical not only for the CEO promotion but also for effective monitoring. Consider a firm with a two-level managerial hierarchy: at the top of this hierarchy is a CEO who is approaching retirement, in the second layer is a younger subordinate manager who will become CEO next period. If the subordinate manager lacks the firm or industry needed experience he might not be considered for CEO promotion and hence he will not be motivated enough to monitor the CEO actions. Learning also helps the manager become more productive as CEO as it may be much harder to acquire the knowledge at the CEO level, where vendors and customers will be far more circumspect and the CEO's time more limited. Thus, we test the following hypothesis.

H5: Firms with more experienced managers, relative to the industry, are more liquid than the firms with less experienced managers.

2.6. Alternative industry-adjusted measure of Internal Governance

The composition of management teams depends on the nature of the industry. For example, industries in their infancy, such as computer software industry, would have companies with younger management teams and younger CEOs than mature or older industries.

Adjusting the internal governance measure to industry trends adds additional important insights to our study. Prior research has demonstrated that younger managers are associated with greater strategic change (Wiersema and Bantel, 1992), while older executives may be less willing to adapt to new ideas or behaviors (Bantel and Jackson, 1989). In addition, older executives may be at a stage in their careers where financial security is more important and risk-taking behaviors may be seen as a threat to that security (Wiersema and Bantel, 1992).

An extension to hypothesis 1 is to test if the higher internal governance as reflected by a positive industry adjusted age difference improves liquidity. We expect that firms with a higher age difference to have better internal governance than those with a lower age difference, relative to the industry. We test the following hypothesis.

H6: There is a positive relationship between industry adjusted internal governance and stock market liquidity.

3. Data and Methodology

Our sample includes 7 years of data for S&P 1500 firms for the period from 2001 to 2007. Standard & Poor's Execu-Comp database provides annual data for the top executives in S&P 1500 Index U.S. firms. The database includes data on CEO and subordinates managers' ages, appointment dates, dates for leaving the firm and other attributes. Following Acharya, Myers and Rajain (2011) we limit our sample to include only the top 4 subordinate managers, in addition to the CEO.[11] In calculating our internal governance measure, relative age difference, we include ages of all available top subordinates, up to 4 subordinates, for each firm. Stock prices, closing bid and ask prices, trading volume, and shares outstanding are derived from the Center for Research in Stock Prices (CRSP) database. Data on number of analyst following is extracted

[11] Acharya Myers and Rajan (2011) shows in Table II, that nearly 80% of new CEOs are appointed from the top four executives in the firm in the previous year (top four because one of the top five in the previous year is typically the old CEO). Some firms in our sample have less than four subordinate managers.

from the Institutional Brokers' Estimate System (I/B/E/S) dataset. Data on institutional holdings is collected from the 13F fillings summarized in the CDA/Spectrum database. Using Institutional Shareholder Service (ISS) database, we extend Chung, Elder, and Kim (2010) Gov-Index beyond their sample period of 2001 to 2004, to cover the period from 2001 to 2007. Gov-Index includes 24 governance standards across six categories that are most closely related to financial/operational transparency and investor protection using the Institutional Shareholders services (ISS) database.[12] Finally, we obtain financial and accounting data such as total assets, intangible assets, dividend, and R&D expenditure from Compustat database.

The trading data included some trades with zero trading prices and bid and ask quotes for the locked and crossed markets (bid price less than/equal to ask price). These observations are removed from the final sample. We also apply the following data filters, which are standard in microstructure literature (Huang and Stoll, 1996) to clean the data errors and outliers. We delete 1) quotes if either bid/ask is negative, 2) if quote changes by more than 10% compared to the last quote, 3) stocks with average annual price less than $5 and greater than $500, and 4) stocks that are not included in SP 1500 index, Compustat, Center for Research in Security Prices (CRSP), CDA/Spectrum, I/B/E/S, or the ISS database. The variables used in this study and their sources are summarized in Appendix A.

3.1 Internal governance measure

A crucial parameter of internal governance in Acharya, Myers and Rajan (2011) model, is the difference in appropriation horizons between the CEO and his subordinates. Prior literature commonly uses age as a proxy for employment horizon (Brickley et al. 1999, Gibbons and Murphy 1992, Dechow and Sloan 1991, Matejka et al, 2009). Tenure in the firm is an alternative

[12] Similar to Brown and Caylor (2006), Chung, Elder and Kim (2010) create their index (Gov-Index) for each firm by awarding one point for each governance standard that is met.

way to proxy horizon but it has three major problems. First, it reflects only the past horizon and may not infer anything about the executives' expected future horizon. Second, it ignores any executive experience outside the current firm. Third, it ignores the cumulative learning and experience of executive beyond their executive position. Age, as a proxy of the horizon within the firm, can circumvent these concerns. Hence, we use the average relative age differences between the CEO and other top four executives as a proxy for the difference in horizons within the firm and thus, the level of internal governance. Our internal governance measure is calculated as follows.

$$Internal\ Governance = CEO's\ Age_{i.t} - Subordinate\ Managers'\ Age_{i,t} \quad (1)$$

where $CEOAge_{i.t}$is the age of CEO and $SubordinateManagers'Age_{i,t}$ is the mean age of the top four subordinate managers for firm *i* at year *t*. The use of relative age difference instead of the original ages, rules out the possibility that this measure may proxy other attributes of CEO or subordinates such as; sophistication, risk taking, education, or experience.[13]

3.1.1 Subordinate Managers' Experience

To test hypothesis 5, we need to empirically measure subordinate manegers' experience level. Antia, Pantzalis and Park (2010) devise a measure of expected CEO decision horizon based on a combination of CEO tenure and age relative to the industry. We use their measure as a proxy for the relative experience of subordinate managers' in each firm to their peers in the same industry. As subordinate managers' knowledge and experience increase at firm and industry levels, their ability to make an effective internal monitoring also increases. The comparison with the other subordinate managers is done on two dimensions; the length of current tenure and age. The measure of subordinate managers' experience is defined as follows

[13] Raw age can be directly related to risk aversion, education, or experience but the age difference between CEO and subordinates controls for the individual attributes (See, Ang, Cole and Lawson, 2010; Lundstrom, 2002).

$$Subordinate\ Managers'Experience$$

$$= \left[Tenure_{i,t} - Tenure_{ind,t}\right] + \left[Age_{i,t} - Age_{ind,t}\right] \quad (2)$$

where $Tenure_{i,t}$, is the number of years that a subordinate manager has been within firm and $Age_{i,t}$ is the age of the subordinate manager who work for firms *i* in *year t*. $Tenure_{ind,t}$ is the industry median of tenure and $Age_{ind,t}$ is the industry median of subordinate managers' ages. Industry classification is defined based on the Fama-French 48 industry classification. Given that the above measure is an industry-adjusted measure, it can take either positive or negative values. A positive value indicates that the subordinate manager's expected experience is more than the industry median either because the subordinate manager is older than the median age of other subordinate managers in the same industry and/or has been in his/her current position as long as or more than the industry median. Similarly, a negative value indicates that the expected experience is less than the industry median because the subordinate manager is younger and/or been in his/her position for shorter period of time than the median competitor firm's subordinate managers.

3.1.2 Industry Adjusted Age Difference

To account for the differences of team composition among the different industries, we develop industry-adjusted measure of internal governance. The industry-adjusted measure of internal governance is calculated as follows.

$$Industry\ adjusted\ age\ difference$$

$$= Firm\ level\ age\ difference_{i,t} - Industry\ level\ age\ difference_{\ t} \quad (3)$$

A positive (negative) value indicates that the relative age difference between the CEO and his subordinates' managers for a firm is greater (less) than the industry average.

3.2 Liquidity Measures

Kyle (1985) notes that ‘‘liquidity is a slippery and elusive concept, in part because it encompasses a number of transactional properties of markets, these include tightness, depth, and resiliency.’’ Empirical liquidity measures span from direct trading costs (tightness) measured by spreads, to indirect trading costs measured by price impact. The literature provides a variety of measures and proxies to estimate liquidity. We use three different measures of liquidity: Gibbs estimate proposed by Hasbrouck (2009), the percentage spread, and share turnover. Gibbs estimate and percentage spread are inverse measures of liquidity while turnover is a direct measure of liquidity.

3.1.1 Gibbs Estimate

Roll (1984) proposes a method to estimate bid-ask spreads from the time series of daily price changes. Specifically, he notes that positive spreads will induce negative serial correlation in transaction price changes and that spreads can be estimated from that serial correlation. One of the limitations of the measure is that estimates of spreads are negative when stock price changes are positively correlated. Hence, we use an updated Gibbs estimate measure, developed by Hasbrouck (2009) that addresses this econometric problem with the Roll's measure.[14]

3.1.2 Percentage Spread

Percentage spread is commonly measured as the difference between the best ask quote and the best bid quote as a proportion of the bid-ask midpoint.

$$Percentage - Spread_{i,t} = \frac{Ask_{i,t} - Bid_{i,t}}{(Ask_{i,t} + Bid_{i,t})/2} \quad (4)$$

where $Ask_{i,t}$ is the closing ask price and $Bid_{i,t}$ is the closing bid price for stock *i* for day *t*.

[14] Gibbs estimate of the Roll's (1984) measure is available at Joel Hasbrouck's website: http://people.stern.nyu.edu/jhasbrou/.

3.1.3 Turnover

Turnover is the daily volume as a proportion of shares outstanding. We use the firm-year average of this measure. Since volume on NASDAQ is known to be overstated as a result of trades between dealers, following Atkins and Dyl (1997) and Lipson and Mortal (2009), we divide volume on NASDAQ-listed firms by 2 to get to an adjusted turnover measure.

$$Turnover_{i,t} = \frac{Daily\ Volume_{i,t}}{Shares\ Outstanding_{i,t}} \quad (5)$$

3.2. Control Variables

Level of monitoring and our measures of market liquidity could be spuriously correlated because they are related to a common set of variables. Including the variables that are related to both level of monitoring and market liquidity in a regression model can reduce the possibility of spurious correlation. For example, Chung and Zhang (2011) and Chung, Elder, and Kim (2010) document that the larger firms may simultaneously exhibit better governance structure due to higher investor interest and lower spreads due to smaller adverse selection risks (e.g., more information is available on larger firms). We include the following control variables: closing price, research and development expenses, firm size, trading volume, return volatility, intangible assets, dividend per share, and return on S&P 500 index. We provide further details on these variables in the later sections.

4. Empirical Results

4.1. Descriptive Results

Table 1 reports the descriptive statistics for the key variables included in our study. The CEO's age is available for 7694 observations and subordinate managers' age is available for 7556 observations for the period from 2001 to 2007. In Table (1) we include statistics about CEO and subordinate managers only for firms that have at least one liquidity measure. The mean CEO age

of 54.63 years is comparable to the mean age reported by Acharya, Myers and Rajan (2011).[15] The youngest CEO in our sample is 32 years old, while the oldest is 92 years old. The mean age for the top four subordinate managers' is 50.6 years; the youngest being 29.33 years old while the oldest is 81 years old. The mean relative age difference between the top 4 subordinate managers' ages and the CEO's age is 4 years. The distribution of relative age difference ranges from firms with subordinate managers older than the CEO by 25 years, to firms with a CEO older than his subordinate managers by 39.25 years. Table 1 further reports an average Gov-Index of 12.49, indicating that, on average, the sample firms meet approximately half of the governance standards.[16] In addition, we find that our sample firms have, on average, 68% institutional ownership and 10.85 analysts following their stocks. Table 1 also shows that the means of Gibbs estimate, percentage spread, and turnover are 0.31%, 0.36%, and 7.39%, respectively. Descriptive statistics for the control variables are also reported in Table 1.

Insert Table (1)

4.2. Liquidity and internal governance

We regress percentage spread, Gibbs estimate, and turnover, on various levels of monitoring and a number of control variables using annual pooled cross-sectional and time-series data. Including the variables that are related to both level of monitoring and market liquidity in the regression model reduces the possibility that any estimated relation between level of monitoring and market liquidity is spurious. Previous studies show that a significant portion of cross-sectional and time-series variation in liquidity can be explained by select stock attributes (see McInish and Wood, 1992; Chung, Van Ness, and Van Ness, 1999; and Stoll, 2000). To

[15] Acharya, Myers and Rajan (2011) provide the distribution of CEO and Subordinated managers' ages in Table 1 over the period of 1992- 2008. They report a mean CEO age of 55.6 years, a mean subordinated managers' age of 51.6 years, and the mean age difference of 4 years.

[16] Chung, Elder and Kim (2010) reports that the average Gov-Index is 11.49 for their sample firms, the minimum is 3 while the maximum is 20.

isolate the effect of internal governance on liquidity, we control for stock's average daily closing price (in logarithm), return volatility, dollar trading volume (in logarithm), and dividend per share. S&P 500 return is included to control for the market conditions in the regression model.

Previous research shows that firm size can be positively correlated with both better governance and lower liquidity. To examine whether corporate governance has an independent, direct impact on liquidity, we control for firm size (as measured by the book value of total assets) in the regression model. Further, we control for asset tangibility and R&D expenditure. Asset tangibility could reduce asymmetric information as payoffs on tangible assets' are easier to observe. In contrast, high R&D intensity may increase asymmetric information problems because payoffs from R&D are difficult to predict. Based on these considerations, we estimate the following regression model.

$$\begin{aligned} &\textit{Percentage Spread}_{i,t}\textit{,or Gibbs estimate}_{i,t}\textit{ or Turnover}_{i,t} \\ &=\beta_0 + \beta_1 \textit{Internal Governance}_{i,t} + \beta_2\, \textit{Other Governance}_{i,t} + \beta_3 \textit{Log(Closing Price}_{i,t}\textit{)} + \beta_4\, \textit{R\&D} \\ &\textit{Expenditure}_{i,t} + \beta_5\, \textit{Total Assets}_{i,t} + \beta_6\, \textit{Log(Dollar Volume}_{i,t}\textit{)} + \beta_7\, \textit{Volatility}_{i,t} + \beta_8\, \textit{Intangible} \\ &\textit{Asset}_{i,t} + \beta_9\, \textit{Dividend per share}_{i,t} + \beta_{10}\, \textit{SP500 Return}_{i,t} + \varepsilon_{i,t}; \end{aligned} \tag{6}$$

where $\textit{Percentage Spread}_{i,t}$ is the proportionate quoted spread, *Gibbs estimate is* a measure of effective cost calculated using Gibb's sampler, $\textit{Turnover}_{i,t}$ is average daily volume as a proportion of shares outstanding, $\textit{Internal Governance}_{i,t}$ is measured as the average relative age differences between the CEO and other top four executives, $\textit{Other Governance}_{i,t}$ includes internal/external governance (Gov-Index), and external governance (institutional ownership and analysts following), $\textit{Closing Price}_{i,t}$ is the mean daily stock price, $\textit{R\&D Expenditure}_{i,t}$ is a firm's annual expenditure on research and development activities, $\textit{Total Assets}_{i,t}$ is the book value of a firm's total assets, $\textit{Dollar Volume}_{i,t}$ is the mean daily dollar trading volume, $\textit{Volatility}_{i,t}$ is the

standard deviation of daily returns, $Intangible\ Assets_{i,t}$ is the book value of total intangible assets, $Dividend\ per\ share_{i,t}$ is the dividend paid per share, *SP 500 Return* is the daily return on S&P index, and $\varepsilon_{i,t}$ is the error term. The subscripts *i* and *t* refers to stock *i* and year *t*. We calculate t-statistics using White's (1980) standard errors and report them in parentheses.

Insert Table 2

Table 2 summarizes our main results from the regression analysis. We use three different model specifications to analyze the relationship between liquidity and internal governance. The first model uses internal governance, measured by the relative age difference, as the sole level of monitoring. The second model adds the external governance as the additional level of monitoring, and the final model accumulates the total effect of the three levels of governance. The results show that the coefficients on relative age difference are negative and statistically significant for both the Gibbs estimate and percentage spread, and positive and statistically significant for turnover. Hence, firms with higher age difference between top subordinate managers and CEO (or a higher divergence of appropriation horizons) are more liquid. These results emphasize the importance of subordinate managers in internal corporate governance. Subordinate managers have a longer horizon in the firm than the CEO, and thus they exert more monitoring effort on the incumbent CEO. In addition, they are motivated enough to provide more reliable and accurate information to the financial market to keep the firm liquid and attractive to stock market investors. These results support Hypothesis 1 and are consistent with Acharya, Myers and Rajan's (2011) theoretical model.

Consistent with previous studies, we also find that liquidity is significantly and positively related to closing price, asset tangibility, return volatility, and dollar volume (McInish and Wood, 1992; Chung, Van Ness, and Van Ness, 1999; and Stoll, 2000). Further we find that

liquidity is negatively related to R&D expenditures, volatility, and dividends. Our results are consistent with the findings of Chung, Elder and Kim (2010) in the sense that a higher R&D expenditure may increase asymmetric information, because payoffs from R&D expenditures are difficult to predict, resulting in lower liquidity. Our results also support the findings of Banerjee, Gatchev, and Spindt (2007) that owners of more (less) liquid common stocks are less (more) likely to receive dividend. They suggest that cash dividends reduce investor dependence on the liquidity of the market, and hence, liquidity and dividends are negatively related.

In the second model we add the two measures of external governance: the institutional ownership and the number of analysts following. We find that the coefficient for institutional ownership is negative and statistically significant for percentage spread and positive and statistically significant for turnover. These results are consistent with Chung and Zhang (2011) and Chung, Elder and Kim (2010). The institutional investors provide effective monitoring for the corporate managers and thus reduce the information asymmetry, between insider and liquidity providers, resulting in an increase in liquidity.

Further we find a significant and negative relationship between liquidity and number of analysts following. One possible interpretation is that analysts have incentives to build their own reputation by following firms with a greater information asymmetry. These results are consistent with the findings of Chung, McInish, Wood, and Wyhowski (1995) and Chung, Elder and Kim (2010).

For our final model, we run a pooled regression by including all three layers of monitoring in one regression equation. We find that the coefficient for Gov-Index is significantly positive for Turnover and significantly negative for Gibb's C-estimate and percentage spread. These results are in line with the conjecture that better governance leads to higher stock market

liquidity. More importantly, our measure of internal monitoring, relative age difference between CEO and subordinate managers, is still significant and positively related to liquidity, even after controlling for the other levels of corporate governance. These results support Hypothesis 2 and document that internal governance significantly positively impacts stock market liquidity beyond the traditional governance measures.

4.3. Internal governance for firms with older vs. younger CEOs

Acharya, Myers and Rajan (2011) argue that subordinate managers are important stakeholders in the firm, who care about their future. They suggest that control need not to be exerted just from top-down (CEO to subordinates managers), or from outside the firm, it can also be exerted bottom-up (from subordinated managers to CEO). However, the internal governance works effectively *only* when there is real divergence between CEO's and the managers' appropriation horizon. Gibbons and Murphy (1992) and Xu (2011) document that a CEO with a shorter remaining horizon within the firm loses incentives for focusing on the long-term firm performance. Pass up positive long term payoffs investment opportunities (Stein, 1989), overinvest to signal that they have investment opportunities (Bebchuk and Stole, 1993) and take excessive risk (Chevalier and Ellison, 1999) are among the common behaviors of a nearsighted CEO.

To investigate the effectiveness of internal governance and the role of subordinate managers when a firm has a CEO close to retirement, we construct two subsamples: firms with CEOs above the mean CEO age (55 years old) and firms with CEOs with less than 55 years old.[17] Table 3 Panel A presents summary statistics of CEOs' and subordinate managers' ages for the two subsamples. CEO above 55 years old subsample's statistics show that the mean CEO age is 59.90 years, while his subordinates have a mean age of 51.71 years. The mean relative age

[17] We choose both mean and median CEO age (55 year old) as a cutoff.

difference is 7.91 years which indicates that there is a big difference in horizon between CEOs and their respective subordinates. On the contrary we find that the subsample with CEO less than 55 years old has no meaningful difference between CEO's age and subordinates managers' age. These findings are consistent with the conjecture that subordinates managers have a longer horizon relative to the CEO, which in turn motivates them to exert higher degree of internal governance and keep the firm attractive to capital market investors.

Our summary statistics are supported with the regression results reported in Table 3 Panel B. The regression results show that the coefficients of relative age difference, our measure of internal governance, are statistically significant for firms with CEOs above 55 years of age. However, the coefficients of internal governance measure in second subsample, firms with CEO below 55 years old, are statistically insignificant. All other layers of corporate governance are still significant and have the correct signs in both subsamples. These results support our Hypothesis 3 that the internal governance mechanism is effective when the remaining horizon of a CEO is short and subordinate managers have a longer horizon relative to the CEO.

Insert Table 3

4.4. Internal governance for firms that require firm specific skills

Another key component for the effectiveness of internal governance is the level of firm-specific learning or effort the manager needs prior to becoming a CEO (Acharya, Myers, and Rajan, 2011). To test the third hypothesis, we adopt Pantzalis and Park (2009) excess value of human capital industrial rank to differentiate between industries that require intensive human capital and those that mainly depend on non- human capital. We construct two subsamples of 24 industries each. The industry classification is based on Fama and French (1997) 48-industry listing. Table 4, Panel A reports the summary statistics for both the subsamples. For the top 24

human capital value industries, we find that the average of CEO's age, subordinate managers' age, and relative age difference are 54.36 years, 50.56 years, and 3.67 years, respectively. Interestingly, we find a similar pattern for bottom 24 human capital value industries with average of CEO's age of 55.15 years, subordinate managers' age of 50.92 years, and relative age difference of 3.84 years.

Table 4, Panel B reports the results from regression analysis for the two subsamples of firms divided based on the value of human capital. We find a positive and statistically significant relation between liquidity and relative age difference only for firms in industries that have higher excess value of human capital. These results suggest that internal governance not only depends on the difference of horizon between the CEO and his subordinates, but also on the nature of the job and the relative power of both the CEO and the subordinate managers within the firm. Hence, internal governance is only effective for firms that require firm specific skills, which restricts the mobility of employees across industries. These results support our Hypothesis 4.

Insert Table 4

4.5. Subordinate manager experience and internal governance

If the subordinate manager lacks the firm or industry needed experience he might not be considered for CEO promotion and hence he may not be motivated enough to monitor the CEO's actions. We use the measure developed by Antia, Pantzalis and Park (2010), and described in equation 2, to proxy the relative experience of subordinate managers in each firm relative to their peers in the same industry. As subordinate managers' knowledge and experience increase at the firm and the industry levels, their ability to make an effective internal monitoring also increases (Acharya, Myers and Rajan 2011). The comparison with other subordinate managers is conducted on two dimensions: the length of current tenure and age. The tenure reflects the firm-

specific experience and knowledge, while the age reflects the accumulated experience beyond the executive position and outside the firm.

Table 5, Panel A reports that experienced subordinate managers have a mean age of 51.7 years, compared to 49.9 year for inexperienced managers. The relative age difference of experienced managers is 2.55 years compared to 4.19 years for inexperienced subordinate managers' sub-sample. Although experienced managers have shorter horizon than inexperienced managers, we expect to find that managers with more cumulative experience are capable of imposing better governance. These results support our argument that age reflects the accumulated experience of subordinate managers outside the firms and beyond executive positions. Table 5, Panel B reports the regression results. We find that firms with more experienced subordinate managers are capable of implementing more effective internal monitoring than those who have subordinate managers with less experience than their industry peers. The coefficients of internal governance measure are significant only for the experienced managers' subsample. These results support Hypothesis 4. Despite the fact that the summary statistics show that inexperienced subordinate managers have higher relative age difference, the regression results shows that internal governance is only effective with experienced subordinate managers. These results highlight the importance of the accumulated experience for effective internal monitoring.

Insert Table 5

4.6. Alternative Internal Governance Measure: Industry Adjusted Age Difference

The nature of the industry maps the demographic attributes of its top management teams. Mature industries might have older top management team compared to industries in their infancy, such as internet and software industries. Emerging industries also might have CEOs

who has the same age as his subordinates. To account for variations in the top management team across different industries, we devise industry adjusted age difference measure of internal governance as described in equation 3.

Table 6 reports the result of regression analysis to rule out the possibility that our results are driven by industry variations. We find that the coefficients of industry adjusted internal governance measures are significantly negative for Gibbs estimate and percentage spread and significantly positive for turnover. These results are in line with the conjuncture that better internal governance leads to higher stock market liquidity and are consistent with results summarized in Table 2.

Insert Table 6

4.7. Positive vs. Negative Industry adjusted age difference

To further understand the relationship between the internal governance and stock market liquidity, we investigate if internal governance improves liquidity by dividing our sample into two subsamples of firms with positive and negative industry adjusted age differences. A positive (negative) value indicates that the relative age difference between the CEO and his subordinates for a given firm is greater than the industry relative age difference. Table 7, Panel A reports the descriptive statistics for both subsamples. For positive industry adjusted age difference subsample, we find that the average CEO's age is 58.01years and the average of subordinate managers' age is 49.23 years. The average of age difference between the CEO and his subordinates is almost 9 years, while the industry adjusted age difference is 5.25 years. On the other hand, the negative industry adjusted age difference subsample has mean CEO age of 51.38 years and the mean subordinate managers' age of 52.07 years. The average of age difference

between the CEO and his subordinates is -1.35 years, while the industry adjusted age difference is -5.11 years.

Table 7, Panel B summarizes the regression results for positive and negative industry adjusted age difference subsamples. We find that only the firms with a positive age difference relative to operating industry have significant coefficients of internal governance as measured by the industry adjusted age difference. The coefficients of industry adjusted measure for both Gibbs estimate and percentage quoted spread are negative and statistically significant. Also the coefficient of internal governance for turnover is positive and statistically significant. These results are consistent with our earlier findings that firms with internal governance are more liquid. However, for the firms with negative industry adjusted age difference, the level of internal governance does not significantly influence the liquidity. It is noteworthy to mention that other governance mechanisms are still significant for negative industry adjusted age subsample. These results suggest the complementary relationship between internal governance and other governance mechanisms.

Insert Table 7

5. Additional Analyses

5.1. Internal Governance and Information Content

In this paper, we conjecture that internal governance affects liquidity because better internal governance improves operational and financial transparency and decreases the information asymmetry in the financial market. Subordinate managers, with the ability to produce more reliable information for the market, can actively reduce the information asymmetry and hence improve the liquidity for the firm. To assess the extent to which internal governance is associated with the information contents of prices, we follow Jiang, Xu and Yao

(2009) and use the return idiosyncratic volatility of the firm as a proxy the information content of prices.

A growing body of literature supports the use of firm-specific return variation as a measure of stock price informativeness. French and Roll (1986) and Roll (1988) show that significant portion of return variation is not explained by market movement. They suggest that firm specific stock return variation measures the rate of private trading information incorporated into prices. Morck, Yeung and Yu (2000) find that stocks in countries with stronger property rights promote informed arbitrage, which capitalizes firm specific information and increase idiosyncratic return volatility. Durnev, Morck, Yeng and Zarowin (2003) find that U.S. industries with high levels of firm-specific return variation have stock prices that are more informative about future earnings. Along the same line of literature, Jiang, Xu and Yao (2009) further document that the predictive power of idiosyncratic volatility is induced by its information content about future earnings.

We estimate a stock's idiosyncratic volatility in each year from daily CRSP data using two different market models. The first estimation method use S&P 500 return as the sole market factor. While the second model uses the Fama and French (1993) three-factor model. To be specific, idiosyncratic volatility, IVOL, is the standard deviation of the residuals ($\varepsilon_{i,t}$) from the following regression models:

$$RET_{i,t} = \alpha + \beta_1 MKT_t + \beta_2 HML_t + \beta_3 SMB_t + \varepsilon_{i,t} \quad (7)$$

where $RET_{i,t}$ is the return for stock i at year t, MKT_t market return at period t (using either the S&P 500 market return or Fama-French market factor) and HML and SMB are the daily Fama-French book-to-market and size factors[18].

[18] The daily and monthly Fama and French factors used in our analysis are obtained from Ken French's Web site.

Table 8 shows that the internal governance, measured by the average relative age differences between the CEO and other top executives, is positively related to the information content of prices. The positive relationship between the internal governance and idiosyncratic volatility reveals that younger subordinate managers can enhance the amount of information available for outside investors and hence reduce the information asymmetry between insiders and outsiders. Our results are consistent with Chung, Kim, Elder (2010) that corporate governance enhance the stock market liquidity through improving the operational and financial transparency and hence reduce the information asymmetry between insider and outsiders.

5.2. Concentrated ownership (family firms)

Acharya, Myers, and Rajan's (2011) model assumes that the CEO and subordinate managers have divergent horizons in the firm. If the CEO has a shorter horizon, he may divert cash out of the firm, consume perks, or convert cash to leisure by shirking, leaving nothing behind him. However, the difference in horizon and inefficient use of resources may not be relevant to firms that owned and managed by family members. In family controlled firms, the CEO and his subordinates, presumably, share the same objectives and do not have the divergent misappropriation horizon problem. As we have no access to data on family ownership, we use the ownership concentration of the top executive in the firm as a proxy for family controlled firms. Untabulated results indicate that internal governance is not effective in enhancing stock market liquidity for firms with executive ownership greater than 10 percent. However, the relationship between stock market liquidity and internal governance is statistically significant for the rest of the sample.[19] This lends support to the assertion that internal governance, as a monitoring mechanism, is less critical to mitigate agency problems when CEO and firm's interests are aligned.

[19] Our results are robust to alternative cutoffs for executive ownership such as 15% and 30%.

5.3. Econometric Issues

Although we find that the internal governance and the other layers of monitoring are positively related to stock market liquidity, the OLS regressions may not fully account for the potential endogeneity and reversed causality in the sample. Modeling the relationship between governance and stock market liquidity may be problematic if there is an endogenous feedback from stock market liquidity to different levels of governance because liquidity and governance are jointly determined. Prior studies suggest that the causality between governance and liquidity is more likely to be influenced by the firm characteristics and ownership structure (Stoll, 2000, Banerjee, Gatchev, and Spindt 2007, Lipson and Mortal 2009). We do not believe that liquidity can affect the relative age difference between the CEO and his subordinates. Hence, the main result of this paper should not have any serious endogeneity issues. We verify this by performing Granger causality test. In results not reported, we confirm that liquidity does not Granger-cause our measure of internal governance.

5.4 *Fixed Effect Estimation*

In this section, we check for the robustness of our results with respect to different estimation methods. In order to improve estimation efficiency, we analyze the relationship between stock market liquidity and the different levels of monitoring using industry fixed effect and year fixed effects. These fixed effects control for the industry's specific characteristics and time trends that are not captured by other control variables. Results reported in Table 9 indicate that the positive relationship between internal governance and liquidity is robust to the alternate model specifications.

Insert Table 9

Conclusion

We examine the impact of internal governance on the stock market liquidity of S&P 1500 firms. Acharya, Myers, and Rajan (2011) introduce a new definition of internal governance based on partnership between the current CEO and his subordinates, who are the potential future CEOs. In order to protect their future in the firm, subordinate managers can effectively exert internal governance to assure that the CEO makes firm value maximizing decisions.

To empirically test the theoretical proposition of Acharya, Myers, and Rajan (2011), we devise a new measure of internal corporate governance that captures the divergence of appropriation horizons between the current CEO and his subordinate managers. We proxy this divergence of horizons by the mean relative age difference between the top four subordinate managers' ages and the CEO's age. Using various, well established measures of liquidity, such as Gibbs estimate, percentage spread, and turnover, we document that firms with a larger divergence of appropriation horizons are more liquid. We further show that internal monitoring is more effective for firms with CEOs with relatively shorter horizon, firms with more experienced subordinate managers, and firms that require a higher degree of firm specific knowledge and skills.

We also study whether the importance of internal governance on liquidity remains when other governance measures are included in the analysis. We use two widely accepted external corporate governance measures, institutional ownership and number of analysts following a firm to proxy the external governance mechanisms. Our results are consistent with Chung and Zhang (2011) who find that institutional investors prefer stocks of better-governed firms for liquidity reasons. We find that analysts follow stocks with lower liquidity, as suggested by earlier literature (Chung, Elder, and Kim, 2010; Van Ness, Van Ness, and Warr, 2001; Chung, McInish,

Wood, and Wyhowski, 1995). Further, our result of a positive relationship between governance index and stock market liquidity is consistent with Chung, Elder, and Kim (2010). In sum, internal governance is positively correlated with liquidity and our results are robust to inclusion of conventional governance measures, alternative model specifications, and different measures of internal monitoring and liquidity.

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Table 1
Descriptive Statistics

We present summary statistics for the sample firms for the period from 1 January 2001 to 31 December 2007. *CEO Age* is the sample firm CEO's present age, *Subordinate Manager Age* is the mean age of the top 4 subordinate managers, *Relative Age Difference* is the difference between *CEO Age* and *Subordinate Manager Age*, *Gov-Index* is the governance index, *Institutional Ownership* is the proportion of outstanding stocks held by institutions, *Number of Analysts* is the mean number of analysts following a firm, *Gibbs estimate* is a measure of effective cost calculated using Gibb's sampler, *Percentage Spread* is the percent quoted spread, *Turnover* is average daily volume divided by total shares outstanding, *Closing Price* is the mean daily stock price at the market close, *Volatility* is the standard deviation of daily returns, *Dollar Volume* is the mean daily dollar trading volume, *Total Assets* is the book value of a firm's total assets, *Intangible Assets* is the book value of total intangible assets, *R&D Expenditure* is a firm's annual expenditure on research and development activities, *Dividend Per Share* is the dividend per year, and *Market Return* is the daily return on S&P index.

Variable	N	Mean	Standard Deviation	Minimum	Maximum
Internal Monitoring					
CEO Age	6539	54.63	6.42	32.00	92.00
Subordinate Managers' Age	6539	50.63	4.62	29.33	81.00
Relative Age Difference	6539	4.00	6.79	-25.00	39.25
Internal/ External Monitoring					
Gov-Index	4579	12.49	2.86	3.00	21.00
External Monitoring					
Institutional Ownership	5547	0.68	0.19	0.00	1.00
Number of Analysts	6494	10.85	6.57	1.00	32.00
Liquidity Measures					
Gibbs estimate (%)	5688	0.31	0.20	0.02	3.31
Percentage Spread (%)	6539	0.36	0.56	0.02	6.78
Turnover (%)	6539	7.39	5.96	0.08	68.96
Control Variables					
Closing Price	6539	37.54	22.92	5.04	463.95
Volatility (%)	6538	0.37	0.20	0.01	2.36

Dollar Volume (billions)	6539	65.10	142	0.03	2,752
Total Assets (millions)	6324	18,627	103,148	0.01	3,001,251
Intangible assets (millions)	6021	2,166	7,890	0.00	169,054
R&D Expenditure (millions)	5456	6.98	123.76	0.00	5,052
Dividend per share	6175	0.54	0.83	0.00	17.27
Market Return (%)	6539	-0.02	0.27	-1.54	2.05

Table 2
Liquidity and Corporate Governance

This table reports the OLS results of the following regression model:

$$Percentage\ Spread_{i,t} or Gibbs\ estimate_{i,t}\ or\ Turnover_{i,t} = \beta_0 + \beta_1 Level\ of\ Monitoring_{i,t} + \beta_2\ Log(Closing\ Price_{i,t}) + \beta_3\ R\&D\ Expenditure_{i,t} + \beta_4\ Total\ Assets_{i,t} + \beta_5\ Log(Dollar\ Volume_{i,t}) + \beta_6\ Volatility_{i,t} + \beta_7\ Intangible\ Asset_{i,t} + \beta_8\ Dividend\ per\ share_{i,t} + \beta_9 MarketReturn_{i,t} + \varepsilon_{i,t}$$

where *Percentage Spread* is the percent quoted spread, *Gibbs estimate* is a measure of effective cost calculated using Gibb's sampler, *Turnover* is average daily volume as a proportion of shares outstanding, *Level of Monitoring* is measured as internal governance (relative age difference), internal/external governance (Gov-Index), and external governance (institutional ownership and analysts following), *Closing Price* is the mean daily stock price at the close, *R&D Expenditure* is a firm's annual expenditure on research and development activities, *Total Assets* is the book value of a firm's total assets, *Dollar Volume* is the mean daily dollar trading volume, *Volatility* is the standard deviation of daily returns, *Intangible Assets* is the book value of total intangible assets, *Dividend per share* is the dividend paid per share, *Market Return* is the daily return on S&P index, and $\varepsilon_{i,t}$ is the error term. The subscripts *i* and *t* refers to stock *i* and year *t*. White's corrected standard errors are reported in parentheses.

Variable	Gibbs estimate			Percentage Spread			Turnover		
	Model l	Model2	Model3	Model1	Model2	Model3	Model1	Model2	Model3
Relative Age Difference	-0.063** (0.032)	-0.061* (0.032)	-0.063** (0.031)	-0.138* (-0.076)	-0.153** (0.073)	-0.186*** (0.072)	0.020** (0.009)	0.022*** (0.008)	0.024*** (0.008)
Gov-Index			-3.378*** (0.951)			-25.62*** (1.983)			1.280*** (0.271)
Institutional Ownership		-1.570 (1.371)	-0.873 (1.388)		-35.50*** (3.140)	-29.93*** (3.055)		8.056*** (0.387)	7.777*** (0.392)
Number of Analysts		0.213*** (0.044)	0.191*** (0.045)		1.181*** (0.098)	1.001*** (0.097)		-0.098*** (0.016)	-0.089*** (0.016)
Closing Price	-2.141*** (0.485)	-1.653*** (0.491)	-1.912*** (0.488)	-7.348*** (1.146)	-3.571*** (1.118)	-5.484*** (1.107)	1.135*** (0.191)	0.651*** (0.180)	0.747*** (0.178)
R& D Expenditure	9.163 (6.272)	12.96** (6.550)	14.53** (6.730)	-36.06* (21.74)	-8.981 (20.53)	3.702 (21.13)	9.216 (5.825)	5.366 (5.215)	4.732 (5.249)
Total Assets	0.065 (0.091)	0.062 (0.091)	0.064 (0.091)	0.097* (0.054)	0.043 (0.034)	0.053* (0.031)	-0.042** (0.017)	-0.029** (0.012)	-0.030** (0.012)

Dollar Volume	-1.810***	-2.540***	-2.281***	-4.805***	-8.400***	-6.525***	1.251***	1.457***	1.363***
	(0.200)	(0.280)	(0.294)	(0.422)	(0.579)	(0.594)	(0.069)	(0.086)	(0.083)
Volatility	67.23***	68.70***	67.54***	110.0***	119.1***	110.6***	17.25***	16.35***	16.77***
	(2.884)	(2.974)	(2.996)	(6.193)	(6.160)	(6.004)	(0.871)	(0.816)	(0.831)
Intangible assets	0.102	0.148	0.130	2.874***	2.140***	2.196***	-1.002***	-0.801***	-0.803***
	(0.670)	(0.690)	(0.689)	(0.629)	(0.607)	(0.563)	(0.159)	(0.135)	(0.132)
Dividend per share	-1.108***	-1.112***	-1.029***	0.797	0.403	0.960**	-0.156*	-0.031	-0.059
	(0.218)	(0.231)	(0.223)	(0.553)	(0.458)	(0.473)	(0.089)	(0.071)	(0.071)
Market Return	-3.531***	-2.944**	-2.806**	-45.60***	-42.22***	-41.23***	2.435***	1.917***	0.024***
	(1.262)	(1.239)	(1.236)	(2.484)	(2.455)	(2.430)	(0.303)	(0.284)	(0.008)
Adjusted R^2	0.420	0.426	0.428	0.403	0.452	0.477	0.326	0.407	0.411

Table 3
Internal governance for firms with older vs. younger CEOs

To investigate if the CEO horizon impacts the effect of internal governance on liquidity, we divide the sample firms into two subsamples; firms with CEOs above the sample mean CEO age (55 years old) and firms with CEOs below the sample mean CEO age. This table reports the OLS results of the following regression model:
$Percentage\ Spread_{i,t}$ *or* $Gibbs\ estimate_{i,t}$ *or* $Turnover_{i,t} = \beta_0 + \beta_1 Level\ of\ Monitoring_{i,t} + \beta_2\ Log(Closing\ Price_{i,t}) + \beta_3\ R\&D\ Expenditure_{i,t} + \beta_4\ Total\ Assets_{i,t} + \beta_5\ Log(Dollar\ Volume_{i,t}) + \beta_6\ Volatility_{i,t} + \beta_7\ Intangible\ Asset_{i,t} + \beta_8\ Dividend\ per\ share_{i,t} + \beta_9\ Market\ Return_{i,t} + \varepsilon_{i,t}$
where *Percentage Spread* is the percent quoted spread, *Gibbs estimate* is a measure of effective cost calculated using Gibb's sampler, *Turnover* is average daily volume as a proportion of shares outstanding, *Level of Monitoring* is measured as internal governance (relative age difference), internal/external governance (Gov-Index), and external governance (institutional ownership and analysts following),*Closing Price* is the mean daily stock price at the close, *R&D Expenditure* is a firm's annual expenditure on research and development activities, *Total Assets* is the book value of a firm's total assets, *Dollar Volume* is the mean daily dollar trading volume, *Volatility* is the standard deviation of daily returns, *Intangible Assets* is the book value of total intangible assets, *Dividend per share* is the dividend paid per share, *Market Return* is the daily return on S&P index, and $\varepsilon_{i,t}$ is the error term. White's corrected standard errors are reported in parentheses.

Panel A: Internal Governance for the sub-samples of firms divided based on CEO horizon

Variable	N	Mean	Median	Minimum	Maximum	SD
CEO above 55						
CEO Age	2077	59.90	59.00	55.33	91.00	4.31
Subordinate Managers' Age	2077	51.71	51.67	36.00	81.00	4.47
Relative Age Difference	2050	7.91	7.33	-25.00	36.33	6.11
CEO under 55						
CEO Age	2261	49.85	51.00	34.00	54.80	3.70
Subordinate Managers' Age	2261	49.75	49.67	33.00	76.00	4.39
Relative Age Difference	2228	-0.08	0.25	-22.00	16.00	5.52

Panel B.

Variable	CEO above 55			CEO under 55		
	Gibbs estimate	Percentage Spread	Turnover	Gibbs estimate	Percentage Spread	Turnover
Relative Age Difference	-0.192***	-0.306***	0.054***	-0.012	-0.134	-0.012
	(0.054)	(0.118)	(0.013)	(0.116)	(0.174)	(0.024)
Gov-Index	-6.360***	-23.98***	0.758**	0.253	-25.43***	1.625***
	(1.416)	(2.770)	(0.347)	(2.177)	(3.908)	(0.607)
Institutional Ownership	-0.656	-28.89***	8.017***	-3.362	-22.97***	5.741***
	(1.951)	(4.453)	(0.498)	(3.306)	(6.277)	(0.956)
Number of Analysts	0.114*	0.733***	-0.080***	0.528***	1.429***	-0.105***
	(0.061)	(0.142)	(0.021)	(0.128)	(0.210)	(0.029)
Closing Price	-2.021***	-5.228***	0.853***	-1.990*	-2.238	0.741**
	(0.750)	(1.778)	(0.247)	(0.946)	(1.898)	(0.310)
R&D Expenditure	13.35	9.639	0.026	22.64	-23.10	-1.258
	(9.843)	(28.95)	(7.286)	(22.48)	(66.50)	(22.69)
Total Assets	0.077	0.023	-0.020**	-0.285*	0.595	-0.155*
	(0.102)	(0.028)	(0.009)	(0.170)	(0.671)	(0.0847)
Dollar Volume	-1.609***	-4.947***	1.373***	-3.999***	-9.920***	1.277***
	(0.389)	(0.926)	(0.117)	(0.893)	(1.229)	(0.176)
Volatility	67.47***	117.7***	18.29***	77.02***	121.7***	13.27***
	(4.415)	(9.426)	(1.149)	(7.313)	(11.19)	(1.576)
Intangible assets	-0.634	1.629***	-0.606***	3.354**	4.530	-1.991***
	(0.999)	(0.597)	(0.138)	(1.672)	(3.252)	(0.772)
Dividend per share	-0.771***	0.663	-0.094	-1.136***	1.014	-0.148
	(0.263)	(0.639)	(0.105)	(0.380)	(1.020)	(0.148)
Market Return	-1.353	-37.99***	1.914***	-2.562	-36.55***	1.757***
	(1.865)	(3.421)	(0.399)	(2.971)	(5.476)	(0.620)
Adjusted R^2	0.410	0.463	0.450	0.435	0.510	0.380

Table 4
Internal governance for firms requiring firm-specific skills

To further investigate if firm specific learning impacts the effect of internal governance on liquidity, we use Pantzalis and Park (2009) measure of excess value of human capital for each industry. We divided our sample firms into top 24 industries and the bottom 24 industries ranked based on the value of human capital and analyze the following regression model for each group:

$$Percentage\ Spread_{i,t} or Gibbs\ estimate_{i,t}\ or\ Turnover_{i,t} = \beta_0 + \beta_1 Level\ of\ Monitoring_{i,t} + \beta_2\, Log(Closing\ Price_{i,t}) + \beta_3\, R\&D\ Expenditure_{i,t} + \beta_4\, Total\ Assets_{i,t} + \beta_5\, Log(Dollar\ Volume_{i,t}) + \beta_6\, Volatility_{i,t} + \beta_7\, Intangible\ Asset_{i,t} + \beta_8\, Dividend\ per\ share_{i,t} + \beta_9\, Market\ Return_{i,t} + \varepsilon_{i,t}$$

where *Percentage Spread* is the percent quoted spread, *Gibbs estimate* is a measure of effective cost calculated using Gibb's sampler, *Turnover* is average daily volume as a proportion of shares outstanding, *Level of Monitoring* is measured as internal governance (relative age difference), internal/external governance (Gov-Index), and external governance (institutional ownership and analysts following), *Closing Price* is the mean daily stock price at the close, *R&D Expenditure* is a firm's annual expenditure on research and development activities, *Total Assets* is the book value of a firm's total assets, *Dollar Volume* is the mean daily dollar trading volume, *Volatility* is the standard deviation of daily returns, *Intangible Assets* is the book value of total intangible assets, *Dividend per share* is the dividend paid per share, *Market Return* is the daily return on S&P index, and $\varepsilon_{i,t}$ is the error term. White's corrected standard errors are reported in parentheses.

Panel A: Internal Governance for the sub-samples of firms divided based on importance of firm-specific knowledge

Variable	N	Mean	Median	Minimum	Maximum	SD
24 Top Human Capital Industry value						
CEO Age	2750	54.36	54.50	34.00	91.00	6.38
Subordinate Managers Age	2750	50.56	50.65	33.00	70.00	4.48
Relative Age Difference	2713	3.67	3.67	-18.50	29.33	6.80
24 Bottom Human Capital Industry value						
CEO Age	1816	55.15	55.00	34.00	87.00	5.98
Subordinate Managers Age	1816	50.92	50.85	36.00	81.00	4.59
Relative Age Difference	1787	3.84	3.50	-25.00	36.33	7.16

Panel B.

Variable	Top 24 Industries			Bottom 24 Industries		
	Gibbs estimate	Percent Spread	Turnover	Gibbs estimate	Percent Spread	Turnover
Relative Age Difference	-0.072*	-0.238***	0.031***	-0.050	-0.164	0.016
	(0.044)	(0.088)	(0.010)	(0.044)	(0.116)	(0.013)
Gov-Index	-2.196*	-26.79***	1.026***	-4.634***	-24.45***	1.684***
	(1.319)	(2.771)	(0.377)	(1.403)	(2.864)	(0.390)
Institutional Ownership	-0.657	-24.85***	7.115***	-1.024	-35.01***	7.870***
	(1.934)	(3.886)	(0.499)	(2.010)	(4.857)	(0.600)
Number of Analysts	0.227***	0.849***	-0.091***	0.161**	1.291***	-0.100***
	(0.063)	(0.123)	(0.020)	(0.065)	(0.153)	(0.027)
Closing Price	-1.280**	-3.837***	0.576***	-2.624***	-7.940***	0.858***
	(0.631)	(1.338)	(0.243)	(0.773)	(1.906)	(0.256)
R&D Expenditure	12.23	-6.285	5.095	473.9*	-1646**	391.3***
	(9.793)	(20.95)	(5.379)	(259.5)	(694.2)	(50.23)
Total Assets	0.070	0.064**	-0.027***	-0.038	-0.029	-0.240***
	(0.101)	(0.033)	(0.011)	(0.110)	(0.259)	(0.081)
Dollar Volume	-2.524***	-6.1417***	1.368***	-2.085***	-7.033***	1.547***
	(0.457)	(0.763)	(0.111)	(0.397)	(0.970)	(0.130)
Volatility	71.35***	111.3***	14.54***	62.16***	111.0	20.21***
	(4.157)	(7.720)	(1.044)	(4.288)	(9.605)	(1.216)
Intangible assets	0.231	1.923***	-0.762***	0.199	4.121***	-0.688**
	(1.046)	(0.597)	(0.147)	(0.388)	(1.060)	(0.304)
Dividend per share	-1.219***	1.294*	-0.038	-0.645*	0.529	-0.113
	(0.275)	(0.693)	(0.084)	(0.346)	(0.552)	(0.124)
Market Return	-3.813**	-40.13***	1.139***	-1.759	-42.42***	2.846***
	(1.738)	(3.329)	(0.385)	(1.752)	(3.548)	(0.407)
Adjusted R^2	0.440	0.476	0.369	0.409	0.483	0.479

Table 5
Internal governance for firms with experienced Subordinate Managers

To test the impact of experience of subordinate managers' in each firm, relative to their peers in the same industry, on liquidity, we divide our sample firms into two sub-samples based on Antia, Pantzalis and Park (2010) measure of expected decision horizon as summarized in equation (3). This table reports the OLS results of the following regression model for each of the sub-sample:

$$Percentage\ Spread_{i,t} or Gibbs\ estimate_{i,t}\ or\ Turnover_{i,t} = \beta_0 + \beta_1 Level\ of\ Monitoring_{i,t} + \beta_2\, Log(Closing\ Price_{i,t}) + \beta_3\, R\&D\ Expenditure_{i,t} + \beta_4\, Total\ Assets_{i,t} + \beta_5\, Log(Dollar\ Volume_{i,t}) + \beta_6\, Volatility_{i,t} + \beta_7\, Intangible\ Asset_{i,t} + \beta_8\, Dividend\ per\ share_{i,t} + \beta_9\, Market\ Return_{i,t} + \varepsilon_{i,t}$$

where *Percentage Spread* is the percent quoted spread, *Gibbs estimate* is a measure of effective cost calculated using Gibb's sampler, *Turnover* is average daily volume as a proportion of shares outstanding, *Level of Monitoring* is measured as internal governance (relative age difference), internal/external governance (Gov-Index), and external governance (institutional ownership and analysts following),*Closing Price* is the mean daily stock price at the close, *R&D Expenditure* is a firm's annual expenditure on research and development activities, *Total Assets* is the book value of a firm's total assets, *Dollar Volume* is the mean daily dollar trading volume, *Volatility* is the standard deviation of daily returns, *Intangible Assets* is the book value of total intangible assets, *Dividend per share* is the dividend paid per share, *Market Return* is the daily return on S&P index, and $\varepsilon_{i,t}$ is the error term. White's corrected standard errors are reported in parentheses.

Panel A: Internal Governance for the sub-samples of firms divided based on Subordinate Managers level of Experience

Variable	N	Mean	Median	Minimum	Maximum	SD
Experienced Subordinates Managers						
CEO Age	503	54.64	54.00	39.00	91.00	6.69
Subordinate Managers Age	503	51.71	51.50	39.00	79.00	5.40
Relative Age Difference	500	2.55	2.83	-25.00	23.67	7.70
Inexperienced Subordinates Managers						
CEO Age	532	54.28	54.50	38.00	78.00	6.38
Subordinate Managers Age	532	49.87	49.71	39.33	81.00	4.28
Relative Age Difference	526	4.19	4.21	-25.00	27.67	7.04

Panel B.

Variable	Experienced Subordinate Managers			Inexperienced Sub Managers		
	Gibbs estimate	Percent Spread	Turnover	Gibbs estimate	Percent Spread	Turnover
Relative Age Difference	-0.102	-0.847***	0.076***	-0.091	-0.277	0.008
	(0.087)	(0.237)	(0.016)	(0.099)	(0.181)	(0.023)
Gov-Index	0.032	-20.131***	0.719	-7.318**	-13.950**	0.007
	(3.122)	(6.453)	(0.754)	(3.467)	(6.079)	(0.824)
Institutional Ownership	7.267*	-42.087***	11.363***	-1.903	-44.557***	8.564***
	(4.392)	(9.506)	(1.053)	(4.991)	(9.292)	(1.105)
Number of Analysts	0.327**	1.785***	-0.109***	0.449***	1.241***	-0.131***
	(0.137)	(0.373)	(0.041)	(0.145)	(0.290)	(0.039)
Closing Price	-0.866	6.218	-0.633	-2.142	-6.717**	1.179***
	(1.911)	(4.102)	(0.449)	(1.522)	(3.327)	(0.431)
R& D Expenditure	15.925*	28.271	-8.284**	81.935	27.423	-31.971*
	(8.782)	(25.171)	(3.548)	(51.450)	(104.357)	(16.582)
Total Assets	-0.055	0.090	-0.144***	-0.322	1.000	-0.514***
	(0.088)	(0.258)	(0.031)	(0.649)	(0.715)	(0.158)
Dollar Volume	-3.755***	-12.992***	1.835***	-3.538***	-9.326***	1.952***
	(1.035)	(2.036)	(0.212)	(0.988)	(1.851)	(0.221)
Volatility	80.018***	142.265***	14.943***	63.338***	117.271***	13.98***
	(11.673)	(19.222)	(2.020)	(8.363)	(18.448)	(2.203)
Intangible assets	1.728*	6.395***	-1.674***	6.218*	4.538	-3.879***
	(0.938)	(2.194)	(0.304)	(3.734)	(3.952)	(0.891)
Dividend per share	0.291	-0.739	0.437	-0.593	-0.509	0.284***
	(1.268)	(2.213)	(0.318)	(0.487)	(1.118)	(0.086)
Market Return	-6.220	-39.319***	2.433***	0.103	-40.156***	1.307
	(3.963)	(7.177)	(0.653)	(3.446)	(6.860)	(0.829)
Adjusted R^2	0.452	0.499	0.523	0.402	0.550	0.485

Table 6
Alternative internal governance measure: Industry adjusted age difference

To control for variation in the level of internal governance due to the inherent differences across industries, we adjust our measure of internal governance as follows:
Industry adjusted Age Difference$_{i,t}$ = Age Difference$_{i,t}$ – Age Difference$_{ind,t}$, where, Age Difference$_{i,t}$ is the difference between CEO's age and top 4 subordinate managers' ages for firm *i* and year *t*, Age Difference$_{ind,t}$ is the Age Difference for the industry*i* and year *t*. Then we use the industry adjusted internal governance measure and analyze the following regression model:
$Percentage\ Spread_{i,t} or Gibbs\ estimate_{i,t}\ or\ Turnover_{i,t} = \beta_0 + \beta_1 Level\ of\ Monitoring_{i,t} + \beta_2 Log(Closing\ Price_{i,t}) + \beta_3 R\&D\ Expenditure_{i,t} + \beta_4 Total\ Assets_{i,t} + \beta_5 Log(Dollar\ Volume_{i,t}) + \beta_6 Volatility_{i,t} + \beta_7 Intangible\ Asset_{i,t} + \beta_8 Dividend\ per\ share_{i,t} + \beta_9 Market\ Return_{i,t} + \varepsilon_{i,t}$
where *Percentage Spread* is the percent quoted spread, *Gibbs estimate* is a measure of effective cost calculated using Gibb's sampler, *Turnover* is average daily volume as a proportion of shares outstanding, *Level of Monitoring* is measured as internal governance (relative age difference), internal/external governance (Gov-Index), and external governance (institutional ownership and analysts following), *Closing Price* is the mean daily stock price at the close, *R&D Expenditure* is a firm's annual expenditure on research and development activities, *Total Assets* is the book value of a firm's total assets, *Dollar Volume* is the mean daily dollar trading volume, *Volatility* is the standard deviation of daily returns, *Intangible Assets* is the book value of total intangible assets, *Dividend per share* is the dividend paid per share, *Market Return* is the daily return on S&P index, and $\varepsilon_{i,t}$ is the error term. White's corrected standard errors are reported in parentheses.

	Gibbs estimate	Percent Spread	Turnover
Industry Adjusted Age Difference	-0.058*	-0.177**	0.016*
	(0.032)	(0.073)	(0.008)
Gov-Index	-3.368***	-25.575***	1.267***
	(0.952)	(1.983)	(0.272)
Institutional Ownership	-0.876	-29.961***	7.781***
	(1.389)	(3.054)	(0.392)
Number of Analysts	0.189***	1.003***	-0.088***
	(0.045)	(0.096)	(0.016)
Closing Price	-1.914***	-5.480***	0.751***
	(0.489)	(1.108)	(0.178)
R&D Expenditure	14.436**	3.162	4.793
	(6.738)	(21.257)	(5.280)
Total Assets	0.063	0.052*	-0.029**
	(0.091)	(0.031)	(0.012)
Dollar Volume	-2.272***	-6.500***	1.357***
	(0.294)	(0.592)	(0.083)
Volatility	67.412***	110.201***	16.830***
	(2.983)	(5.990)	(0.830)
Intangible assets	0.142	2.213***	-0.805***
	(0.691)	(0.567)	(0.132)
Dividend per share	-1.026***	0.964**	-0.061
	(0.223)	(0.474)	(0.071)
Market Return	-2.834**	-41.297***	1.881***
	(1.237)	(2.431)	(0.284)
Adjusted R^2	0.428	0.477	0.410

Table 7
Positive vs. Negative Industry-Adjusted Age Difference

To further investigate if industry-adjusted internal governance measure affects liquidity, we divide our sample firms into groups with positive and negative industry adjusted age differences and analyze the following regression model for each sub-sample:

$$Percentage\ Spread_{i,t} or Gibbs\ estimate_{i,t}\ or\ Turnover_{i,t} = \beta_0 + \beta_1 Level\ of\ Monitoring_{i,t} + \beta_2\, Log(Closing\ Price_{i,t}) + \beta_3\, R\&D\ Expenditure_{i,t} + \beta_4\, Total\ Assets_{i,t} + \beta_5\, Log(Dollar\ Volume_{i,t}) + \beta_6\, Volatility_{i,t} + \beta_7\, Intangible\ Asset_{i,t} + \beta_8\, Dividend\ per\ share_{i,t} + \beta_9\, Market\ Return_{i,t} + \varepsilon_{i,t}$$

where *Percentage Spread* is the percent quoted spread, *Gibbs estimate* is a measure of effective cost calculated using Gibb's sampler, *Turnover* is average daily volume per share outstanding, *Turnover* is average daily volume as a proportion of shares outstanding, *Level of Monitoring* is measured as internal governance (relative age difference), internal/external governance (Gov-Index), and external governance (institutional ownership and analysts following), *Closing Price* is the mean daily stock price at the close, *R&D Expenditure* is a firm's annual expenditure on research and development activities, *Total Assets* is the book value of a firm's total assets, *Dollar Volume* is the mean daily dollar trading volume, *Volatility* is the standard deviation of daily returns, *Intangible Assets* is the book value of total intangible assets, *Dividend per share* is the dividend paid per share, *Market Return* is the daily return on S&P index, and $\varepsilon_{i,t}$ is the error term. White's corrected standard errors are reported in parentheses.

Panel A: Internal Governance for the sub-samples of firms divided based on level of industry adjusted internal governance

Variable	N	Mean	Median	Minimum	Maximum	SD
Positive Industry adjusted measure (Firm-Industry)						
CEO Age	2239	58.01	57.50	40.00	91.00	5.59
Sub Managers' Age	2239	49.23	49.25	33.00	65.50	4.15
Relative Age Difference	2239	8.99	8.00	-3.50	36.33	4.77
Industry adjusted Age Difference	2239	5.25	4.20	0.00	31.97	4.42
Negative industry adjusted measure (Firm-Industry)						
CEO Age	2229	51.38	51.50	34.00	68.50	5.01
Sub Managers' Age	2229	52.07	52.00	39.33	70.00	4.20
Relative Age Difference	2229	-1.35	-0.50	-15.50	13.33	4.19
Industry adjusted Age Difference	2229	-5.11	-4.18	-17.90	0.00	3.95
Panel B.						

Variable	Positive Age difference relative to the industry			Negative Age difference relative to the industry		
	Gibbs estimate	Percent Spread	Turnover	Gibbs estimate	Percent Spread	Turnover
Industry adjusted Age Difference	-0.192*** (0.066)	-0.507*** (0.146)	0.043** (0.017)	-0.032 (0.077)	-0.133 (0.170)	-0.002 (0.024)
Gov-Index	-5.534*** (1.353)	-29.712*** (2.872)	0.974*** (0.369)	-1.047 (1.353)	-21.115*** (2.631)	1.611*** (0.409)
Institutional Ownership	0.173 (2.112)	-27.927*** (4.611)	7.106*** (0.554)	-1.766 (1.890)	-31.028*** (4.010)	8.467*** (0.580)
Number of Analysts	0.102 (0.065)	0.781*** (0.127)	-0.079*** (0.021)	0.278*** (0.065)	1.251*** (0.147)	-0.093*** (0.024)
Closing Price	-2.193*** (0.775)	-6.504*** (1.714)	0.719*** (0.258)	-1.730*** (0.634)	-5.555*** (1.432)	0.884*** (0.257)
R&D Expenditure	11.412 (9.368)	17.556 (30.012)	-1.445 (8.453)	18.259*** (6.582)	-10.566 (25.897)	8.954* (5.184)
Total Assets	0.249 (0.240)	0.060 (0.064)	-0.062*** (0.017)	-0.022 (0.015)	0.067** (0.033)	-0.019* (0.010)
Dollar Volume	-1.703*** (0.416)	-5.623*** (0.876)	1.422*** (0.110)	-3.083*** (0.414)	-7.217*** (0.779)	1.283*** (0.128)
Volatility	65.255*** (4.107)	110.691*** (7.773)	15.772*** (1.146)	69.135*** (4.368)	109.706*** (9.228)	17.659*** (1.200)
Intangible assets	-0.715 (1.425)	3.178*** (0.812)	-1.077*** (0.263)	0.956** (0.385)	1.432** (0.625)	-0.622*** (0.138)
Dividend per share	-1.152*** (0.357)	2.596*** (0.735)	-0.217** (0.094)	-0.898*** (0.267)	0.266 (0.475)	0.014 (0.088)
Market Return	-2.723 (1.765)	-46.714*** (3.614)	1.975*** (0.387)	-2.923* (1.763)	-37.288*** (3.311)	1.874*** (0.423)
Adjusted R^2	0.401	0.479	0.426	0.467	0.481	0.396

Table 8
Internal Governance and Information Content

To assess the extent to which internal governance is associated with the information contents of prices, we analyze the following regression model:

$IVOL = \alpha_0 + \beta_1 Internal\ Monitoring_{i,t} + \beta_2 Log(Closing\ Price_{i,t}) + \beta_3 R\&D\ Expenditure_{i,t} + \beta_4 Total\ Assets_{i,t} + \beta_5 Log(Dollar\ Volume_{i,t}) + \beta_6 Intangible\ Asset_{i,t} + \beta_7 Dividend\ per\ share_{i,t} + \beta_8 Market\ Return_{i,t} + \varepsilon_{i,t}$

where *IVOL* represents the idiosyncratic volatility of stock i during period t. IVOL in model 1 use S&P 500 return as the sole market factor. While the second model use Fama and French (1993) three-factor model. *Internal Monitoring* (relative age difference), *Closing Price* is the mean daily stock price at the close, *R&D Expenditure* is a firm's annual expenditure on research and development activities, *Total Assets* is the book value of a firm's total assets, *Dollar Volume* is the mean daily dollar trading volume, *Volatility* is the standard deviation of daily returns, *Intangible Assets* is the book value of total intangible assets, *Dividend per share* is the dividend paid per share, *Market Return* is the daily return on S&P index, and $\varepsilon_{i,t}$ is the error term. White's corrected standard errors are reported in parentheses.

	Model 1	Model2
Age Difference	0.048***	0.050***
	(0.166)	(0.167)
Closing Price	-0.404***	-0.400***
	(3.080)	(3.100)
R&D Expenditure	-0.003	-0.001
	(0.004)	(0.004)
Total Assets	-0.017	-0.017
	(0.000)	(0.000)
Dollar Volume	0.093***	0.064***
	(0.959)	(0.971)
Intangible assets	-0.128***	-0.135***
	(0.000)	(0.000)
Dividend per share	-0.198***	-0.194***
	(2.784)	(2.841)
Market Return	-0.209***	-0.202***
	(5.228)	(5.241)
Adjusted R^2	0.280	0.288

Table 9
Fixed Effects

To control for the effects of differences across industries on the liquidity and level of monitoring, we analyze the following regression model:
$Liquidity_{i,t} = \alpha_0 + \beta_1 Level\ of\ Monitoring_{i,t} + \beta_2\ Log(Closing\ Price_{i,t}) + \beta_3\ R\&D\ Expenditure_{i,t} + \beta_4\ Total\ Assets_{i,t} + \beta_5\ Log(Dollar\ Volume_{i,t}) + \beta_6\ Volatility_{i,t} + \beta_7\ Intangible\ Asset_{i,t} + \beta_8\ Dividend\ per\ share_{i,t} + \beta_9\ Market\ Return_{i,t} + \sum_{i=1}^{48} \beta_i Industry_i + \varepsilon_{i,t}$
where *Liquidity* is measured in terms of *Percentage Spread*, which is the percent quoted spread, *Gibbs estimate*, which is a measure of effective cost calculated using Gibb's sampler, and *Turnover* is average daily volume as a proportion of shares outstanding, *Level of Monitoring* is measured as internal governance (relative age difference), internal/external governance (Gov-Index), and external governance (institutional ownership and analysts following),*R&D Expenditure* is a firm's annual expenditure on research and development activities, *Total Assets* is the book value of a firm's total assets, *Dollar Volume* is the mean daily dollar trading volume, *Volatility* is the standard deviation of daily returns, *Intangible Assets* is the book value of total intangible assets, *Dividend per share* is the dividend paid per share, *Market Return* is the daily return on S&P index, *Industry* is a dummy variable that takes value 1 if the firm *i* belongs to industry *i*, and $\varepsilon_{i,t}$ is the error term. White's corrected standard errors are reported in parentheses.

Variable	GibbsC-estimate	Percentage Spread	Turnover
Relative Age Difference	-0.063**	-0.174***	0.016**
	(0.030)	(0.061)	(0.008)
Gov-Index	-2.900***	-26.94***	1.417***
	(0.943)	(1.906)	(0.253)
Institutional Ownership	-0.327	-26.25***	7.527***
	(1.452)	(2.913)	(0.387)
Number of Analysts	0.231***	1.129***	-0.110***
	(0.053)	(0.106)	(0.014)
Closing Price	-1.851***	-4.729***	0.623***
	(0.526)	(1.059)	(0.141)
R&D Expenditure	6.612	-3.446	-0.368***
	(16.95)	(35.65)	(4.739)
Total Assets	0.103***	0.052	-0.025***
	(0.034)	(0.068)	(0.009)
Dollar Volume	-2.632***	-6.926***	1.377***
	(0.273)	(0.543)	(0.072)
Volatility	66.09***	122.2***	14.70***
	(2.183)	(4.367)	(0.581)
Intangible assets	0.298	2.333***	-0.619***
	(0.497)	(0.786)	(0.104)
Dividend per share	-0.740**	0.541	-0.150**
	(0.304)	(0.578)	(0.077)
Market Return	-2.589**	-39.83***	1.643***
	(1.067)	(2.155)	(0.287)
Industry Fixed Effect	Yes	Yes	Yes

Appendix A
Variable Description and source

Variable	Description	Source
CEO Age	Mean CEO age for each firm each year	EXECUCOMP
Subordinate Manager Age	Mean age for top 4 managers for each firm each year	EXECUCOMP
Relative Age Difference	Difference between the mean CEO age and mean subordinate manager age	EXECUCOMP
Gov-Index	Chung, Elder and Kim (2010) Governance Index	Institutional Shareholders Services (ISS)
Institutional Ownership (%)	Proportions of stocks held by institutions	Spectrum CDA
Number of Analysts	Number of analysts following a firm	I/B/E/S
Gibbs estimate (%)	Hasbrouck's Gibbs estimate using Gibbs Sampler	Hasbrouck's website
Percent Spread	Quoted spread as a proportion of quote midpoint	CRSP
Turnover Ratio	Dollar volume per share outstanding	CRSP
S and P index return (%)	Daily return on S and P 500 index	CRSP
Closing Price	Daily closing price for a stock	CRSP
R& D Expenditure(Millions)	Annual firm expense on research and development activity	COMPUSTAT
Dollar Volume (billions)	Daily dollar volume	CRSP
Total Assets (millions)	Firm's total assets	COMPUSTAT
Volatility (%)	Standard deviation of returns	CRSP
Intangible assets (mill)	Total intangible assets	COMPUSTAT
Dividend per share	Dollar dividend paid per share outstanding	COMPUSTAT